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Fieleke
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Goodhart
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Kopcke
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The Political Economy of Monetary Policy: National and International Aspects

Edited by
Donald R. Hodgman

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Department of Economics and College of Commerce and Business Administration

Proceedings of a Conference Held in July 1983

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Held at Perugia, Italy
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Contents

Preface

Actual monetary policy decisions result from a complex mixture of technical economic considerations, domestic socio-political forces, and influences stemming from international economic and political relations. These themes provided the agenda for papers presented at a conference held in Perugia, Italy on July 19-22, 1983 and published in this volume.

The conference brought together academic students of monetary policy, central bankers, and staff members of international organizations concerned with international monetary cooperation. The principal papers and discussants' comments can be organized under three main headings. First, there are five country-oriented studies concerned, respectively, with the political economy of monetary policy in France, Italy, the Federal Republic of Germany, the United Kingdom and the United States. These papers and comments constitute part I of this volume. Part II presents five papers that take a comparative or international approach to various issues in monetary policy. These issues include the determinants of central bank behavior in using domestic policy instruments, central bank intervention policy in foreign exchange markets, and an investigation of ex ante crowding out in the E.E.C. member countries as this may influence possibilities for macroeconomic (including monetary) policy coordination in the E.E.C. . Part III presents three theoretical papers concerning, respectively, the choice between a credit or monetary aggregate as intermediate monetary target in an open economy, alternatives to exchange market intervention as means to influence a country's exchange rate, and estimation methods appropriate to reaction function or control theory models of central bank behavior.

The conference was made possible by the generous cooperation of the central banks and international organizations whose staff members participated and by principal support from several sources. The Banca d'Italia hosted the conference in flawless fashion at its School of Automation for Bank Executives in Perugia, Italy. The Federal Reserve Bank of Boston is publishing the conference proceedings in this volume. The Volkswagen Foundation and the Council for European Studies assisted with travel expenses for some participants and with various preparatory expenses. The Department of Economics and the College of Commerce and Business Administration at the University of Illinois, Urbana-Champaign also contributed support. To all these I express sincere thanks on behalf of the conference. Finally, I wish to express my appreciation to Ruth Norr for her skill and diligence in copy editing this volume.

Donald R. Hodgman
Champaign, Illinois

Introductory Remarks

Lamberto Dini*

Just a few words by way of introduction to the opening session of this important Conference.

First, I wish you all a very warm welcome on behalf of the Bank of Italy and, in particular, on behalf of the Governor himself. The Conference has been convened in a place that usually hosts courses and seminars for the Bank's internal training programs and for periodical exchanges of views with public and private institutions, experts, and academics. I hope this environment will prove suitable for your work and that you will spend a pleasant period in Perugia.

As you all know, this Conference sets out to be a follow-up of the one held on the same subject in Urbana in November 1981. Both events owe much to the generous sponsorship of private and official institutions, and particularly to the imaginative effort of Professor Donald Hodgman. I am sure that you will share my appreciation and gratitude for what they have done.

The importance of the subject matter—the political economy of monetary policy—hardly needs stressing, and its timing could not have been more appropriate. Almost throughout the four years that have elapsed since the second oil shock, the objective of reducing inflation has been given top priority in all major countries, and monetary policy has been in the van of the stabilization effort.

Interest rates have remained exceptionally high, well above inflation, for an exceptionally long period; financial innovation has accelerated dramatically; new techniques and procedures have been introduced to strengthen monetary control in a rapidly changing environment. Gradually, inflation in major industrial countries has been brought back to the levels of the sixties.

I suspect however that this experience has in varying degrees shaken some of the beliefs firmly held by academic economists and central bankers as well as government officials.

Allow me to elaborate a bit on these various points.

When we entered this troubled period, monetary policy had already been put in the dock for some time by both monetarists and rational expectations theorists, on the ground that it allowed a sustained rise in inflation and increased—rather than moderating—cyclical instability in the real economy. The monetarists stressed the long-term neutrality of money, the long operating lags of monetary policy, and the temporary nature of its

*Director General, Bank of Italy.

effects on output and employment. The rationalists focused instead on the announcement effects of policies, which bring the future to the present; they short-circuit the relationship between money, activity levels and inflation, and reduce it to an instantaneous, one-directional causal chain.

Strict control of monetary growth thus came to be seen as the necessary, and perhaps also the sufficient, condition for disinflation; strong emphasis was laid on the need for steadiness and predictability in monetary policy management. Indeed, some extreme interpretations actually recommended the legislative introduction of monetary "rules."

The influence of these ideas coupled with the public's mounting concern about inflation led to much tighter monetary policy, to greater emphasis on controlling quantitative aggregates rather than interest rates, and to wider use of "targeting" as a way to enforce greater consistency and steadiness in monetary policy management.

Developments over the past four years have shown that monetary policy is indeed a powerful instrument for bringing inflation under control.

However, many of the views that became established in academic thinking and exerted great influence on policymaking do not appear to have passed the acid test of experience. The evidence for an expectations-type monetary restraint on inflation is scanty; nor have the separate effects of the supply of money on prices been clearly identified, other than those resulting from the movements of interest rates and their effects on demand and supply conditions in the goods and labor markets.

Moreover, monetary restraint pursued hand-in-hand with expansionary fiscal policies for long periods has clearly revealed the interdependence between these two instruments and the crucial role that their mix plays in producing the desired effects on output and employment.

Also, the attempts made to implement a rigid control of monetary growth have met with growing difficulties, as financial innovation has spread and altered both the nature of targeted aggregates and their functional relationships with final policy objectives. In some cases, there were legitimate grounds for suspecting that the announced monetary management rule generated "perverse" behavior by private agents, which counted on the automatic response of central banks to short-term disturbances in targeted aggregates. The new instability in financial relationships again emphasizes the need for judgment and discretion in monetary policy management.

Finally, the exchange rate has emerged as a major actor, not only in the transmission of monetary impulses to the domestic economy, but also in linking developments in domestic and external financial markets and thus constraining each country's room for maneuver. Fresh problems—notably the international repercussions of monetary policies and the coordination of these policies among the major countries—have thus come to the fore in international discussions.

To sum up, besides influencing our thinking on how monetary management techniques work, recent experience compels us to review our theories and practices. For these reasons, I consider that this Conference addresses extremely important and relevant subjects, and that its timing could hardly have been improved.

The quality of the papers which have been submitted and the eminence of the participants with us today justify my hope that significant advances will be made in our understanding of the problems such as those I have referred to, as well as our ability to cope with them.

Part I
Monetary Policy of Selected Countries

The Political Economy of French Monetary Policy

Florin Aftalion*

I. Introduction

The purpose of this paper is to analyze the monetary policy decision process in France over the recent years. Since the end of World War II the French banking system has been submitted to several series of reforms. The most significant one took place between 1966 and 1971. In order to achieve more competition the authorities allowed the expansion of bank activities and the unchecked opening of new branches and reduced the regulatory differences between various types of banks. Finally, a very important reform was instituted in 1971 when the refinancing system, consisting of quasi-automatic rediscounting of trade acceptances, was replaced by the operation of the money market (marché monétaire).

We have chosen to concentrate on the September 1976 to December 1980 period and to compare monetary policy during this period with that of the preceding and especially of the following ones. In August 1976 a new government was appointed. Raymond Barre, its Prime Minister, decided to follow a more stringent monetary policy than previously and to this effect to control the expansion of the money supply. He instituted the announcement of monetary growth targets while implementing his policy by systematically using credit expansion ceilings (which had been used since 1973).

In May 1981, a socialist President of the Republic was elected who strongly opposed Raymond Barre's policy. Under the presidency of François Mitterrand a new and much more interventionist economic policy was announced and implemented through a series of legislative changes including nationalization of the banking system and of the leading industrial concerns. A series of measures of which the increase in Government spending (of 27 percent for fiscal 1982), financed in part by a record deficit of approximately 100 billion francs, strained the position of the franc. It seems likely that under these conditions factors affecting monetary policy will also have changed significantly although at the time of writing the instruments of this policy have not been altered significantly.

By focusing our attention on the Raymond Barre years we hope to deal with a homogeneous period, stable in terms of institutions, instruments, and objectives. Results obtained for this period could be compared

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to those of the preceding and following periods. Our findings, although limited in scope, should be more meaningful than those produced by the study of a longer period. But even during this limited interval a disturbance has occurred. On March 13, 1979 the European Monetary System was introduced compelling the French monetary authorities to keep the franc's exchange rate in a 2.25 percent fluctuation band around a central parity. The possibility that this was a turning point in French monetary policy should also be explored.

The organization of our paper is as follows: In the second section we will describe the intellectual climate, that is, the theories or ideas which seem to prevail among monetary policy decisionmakers, and state the official objectives of monetary policy and the instruments assigned to them. In the third section we will turn to the problem of the hierarchy of goals in monetary policy. This is an important issue given the specifics of the French technique of monetary control and the utilization of the financial system to stimulate particular sectors of the economy. In section four we will relate the authorities reaction function to their "utility function," analyze this reaction function and compare results for our reference period with those for former and especially latter ones.

This paper assumes that the reader has some knowledge about the French institutional setting.

II. Official Thinking

1. The intellectual climate

All the individuals involved in the monetary policy decisionmaking process must have some idea of how the world functions. When formalized such ideas become models. They inform the decisionmakers what changes to make to achieve given goals.

The academic community has produced a host of economic models stressing in particular what instruments to use to reduce inflation. Many of its members have criticized central bankers for not following recommendations arising from these models.

In the case of France, one of the difficulties in understanding why monetary authorities do not seem to follow any normative economic model when deciding monetary policy lies in the definition of who the monetary authorities are. A diagram showing links between various institutions involved in monetary policy would be misleading. Take intervention in the money market. Theoretically, it should be conducted by the Banque de France. In fact, at least two seemingly independent institutions, the Caisse des Dépôts et Consignations (CDC) and Crédit Agricole lend more to the money market than does the Central Bank.[1] Their activity is coordinated at

[1]For an analysis of the techniques involved in French monetary policy, see R. Raymond and J.H. David.

the ministerial level. The Directeur du Trésor at the Minister of the Economy has the upper hand on monetary policymaking. But his own decisions are subordinated to those of the Prime Minister. Under the previous political majority the President of the Republic and the Prime Minister themselves were involved in the design of monetary policy. Thus it is very difficult to locate responsibility in the hierarchy.

Returning to normative formal models of the economy, one wonders to what extent they are used by policymakers. In the case of France, as in most other countries, the answer is probably a mixed one. Most French high-ranking civil servants have received a pragmatic economic education (at institutions such as Ecole Nationale d'Administration) with less emphasis on modern economic theory than that advocated by most academics.[2]

Researchers at Banque de France and also at Institut National de la Statistique et des Etudes Economiques (INSEE), at Commissariat Général du Plan and at other public sector institutions are engaged in theoretical studies of the French economy and its monetary sector. The main output of these studies is a "theory of the overdraft economy"[3] developed especially at the Banque de France and various econometric models.[4] Although these models are used for simulations and forecasts, it is difficult to assess their importance in the policymaking process.

2. The objectives of monetary policy

In an article written towards the end of his tenure Raymond Barre defined the objectives and the instruments of his economy policy. For him: "l'inflation (constitue) en réalité la plus grave menace pour la croissance et l'emploi . . . la lutte contre l'inflation (est) prioritaire et (doit) s'inscrire dans la durée"—the fight against inflation should receive top priority and be of permanent concern. In order to achieve this objective he defined four instruments:

—control of the money supply achieved through credit control (credit ceilings). Interest rates should not be less than the inflation rate and long-term rates should be greater than short-term rates,

—reduction of the budget deficit,

—stabilization of real incomes and purchasing power,

—stabilization of the franc.

These objectives and these instruments, as expressed by R. Barre, are very general. Only the first and the last are of concern to us here. R. de la Genière, Governor of the Banque de France, has on several occasions

[2]A good analysis of who French civil servants are and among other things how they are trained can be found in Ezra Suleiman. Civil servants at the Direction du Trésor are described by Nigel Adams.

[3]Concerning the "overdraft economy" see V. Lévy-Garboua and G. Maarek, 1978 and 1982.

[4]A survey of these models has been published by the Commissariat Général du Plan. For a discussion of the integration of financial variables see R. Sterdyniak and H. Villa.

expressed a more precise view about monetary policy in France, which according to him should have three objectives (not really different from those of Raymond Barre). He presents and justifies them in the following way:

—the first objective of monetary policy is *to provide money to the economy*. R. de la Genière seems to believe in the quantity theory of money and in the relationship between inflation and monetary growth that it implies; but at the same time he considers that money should not be controlled irrespective of changes in other indicators. Therefore we should have a second objective which is:

—*to regulate interest rates*, in order to keep short-term rates slightly above the inflation rate and long-term rates above short-term ones. R. de la Genière contrasts this objective with the consequences of a purely monetarist policy under which interest rates can fluctuate widely and initiate a disruptive process if high interest rates are themselves a cause of inflation (as R. de la Genière assumes).

—the third objective is *to control the foreign exchange rate* by manipulating interest rates and thus influencing capital movements, as well as by intervening on the foreign exchange market.

According to R. de la Genière, foreign exchange control is important not only because France is bound by the rules of the European Monetary System but also because a depreciation of the franc is inflationary (by raising the cost of imports and because adherence to fixed foreign exchange rates provides discipline to French firms which then have to compete with goods produced in less inflationary economies).

Academic economists whatever their persuasion must present internally consistent theories to the scientific community. They may criticize R. de la Genière's objectives by pointing out that monetary policy can at best be used to achieve only one of them given the fact that they might contradict each other. R. de la Genière agrees that contradictions could exist in the short run. However, for him the act of government consists of reconciling them by proper policy measures. Unfortunately, he does not explain what these measures should be.

Obviously, academic economists may also point out that the justification of the three objectives may not be theoretically sound, that for instance high interest rates cannot be at the same time consequences and causes of inflation. Unfortunately, we do not know of any formal model which would incorporate all the features that R. de la Genière attributes to the French economy and thus would properly explain their coexistence.

For all the reasons mentioned above, R. de la Genière recommends that changes in French monetary policy should be *gradual* and allow inflation to be reduced over several years without upsetting interest and exchange rates. He points out that in today's very unstable international environment, this policy should also smooth out the consequences of dollar fluctuations on the French external sector.

III. Priority Ranking in Monetary Policy

As mentioned already, French monetary authorities attempt to control the money supply by limiting the volume of loans extended by the financial system.

The technique used consists of forecasting for the coming year changes in gold and foreign reserves of the Central Bank and Treasury financing needs. Given a target increase for the money supply, the desired growth of loans to the economy can be set as a difference (see Appendix). However, a problem arises. Several specific sectors of the economy (housing, exports, industrial development, agriculture, local entities) receive support from the government, in particular through subsidized loans (crédits aidés[5]). Restricting the volume of these loans would defeat their purpose. Therefore, their expansion is less severely limited than that for "ordinary" loans. In the latter case, monthly "ceilings" are fixed for each bank.

The credit ceiling method causes many problems concerning competition between banks (which *de facto* are given quotas) and efficient allocation of resources.

From the monetary authorities' point of view there is also a hierarchy of goals problem: given the total money expansion targets, what growth rate should be permitted for the different money supply sources? In particular, how severely should the expansion of subsidized loans be limited?

No public information is available concerning the bargaining process through which the expansion of privileged loans is decided. Nor do we know by which decisionmaking process ordinary loan increases are finally arrived at. It is only by studying actual figures presented in Table 1 that we can venture some assumption about the public authorities' hierarchy of goals.[6]

The total growth of the money supply over the 1977–1980 period, 60.4 percent, is quite close to the overall growth objective of 55.2 percent. This seemingly good result is diminished by the fact that, except for 1980, actual growth was systematically greater than the announced objective. The stability of the target growth rate, which has only been lowered by 1.5 percent in four years shows that the authorities were able to stabilize this rate at an average of 12.5 percent but not to reduce it significantly.

In a tightly regulated and controlled financial system it would seem easy for the authorities to control the sources of the money supply. Why then were the French authorities unable to reduce monetary growth in a more drastic fashion?

The answer to this question may be that control is applied to only one money supply source, ordinary loans, while other "uncontrolled" sources

[5]Methods used by the authorities to channel low interest loans to certain sectors of the economy are described by F. Aftalion, 1981.

[6]We have performed a similar analysis for the 1976–1978 period. See F. Aftalion and P. Poncet.

Table 1
Growth of Money and of Monetary Sources (end of year figures)

	1976	1977	1978	1979	1980	1981	1982
M2 growth objective	—	12.5%	12.0%	11.0%	11.0%	10 %	12.5–13.5%
Realized growth		13.9%	12.2%	14.4%	9.8%	11.4%	11.5%
M2 end of period (billion francs)	879.9	1002.0	1124.5	1286.4	1411.4	1573.8	1754.9
Sources of M2							
Gold and foreign reserves	41.3 (4.7%)	46.3	55.7	63.0	88.2	81.8	31.9
Treasury debt	120.3 (13.7%)	121.4	124.8	137.1	130.8	165.2	197.6
Loans from banks	915.9 (104.1%)	1041.8	1154.6	1351.6	1559.2	1786.4	2104.2
Nonmonetary funds	−125.0 (14.2%)	−134.1	−146.9	−183.2	−233.1	−253.1	−346.7
Other	−72.7 (8.3%)	−73.4	−63.8	−82.1	−132.9	−206.5	−232.2
Loans from banks:	915.9 (104.1%)	1041.8	1154.6	1351.6	1559.2	1786.4	
Controlled loans	678.6 (77.2%)	742.8	807.8	879.9	1007.9	1143.7	
Uncontrolled loans	167.4 (19.0%)	225.3	274.0	349.5	401.0	514.8	
Accruals, etc.	69.9 (7.9%)	73.7	72.8	122.2	150.3	127.9	

(Some slight discrepancies exist between figures in this table).
SOURCE: Rapports annuels du Conseil National du Crédit.

sometimes behave differently than forecasted by the central authorities.

"Gold and foreign reserves" more than doubled during the period but the growth of this item contributed only 8.8 percent to the money supply growth. Even less important was the contribution of the Treasury's debt (2· percent of monetary growth).

"Controlled loans" accounted for 77.1 percent of the money supply's source at the end of 1976 and grew by 48.5 percent over the total period; the growth of this category contributed 61.8 percent to the money supply growth. Detailed analysis shows that the ceilings imposed by the authorities most of the time effectively limited ordinary loans extended by banks. "Uncontrolled subsidized loans" accounted for only 19.0 percent of the sources of the money supply at the end of 1976 but grew by 139.5 percent to account for 28.4 percent of the sources of M2 at the end of 1980. This growth represents 43.9 percent of the growth of M2. Whether it was intentional or due to a slippage is difficult to assess.

Within the category of "uncontrolled loans" the most spectacular growth was that of loans to housing (crédits à l'habitat) with a growth of 67.6 billion francs (360 percent) (see Table 2). This can be explained by the introduction of a reform of credit incentives in this sector, which took effect in 1978–79. To the extent that the consequences of this reform may have been miscalculated, this particular increment in the growth of the sources of M2 could have been unintentional. But since the increases in the other uncontrolled loans, even if not as strong, are quite important, it seems reasonable to assume that the government's policy of channeling funds to specific sectors had a higher priority than the control of the money supply.

Table 2
Uncontrolled Loans (billion francs)

	End 1976	1977	1978	1979	1980
Loans in foreign currency	53.2	67.1	67.2	79.9	124.2
Exports	66.0	87.5	103.1	119.6	124.3
Special investments	9.9	24.7	30.8	35.1	38.8
Housing	14.7	23.5	44.1	81.7	82.3
Other	23.6	23.6	28.5	33.2	31.4
Total	167.4	226.4	273.7	349.5	401.0

(There are slight statistical discrepancies with data in Table 1).
SOURCE: Rapports du Conseil National du Crédit.

Note however that starting in 1978 the authorities tried to hamper the growth of uncontrolled loans by gradually integrating them into the "ceilings."

The socialist government has continued to control monetary growth and has used the same techniques as its predecessor. In 1981 and 1982 M2 grew by 11.4 percent and 11.5 percent respectively. These rates are lower than those of the previous period. Loans from banks expanded relatively faster than M2, which again was due to the behavior of uncontrolled loans (at least in 1981). The total of gold and foreign exchange reserves and Treasury debt has remained stable; the decrease of the former was compensated by the increase of the latter.

During 1981 and 1982 monetary growth was checked even more than before because banks increased their "nonmonetary" and "other" sources of funds (especially: long-term debt and equity, borrowing from financial nonbanking institutions and from foreign banks).

IV. Monetary Policy Reaction Functions

By studying the actual behavior of monetary authorities on the money market and on the foreign exchange market various authors have tried to reveal their objectives directly. In this case the technique used consists in fitting a reaction function to observed data. The monetary authorities' control variables (the interest rate on the money market, or the level of reserves on the foreign exchange market in the case of France) are regressed against whatever variables seem to influence official behavior. There are several problems with such a rough approach.[7] Our purpose is not to discuss these problems here but to report whatever significant results were obtained to date and to present and analyze our own.

1. Some results from the literature

A great number of empirical estimates of reaction functions have been published to date. These functions are either single equations used to analyze policymaking behavior or are part of a multi-equations system modeling some endogenous variable such as the exchange rate. Only very few of the reaction function studies are devoted to France. These use as reaction function instruments either the money market interest rate or the level of gold and foreign exchange held by the central bank.[9]

F. Aftalion and P. Artus and H. Styderniak estimated structural models of the French foreign exchange market. Both studies found that for 1968

[7]A discussion of these problems is presented at this conference. See J.E. Alt and J.T. Woolley.

[8]Some analyses of macroeconomic policy performed by using reaction functions are surveyed by J.E. Alt and J.T. Woolley. Recent work on multiequation systems include that of W.H. Branson, H. Hattunen and P. Masson and E.C. Suss.

[9]French banks can either borrow directly from the central bank by discounting certain well specified loans, or borrow from the money market (marché monétaire). Other participants to this market are the Banque de France and various financial nonbanking institutions. By its daily intervention the central bank keeps the overnight rate on this market above its short-run targets.

to 1973 and for 1971 to 1976, authorities intervene proportionally to the difference between the actual exchange rate and some target rate. The latter authors also show that the central bank raises the interest rate on the money market when foreign interest rates rise, when official reserves fall, when the franc depreciates or when the franc is expected to depreciate (that is, when the export/import ratio falls).

R. Pinçon has studied the behavior of the authorities on the money market over the 1966 to 1978 period. By using quarterly data he estimated the following equation:

$$
\begin{aligned}
(1)\quad TX_m &= \underset{(6.25)}{0.46}\ (TX_d)_l + \underset{(4.22)}{1.95}\ TCH + \underset{(5.94)}{1.34}\ \left(\frac{\Delta P}{P}\right)_l + \underset{(5.82)}{0.59}\ \left(\frac{\Delta Q}{Q}\right)_l \\
&\quad + \underset{(6.30)}{1.18}\left[\epsilon\left(\frac{MM}{GDP_l}\right)\right] + \underset{(5.11)}{1.07} ENC - \underset{(-2.86)}{2.07}
\end{aligned}
$$

t: (6.25) (4.22) (5.94) (5.82) (6.30) (5.11) (−2.86)

with $R^2 = 0.962$ and $DW = 2.00$.

Symbols have the following meaning:

TX_m: money market overnight rate, TX_d: Eurodollar 1 month rate, TCH: German mark rate (in francs), $\Delta P/P$: quarterly price increase (in %), $\Delta Q/Q$: quarterly industrial production change (in %), $[\epsilon(\frac{MM}{GDP})_l]$: gap between the (money supply)/GDP ratio and its long-term trend X 100, ENC: dummy variable used when credit ceilings are applied, $(\ \ )_l$: indicates variables smoothed over several periods by using Almon's method.

Pinçon's results indicate that the central bank raises the money market interest rate when the dollar interest rates rise and when the franc depreciates vis-à-vis the German mark. It also shows that the money market interest rate rises more than proportionally to the inflation rate, that it rises with production and that it decreases with the velocity of money.

2. The model

We will assume that monetary authorities are trying to maximize a utility function which has two types of arguments: a policy instrument (the money market interest rate for instance) which takes the value X(t) at time t and a target variable Y(t) (the rate of some foreign currency). A general form of this utility function could be:

$$
\begin{aligned}
(2)\quad U(t) = &-a\,X(t) - b\,X(t)^2 - c[X(t) - X(t-1)]^2 - Y - e\,Y(t)^2 \\
&- f[Y(t) - Y(t)^*]^2
\end{aligned}
$$

where all the coefficients are positive (a and b would have positive signs in U if the policy instrument is the level of gold and foreign reserves).

The meaning of such a utility function is that authorities would like the levels of the policy instrument and of the target variable to be as low as possible. They would also like changes of the policy instrument between one period and the next and differences between the target variable and some optimal value Y(t)* (which may change through time) to be as small as possible.

If authorities view the target variable as being influenced by the policy instrument as well as by an exogenous variable Z, their behavior will be constrained by what they see as a reduced form of a model representing the economy:

$$Y(t) = Y(X(t), Z(t))$$

($\frac{\delta Y}{\delta X}$ is negative if X is the interest rate and positive if it is a change in reserves, given that the exchange rate Y is expressed in F/ units of foreign currency).

By maximizing their utility under this constraint authorities will react to changes in the economy. They will change X(t) in such a way that:

$$(3) \quad X(t) = -\frac{a + d(\frac{\delta Y}{\delta X})}{(b + c)} - \frac{f}{b + c}(\frac{\delta Y}{\alpha X})\,[Y(t) - Y(t)^*] - \frac{e}{b + c}(\frac{\delta Y}{\delta X})Y + \frac{c}{2(b+c)}X(t-1)$$

This reaction function could be linearly dependent on several policy variables; if these are independent in the utility function their coefficients would have the same meaning as those of equation [3]. The same general form of reaction functions would also prevail if there were two independent policy instruments (the money market interest rate and the level of gold and foreign exchange reserves).

A reaction function such as the above should be fitted over some adequate period. Too short periods contain too little information and can not yield significant results. Too long periods could contain shifts in policy which blur the overall results. Therefore it is important to identify periods of sufficient length during which a consistent monetary policy could have been conducted.

We have selected the period from September 1976 to December 1980. In August 1976, Mr. Raymond Barre became Prime Minister and announced a new monetary policy characterized by the setting of annual targets for monetary (M2) growth. Although the Raymond Barre government was terminated in May 1981, the last months of its tenure were troubled by the forthcoming presidential elections and were not typical for its policy.

In order to check that the reaction function fitted to our reference period is typical of this period we have tested it with data of the preceding as well as of the following periods. The period from the beginning of 1972, when a "money market" was instituted in France, to August 1976, from a policy point of view, was less homogeneous than the one during which Raymond Barre was Prime Minister. From 1972 to 1976, France had two presidents and several governments; besides the "energy crisis" of 1973–74 affected the country's economic policy seriously. However, further splitting of the period could be counterproductive for the reason outlined above. The post Raymond Barre period (from September 1981 to March 1983) is homogeneous from a political point of view although it contains three discontinuities due to successive devaluations of the franc with respect to the other European Monetary System currencies.

For a dependent variable we have taken money market monthly averages of 30-day rates (taux du marché monétaire à 1 mois contre effets privés). The specific character of the French monetary system explains this choice. Banks and thrift institutions are participants in this market and so is the central bank. The latter intervenes by lending to the market through specialized intermediaries (Maisons de Réescompte) and also by influencing the behavior of the treasurers of some of the big financial institutions that the government controls indirectly (most of the time, the Caisse des Dépots et Consignations and Crédit Agricole lend considerably more to the market than does Banque de France). Money market professionals often say that the Banque de France can on any day bring the money market rate within ⅛ of 1 percent of its target.

It may seem paradoxical that the Banque de France may attempt simultaneous control of the money supply and of the interest rate. What really happens is the following. The total amount of loans supplied by the banking system is set once a year for each month of the coming year by the monetary authorities. Together with the demand for loans it determines the interest rate on the credit market. Meanwhile the cost at which banks must borrow central bank money in order to set up required reserves is also controlled, at least in the short run. Thus the profits of the banking system are influenced by central bank behavior together (and this is here the important consideration) with the rate that banks will offer nonresidents for deposits. By controlling the money market rate the monetary authorities believe they can control short-term capital movements and thus indirectly the exchange rate (this is one of the objectives stated by Renaud de la Genière—see above).

According to all official declarations the monetary authorities believe that interest rates influence exchange rates. Therefore, the dollar and German mark interest rates are obvious candidates as independent variables in their reaction function; the first because it is the major international currency (approximately two-thirds of all French imports are paid in dollars); the second because Germany is France's most important customer and supplier of goods and services.

Since the collapse of the Bretton Woods system various European governments have attempted to replace it on a regional scale, by pegging European Economic Community currencies together. The last of these attempts was the European Monetary System (EMS) instituted in April 1979 and still in force at the time of writing. In every case some fixity of the franc-mark exchange rate has been pursued. For this reason too, this rate is used as an independent variable in the reaction function of the French authorities.

Monetary authorities could also respond to the internal economic situation, in particular to activity (production or unemployment) and inflation. If such is the case, the money market interest rate should be decreased when unemployment increases above some target while it should follow inflation movements as stated by Renaud de la Genière's second objective. In this section the various independent variables outlined previously will be tested.

Another obvious monetary policy instrument would be intervention on the foreign exchange market. Unfortunately, this is not public information and cannot be studied. In its place we have tested the use of gold and foreign exchange reserves.

3. The 1976-10 to 1980-12 period

Over this period we have found that the money market rate can be "explained" by the following reaction function (using monthly date):

$$(4)\quad \underset{t:}{TMM} = \underset{(-3.23)}{-\,18.7} + \underset{(2.94)}{1.51\,XDO} + \underset{(3.31)}{5.41\,XDM} + \underset{(2.21)}{1.136\,DPR} + \underset{(19.1)}{0.885\,TMM(-1)}$$

$R^2 = 0.933 \quad DW = 1.21 \quad F(4.46) = 160.6$

where XDO and XDM are respectively the value of the dollar and of the German mark (monthly averages)[10]; DPR is a weighted average of price increases over a period of four months lagged one month (in monthly percentage changes).

By regressing TMM over changes in the consumer price index, it was found that only changes in months ranging from t-2 to t-5 have significant coefficients. DPR is an average of monthly price changes ($\triangle P$) weighted by these coefficients:

$$(5)\quad DPR = 0.23\,DP_{t-2} + 0.18\,DP_{t-3} + 0.28\,DP_{t-4} + 0.31\,DP_{t-5}$$

When an equally weighted inflation measure is used in reaction function regressions only very minor changes in the various statistics occur.

We have also tested the influence of the industrial production index and of its changes lagged from one to seven months on TMM. No significant influence has been found for the 1972 to 1980 period and for various

[10]Data sources are:

—French money market interest rates and French gold and foreign exchange reserves: Rapports du Conseil National du Crédit,

—exchange rates and price indices are from OECD Main Economic Indicators,

—Eurodollar interest rates are from World Financial Markets.

sub-periods. Similarly, introducing industrial production related variables in various reaction functions does not improve the fit and does not yield significant coefficients.

In equation (4) the lagged interest rate seems to largely explain the contemporary one. Indeed, by regressing TMM on TMM(−1) we find that:

$$\text{(6)}\quad \underset{}{TMM} = \underset{(1.0)}{0.414} + \underset{(22.67)}{0.960}\ TMM(-1)$$

$R^2 = 0.912$ DW = 1.37 F(1.49) = 514.

However, removing TMM(−1) from the reaction function also gives a satisfactory explanation of the money market interest rate:

$$\text{(7)}\quad TMM = \underset{(-3.1)}{18.9} + \underset{(2.92)}{0.936}\ XDO + \underset{(4.70)}{9.91}\ XDM + \underset{(2.92)}{1.55}\ DPR$$

$R^2 = 0.950$ DW = 1.09 F(3.46) = 294.

(after correction for serial correlation by the Cochrane-Orcutt method some positive correlation is still present).

Since colinearity may exist between the dollar and the mark rates, we have also fitted a reaction function where XDO, the dollar's exchange rate has been removed:

$$\text{(8)}\quad TMM = \underset{(-1.33)}{-2.57} + \underset{(1.44)}{1.303}\ XDM + \underset{(1.10)}{0.567}\ DPR + \underset{(18.8)}{0.915}\ TMM(-1)$$

$R^2 = 0.92$ DW = 1.34 F(3.47) = 182

The specification of this equation is much less satisfactory than that of equation (4). So is also that of a reaction function where the dollar exchange rate is replaced by the dollar interest IDO (on one month Eurodollars):

$$\text{(9)}\quad TMM = \underset{(-0.99)}{-2.83} + \underset{(-0.0)}{0.00}\ IDO + \underset{(1.06)}{1.43}\ XDM + \underset{(1.08)}{0.59}\ DPR + 0.916\ TMM(-1)$$

$R^2 = 0.92$ DW = 1.34 F(4.46) = 134.

Thus equation (4) describes French monetary authorities' behavior better than does any other tested reaction function. In order to compare it with the theoretical function [3] (with two target variables) objectives for XDO and XDM should also be used as variables. However there are no obvious candidates for the period under consideration. The simplest assumption that can be made, is that the foreign exchange targets were the average values for the overall period: 4.45 F for the dollar and 2.25 F for the DM. By taking these rates as the French authorities' target rates and using equation (4)'s coefficients and assuming that the value of the constant is zero, the following reaction function obtains:

$$\begin{aligned}\text{(10)}\quad TMM &= 151\ (XDO-4.45) + 5.41\ (XDM-2.25) + 1.736\ DPR \\ &\quad + 0.885\ TMM\ (-1) \\ &= 18.9 + 1.51\ XDO + 5.41\ XDM + 1.136\ DPR \\ &\quad + 0.885\ TMM(-1)\end{aligned}$$

where the constant value is very close to that of equation (4). A true constant of zero in the reaction function could mean that a and d in the utility function (2) are also equal to zero.

In equation (4) the coefficients of XDO and XDM are positive as expected and significantly different from zero (at the 5 percent level). The inflation rate during the past quarter (lagged by one month), also, has a significant positive coefficient. If the value of this coefficient were one (of which value it is not significantly different) monetary authorities would ceteris paribus adjust the interest rate in line with the inflation rate.

Other specifications of the reaction function, using in particular the franc-mark real rate, have been tested and have yielded unsatisfactory results.

Within the period under scrutiny the European Monetary System was instituted (March 1979). To test whether this was followed by a change in monetary policy, a dummy variable was added to the reaction function (4). It was found that the coefficient of such a variable is not different from zero. In another test a reaction function with the same variables as (4) was tested for the periods 1976–10 to 1979–3 and 1979–4 to 1980–12. Although the coefficients of the latter equation are not significantly different from zero, neither are they significantly different from the coefficients of the former. Thus we have found no evidence of a change in the reaction function.

We have already mentioned that gold and foreign exchange reserves (RES) or changes thereof (DRES) could also be used as a policy instrument. If the dollar and mark rate together with the lagged level of reserves are used to explain changes in reserves:

$$(11)\quad \begin{array}{l} \mathrm{DRES} = \underset{(2.03)}{26.4} - \underset{(-1.43)}{1.609\,\mathrm{XDO}} - \underset{(2.56)}{10.3\,\mathrm{XDM}} + \underset{(3.82)}{0.087\,\mathrm{RES}(-1)} \\ R^2 = 0.303 \quad \mathrm{DW} = 1.923 \quad F(3.47) = 6.81. \end{array}$$

A more satisfactory reaction function is obtained if the real rate (RXDM = XDMxPD/PF where PD and PF are the German and French consumer price indices) is used:

$$(12)\quad \begin{array}{l} \mathrm{DRES} = \underset{(4.16)}{41.21} - \underset{(-4.39)}{19.29\,\mathrm{RXDM}} - \underset{(-2.34)}{0.0792\,\mathrm{RES}(-1)} \\ R^2 = 0.428 \quad \mathrm{DW} = 1.95 \quad F(2.48) = 18.0. \end{array}$$

4. Other periods

The fitting of a reaction function of the type TMM = f(XDM, XDO, DPR, TMM(−1)) for the 1972—1 to 1976–9 period shows that the mark does not appear to be a significantly explanatory variable. The reaction function must have a different form possibly similar to the one studied by R. Pinçon. By replacing in the above relationships the dollar's exchange rate by the Eurodollar (here three months) interest rate we get:

$$(13)\quad \begin{array}{l} \mathrm{TMM} = \underset{(-2.41)}{-4.33} + \underset{(4.08)}{0.258\,\mathrm{IDO}} + \underset{(2.33)}{2.86\,\mathrm{XDM}} + \underset{(1.24)}{0.745\,\mathrm{DPR}} \\ \qquad + \underset{(8.27)}{0.637\,\mathrm{TMM}(-1)} \end{array}$$

$$R^2 = 0.968 \quad DW = 1.98$$

where all the coefficients are significant and have the expected signs except that of the inflation rate which is not significantly different from zero (but is not significantly different from one either).

Following the May-June 1981 elections a new President of the Republic and a new parliamentary majority were elected. Using the reaction function technique it seems possible to investigate if a change of monetary policy occurred with the new government. In order to do so we have applied the set of variables significant for the Raymond Barre years to the September 1981 (we allowed a few months for the monetary post election turmoil to settle) to March 1983 (date of the most recent data available at the time of writing). However we have added PFM, the central franc/mark rate in the EMS, as the objective of the target variable XDM (F/DM rate).[11] The following regression results were found:

$$(14) \quad \underset{(1.39)}{TMM = 9.95} + \underset{(0.76)}{0.627\,XDO} + \underset{(1.51)}{11.147\,XDM} - \underset{(-2.69)}{14.22\,PFM} + \underset{(2.99)}{2.463\,DPR} + \underset{(3.28)}{0.453\,TMM(-1)}$$

$$R^2 = 0.886 \quad DW = 2.21 \quad F(5.18) = 20.28$$

where the dollar and the mark exchange rates don't have significant coefficients any more.

Much more satisfactory seems to be a reaction function where the dollar interest rate is substituted for the dollar exchange rate:

$$(15) \quad \underset{(0.85)}{TMM = 3.45} + \underset{(4.67)}{0.351\,IDO} + \underset{(2.58)}{10.508\,XDM} - \underset{(-2.82)}{9.705\,PFM} + \underset{(2.22)}{1.250\,DPR} + \underset{(2.40)}{0.236\,TMM(-1)}$$

$$R^2 = 0.955 \quad DW = 2.08 \quad F(5.13) = 56.1.$$

Notice that the value of the constant is not significantly different from zero here while all other coefficients behave as expected.

Concerning the change in reserves during the 1981–9 to 1983–3 period, a reaction function like DRES = f(XDO, XDM, PFM, RES(−1)) which has been fitted for the preceding period no longer yields significant coefficients. A more satisfactory reaction function is obtained when the dollar's exchange rate and the lagged value of reserves are removed and the latter replaced by the lagged value of DRES:

$$(16) \quad \underset{(2.99)}{DRES = 67.23} - \underset{(-5.14)}{218.24\,XDM} + \underset{(4.79)}{191.42\,PFM} - \underset{(-1.68)}{0.294\,DRES(-1)}$$

$$R^2 = 0.676 \quad DW = 2.75 \quad F(3.14) = 9.75.$$

Notice that in none of the equations tested (not reported here) had the dollar interest rate or the real franc-mark rate significant coefficients.

[11]PFM changes with each devaluation of the franc or reevaluation of the mark. Such changes in parity took place in October 1981, June 1982 and March 1983.

5. Interpretation

One possible interpretation of our results is the following:

—*There is a typical set of reaction functions for the Raymond Barre period.* The one concerning the money market interest rate (TMM) seems to be in accordance with Mr. de la Genière objectives: it incorporates changes in inflation and is used to control the exchange rate of the franc (vis-à-vis the two major currencies).

—The change in reserves reaction function displays a positive constant, as well as negative coefficients for the exchange rates. Going back to our model this could mean that *authorities get satisfaction from accumulating reserves* ("a" has a significant positive value in the utility function while "d" is known from the TMM reaction function to be close to zero).

—By comparing the interest rate reaction functions for the Raymond Barre and for the following periods it seems that *the same objectives of monetary policy have prevailed.* However, due to the changes in the environment—the strong appreciation of the dollar between 1981 and 1983—the exchange rate of this currency has been dropped as a policy target and replaced by the dollar's interest rate.

The institution of the EMS has brought the franc-mark central parity into focus and made it into a policy variable target.

Close values (both close to one) of the inflation coefficient show that the objective of keeping the interest rate above the inflation rate has been maintained.

Significant positive coefficients for the mark in both reaction functions show that interest rates have continuously been used in French monetary policy (this was also true for the 1970–76 period) in order to control the foreign exchange rate. Similarly significant positive coefficients for the lagged interest rate shows that in both periods authorities dislike variability in TMM (this necessarily means a positive c in the utility function).

—However different values for the coefficients of XDM (the mark rate) and TMM(-1) (the lagged interest rate) could mean that if the same objectives have been assigned to monetary policy by different governments the relative "utility" derived by them from the various economic variables has changed.

If we assume that the influence of interest rates on foreign exchange rates has not changed after 1981 ($\frac{\delta Y}{\delta X}$ has remained constant) referring to equation (3), $\frac{f}{b+c}$ will have increased after 1981 and $\frac{c}{2(b+c)}$ decreased. Going back to the utility function, this could mean that in the tradeoff between variability of interest rates and divergence of the exchange rate from the EMS central parity, Raymond Barre's government gave more weight to the former relatively to the socialist government.

This change in the utility function could be due to the institution of the EMS. However, our tests don't allow us to infer a change in Raymond Barre's reaction function after March 1979.

—Comparison of "changes in reserves" reaction functions for the

1976–9 to 1980–12 and 1981–9 to 1983–3 periods (equations (11) and (16)) shows that in both cases reserves are used to control the mark rate. As for the interest reaction functions, the dollar exchange rate vanishes as an argument after 1981. The other difference between the two reaction functions seems to be the magnitude of the mark coefficient and the absence of lagged reserves in (16). In terms of the utility function this could mean that f has increased relatively to (b + c) after 1981: in the second period there is more relative weight given to fluctuations in the foreign exchange rate (vis-à-vis the mark) than to the variability of reserves and the desire to accumulate such reserves.

The lagged "change in reserves" term in (16) could be due to the authorities' attempt to regain reserves after incurring heavy losses.

VI - Conclusion

In order to understand the monetary policy decision process in France one has to understand the particular intellectual climate of this country. Studies conducted at various public institutions show that at least at the staff level there is a belief that the French financial sector is not sufficiently market oriented to be well represented by most theories developed for the United States. Most models elaborated at these institutions take the actual system as a given and show that in this context interest rates should be used as intervention instruments.

During the Raymond Barre years, at the top executive level the main official objectives of monetary policy were the reduction of the inflation rate and the stabilization of the foreign exchange rate. Another objective was to keep short-term interest rates above the inflation rate. The instruments used to achieve these objectives were respectively: control of the money supply and control of interest rates.

The technique used for monetary control was, and still is, control of the volume of "ordinary" loans extended by banks. Inspection of money supply figures shows that although on the average M2 growth has been stabilized at 12.5 percent annually, growth objectives have been exceeded in every year except in 1980. Given the authorities' gradualism this has prevented them from setting more stringent objectives. The reason for this lack of achievement may be that the authorities simultaneously conducted a policy of allocating "privileged" loans to certain sectors of the economy. Such "uncontrolled" loans grew much faster than ordinary ones and upset quantitative control. It appears that the objective of credit allocation took precedence over that of inflation control.

Typical reaction functions were found to explain the use of the money market interest rate and of reserves during the 1976–9 to 1980–12 period. The one explaining interest rate behavior is in accordance with official objectives.

Reaction functions which fit the Raymond Barre period best are not satisfactory either for the preceding or for the following period. Some of the changes of behavior after 1981 may be due to changes in the environment (institution of the EMS and the appreciation of the U.S. dollar). Others may reflect a change in authorities' preference: they have traded more interest rate variability for a relatively more stable exchange rate (against the mark). This change could be due to constraints imposed by the EMS, but we have not found proof of a change in the reaction function after March 1979 when the new system was started.

Appendix

A Simplified Model of the French Financial Sector

Balance sheets of the central bank, the Treasury and the commercial banking system are:

Central Bank

Gold and foreign exchange	OD	E	Currency
Loans to the Treasury	F_T^B	RO	Fractional reserves
Refinancing of commercial bank	RF^B		

Treasury

Accumulated budget deficits	DB	CCP	Treasury circuit deposits
		F_T^B	Loans from the Central Bank
		F_T^p	Loans from the public

Commercial Banks

Fractional reserves	RD	D	Deposits
"Ordinary" loans to the economy	C	RF^B	Refinancing from the Central Bank
"Privileged" loans to the economy	CP	RF^s	Refinancing from "Special Institutions"
		K	Equity and long-term debt

By aggregating these three balance sheets one finds:

$$\boxed{OD + (DB - F_T^p) + (C + CP - RF^s - K) = E + CCP + D = M2}$$

where $DB - F_T^p = CCP + F_T^B$.

The credit control technique consists of setting ceilings to the expansion of C and partially to the expansion of CP. The other money supply source components are not controlled, but merely forecasted.

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Discussion

Robert Raymond*

Mr. Aftalion's presentation of French monetary policy is interesting in many ways:

—because he is familiar with the United States, he has rightly spotlighted the differences in attitudes and institutions that divide these two countries and sometimes render the mechanisms of the French economy unintelligible to the Anglo Saxon;

—he vigorously, and at times cruelly, points out the piecemeal nature of the French financial system and the plethora of regulations that govern it;

—he does however show that these peculiarities do not prevent France from adjusting to the broad trends that affect the industrial countries, notably interest rate movements. The French economy is to a large extent open to the outside world, and the consequences of this are accepted. The fact that the administration exercises control over a great many areas of the economy should be seen as an expression of French concern for sound management, a legacy of our farming past, when we skillfully exploited our natural wealth. We love nature not when left to her own devices, but when she is well-tended. If our vines were not subjected to strict discipline through constant care and attention, they would not bring forth good wines. By the same token, we are inclined to think that one cannot simply leave the economy to develop in jungle-like disorder.

My role here will be to explain the logic behind certain features referred to by Mr. Aftalion. Concerning the general framework of the workings of the financial system and the financing structures of the economy, I refer participants to fuller presentations given by me on earlier occasions, here and in Chicago, the latter version of which is available in a recent publication by the Federal Bank of New York.[1]

Here, I shall only discuss the workings of the money market and my Institute's thinking on the present role of interest rates in France; I shall conclude with some general thoughts on the assignment of priorities in monetary policy.

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[1] Paul Meek (ed.), *Central Bank Views on Monetary Targeting*, Federal Reserve Bank of New York, 1983.

Monetary Aggregates: Targets and Performance

(percentages)

	1977	1978	1979	1980	1981	1982
TARGET (M2)	12.5	12.0	11.0	10.0	10.0	12.5
					(12.0)	13.5
Performance						
M2 (December/December)	14.0	12.1	14.4	9.8	11.4	11.5
M2 (Annual average)	12.3	13.2	13.4	11.7	12.6	12.3
M2[1]	13.2	12.8	13.5	10.7	11.9	12.1
GDP (in money terms)	12.3	13.6	13.9	13.1	12.2	13.7
GDP (in volume)	3.1	3.3	3.1	1.3	0.3	1.4
GDP price deflator	8.9	10.0	10.5	11.7	11.8	12.1

[1] Quarterly average centered on December over quarterly average centered on December for the previous year.

I - The Money Market

1. I contest Florin Aftalion's claim that the Bank of France does not control the money market rate. According to the author, two structural lenders dominate this market, namely the Caisse des Dépôts et Consignations and the Crédit Agricole.

The first named manages the savings banks' deposits. It invests these funds in the capital market (in the form of shares and bonds), in direct loans to certain nonprofit agencies or to local authorities, in Treasury bills, and lends the balance to banks on the money market.

The Crédit Agricole has a surplus of deposits over lending to customers; it too lends this surplus on the money market.

Nevertheless, the Bank of France can vary the interbank money market rate as it sees fit for one simple reason, which is as true in France as elsewhere, namely that it alone has the power to create or cancel central bank money at will. All it needs to do is to add or subtract one franc from the central bank money stock to affect the interbank rate. Conversely, if it wants to maintain this rate at a given level, it simply has to announce that it will intervene without limit at this level.

Were it otherwise, Florin Aftalion would have been unable to calculate a central bank reaction function.

2. To be more specific, how could the Caisse des Dépôts et Consignations and the Crédit Agricole resist a change in interest rate if this was what the central bank wanted?

The Crédit Agricole can cut its lending to other banks on the money market by holding more central bank money in its account at the Bank of France. This can only happen at the start of the compulsory reserve maintenance period (the reserves are calculated as a monthly average of daily balances at the Bank of France); this cannot last very long, for otherwise the Crédit Agricole would start to accumulate voluntary, interest free reserves, which, like the other French banks, is something it never does. All the Bank of France needs to do then is to compensate for this by injecting an equivalent amount of central bank money into the market to head off a rise in interest rates. Shortly afterwards, in order to restore the required average level of reserves, the Crédit Agricole will on the contrary have to reduce its liquidities held with the central bank, and the reverse movement will set in. In a word, this does produce short-term variations around a mean position in the portfolio of open market bills held on the assets side of the Bank of France balance sheet, and in the banks' reserves item on the liabilities side.

The Caisse des Dépôts is not in a position to create these temporary disturbances: being under no obligation to maintain compulsory reserves, it does not hold liquid funds with the Bank of France.

3. These two institutions can withdraw from the money market to build up their holdings of securities or Treasury bills. However, in that case: (i) they will not dry up the money market, since the central bank money

that they hand over to the Treasury flows back to the financial system when the government expenditures funded by the issue of Treasury bills are carried out;

(ii) bank deposits will rise: sellers of securities receive payment, or Treasury spending funded by the issue of bills increases monetary assets held by private citizens and businesses. Central bank money demand will grow to meet the rise in reserve requirements, and the central bank can then raise its intervention rate if it sees fit.

4. In short, the Bank of France is not weak, despite the presence of a handful of big participants in the money market. Its balance sheet structure is in line with theory. Recently, the fall in its foreign currency reserves was offset by a sharp rise in its buying under its open market policy, so that on 31 December 1982 the "lending" positions of the three protagonists in the money market were as follows:

	Billions of French francs	
Bank of France		215
Rediscount	65	
Open market	150	
Crédit Agricole		66
Caisse des Dépôts et Consignations		5

The change in the structure of monetary base counterparts has restored the role of the Bank of France as principal lender in the market. But even if this were not the case little would be changed. The Bank of France could just as well control the money market rate by acting as a borrower, supposing, for example, it had created a surplus of liquidity through its foreign currency buying. Then, it could also raise compulsory reserves and so force the financial system to become its debtor overall.

II - Money Market Interest Rates

1. For several reasons the Bank of France has never pursued a monetary base control policy as the United States and Switzerland have done. Firstly, it wants to avoid subjecting the franc to frequent, broad interest and exchange rate swings.

Above all, the ratio of corporate indebtedness to banks is materially higher in France than in the other industrial countries, except Japan, which is a good reason for avoiding sudden or sharp variations in the cost of credit. So ceilings are imposed on bank lending growth which work effectively in a country with a high level of bank intermediation.

2. On a number of occasions, however, external pressures have led to a raising of short-term rates, from which the following effects are expected:

—a slowdown in the conversion of nonresident franc balances into foreign currencies;

—a rise in the cost of forward purchases of foreign currency (i.e., forward selling of francs), and a greater incentive to sell forward foreign currencies for francs;

—thanks to a rise in the prime rate, a reduced incentive to finance international trade in France rather than abroad, which amounts to acting upon leads and lags.

Not surprisingly, therefore, attention is drawn to relations between interest rates in the French money market and those in other countries. Several periods need to be distinguished in this respect:

—during the period of the floating franc, which lasted from 1976 to March 1979, the monetary authorities strove to stabilize the trade-weighted exchange rate of the franc. This led the authorities to keep an eye on interest rates in the United States and Germany in particular. Having restored their external accounts to equilibrium in 1978, however, the French authorities were then in a position to ease domestic interest rates even though Eurodollar rates were just beginning their rise and German rates were remaining stable.

—since the setting up of the European Monetary System (EMS), the French authorities no longer refer to American interest rates in guiding their own money market. Since March 1979, they have bowed to the discipline of maintaining a stable franc against the mark, in so far as is possible. To this end, the central bank focuses essentially on the gap between short-term interest rates in France and Germany. In periods when both countries' rates vary jointly, it is only possible to discern a link with Eurodollar rates when Germany aligns her rates with the latter in order to regulate the dollar-mark exchange rate. This strategy depends on the German authorities and on the cooperation within the European institutions.

3. Over the last two years, however, the French monetary authorities have undergone a change of attitude towards the use of money market rates as a means of defending the franc, and we believe this change to be based on objective considerations.

Several factors conferred on the franc a remarkable degree of stability between the creation of the EMS and the beginning of 1981: a temporary weakness of the mark, and a fairly steady inflow of capital. The franc came under pressure in the early months of 1981. The Bank of France handled this acute crisis notably by raising interest rates in the money market, which peaked at 20 percent in May 1981. The aim here was to stem the outflow of both resident and nonresident short-term capital, which was occurring through a great variety of channels (conversion of funds, forward currency dealings, leads and lags).

Two realignments within the EMS took place, in October 1981 and June 1982. The French monetary authorities gradually tightened exchange controls so as to throttle outflows of capital held by residents.

After June 1982, the situation looked rather different:

(i) for residents, the outflow of capital, which had until then played an unfavorable role, ceased to have any effect;

(ii) nonresidents had to borrow on the Eurofranc market if they wanted to take short positions against the franc. Our exchange controls prevent the Eurofranc market from being supplied by loans or transfers from residents (French banks in particular). Any nonresident speculation against the franc therefore puts (sometimes very sharp) pressure on interest rates in the Eurofranc market.

Under these conditions, there was no longer any need to act to modify money market rates in order to attenuate currency crises at their height. On the contrary, what was needed was to tackle the underlying factors; this was the case from June 1982 until now, and especially prior to the latest devaluation of the franc in March 1983.

These underlying factors were:

—the external account deficit, which was very large in 1982 and was itself associated with a rise in "absorption" in France, at a time when it was falling in Germany and other industrial countries;

—the inflation differential between France and Germany.

Consequently, the Bank of France refrained from raising the money market rate during the foreign currency crisis leading to March 1983. Nor has it lowered rates since. The drop in official reserves in the three months prior to the March 1983 realignment was made good in the two months that followed.

At the present moment, money market and other interest rates depend primarily on the domestic economic situation. Although they have not been used in a monetarist perspective to achieve the adjustment that is needed at present, they do play an important role:

(i) after all, we must offer the saver a return on his money. The fact that long-term interest rates have stood perceptibly above the rate of inflation has encouraged a steady expansion of bond issues. Now, the two leading borrowers are the state and the banks. The issuing costs of medium and long-term bank bonds is one of the factors that determines the bank base lending rate.

(ii) the money market rate provides the return on primary nonresident deposits and fairly strongly influences the prime rate. These two reasons explain why it is kept above the inflation rate.

(iii) lastly, banks' resources also include noninterest-bearing current accounts and deposits on which interest is subject to regulation.

(iv) overall, the cost of credit, which covers bank operating expenses and financial costs, remains higher, on average, than the underlying rate of inflation.

4. One may conclude that the Bank of France's money market intervention rate has very frequently been affected, in recent years, by France's external position. This dependence is attenuated, sometimes very considerably, when the authorities react to external pressures by means of one or another of the alternative policies, namely:

—exchange controls

—borrowing abroad

—intervening with the aid of currency reserves

—and, as a last resort, adjusting the exchange rate.

Each of these reactions—and I do not know whether they can be equated or not—depends on the political climate, the economic situation, and is in any case limited in scope.

III - The Targets of Monetary Policy

1. The foregoing might be taken to mean that the Bank of France is able to call on more than the two instruments cited by Aftalion, namely the credit ceiling system and short-term interest rates. However, I utterly agree that a profusion of targets and instruments would be unwise, as this would create a risk of over-determining the economy and ultimately losing real control over it.

However, French monetary policy does not strike me as pursuing three competing objectives simultaneously, namely money stock, exchange rate and interest rate level, as Florin Aftalion suggests, and I do not think he has interpreted Mr. de la Genière's statements correctly in this respect.

The Bank of France has had but a single effective target since 1977, and that consists of the money stock M2 growth rate. I shall not go into the technical reasons for preferring this aggregate to another concept of money. I think it would be more interesting to discuss the possible choice of a credit target rather than a money stock target. I shall confine myself here to listing the following principles:

—the money target was chosen at a time when the foreign deficit was less frightening than today and could be financed without drawing on foreign currency reserves. This target permitted overall control of the three sources of new money, namely external monetary position, monetary financing (which was very low at the time) of government spending, and lending to the private sector.

—it was only from 1981 onwards that a credit target would have been more appropriate, owing to the deterioration of our external accounts; a target restricting domestic credit would have helped to reduce the current account deficit, while an overall credit target would have provided better control over the basic balance. Though true in theory, in practice this would have run radically counter to the overall thrust of economic policy after the 1981 elections. It is hard to imagine the Bank of France singlehandedly resisting the application of a programme (which included, among others, a bigger budget deficit) that had been sanctioned by universal suffrage. Such situations are familiar in other countries too, notably in our host country today.

The more restrictive phase of economic policy introduced in June 1982 and accentuated in March 1983 presupposes, inter alia, much slower growth in domestic credit than last year.

2. The exchange rate and interest rates do not rank on a par with monetary growth. They are secondary objectives, in the sense that these variables are not left to their own devices, and that the monetary authori-

ties enjoy only limited room for manoeuvre with respect to them.

I have already explained the variety of ways in which the authorities can react to exchange rate crises. Hitherto, the principle has been to avoid an undervaluation of the franc which would have fuelled inflationary pressures in an open economy. Conversely, it may be held that the central bank can reasonably take advantage of a stronger exchange rate to build up its currency reserves, even at the risk of temporarily overshooting its M2 target. Objectives may clash as a result, requiring settlement by means of some tradeoff, although there are means of neutralizing this inflow of liquidity.

I have also had occasion to spell out the position of the French authorities on interest rates. We view the present scale of interest rates in France as fairly well suited to the domestic situation, given that this is not our key instrument in our efforts to bring the economy back into balance, for which we are relying on a combination of a credit ceiling system and reduced "absorption" through fiscal and incomes policy.

3. This last remark is evidence of the recent improvement in the French policy mix. Governments have generally pursued two objectives over the last few years, namely keeping both inflation and unemployment in check. These may be thought irreconcilable, the one necessarily taking precedence over the other, even if the latter is not neglected. Several specific measures, many of them successful, have been directed at the labor market. At present, however, our priority is to break free from external pressures.

Persevering with money stock growth targets close to 10–12 percent is, in the Bank of France's view, the best monetary strategy in an environment that is economically, politically, internationally and, if I may be permitted a slight dig at the economists, theoretically unstable.

The Monetary Policy Decision Process in the Federal Republic of Germany

Manfred Willms*

I. Introduction

In theoretical analysis and econometric models monetary policy is generally treated as being exogenously determined. It is assumed that the central bank operates in the public interest, i.e., that it tries to realize the main goals of economic policy simultaneously: stabilization of the price level, full employment, high growth rates of real GNP and balance of payments equilibrium.

In more recent approaches both the exogeneity of monetary policy decisions and the public interest hypothesis have been questioned. Central banks and their behavior are incorporated into the general economic and political process. This implies that central banks do not react independently with respect to a given economic situation. Deviations between actual and desired goal variables of monetary policy as well as political pressure influence the decisions of the central bank. The question then is, to which disturbances do central banks react and how strong is their reaction pattern. In the following analysis an answer to this question shall be given for the behavior of the Deutsche Bundesbank. In addition, whether the Bundesbank has followed a discretionary or a nondiscretionary monetary policy over the past 22 years will be empirically analyzed.

II. Principles of Monetary Policy: Discretionary versus Nondiscretionary Policy

Monetary policy can be conducted either as discretionary or as nondiscretionary policy.

Arguments in favor of a discretionary policy are:

(1) The economy is a constant deterministic or stochastic system, where the impact of monetary policy actions on the final goal variables is systematically determined.

(2) Policymakers have a thorough understanding of the structural properties of the economy while private agents are poorly informed about the working of the economy and are unable to learn. Thus, policymakers can exploit the lower information level of the general public.

(3) Information on target variables of monetary policy is available with

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different lags. Fine tuning is necessary to correct deviations between the course of "fast-speed" and "low-speed" target variables.

(4) Undesired results that are produced by monetary policy actions within the stochastic system can be corrected by prompt policy actions.

(5) The central bank is an institution that operates in the public interest and tries to make its operations as transparent as possible.

The proponents of a discretionary policy assert that it achieves a higher performance level of the economy than any other policy. The flexible adjustment to all possible disturbances is considered to be a great advantage of this type of monetary policy. The basic assumption behind this approach is that the private sector of the economy is inherently subject to shocks which are caused by erratic changes of aggregate demand, mainly due to shifts in the marginal efficiency of capital (Keynesian view of the economy).

Nondiscretionary policy can be executed by following some precommitted constraints or by following a fixed rule of monetary expansion.

Arguments in favor of a nondiscretionary policy are:[1]

(1) The structure of the economy is not fixed. It changes with variations of the policy regime. Economic agents modify their behavior by absorbing information on the effect of policy actions.

(2) Policymakers do not have a monopoly of information on the structural properties of the economy. Private agents are—on the average—able to learn to understand how the economy works and how it is affected by policy actions. The accumulation of all available information on economic affairs by private agents leads to the rejection of the hypothesis of systematic long-lasting effects of monetary policy on the real sector of the economy.

(3) A central bank should only have one target variable of monetary policy and not "look at everything."

(4) A nondiscretionary monetary policy reduces the uncertainty about the current and future course of the development of monetary policy variables and thus improves the framework for the private decisionmaking process.

(5) Central banks do not act independently of the political process and follow their own preference function. In order to prevent a critical evaluation of their decisions they prefer to issue vague statements concerning their actions and an unconstrained activism.

(6) Central banks are not interested in a nondiscretionary policy since their degree of public esteem and thus their welfare level increase with the development of new instruments and their more frequent use.

The proponents of a nondiscretionary policy are convinced that this policy stabilizes the economy's long-term real growth rate and the rate of

[1]Some of these arguments are derived from Karl Brunner, "The Pragmatic and Intellectual Tradition of Monetary Policymaking and the International Monetary Order," unpublished paper presented at Geldtheoretischer Ausschuß des Vereins für Socialpolitik, Frankfurt, July 1982.

inflation more than a discretionary policy. A nondiscretionary policy allows for higher real growth through reducing information costs on investment and thus leads to more capital formation and a better utilization of the existing capital stock. Discretionary monetary policy itself—according to this approach—causes the destabilization of aggregate demand and the cyclical fluctuations of the economy. The private sector is assumed to be basically stable since the demand for money is a stable function of some predetermined variables. Most of the fluctuations of aggregate demand for goods and services are the result of fluctuations of the money supply caused by the central bank (monetarist view of the economy).

III. The Legal Framework of Monetary Policy in Germany

1. The Main Goal of Monetary Policy as defined by the Bundesbank Law of 1957

The main goal of monetary policy of the Deutsche Bundesbank is to ensure the stability of the price level. This goal is explicitly mentioned in paragraph 3 of the Law of the Deutsche Bundesbank (Gesetz über die Deutsche Bundesbank von 1957).[2] According to paragraph 3 the Bundesbank has to expand the supply of money and credit with special regard to the stabilization of the price level.

Thus the Bundesbank Law is based on the classical view of economic theory that the main task of monetary policy is to prevent inflation. The focusing on the goal of price stability has its origin in the experience the Germans had with inflation during the twenties. Since then the Germans have become more sensitive towards inflation than people in many other countries.

However, the Bundesbank Law also requires the Bank to support the general economic policy of the government.[3] On first glance this could imply that the Bundesbank can be forced by the government to finance an official inflationary full-employment policy. The law itself protects the Bundesbank against such pressure by two qualifications: 1. The support of government policy ends when the goal of price stability is in danger; 2. The Bundesbank makes its decisions independently of the government.

2. The Independence of the Bundesbank

The Bundesbank is a public institution, whose capital is owned by the Federal Government and which provides itself with its own funds. Responsibility for monetary policy decisions rests with the Central Bank Council (Zentralbankrat). This Council consists of 17 members, namely the 6 members of the Directorate of the Bundesbank and the 11 presidents of the (regional) State Central Banks (Landeszentralbanken). The Directorate

[2] Gesetz über die Deutsche Bundesbank, Frankfurt 1957, paragraph 3.
[3] Ibid., paragraph 2.

has to execute the decisions of the Central Bank Council. Both the council and the Directorate operate basically independently of the government and other economic and political institutions. However, paragraph 13 of the Bundesbank Law requires the Bundesbank to consult the Federal Government in decisions that have substantial effects on monetary variables. Members of the Federal Government have the right to attend the meetings of the Central Bank Council. Although they are not allowed to vote they can include points on the agenda and can delay decisions by two weeks. Conversely, the Federal Government has to consult the President of the Bundesbank in decisions that affect national and international monetary matters. The last point is of special importance since the Federal Government and not the Bundesbank is officially responsible for all international financial agreements such as those involving the International Monetary Fund or the European Monetary System.

Members of the government have frequently attended meetings of the Central Bank Council while the President of the Bundesbank has only occasionally participated in meetings of the government. From time to time the government has decided on policy matters affecting monetary variables without consulting the Bundesbank.[4]

While the political influence of the government on the operational level of the Bundesbank is rather small its influence through the appointment of the members of the Council and the Directorate is much more significant. The president, the vice-president and the other members of the Directorate are put in power by the Federal Government. Their term is generally eight years but can also be as short as two years. The presidents of the 11 State Central Banks are de facto selected by the State Governments. Their term is also generally eight years.

In the 1950s and 1960s the Federal Government and the State Governments generally appointed qualified central bank experts suggested by the Bundesbank. In the 1970s the Socialdemocratic governments in Bonn as well as in the states broke with this tradition and frequently appointed party members or members of the trade unions without central bank experience. In several cases the appointments have been pushed through against the objection of the Central Bank Council.[5]

The impact of the political appointments on the policy of the Bundesbank is difficult to ascertain.

3. *Instruments and Intermediate Target Variables of Monetary Policy*

In order to carry out its tasks as specified by the law the Bundesbank has a variety of instruments available in the form of the discount policy, Lombard policy, open market policy and the minimum reserve policy.

[4]Rolf Caesar, Der Hanlungsspielraum von Notenbanken, Nomos, Baden-Baden 1981, p. 185.

[5]Ibid. p. 187

Through the discount policy commercial banks can obtain credit generally for three months from the Bundesbank against commercial drafts. The Bundesbank determines the discount rate and the rediscount quota. The quota is set individually for each bank. An overextension of the quota is not allowed. Only qualified drafts are accepted by the Bundesbank.

Lombard policy is the allowance of credit from the Bundesbank against collateral. Such credits are only granted for very short periods of time (normally not more than seven days); their purpose is to help commercial banks overcome short-run liquidity squeezes. The Bundesbank has the right to abandon the supply of Lombard credits completely. Instead of the ordinary Lombard credit it can introduce a special Lombard credit at a special Lombard rate. This special Lombard credit can be cancelled daily and the rate can be changed daily.

Open market policy consists of the purchase and sale of different types of bonds or papers in the open market. The Bundesbank usually sets the rate at which it buys or sells these papers to commercial banks while commercial banks decide about the quantity they want to hold in their portfolio. However, from time to time the Bundesbank has fixed the quantity of papers it intends to buy or to sell, leaving the determination of the interest rate to market forces. In addition, the Bundesbank can buy open market papers or commercial drafts from commercial banks under special repurchase agreements (Offenmarktgeschäfte über Wertpapiere mit Rückkaufsvereinbarung). In the recent past this instrument of monetary policy has become more and more important.

Minimum reserves are imposed on the deposits of all credit institutions including branches of foreign banks. Only a few institutions like the postal office, the social security system, insurance companies and the Bundesbank itself are exempted. Reserves must be held on deposits of nonbanks and foreign banks with a maturity of less than four years. Minimum reserve rates are differentiated with respect to maturity. For demand deposits the maximum rate is 30 percent, for time deposits it is 20 percent and for savings deposits it is 10 percent. For nonresident deposits the Bundesbank can impose a reserve ratio up to 100 percent. If the minimum reserves are below their required level, commercial banks have to pay a penalty.

Almost all the Bundesbank's tools are nondirigistic in nature. Tools like credit-rationing, fixing interest rates on credits and deposits or direct capital controls are not available to the Bundesbank. In Germany monetary policy operates by influencing the conditions in the market for short-term assets. The Bundesbank controls bank liquidity, money, and credit mainly by changing the relative prices of assets.

The collection of monetary policy instruments as set forth in the Bundesbank Law of 1957 has so far proved to be very adequate; as such, the introduction of basically new instruments has not been necessary. With their given tools the Bundesbank was able to handle even difficult situations in the sixties and seventies.

In the seventies the Bundesbank found it necessary to change its intermediate target variable of monetary policy. Up to the early seventies the liquidity ratio of commercial banks served as the main intermediate target variable. The Bundesbank interpreted an increase of this ratio as an expansionary situation and a decrease as a restrictive situation. In periods of relatively stable interest rates bank liquidity was a relatively reliable indicator of monetary policy. By focusing on bank liquidity the Bundesbank was for a long time able to provide the economy with a supply of money and credit that allowed for high rates of real growth while generating only very modest rates of inflation. With the severe disturbances of the international economy caused by the United States within the Bretton Woods System in the late sixties and early seventies the Bundesbank increasingly lost its control over bank liquidity and the monetary aggregates. As a consequence, the rate of inflation reached a level of more than 7 percent in 1973. The main goal of Bundesbank policy was heavily in danger. Therefore, with the breakdown of the Bretton Woods System in 1973 the Bundesbank took quick initiative in order to fight inflation. At the same time the Bundesbank shifted its intermediate target variable from bank liquidity to central bank money. As part of this new approach, since 1974 the Bundesbank has announced the planned annual growth rate of central bank money in advance.

IV. Actual Behavior of the Bundesbank since 1960

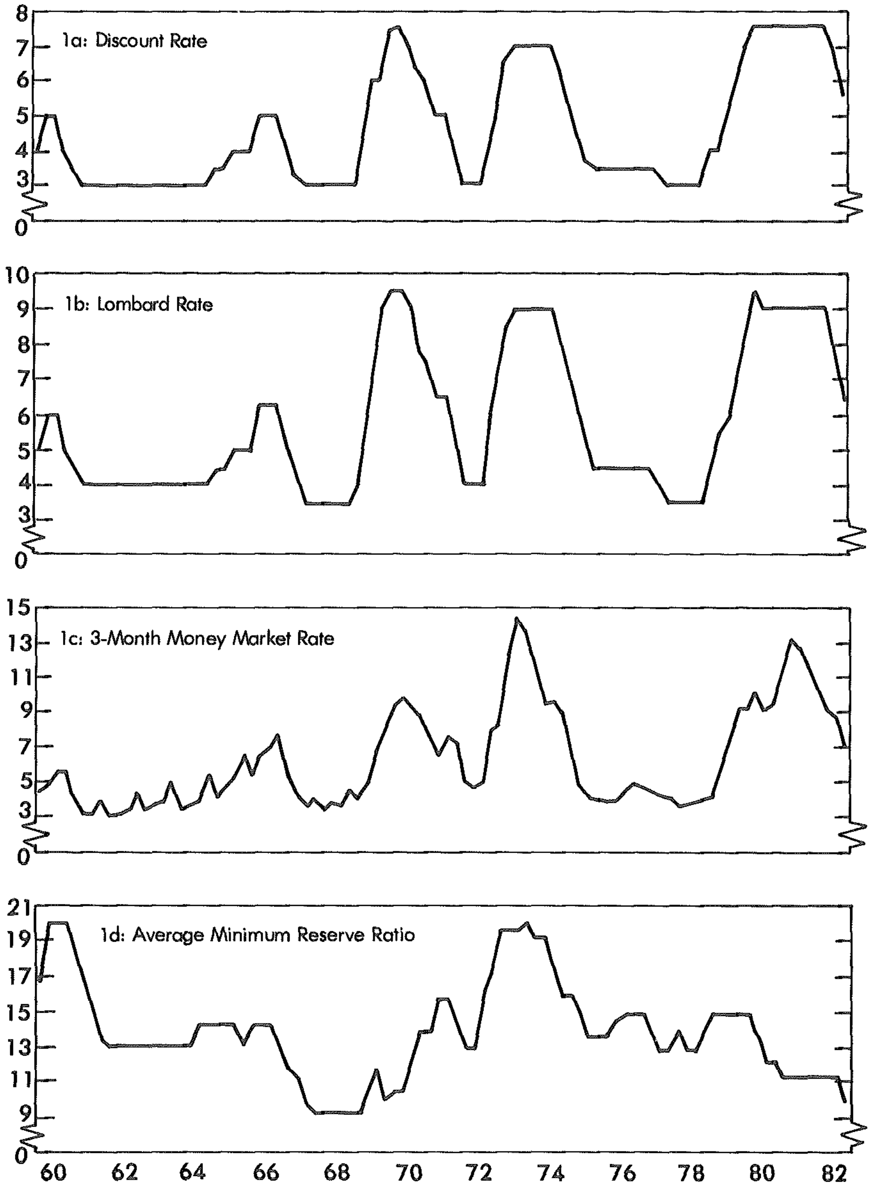
1. The Development of Instruments, Indicators and Target Variables of Monetary Policy

In the period under consideration, the Bundesbank applied the various instruments of monetary policy intensively. One of the most important instruments has been the discount rate. Decreases or increases in this rate have a significant announcement effect on the economy as they indicate the trend of general monetary policy or shifts of this policy. The discount rate has been varied much more frequently in the period since 1969 than in the sixties. In addition, the range of variation was much wider in the latter period than before. In the first decade the discount rate oscillated between 3 percent and 5 percent; in the following period the lowest rate was 3 percent but the highest rate was 7½ percent. In the seventies restrictive as well as expansionary policies were carried out much more intensively than before (Chart 1a). On the average, between 1960 and 1982, the discount rate has been 4.5 percent.

The Lombard rate has followed a patern very similar to the discount rate. Both rates have almost always been changed simultaneously in the same direction. However, the Lombard rate has fluctuated somewhat more strongly, varying from 3½ percent to 6¼ percent up until 1969 and from 3½ percent to 9½ percent in the following period (Chart 1b). The Lombard rate has generally been somewhat higher than the discount rate (averaging 5.7 percent in the period under consideration). The reason for this is that

Chart 1

Development of Instrument Variables of Monetary Policy 1960 - 1982



Source: Deutsche Bundesbank

the Bundesbank wants to warn commercial banks which are borrowing through the Lombard window that they should pursue a more careful credit policy. Usually, commercial banks only borrow through the Lombard window when cheaper and more convenient facilities of refinancing are no longer available.

Open market policy has played and continues to play an important role in the fine tuning of bank liquidity, central bank money and short-term interest rates in Germany. The institutional framework and the handling of this policy in practice has been drastically changed by the introduction of open market papers in combination with repurchase agreements in 1973. Since then, the Bundesbank has shifted from a price tender system to a system where price tenders and quantity tenders have been varied in an alternating fashion in which the Bundesbank has even limited the tender system from time to time. Therefore, it is very difficult to analyze the Bundesbank's behavior with respect to open market policy in the 1970s. It is clear though that open market rates fixed by the Bundesbank cannot deviate too much from short-term interest rates in financial markets. The development of the three-month money market rate is shown in Chart 1c. The chart shows that this rate's pattern is very close to the cyclical movement of the discount rate but that it has fluctuated much more than the discount rate.

Through its minimum reserve policy the Bundesbank tries to equilibrate large-scale shifts in commercial banks' liquidity. If, for example, banks lose reserves due to the transfer of funds abroad, the Bundesbank reduces the minimum reserve ratio. Conversely, if a sizable liquidity inflow to commercial banks occurs, the Bundesbank increases the minimum reserve ratio in order to neutralize this effect. Thus, minimum reserve policy is not intended to contribute primarily to policies relating to the growth of central bank money but instead to contribute to more stable liquidity on the part of commercial banks. The development of the average reserve ratio is shown in Chart 1d.

During the sixties and up to 1973 bank liquidity was the leading target variable of monetary policy in Germany. The Bundesbank tried to control the stock of liquid assets available to commercial banks rather than central bank money or the money supply. The theoretical concept behind this approach is that bank liquidity affects interest rates and the credit supply which, in turn, influence captial investment and thus real growth. For the Bundesbank the main indicator of commercial bank liquidity has been a variable that consisted of commercial banks' excess reserves, their stock of domestic money market papers, short-term foreign assets as well as their unutilized capacity to borrow through the discount window. However, the definition of bank liquidity and free liquidity reserves has been changed quite frequently by the Bundesbank. The concept was based on the notion that monetary aggregates could be influenced indirectly by the Bundesbank through the control of bank liquidity.

Using bank liquidity as the primary target variable and indicator of monetary policy has been subject to heavy criticism by many economists in Germany.[6] The main objections have been that the whole approach has lacked a consistent theoretical underpinning capable of explaining the factors determining the monetary process and furthermore, that it has been unable to take into account commercial banks' portfolio reactions as relative yields have changed. It was shown that under certain circumstances, bank liquidity was a misleading indicator of monetary policy. This became evident in the early 1970s, when the liquidity ratio of commercial banks declined drastically—thus indicating a restrictive monetary policy—while the volume of bank credit and the money stock grew rapidly. The Bundesbank tried to explain this situation with a shift of commercial banks' behavior. The fact was that a strong credit demand pushed up interest rates considerably so that it became profitable for commercial banks to reduce their stock of liquid assets as far as possible to satisfy this demand.

The observed inadequacy of the liquidity concept of the Bundesbank stimulated a reconsideration of the principles of monetary policy within the Bundesbank. More and more members of the Central Bank Council became convinced that the relationship between the money stock and economic activity was much closer and much more stable in the long- as well as in the short-run than the relationship between bank liquidity and the real sector of the economy.[7] The direct effect of changes in the money stock on aggregate demand was no longer questioned. This was in contrast to the view prevalent in the 1960s that variations of the money stock were endogenous reflections of real economic activity. At the same time the Bundesbank accepted the hypothesis of a relatively stable money demand function, at least in the long run.[8]

The process toward paying more direct attention to the money stock than before was expedited by the accelerating rate of inflation in the early 1970s. In several statements leading members of the Directorate of the Bundesbank declared that in order to control inflation the growth rate of the money stock had to be reduced.[9] These remarks confirmed that the Bundesbank intended to shift its target variable from bank liquidity to the money stock. However, the implementation of the new concept was delayed until the breakdown of the Bretton Woods System. Only the discon-

[6]Manfred J.M. Neumann, "The Deutsche Bundesbank's Concept of Monetary Theory and Monetary Policy," *Proceedings of the First Konstanzer Seminar on Monetary Theory and Monetary Policy,* (Karl Brunner, Ed.), *Supplement to Kredit and Kapital,* Vol. 1, Berlin 1972, pp. 165–218; Manfred Willms, "An Evaluation of Monetary Indicators in Germany," Ibid., pp. 219–242.

[7]See for example Deutsche Bundesbank, Längerfristige Entwicklung des Geldvolumens, *Monthly Report,* Vol. 23 (1971), No. 7, Frankfurt, July 1971, pp. 11–28.

[8]Ibid.

[9]Heinrich Irmler, "Ursachen und Abwehr der Inflation," Deutsche Bundesbank, Auszüge aus Presseartikeln, No. 12, Frankfurt, February 1972, pp. 1–10; Helmut Schlesinger, "Der Beitrag der Geldpolitik zur Preisstabilisierung," Deutsche Bundesbank, Auszüge aus Presseartikeln, No. 94, Frankfurt, August 1972, pp. 1–6.

Table 1
Annual Target Rates of Central Bank Money Growth, Actual Growth Rates of Central Bank Money and Growth Rates of the Money Stock M_1 (1975–1983)

Year	Target Rates of Central Bank Money Percent	Actual Rates of Central Bank Money[b] Percent	Growth Rates of M_1[b] Percent
1975	8[a]	7.8	13.7
1976	8[b]	9.2	10.4
1977	8[b]	9.0	8.2
1978	8[b]	11.4	13.3
1979	6 – 9[a]	9.1	7.5
1980	5 – 8[a]	4.8	2.3
1981	4 – 7[a]	4.4	1.1
1982	4 – 7[a]	4.9	3.1
1983	4 – 7[a]	—	—

[a]Target in the Course of the Year
[b]Average Annual Growth Rates
SOURCE: Deutsche Bundesbank, *Monthly Report,* Current Issues; Deutsche Bundesbank, Statistical Supplements to the *Monthly Reports* of the Deutsche Bundesbank, Series 4, Seasonally Adjusted Economic Data, Current Issues.

tinuation of the system of fixed exchange rates gave the Bundesbank the chance to control the growth of the money stock effectively. In the spring of 1973 the Bundesbank began direct control of central bank money. Central bank money became the primary target variable of monetary policy in Germany. In December 1974 the Bundesbank, for the first time, announced a target growth rate of central bank money for the year 1975. Since then the Bundesbank has annually declared a target rate in advance and since 1979 a target range of the planned annual rate of expansion of central bank money. The target rate or target range was based on a combination of the following four criteria:[10]

—the expected growth rate of production capacity,
—the expected change of capacity utilization,
—the unavoidable increase of the price level and
—the expected change in the velocity of money.

The annual target rates and the actual rates of growth of central bank money since 1975 are shown in Table 1. A comparison of the two makes it clear that—with the exception of 1978—the actual growth rates have not deviated too much from the target rates. Thus, at first glance one of the main goals of the new monetary policy, namely to stabilize the growth rate of central bank money in order to stabilize economic growth seems to have been realized.

[10]Deutsche Bundesbank, *Annual Report,* Frankfurt 1975, p. 11.

In order to examine whether monetary policy has been more stable since 1973 than before, the variance of the growth rates of central bank money has been calculated. The variance shows the average squared deviation of the growth rates of central bank money from the average growth rate. In the following analysis the variance is calculated on quarterly growth rates and an eight-quarter-moving-average-basis:

$$VAR(\hat{CBM}_t) = \frac{1}{8} \bullet \sum_{i=0}^{7} (\hat{CBM}_{t-i} - \overline{\hat{CBM}})^2$$

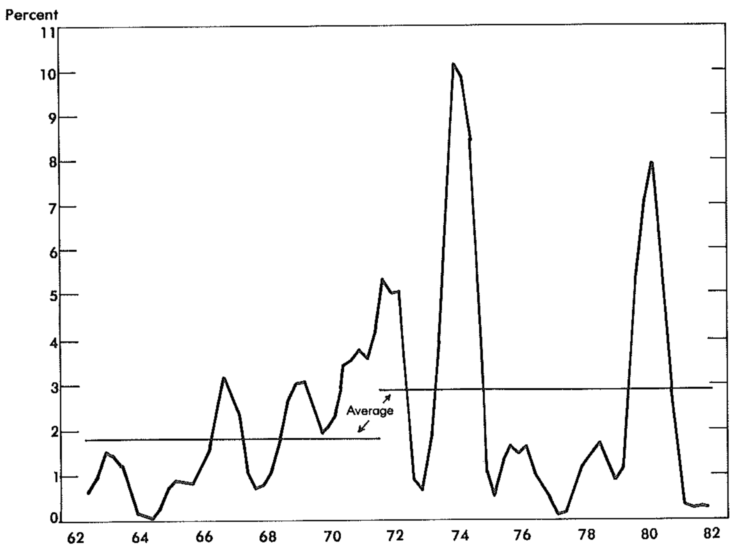
$\hat{CBM}_t$ = Quarterly growth rate of central bank money to previous year.

$\overline{\hat{CBM}}$ = 8-quarter-moving-average of growth rates of central bank money to previous year.

The values are displayed in Chart 2. It is obvious that the variance of the growth rates of central bank money fluctuated much more in the seventies than in the sixties. This result is surprising since the direct control and stabilization of central bank money has been declared as the primary goal of monetary policy in the seventies and not in the sixties. If it is true that a greater variance of monetary policy stimulates the economy less than a smaller variance, monetary policy in the sixties was more expansionary than monetary policy in the seventies.

Chart 2

Variance of Growth Rates of Central Bank Money 1962 - 1982



Source: Own calculations

2. Monetary Policy and Internal Disturbances

If seven-month moving averages of central bank money growth rates are applied to distinguish between periods of restrictive and periods of expansionary policy, five periods of restrictive monetary policy and five periods of expansionary monetary policy can be observed between 1962 and 1982 (Chart 3a). On the average the Bundesbank has shifted its policy every 24 months.

In some periods the fight against inflation has obviously dominated the course of monetary policy. The increasing deterioration of the value of money since 1964 may have induced the Bundesbank to shift to a restrictive course in 1965 II (Chart 3b). As a result of this policy, inflation rates have been as low as 0.7 percent in 1967 IV and 0.9 percent in 1968 II. The following increase in the rate of inflation, up to 7.3 percent in 1973 II was due to the adjustment of the German rate of inflation to the world inflation rate as a consequence of the Bretton Woods System. The Bundesbank cannot be made responsible for the increase in the inflation rate during this period.

The Bundesbank's concern about inflation became obvious by the very restrictive course monetary policy has followed since the spring of 1973. This policy was intended to break inflationary expectations. It brought the inflation rate down from its peak of 7.3 percent in 1973 II to 2.2 percent in 1978 II. The slow downward adjustment of the rate of inflation between 1973 and 1978 was in part due to the oil price increase in 1973 and in part to the fact that the Bundesbank had shifted to an expansionary monetary policy from 1974 onwards. The inflation rate began to rise again at the end of 1978. It took three years of restrictive monetary policy in order to get the rate of inflation to decline.

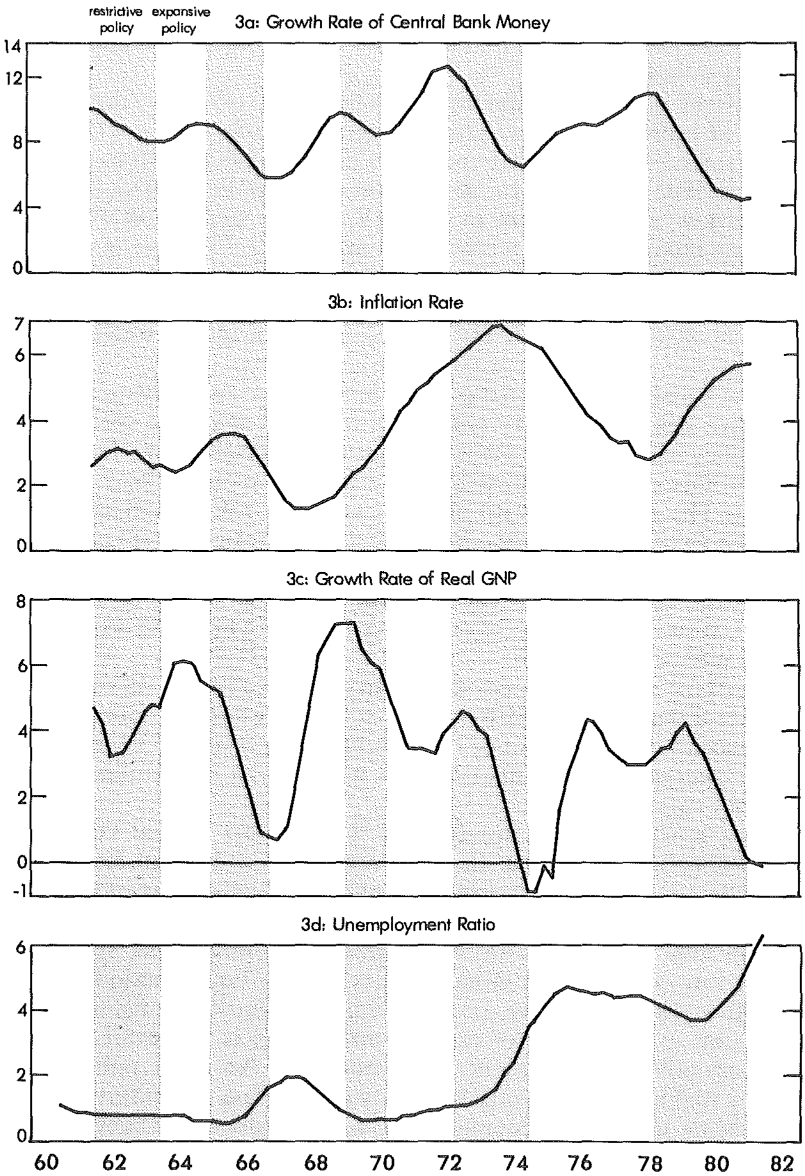
Looking at the total period with an average annual rate of inflation of 3.9 percent the Bundesbank has not realized its most important goal. Amazingly enough, in the period of managed floating from 1973 I through 1982 IV the average rate of inflation was higher than in the period of fixed exchange rates.

The reaction of the Bundesbank with respect to real GNP is much more difficult to determine than the reaction towards inflation, although the cyclical connection between the growth pattern of central bank money and the growth pattern of real GNP is relatively narrow. At first glance one can conclude that in recessionary periods the Bundesbank systematically shifted towards an expansionary policy and in boom periods towards a restrictive policy. However, from the data it cannot be concluded whether the change in the growth of central bank money is the result of an active monetary policy or a policy of accommodation. An active policy would be a policy that leads to a change in money growth due to a variation of policy instruments while an accommodative policy induces a change in money growth by forces from the real sector of the economy. In recessionary periods money-growth changes are very often the result of a policy of ac-

Chart 3

Development of Central Bank Money and Internal Economic Variables 1960-1982

(7 quarter-moving-averages)



Source: Deutsche Bundesbank

commodation, while in inflationary boom periods they are mainly the result of an active policy of restraint.

With respect to unemployment no systematic behavior pattern of the Bundesbank has been observable. For example, the unemployment rate increased from 0.6 percent in 1966 I to 2.7 percent in 1967 III (Graph 3d). During this period the policy of the Bundesbank was a restrictive one. The Bundesbank did not switch to an expansionary policy before the fall of 1967. On the other hand, the Bundesbank reacted promptly with an expansionary policy to the increase of the unemployment rate in 1974. However, the renewed increase of the unemployment rate in 1980 has not been followed by an expansionary monetary policy since the fall of 1981.

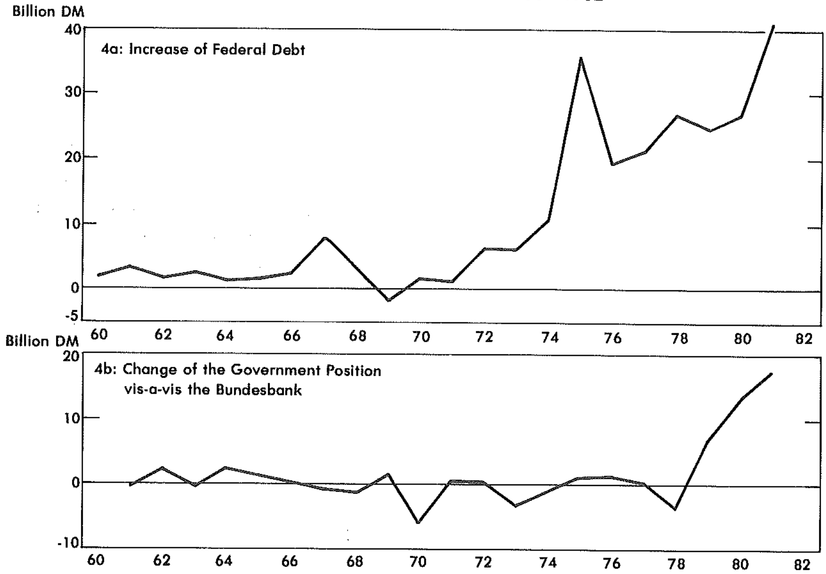
Besides inflation, growth, and unemployment, another variable to which an independent central bank like the Bundesbank could react is the increase in the stock of public debt. Since policymakers in almost all democratic societies tend to spend more than can be financed by taxes, there is considerable pressure on the central bank to finance a portion of the budget deficit by issuing new money. Very often this pressure is not a direct one but comes indirectly through developments within financial markets. In advanced economies, as a first step, budget deficits are typically financed by newly issued bonds which are sold to the commercial banking sector. As a consequence, interest rates increase, private investment is crowded out and the unemployment rate goes up. In order to get interest rates to decline, the government demands that the central bank finance part of the government debt in the open market. For a short period this procedure can lead to decreasing interest rates and stimulate the economy. The long-run inflationary effects are disregarded at that moment. Especially in order to escape this type of government pressure many central banks introduced target variables of money growth in the seventies.

In Germany, the Bundesbank has been relatively successful in resisting government pressure to finance the rapidly increasing budget deficits since the mid-seventies by printing new money.[11] Chart 4 shows the annual increase of the federal debt and changes in the net government position at the Bundesbank. This position is the sum of government deposits at the Bundesbank, of short-term government credit and of open-market papers in the hands of the Bundesbank. It can be seen that only since 1979 has the Bundesbank contributed to a large extent to the financing of the public debt. In addition to these amounts the Bundesbank transferred profits of DM 2.3 billion in 1980 and of DM 10.5 billion in 1981 to the Federal Government.

3. Monetary Policy and External Disturbances

In many statements the Bundesbank has declared that external goals are almost as important in its policy decisions as internal goals. External goals are balance of payments equilibrium and exchange rate stability. Both the balance of payments and the exchange rate are influenced by domestic

Chart 4
Increase of Federal Debt and Change of the Government vis-avis-a-vis the Bundesbank 1960 - 1982



Source: Deutsche Bundesbank

monetary policy actions. The current account depends very much on the absorption of the economy. The absorption itself is a function of the expansion of the domestic money stock relative to the expansion of the foreign money stock. A relatively restrictive domestic monetary policy leads to a surplus in the current account while a relatively expansionary policy causes a current account deficit.

In Germany, the relatively expansionary monetary policy compared to the previous period and to other countries from 1974 through 1977—with a brief interruption in 1977—led to a rapid deterioration of the current account from 1978 through 1980. Obviously, the very restrictive course of monetary policy since 1978 was intended to reduce domestic absorption. The result of this policy showed up in the current account in 1980 when the deficit began to decline for the first time after two years. In 1982 after almost four years of deficits the current account switched into a surplus.

The short-term capital account is influenced by interest rate policies. A positive interest rate differential vis-à-vis the domestic economy leads to an inflow of short-term capital while a negative differential induces a capital outflow. For Germany, the most important interest rate differential is the difference vis-à-vis the United States. Substantial net outflows of short-

[11]See Manfred Willms, "Monetäre Wirkungen der Staatsverschuldung," *Die Bank*, Cologne 1978, pp. 466–471.

term capital from Germany occurred in 1967/68 and 1973/74 (Chart 5c). In both of these periods the short-term interest rates in the United States were above those in Germany. The heavy inflow of short-term capital in 1969/70 and 1976/77 was obviously related to expectations of a revaluation of the mark. Although with its interest rate policy the Bundesbank followed the development of the U.S. interest rate closely (Chart 5a), it was not able to control short-term capital movements effectively.

The behavior of the Bundesbank with respect to exchange rates is best reflected by changes in the stock of foreign reserves. This stock has been relatively stable during most of the period of fixed exchange rates (Chart 5d). It was not before 1970 that the Bundesbank tried to oppose the devaluation of the dollar with substantial interventions in the exchange market. However, even with an increase in the stock of foreign reserves—mainly U.S. dollars—from DM 7.2 billion in 1970 I to DM 73.5 billion in 1973 III, the Bundesbank has not been able to prevent a devaluation of the dollar from DM 3.66 in 1970 to DM 2.40 in 1973 (Chart 5e).

During this period the Bundesbank lost control of the stock of central bank money. This process contributed to the adjustment of the German inflation rate to the international rate of inflation. With the final collapse of the Bretton Woods System in 1973 it was possible to stop the deterioration of the dollar's value and the Bundesbank was able to sell about DM 25 billion of its stock of foreign reserves between the fall of 1973 and the fall of 1975. In late 1975 the dollar once again was under pressure and the Bundesbank again started to buy U.S. dollars. As before, the Bundesbank was not able to prevent the downfall of the dollar.

In 1979 IV the dollar at DM 1.77 reached its lowest level in postwar history. Since then the value of the dollar increased again to about DM 2.50. The statistical data do not indicate that this development has been influenced by the Bundesbank. In total, the data seem to demonstrate that the Bundesbank, despite comprehensive interventions in the exchange market, has never been able to influence the course of the U.S. dollar except in the very short run. The interventions towards exchange rate stabilization only disturbed the course of domestic monetary policy.

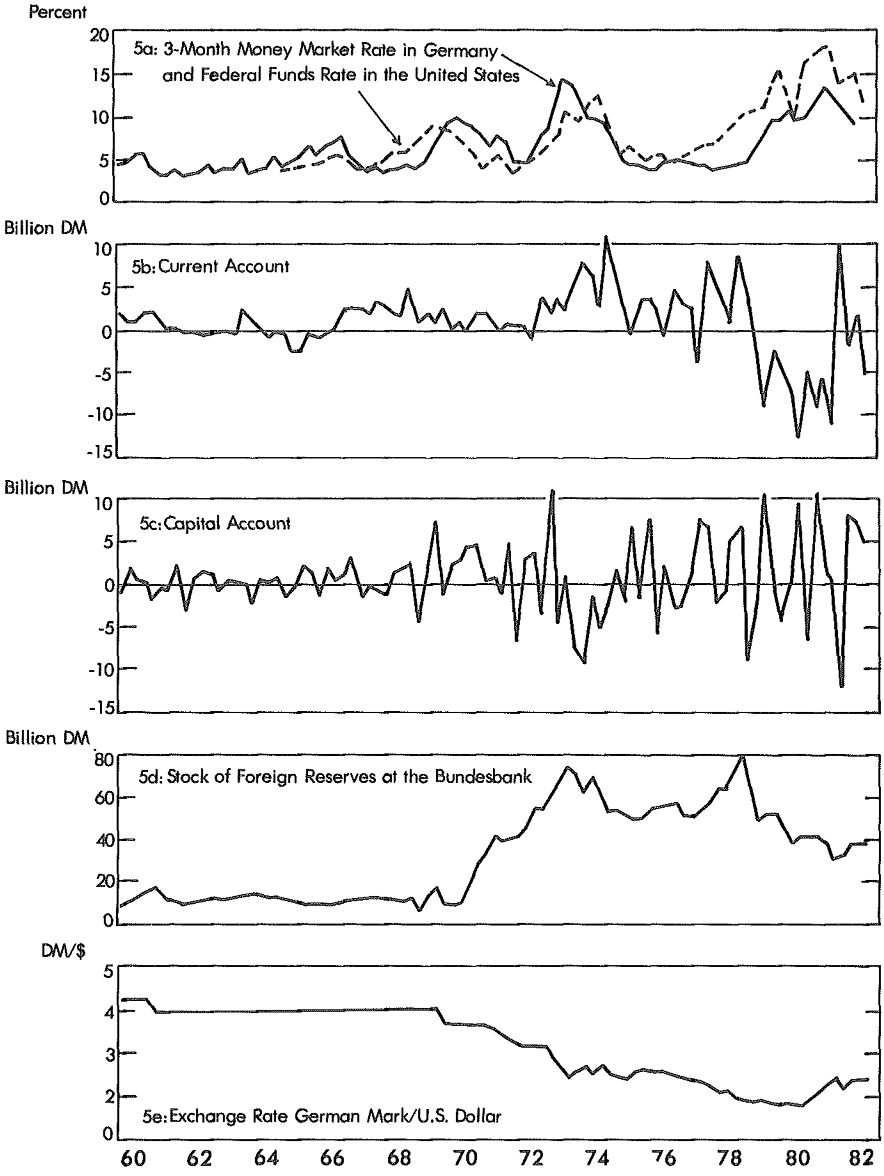
V. Models and Empirical Tests of Bundesbank Behavior

1. Existing Models and Empirical Results

In the recent past two efforts have been made to analyze the monetary policy decision process of the Bundesbank within the context of more rigorous models. A model applied by Basler is based on the theory of bureaucracy.[12] It assumes that the Bundesbank behaves like any other bureaucracy: it tries to maximize its own utility in the form of its prestige and power. This

[12] Hans-Peter Basler, "Die Wirtschaftspolitischen Zielpräferenzen der Deutschen Bundesbank," *Kredit und Kapital*, Vol. 11 (1978), pp. 84–108.

Chart 5
Development of Short-Term Interest Rate and External Economic Variables 1960 - 1982



Source: Deutsche Bundesbank

can best be done by an optimal fulfillment of its legally defined goals. Any deviation from the final goals of monetary policy is considered to be a loss of utility for the central bank and leads to a shift of its monetary policy actions. An underfulfillment of the goals implies a greater loss of utility than an overfulfillment. Furthermore, the central bank tries to reduce disturbances in financial markets. Accordingly, it adjusts the instruments of monetary policy only by small steps.

In the estimated reaction functions various instruments of monetary policy like the discount rate, the minimum reserve ratio, the rediscount quota, and the money market rate are regressed as dependent variables on differences between desired values of final goal variables and their actual standard. Goal variables are the inflation rate, the unemployment rate, the growth rate of real GNP, and the stock of foreign reserves. Desired values of the variables have been taken from statements of the Bundesbank or were estimated individually by the researcher. The regression results indicate that price stability has been the most important goal of monetary policy from 1958 through 1974. Real growth and balance of payments equilibrium were less important goals, while a reaction of the Bundesbank with respect to unemployment could not be observed. The last result may be due to the fact that unemployment—with the exception of 1967—was not a problem during the period under consideration.

In a more general politico-economic approach Frey and Schneider have tried to analyze the behavior of the Bundesbank within the framework of a model that explicitly incorporates the influence of the government and the electorate on monetary policy.[13] While it is assumed that the Bundesbank is largely independent of the voters' opinion, a conflict situation between the government and the Bundesbank is inferred whenever the Bundesbank is not willing to support the fiscal policy actions of the government. According to the model, such a situation occurs when the government attempts to stimulate the economy by monetary/fiscal policy actions in order to become reelected while the central bank in turn has opposed accommodating procedures in the fear of their subsequent long-run inflationary impact.

In the empirical estimates on Bundesbank behavior instruments of monetary policy like credits of the Bundesbank to the Federal Government, the rate on open market papers, the minimum reserve ratio, the discount rate, and the Lombard rate as dependent variables are regressed on their lagged endogenous variables as well as on variables that measure situations of conflict or nonconflict between central bank policy and government policy. A situation of conflict has been postulated when the Bundesbank increased its credit to the Federal Government while the stock of free liquid reserves of commercial banks decreased. In such a situation government policy was defined as expansionary, while central bank policy was

[13]Bruno S. Frey and Friedrich Schneider, "Central Bank Behavior. A Positive Empirical Analysis," *Journal of Monetary Economics*, Vol. 7 (1981), pp. 291–315.

defined as contractionary. For periods of an increase of Bundesbank credit to the government combined with an increase in the stock of free liquid reserves a nonconflict situation between the central bank and the government was assumed.

The regression results show that the lagged level of every instrument variable had a statistically significant positive effect on its current value.[14] Net credits of the Bundesbank to the Federal Government decreased in situations of nonconflict between the two institutions, i.e., when the Bundesbank could follow its anti-inflationary goal. In situations of conflict, however, the empirical results indicate that the Bundesbank had to follow the direction of government policy. Using the interest rates and the minimum reserve ratio as independent variables, a nonconflict situation led to an increase in interest rates while in situations where the Bundesbank had to adjust its instruments to an expansionary fiscal policy interest rates declined.

Although the models of Bundesbank behavior are consistent and the empirical results are plausible some questions remain with respect to the approaches in general. One question refers to the usefulness of applying instruments of monetary policy as endogenous variables in the regressions. The measurement of the effect of a change of an individual instrument variable on hypothesized situations of conflict or nonconflict is not very meaningful. What matters in monetary policy is not the shift of an individual instrument variable but the development of intermediate target variables like central bank money or short-term interest rates. Another question refers to the selection of an adequate variable to measure monetary and fiscal policy actions in order to separate periods of conflict between the Bundesbank and the Federal Government and periods of nonconflict. The liquidity ratio is certainly not a meaningful indicator or intermediate target variable of monetary policy. In addition, due to the small value of government debt in the hands of the Bundesbank and its relatively small change in the period under consideration this variable can hardly have affected the interest rate or the rate of inflation in a measurable way.

2. Reaction Functions Based on Intermediate Target Variables

In estimating reaction functions of the Bundesbank, the traditional Theil approach is applied in this section.[15] It is assumed that the utility of the Bundesbank increases as the actual goal variables and intermediate target variables of monetary policy approach their corresponding desired values. Diverging developments between actual and desired values imply a loss of utility and lead to policy reactions.

If a low rate of inflation, a high rate of real growth, and a low rate of

[14] Ibid, p. 302.

[15] See Henri Theil, *Optimal Decision Rules for Government and Industry*, Amsterdam 1964.

unemployment are the main goal variables of monetary policy and if central bank money is the intermediate target variable of the Bundesbank, the following loss function L_t can be specified:

$$(1)\ L_t = a_1(\hat{P}_t - \hat{P}_t^*)^2 + a_2(\hat{Y}_t - \hat{Y}_t^*)^2 + a_3(U_t - U_t^*)^2 + b(C\hat{B}M_t - C\hat{B}M_t^*)^2.$$

The function is subject to the following constraints

$$(2a)\ \hat{P}_t = a_{11}C\hat{B}M_t$$

$$(2b)\ \hat{Y}_t = a_{21}C\hat{B}M_t$$

$$(2c)\ U = a_{31}C\hat{B}M_t$$

where
$\hat{P}$ = growth rate of consumer price index
$\hat{Y}$ = growth rate of real GNP
U = unemployment rate
$C\hat{B}M$ = growth rate of central bank money
Variables with a star are desired variables.

Differentiating equation (1) totally with respect to $C\hat{B}M_t$ leads to

$$(3)\ 0 = 2a_1(\hat{P}_t - \hat{P}_t^*)a_{11} + 2a_2(\hat{Y}_t - \hat{Y}_t^*)a_{21} + 2a_3(U_t - U_t^*)a_{31} + 2b(C\hat{B}M_t - C\hat{B}M_t^*).$$

Solving equation (3) for $C\hat{B}M_t$ results in the reaction function

$$(4)\ C\hat{B}M_t = C\hat{B}M_t^* - \frac{a_1a_{11}}{b}\hat{P}_t - \frac{a_2a_{21}}{b}\hat{Y}_t - \frac{a_3a_{31}}{b}U_t + \frac{a_1a_{11}}{b}\hat{P}_t^* + \frac{a_2a_{21}}{b}\hat{Y}_t^* + \frac{a_3a_{31}}{b}U_t^*.$$

Assuming that the desired values of the goal variables are dependent on lagged observed values of the variables in question we obtain

$$(5a)\ \hat{P}_t^* = f_1(\hat{P}_{t-1}, \hat{P}_{t-2}, \ldots, \hat{P}_{t-n})$$

$$(5b)\ \hat{Y}_t^* = f_2(\hat{Y}_{t-1}, \hat{Y}_{t-2}, \ldots, \hat{Y}_{t-n})$$

$$(5c)\ U_t^* = f_3(U_{t-1}, U_{t-2}, \ldots, U_{t-n}).$$

The desired growth of central bank money is considered to be a function of lagged inflation rates, lagged growth rates of real income, lagged unemploy-

Table 2
Intermediate Target Reaction Functions of the Deutsche Bundesbank (1973 I-1982 II)
Cochrane-Orcutt-Procedure

Intermediate Target Variable	Const.	$\hat{P}_t$	$\hat{P}_{t-1}$	$\hat{P}_{t-2}$	$\hat{P}_{t-3}$	$\hat{P}_{t-4}$	$\hat{P}_{t-5}$	$\hat{Y}_t$	$\hat{Y}_{t-1}$	$\hat{Y}_{t-2}$	$\hat{Y}_{t-3}$
	Independent Variables										
(1) $\hat{CBM}_t$	18.27	−0.57	−1.58	0.91	−0.67	−0.45	0.32	−0.08	−0.14	0.11	−0.32
	(4.7)	(−1.8)	(−4.5)	(2.9)	(−2.2)	(−1.5)	(1.2)	(−0.7)	(−1.1)	(0.9)	(−2.9)
(2) $\hat{CBM}_t$	17.50	−0.78	−1.56	1.01	−0.69	−0.53	0.25	0.00	−0.07	0.08	−0.36
	(8.8)	(−2.9)	(−5.5)	(4.2)	(−2.8)	(−1.9)	(1.0)	(0.0)	(−1.0)	(1.2)	(−5.5)
(3) $\hat{CBM}_t$	14.49	−0.80	−0.90	0.77	−0.61	−0.77	0.62				
	(6.4)	(−2.4)	(−2.4)	(2.4)	(−1.9)	(−2.0)	(1.8)				
(4) $\hat{CBM}_t$	14.58	−0.58	−1.22	0.60	−0.49	−0.62	0.43				
	(3.7)	(−1.7)	(−3.3)	(2.0)	(−1.6)	(−1.7)	(1.3)				

List of symbols:
$\hat{CBM}$ = Growth Rate of Central Bank Money
$\hat{P}$ = Rate of Inflation
$\hat{Y}$ = Growth Rate of Real Gross National Product
U = Unemployment Rate
$\hat{\rho}$ = Autocorrelation Coefficient

ment rates and a variable Z that reflects long-run growth of production capacity:

$$(6)\ \hat{CBM}_t^* = f_4(\hat{P}_{t-1}, \ldots, \hat{P}_{t-n}, \hat{Y}_{t-1}, \ldots, \hat{Y}_{t-n}, U_{t-1}, \ldots, U_{t-n}, Z).$$

Assuming that central bank money will be adjusted only partially with respect to time the following reaction function will be obtained:

$$(7)\ \hat{CBM}_t = \text{const.} + \gamma_{11}\hat{P}_t + \gamma_{12}\hat{P}_{t-1} + \ldots \gamma_{1n}\hat{P}_{t-(n-1)} + \gamma_{21}\hat{Y}_t + \gamma_{22}\hat{Y}_{t-1} + \ldots \gamma_{2n}\hat{Y}_{t-(n-1)} + \gamma_{31}U_t + \gamma_{32}U_{t-1} + \ldots \gamma_{3n}U_{t-(n-1)}$$

Intermediate Target Variable	Independent Variables										
	$\hat{Y}_{t-4}$	$\hat{Y}_{t-5}$	U_t	U_{t-1}	U_{t-2}	U_{t-3}	U_{t-4}	U_{t-5}	R^2	DW	$\hat{\rho}$
(1) $C\hat{B}M_t$	−0.12 (−1.3)	−0.03 (−0.4)	−1.10 (−1.9)	0.28 (0.4)	0.51 (0.6)	0.26 (0.3)	−0.01 (0.0)	−0.16 (−0.2)	0.98	2.08	0.90
(2) $C\hat{B}M_t$	−0.10 (−1.4)	0.00 (0.0)							0.97	2.00	0.90
(3) $C\hat{B}M_t$									0.93	1.49	0.88
(4) $C\hat{B}M_t$			−0.75 (−1.3)	0.17 (0.3)	1.32 (2.0)	0.10 (0.2)	0.59 (0.8)	−1.39 (−2.2)	0.96	1.80	0.90

with

$$\gamma_{11} = \frac{a_1 a_{11}}{b} \quad \gamma_{12} = \frac{a_1 a_{12}}{b} f_1 \quad \gamma_{1n} = \frac{a_1 a_{1n}}{b} f_1$$

$$\gamma_{21} = \frac{a_2 a_{21}}{b} \quad \gamma_{22} = \frac{a_2 a_{22}}{b} f_2 \quad \gamma_{2n} = \frac{a_2 a_{2n}}{b} f_2$$

$$\gamma_{31} = \frac{a_3 a_{31}}{b} \quad \gamma_{32} = \frac{a_3 a_{32}}{b} f_3 \quad \gamma_{3n} = \frac{a_3 a_{3n}}{b} f_3$$

$$n = 3 \ldots$$

Equation (7) has been estimated with quarterly data for the 1973–1982 period utilizing the COCHRANE-ORCUTT iteration technique for reducing autocorrelation (Table 2). During this period central bank money has been the most important intermediate target variable of monetary policy. Out of various calculated lag patterns a lag structure of six periods has been selected according to best fit criteria. The reaction functions were regressed on inflation rates, real growth rates of GNP and unemployment rates together as independent variables, and by dropping real growth rates and unemployment rates from other equations.

The results indicate that the Bundesbank's central bank money policy has primarily been a reaction to the development of the inflation rate. This is the only variable for which most of the coefficients have the right sign and are statistically significant. F-tests show that the unemployment rate (equations 1 and 4) does not contribute to the explanation of the growth rate of central bank money. On the other hand—according to the F-test—real GNP has had an influence on Bundesbank behavior, although most of the lagged GNP-variables have a negative instead of the expected positive sign and many coefficients are not statistically significant (equations 1 and 2). According to the F-test equation 2 has the best explanatory power. The equation reveals that over six-quarter periods the Bundesbank reacted to a 1 percent increase in the rate of inflation with a 2.3 percent decline in the growth rate of central bank money.

While central bank money has only become an intermediate target variable of the Bundesbank since the early 1970s, short-term interest rates have been an important intermediate target variable throughout the post-war period. Therefore, reaction functions of the Bundesbank using the three-month money market rate (MMR) as the intermediate target variable have been estimated for the 20-year period 1962 II through 1982 II. As above, the inflation rate, the growth rate of real GNP, and the unemployment rate were used in various combinations as independent variables. The best fit was obtained for a lag structure of three quarters.

The results in Table 3 show that a statistically significant reaction pattern of the short-term interest rate can only be observed with respect to the rate of inflation. Real GNP and the unemployment rate do not significantly contribute to the explanation of Bundesbank behavior as reflected in the short-term interest rate. Therefore, equation 3 explains the behavior of the Bundesbank with respect to the short-term interest rate best. According to the sum of the coefficients the Bundesbank reacted towards a 1 percent increase in the inflation rate by increasing the short-term interest rate by 1.3 percentage points over three quarter periods.

VI. Summary

1. During the period under consideration (1960–1982) the Bundesbank mostly followed an activist rather than a nonactivist monetary policy.

Table 3
Intermediate Target Reaction Functions of the Deutsche Bundesbank (1962 II-1982 II)
Cochrane-Orcutt-Procedure

Intermediate Target Variable	Independent Variables												
	Const.	$\hat{P}_t$	$\hat{P}_{t-1}$	$\hat{P}_{t-2}$	$\hat{Y}_t$	$\hat{Y}_{t-1}$	$\hat{Y}_{t-2}$	U_t	U_{t-1}	U_{t-2}	R^2	DW	$\hat{\rho}$
(1) MMR	2.69	0.67	0.31	0.25	0.05	−0.05	0.12	−0.46	−0.34	0.24	0.88	1.53	0.92
	(0.7)	(2.2)	(0.9)	(0.8)	(0.5)	(−0.5)	(1.2)	(−0.6)	(−0.4)	(0.3)			
(2) MMR	0.64	0.71	0.33	0.27	0.08	−0.01	0.15				0.88	1.40	0.88
	(0.3)	(2.4)	(1.0)	(0.9)	(0.9)	(−0.1)	(1.8)						
(3) MMR	3.24	0.66	0.48	0.17							0.86	1.36	0.86
	(1.8)	(2.4)	(1.6)	(0.6)									
(4) MMR	6.61	0.56	0.44	0.09				−0.45	−0.68	0.02	0.87	1.63	0.94
	(1.9)	(2.0)	(1.5)	(0.3)				(−0.7)	(−0.8)	(0.0)			

List of symbols:
MMR = 3-Month Money Market Rate
$\hat{P}$ = Rate of Inflation
$\hat{Y}$ = Growth Rate of Real Gross National Product
U = Unemployment Rate
$\hat{\rho}$ = Autocorrelation Coefficient

2. Monetary policy became increasingly more destabilizing in the 1970s than in the 1960s. The fluctuation of central bank money as measured by the variance of its growth rates was much higher during the seventies than in the sixties even though the seventies was a period with floating exchange rates and where target growth rates of central bank money were announced.
3. Due to the heavy fluctuations of central bank money growth the Bundesbank obviously contributed considerably to the cyclical fluctuations of real GNP. An overrestrictive course of monetary policy led to a situation where an over-expansionary policy was felt to be required, which, in turn, soon led to a situation where a restrictive course was followed again. Through this behavior the Bundesbank destabilized the economy instead of stabilizing it.
4. The Bundesbank successfully resisted any pressure to absorb high portions of the government debt that has been growing rapidly since 1974. The increase in the net government position vis-à-vis the Bundesbank since 1978 did not result in an inflationary acceleration of central bank money.
5. The estimation of reaction functions of the Bundesbank is a difficult task. Estimates of reaction functions with central bank money and the three-month money market rate as dependent variables and the inflation rate, the growth rate of real GNP, and the unemployment rate as independent variables show that the most important goal of Bundesbank policy has been the stabilization of the price level. According to the estimates over six-quarter periods the Bundesbank reacted to a 1 percent increase in the rate of inflation with a 2.3 percent decline in the growth rate of central bank money and over three-quarter periods with an increase in the short-term interest rate of 1.3 percentage points.

Discussion

Hermann-Josef Dudler*

At a recent monetary conference in Tokyo, Milton Friedman, the dean of professional central bank critics, confessed privately that among the larger central banks the Bank of Japan and the Deutsche Bundesbank indulged less in monetarist "rhetorics" than others, but did "quite well" policy-wise. His views were corroborated on the spot as Japanese academics sang the praises of their own central bank. Fortunately, no German university teachers of monetary economics had been invited. In Germany academics can best maximize their individual utility function by severely criticising the Bundesbank's performance. Professor Willms' paper, which I find deserves to be carefully considered by the Bundesbank, provides a good example of a monetarist subculture indigenous to Germany, that may seem somewhat peculiar to outsiders, but helps us to maintain high stability standards.

I shall refrain from discussing technical or institutional details of Professor Willms' paper which might only be relevant in the context of an intra-German dialogue. The system of monetary policymaking in Germany is well described in his paper. However, the rather critical view that he takes on the Bundesbank's performance needs to be more closely examined. Since the author has conveniently summarized his assessment by placing five concise judgmental statements at the end of his paper, I shall take up these key propositions in order to structure my own comments and refer to the most important sections of the main body of the paper in the relevant context.

Before turning to the author's concluding theses, let me clarify my own position with respect to the academic tradition in which his paper is written. The criteria and analytical framework, which Professor Willms applies to assess the Bundesbank's performance, are apparently derived from a "strong" or "hard-core" monetarist position. The German inflation rate, real income and employment fluctuations and the declining growth performance of the German economy are attributed almost uniquely to variations in the nominal stock of central bank money for which the Bundesbank is held responsible. It is not clear from Professor Willms' paper what kind of reaction mechanism—a radical "rational" or more gradually working "adaptive" expectations structure—he sees at work in Germany that links the observed behavior of the money stock with information processing by private agents. But the author, at any rate, seems to adhere to the well-known monetarist tenet that systematic monetary policy action cannot exert any lasting effects on the level of economic activity.

As a central banker I am inclined to take a less neoclassical view of the

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functioning of the German economy. I am uncertain about the strength or dominance of the presumed self-stabilizing properties of the German private sector. I also doubt whether expectations mechanisms are at work that leave no room for efficient corrective monetary action in the face of domestically or externally generated demand and supply shocks.

On the other hand, I must confess that monetary policy in Germany—as elsewhere—may, at times, tend to overreact to perceived inflationary or deflationary disturbances. This does not necessarily reflect a pathological preference function of a central bank bureaucracy operating in an ivory tower. An even more important reason are public opinion pressures, from which the monetary authorities cannot be insulated in a democratic society. Government, parliament, industrial organizations, the financial community and the public at large frequently tend to underestimate the impact lags in monetary management, overestimate its efficiency and demand quick remedial monetary action, whenever a major stabilization goal is missed in the short run.

Virtually all major central banks have adopted monetary targeting techniques as an institutional device that helps to reduce such destabilizing political pressures and commits monetary management to a longer term anti-inflationary orientation. I am therefore in basic agreement with a good deal of the political economy spirit in which Professor Willms' paper is written.

Nevertheless, among Professor Willms' concluding propositions I found only one statement which I would accept without reservation, namely the author's assertion that "the estimation of reaction functions of the Bundesbank is a difficult task." Given this apparent difficulty he seems to have decided to base his assessment of policymaking at the Bundesbank and the German central bank's performance on a fairly limited set macroeconomic data, which he interprets in the light of a well-established German school tradition.

Proposition 1.

The author's first concluding observation that the Bundesbank mostly pursued "activist" policies over the past 20-odd years must be heavily qualified in order to convey a reasonable up-to-date impression of the Bundesbank's policy intentions. Judging from the main text of the paper, the author bases his judgment on a narrow perception of "activist" policies which he equates with the traditional notion of "discretionary" monetary "fine tuning." The empirical evidence presented is more or less confined to his own measurement of variance in central bank money (which statistically and visually exaggerates volatility near turning points), the policy response pattern derived from his monetary policy reaction functions and the impressionistic messages he reads from graphs juxtaposing changes in the central bank money stock with variations in domestic economic variables (cf. Graphs 2 and 3).

Contrary to what the paper asserts, the Bundesbank has hardly ever accepted the notion of a "direct effect of changes in the money stock on aggregate demand." Our own assessment of the relevant magnitude and periodicity of monetary fluctuations incorporates a fairly long time lag from shifts in monetary policy to output changes, since the demand for money is assumed to be fairly interest elastic while private expenditures appear to be relatively insensitive to changes in nominal interest rates.

At the conceptual plane, Professor Willms' conventional distinction between activist "discretionary" and "nondiscretionary" policies guided by a constant monetary growth rate rule is no longer fully adequate to characterize the relevant options concerning the Bundesbank's choice of policy regime in recent years. Since 1979, the Bundesbank establishes a 3 percentage point target band for the money supply, whose upper and lower ends are associated explicitly with specific changing circumstances (such as unpredicted exchange rate and domestic inflationary disturbances or recessionary tendencies). Limited departures from the medium-term mid-point target path were thus made dependent on well-defined events, and the Bundesbank deviated from the targeted middle-path for monetary growth only, when such disturbances actually occurred. The Bundesbank's present policy approach thus combines—within the confines of our limited knowledge of the dynamic response patterns of the German economy—elements of "formula flexibility" or "control-theoretic" procedures with more conventional monetary targeting.The so-called "activist" ingredients in the Bundesbank's policy approach do thus not allow the monetary authorities to act in a completely unconstrained or unaccountable manner or to "look at everything" in an unstructured way. Our policies should therefore not be labelled "discretionary" in the traditional sense.

Proposition 2.

Based on his measurement of variance of the central bank money stock, Professor Willms concludes that monetary policy in Germany became increasingly more destabilizing in the 1970s, although the Bundesbank adopted monetary targeting practices in a floating rate environment. The term destabilizing is qualified mainly to refer to real income volatility, but the paper also suggests that the Bundesbank "has not realized its most important goal" and may also be responsible for the economy's poorer growth performance in the 1970s.

I could not claim with a safe conscience that the Bundesbank always followed an ideal stabilization course. On the other hand, I fail to see any hard evidence in Professor Willms' paper that would support his harsh verdict on what appears to be an outstandingly poor policy record of the German central bank.

With respect to nominal and real income fluctuations, the relevant statistical tests of the Sims and Granger type tend to give inconclusive and poor results with respect to the potential causal role of key monetary aggregates in Germany. Similarly, policy simulations undertaken with the help of the Bundesbank's large-scale econometric model do not suggest that implementation of a rigid monetary rule could have produced better results than the Bundesbank's actual policy behavior in the 1970s.

The deterioration in economic performance experienced in the 1970s is, of course, less of a puzzle to those economists who recognize the influence of the sizable abnormal demand and supply shocks characterizing the 1970s, which Professor Willms' paper hardly ever mentions. Germany entered the 1970s in a state of sharply accelerating inflationary expectations and increasing trade union militancy. The economy suffered not only from the impact of international monetary disturbances, but also from the aftermath of the most excessive postwar boom to which fiscal and monetary overstimulation in the late 1960s had greatly contributed. The world raw material boom and the first oil shock (1973/74), the dollar depreciation crisis (1977/78), the second oil shock (1979/80) and the recent pronounced real dollar appreciation affected the German economy as heavily as other open industrial economies. Apart from these intermediate-run disturbances, the long-run growth performance of the German economy was influenced unfavorably by the rapid expansion of the public sector, international competition from newly industrialized countries and the new world energy situation which rendered part of the capital stock obsolete.

Proposition 3.

Since the paper takes virtually no account of the deteriorating economic environment, in which monetary policy had to operate since the early 1970s, the author sees the economy over the past two decades exposed to what he conventionally calls "cyclical fluctuations" in real GNP, which he links with a self-perpetuating destabilizing four-year monetary policy cycle. For obvious reasons, I find this interpretation of the data unacceptable, especially for the 1970s. If the German monetary authorities were so regularly and almost predictably wrong, one really wonders, why the private sector failed to anticipate the Bundesbank's recurrent, more or less offsetting policy shifts and why agents did not learn to disregard these transitory short-run monetary disturbances altogether.

Proposition 4.

There is one measure of success presented by the author which should please the Bundesbank. In his view the German monetary authorities "successfully resisted any pressure to absorb higher portions" of government debt. I do not believe that this observation, by itself, provides any evidence that the Bundesbank completely refrained from accommodating large fiscal deficits. The Bundesbank Law simply prevents it from lending more than marginal amounts directly to the Government and from buying marketable public debt in order to finance the Government. However, there are no direct legal restrictions on the extent to which the central bank may facilitate public sector borrowing from commercial banks by lowering minimum reserve ratios, acquiring foreign and private sector assets, or lending to the banking system against security collateral. There was at least one period—namely the years 1967/68—when the Bundesbank under heavy political pressure facilitated the placement of an abnormally large volume of highly liquid short-term government debt with the banking system. This helped to finance smoothly several ambitious deficit spending programs which cotributed to the subsequent period of pronounced overheating.

Proposition 5.

Professor Willms concludes from his work on Bundesbank reaction functions that the overriding concern of Bundesbank policy has been the stabilization of the price level. I cannot quarrel with this general statement. The Bundesbank Law requires the German monetary authorities to follow such a course of action, and our own perception of the stabilization function of monetary management clearly implies that maintenance of a fairly stable and reasonably low inflation rate represents the main contribution that a modern central bank can make to support the smooth functioning of a market economy and maximize public welfare.

In other places in the paper, notably the fourth section, the author indicates, however, that concern about recessions repeatedly produced excessively expansionary policy shifts and that external goals have almost been as important among the Bundesbank's explicit targets as domestic final objectives. It is certainly true that the Bundesbank, at times, took account of output objectives when the long-lasting fight against inflation seemed to be won. The specific decisionmaking model tested by Professor Willms and notably the adopted lag structure may have prevented him from establishing strong empirical evidence on this aspect of Bundesbank policymaking.

The author was principally right to refrain from directly testing the relevance of external goal variables. Contrary to what the paper states in other places, a stable DM/$- or effective exchange rate and a desired gross interest rate differential between Germany and the United States have hardly ever represented final goals of monetary policy after 1973. The Bundesbank was concerned, however, about the destabilizing output and inflation effects associated with pronounced real exchange rate variations which occurred since the second half of the 1970s. These external disturbances, which destroyed our belief in the "neutrality" or ideal insulating function of a floating exchange rate regime, complicated the independent pursuit of domestic monetary and final economic objectives. They could therefore not be neglected in considering feasible and desirable combinations of internal price and output objectives. A complete model of Bundesbank decisionmaking would have to allow for such complexities.

Generally speaking the rudimentary decisionmaking model presented by the author can hardly adequately represent the economic structure at which the Bundesbank was looking over the past 10 to 20 years and greatly simplifies the decisionmaking process. The author "explains" quarterly variations in the central bank money stock (and a key money market rate) with the help of lagged observed changes in prices, output, and unemployment, with no explicit allowance being made for exogenous shocks, interdependence between final goal variables, shifts over time in the Bundesbank's perception of feasible and desirable goal combinations, lags in the transmission of monetary shocks to final objectives and the working of expectation mechanisms or learning processes. The exercise also exhibits some obvious weaknesses from a purely statistical point of view. The reaction function treating the central bank money stock as a control instrument may suffer from simultaneous equation bias, the estimated coefficients and t-ratios for all reaction functions could be distorted due to intercorrelations between independent variables, higher-order autocorrelation cannot be excluded, and the simple lag structure applied may not be appropriate given the likely complexity of the problem at hand.

The fairly extensive list of critical counterarguments which I have presented in the foregoing should, of course, be read with a grain of salt. They represent a response of an interested party in the continuous fruitful dialogue between Bundesbank economists and German academic critics of the central bank's behavior. Let me repeat that the central political messages of monetarism are well understood and heeded at the Bundesbank, even if we feel that implementation of a rigid monetary growth rate rule does not provide the secular answer to all our problems. What we have achieved since the transition to monetary targeting in 1975 in terms of the level and variability of the inflation rate—our prominent final goal variable—may best be judged from the behavior of the German GNP deflator (which eliminates the distorting direct inflationary impact of external price shocks):

Annual average change in German GNP deflator, 1975–1983 in percent.

1975	1976	1977	1978	1979	1980	1981	1982	1983[e]
6.1	3.4	3.7	4.2	4.0	4.5	4.2	4.8	3.0

[e]Partly estimated.

Methods of Monetary Control in Italy: 1974-1983

Cesare Caranza and Antonio Fazio*

1. Introduction. Instruments and Objectives of Monetary Policy

Monetary policy aims at achieving specified values and results for variables outside the financial sector: aggregate demand, investment, the balance of payments and prices. These may be defined as final objectives of monetary policy and are strictly correlated with income, employment and the orderly course of economic and social life.

In some cases monetary policy objectives involve variables "inside" the financial sector such as the structure and nature of financial intermediation, the interest cost of the public debt, etc. These variables are considered not only to be of immediate importance for some categories of economic agents, but also to exert an influence in the long term, and sometimes a decisive one, on the final objectives of monetary and economic policy. The objectives "inside" the financial sector can sometimes also be seen as constraints rather than as objectives to be achieved or maximized (minimized).

The different objectives of monetary policy can be positively correlated between themselves. Sometimes, by contrast, they are negatively correlated so that pursuit of one implies renouncing, at least in part, pursuit of another.

Monetary policy employs instruments in the specific sense of variables that are under the *immediate* and *direct* control of the monetary authorities, and in particular of the central bank. Financial variables that are not important as economic policy objectives but which influence them and are only controlled *indirectly* by the central bank are usually known as intermediate objectives.

Intermediate objectives are correlated between themselves and related more or less closely to the different final objectives. The instruments may also be mutually correlated or independent to a greater or lesser extent, as well as being more or less closely correlated with the intermediate objectives.

Even when one particular aggregate is officially adopted as "the intermediate objective," the authorities monitor a series of intermediate objectives (and use a series of instruments), since they are aiming at several final objectives. Following Tinbergen, the number of (mutally independent) in-

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struments must be equal to the number of objectives.[1] Moreover, Mundell has shown that each instrument should be used for the objective that it influences most effectively.[2]

The emphasis placed on certain intermediate objectives (and instruments) depends on the whole system of interrelationships between instruments, intermediate and final objectives and on the priority attached to each objective.

A formal and rigorous attempt to trace back these relationships in the Italian institutional context has been made with the construction of the econometric model of the Bank of Italy.[3] The aim of this paper is to focus on the evolution of the modus operandi of monetary policy during the last 10 years and to describe which analytical framework has been adopted. A review of some aspects of the general problem of choosing intermediate objectives (Section 2) is followed by a discussion of the approach adopted by the Bank of Italy in analyzing financial flows (Section 3) and of the modalities of its application in monetary and credit management since 1974 (Section 4). Finally, the evolution of the instruments of this policy is examined in the light of recent developments in the money and financial markets (Section 5).

2. The Choice of the Intermediate Target.

Taking into account information lags regarding final objectives and the structural lags in the effects of monetary policy on real variables, intermediate objectives provide a reference point for the authorities' action in the short term.[4]

The problem of the choice of intermediate objectives was thoroughly studied in the literature on optimal techniques of monetary control during the seventies. This has helped to clarify the basic elements and implications of the choice between various objectives. The solutions adopted in practice depend on knowledge of the relationships linking instruments, intermediate objectives and final objectives, both as regards the values of the parameters that define the financial structure and the stability of the key behavioral functions.[5]

The first basic alternative that authorities have to tackle is whether to define their intermediate objectives in terms of interest rates or monetary

[1] J. Tinbergen, *Economic Policy: Principles and Designs*, North Holland, 1966.

[2] R. Mundell, "The Monetary Dynamics of International Adjustment under Fixed and Flexible Exchange Rates," *Quarterly Journal of Economics*, No. 2, 1960.

[3] *Modello Econometrico della Banca d'Italia, M2BI*, February 1979.

[4] B. Friedman, "Targets, Instruments and Indicators of Monetary Policy," *Journal of Monetary Economics*, October 1975.

[5] F. Modigliani and L. Papademos, "The Structure of Financial Markets and the Monetary Mechanism," *Controlling Monetary Aggregates III*, Federal Reserve Bank of Boston Conference Series No. 23, October 1980; B. Sitzia, "Teoria dei sistemi e programmazione economica," *Etas libri*, 1979.

aggregates. Under conditions of uncertainty deriving from the instability of economic agents' behavior and incomplete knowledge of the causal links between intermediate and final objectives, the first solution (given certain assumptions) is preferable when the factors causing instability primarily influence the supply and demand conditions of money and other financial instruments; the second when the factor causing instability mainly affects the real sector of the economy.[6]

During the seventies the disequilibria in the industrial countries stemming from the raw material and labor markets, as well as high and variable inflation rates, undermined the use of interest rates as intermediate objectives, and encouraged the increasingly widespread use of monetary and credit aggregates for this purpose. The abandonment of the fixed exchange rate system, which had anchored the various national monetary targets to that of the reserve currency, also contributed to this development.[7]

The replacement of interest rates by monetary aggregates had nonetheless already been prepared at the theoretical level by the criticism leveled against the text-book version of the Keynesian model and the success of monetarist doctrine, which postulates a basically stable relationship between the quantity of money and the level of economic activity.[8]

The choice of the aggregate for the purpose of monetary control raises some basic issues of monetary theory. A choice has to be made: a) between a narrow or a broad aggregate of financial assets, and b) between an asset or a liability aggregate in the private sector balance sheet.

According to Tobin, the special role of money in the transmission of monetary policy is due to its yield being fixed exogenously, while those of other financial assets are determined endogenously by the market.[9] When the supply of a certain type of financial asset is increased, its yield and that of alternative assets will rise so as to induce the public to hold a larger quantity in its portfolio. If the supply of money increases, the adjustment will be entirely in terms of the interest rates on alternative assets since the yield on money is fixed. This explains why a substitution of securities with money in the public's portfolio has an expansionary effect. The decline in the interest rates on the assets that are the closest substitutes for money will also influence the yields on longer term assets owing to the attempt by the public to shift towards longer maturities. In the end this process will influence the demand for shares and capital goods. Furthermore, the decline in

[6]W. Poole, "Optimal Choice of Monetary Policy Instruments in a Simple Stochastic Macromodel," *Quarterly Journal of Economics*, May 1970.

[7]J. E. Woodsworth and F. Leonard De Juvigny (eds.), *New Approaches in Monetary Policy,* The Netherlands: Sitjhoff and Noordhoff, 1979; OECD, *Monetary Targets and Inflation Control*, Monetary Studies Series, 1979; A. Lamfalussy, "Rules versus Discretion: An Essay on Monetary Policy in an Inflationary Environment," *BIS Economic Papers*, April 1981.

[8]M. Friedman, "The Role of Monetary Policy," *American Economic Review*, March 1968.

[9]J. Tobin, "A General Equilibrium Approach to Monetary Theory," *Journal of Money, Credit and Banking*, February 1969.

interest rates will lead to a reduction in the cost of borrowing, so that the final outcome will be an increase in investment and income.

In the transmission of monetary policy these "substitution effects," produced by changes in interest rates, may be reinforced by "wealth effects," caused by the development of excess demand for (or supply of) financial assets.

Within this framework the definition of the most important aggregate depends on its relative stability vis à vis (a limited number of) real variables. An important part of the literature that took the Keynesian theory of liquidity preference as its basis and the Radcliffe Report as its monetary manifesto, has emphasized the greater stability in relation to income and wealth, compared with money, of a broader range of financial assets representative of what economic agents consider as their liquid reserves.[10]

In the Netherlands, for instance, the concept of "liquid assets," judged to be of greatest importance for the purposes of monetary control includes, in addition to money in the strict sense, all the liabilities issued by the public sector and banks that can be converted into money "at relatively short notice, without much expense or great losses on the transaction, and which can be used at their face value to make payments in satisfaction of current tax assessments."[11] This definition goes beyond the boundaries of the broadest monetary aggregates and embraces most of the economy's financial portfolio.

The formation of financial assets is the counterpart of the total flow of finance to the sectors that are final users of savings resources. In a closed economy the flow of credit is always equal, by definition, to the formation of financial assets. It is significant that the initial formulation of models in which credit plays a predominant causal role occured when attempts were made to adapt monetary analysis models to the case of an open economy. In the analytical model developed by the IMF[12] credit is considered as the independent variable that generates expansionary impulses and hence the one that must be controlled by the monetary authorities. In a simplified model in which the formation of financial assets and liabilities is concentrated in the banking system, the existing stock of money derives from domestic credit (Domestic Credit Expansion) and from the foreign currency reserves accumulated by banks. An increase in the money supply is therefore the result of an expansion of credit or of a balance of payments surplus, taken as coincident with that of the current account.

This means, however, that, in the case of a balance of payments deficit, an intermediate objective in terms of money may mislead the authorities since, if the destruction of liquidity via the balance of payments is regularly

[10]M.W. Holtrop, "On the Effectiveness of Monetary Policy: the Experience of the Netherlands in the Years 1954–1969," *Journal of Money, Credit and Banking*, May 1972.

[11]F.J. De Jong, "Dr. M.W. Holtrop, the Nederlandsche Bank, and the Monetary Model," in M.W. Holtrop, *Money in an Open Economy*, Leyden: Stenfert Kroese, 1972.

[12]J.J. Polak, "Monetary Analysis of Income Formation and Payments Problems," *IMF Staff Reports*, 1957.

offset, adjustment of the real disequilibrium could be postponed indefinitely. In the end the choice of the monetary objective is linked to that of the exchange rate objective. If the exchange rate is fixed, the intermediate objective of monetary policy must refer to the internal component of the monetary or financial aggregate that is most important in the transmission process.

The above-mentioned stylized description of the monetary mechanism is a useful representation of the real world if the credit and money markets are efficient and competitive. The less this is so, the less rapidly the impulses of monetary policy pass along the chain of substitutions between financial assets, until those affecting the demand for investment goods are reached. Moreover, if the price of credit is an administered price (which could be the case of "rationing")[13] the movements in the cost of credit do not adequately reflect market conditions and, in particular, the availability of funds.

Indeed, reference to a credit target can be defended in its own right, rather than as the domestic component of an asset aggregate. If financial markets are not sufficiently competitive and economic agents rely heavily on credit to finance their spending, an intermediate objective expressed in terms of credit is more appropriate. Direct control of the flow of credit to the economy may have impact effects on the level of economic activity and the balance of payments that are more important than those obtained by controlling the money supply.

In general, there are two coordinates upon which to base the choice of the aggregate (or aggregates) that best serves the authorities as an intermediate objective: a) the financial structure, i.e., the different sources of corporate finance, the composition of households' financial assets and the extent to which the credit and money markets are developed and competitive; b) the degree of trade and financial openness of the economy, and hence the scope for a sufficiently independent exchange rate policy.

In conclusion, it is not surprising that different countries have adopted intermediate objectives with special features judged to be particularly appropriate to their institutional contexts. The criteria for choosing these objectives are, in fact, strongly influenced not only by each country's structural features and institutional organization, but also by different views of how monetary policy operates and of the influence of monetary variables on final objectives. This choice also depends on the availability of effective instruments with which to affect the values of the variables judged to be important.

[13]D. Jaffee and F. Modigliani, "A Theory and Test of Credit Rationing," *American Economic Review*, 1969.

3. Intermediate Targets in Italy.

A financial asset that can be defined as money and differs from the other assets in its means-of-payment functions and fixed yield (equal to zero or set by the authorities) exists in Italy only in the form of currency in circulation and of the other components of the monetary base. Bank deposits are remunerated at high and variable rates and, besides performing a means-of-payment function, also act as a store of value for a large share of households' financial wealth.

The fact that the interest rate on bank deposits can vary freely, makes it possible for the public's portfolios to absorb large fluctuations in their supply without this requiring—other conditions being equal—large changes in the yields on other financial assets or in the propensity to buy real goods. This, as well as the high degree of liquidity of the other component of financial portfolios,[14] reduces the meaningfulness of the analysis of the quantity of money in the context of the transmission mechanism. The greater efficiency of the credit market and its more direct link with the markets for real goods make it a better channel for the transmission of monetary policy.

Moreover firms tend to borrow heavily, primarily from the banking system. A credit squeeze therefore has a direct impact on investment. The high proportion of short-term debt increases the effectiveness of an increase in interest rates, because it reduces enterprises' cash flows precisely when new credit is most difficult to obtain.

These features of the Italian financial structure, together with the aim of checking balance of payments deficits, led the authorities to consider control of credit expansion to be more important (in the short term) than control of the money supply or of some other financial aggregate.

The approach followed by the Bank of Italy from the mid-1960s on, however, has not been to announce a quantitative target for only one intermediate objective, but rather to indicate the main elements of a framework of mutually consistent financial flows. In analytical terms it is the approach of those who prefer to define and monitor monetary policy with a wide range of indicators rather than stressing one single relationship.

In 1974, when an IMF stand-by agreement was negotiated and the external constraint became tighter, a greater emphasis was placed on the importance of one single aggregate, i.e., total domestic credit (TDC) or, in other words, the domestic component of total financial assets (i.e., money

[14]During the second half of the 1960s bonds—the most important component of households' financial portfolios after deposits—were highly liquid because of the official pegging of the long-term rate. After 1973, due to the acceleration of inflation and to the greater variability of interest rates on fixed-interest securities, the switch to liquid assets stepped up: in 1977 bank deposits accounted for over 70 percent of the stock of domestic financial assets, against about 40 percent in 1961. Since the late 1970s the share of deposits decreased as the public turned gradually to short-term Treasury bills and, in the last couple of years to medium-term Treasury certificates, whose yield is indexed to that of six-month bills.

plus short-term securities and public and private bonds in the hands of enterprises and households).

Total domestic credit consists of domestic lending to the economy (enterprises and households) plus the public sector borrowing requirement (PSBR).[15] It is easy to show that the sum of the two aggregates is equal to the saving available to the financial markets, net of the balance of payments.

The identity linking the flows of saving and investment can, in fact, be written as follows:

$$Y - C - T = I + (G-T) + (X-M) \tag{1}$$

that is, private sector saving is equal to private investment plus the public sector deficit and the external balance (the symbols have the usual meanings: Y: GNP, i.e., national income; C: private consumption; T: net overall taxation; G: government expenditure; I: private investment; X: exports; M: imports).

A direct correspondence can be established between the amount of saving and the formation of financial assets (FA); while the sum of private plus public sector deficits can be defined as total domestic credit (TDC). So one can write:

$$FA = TDC + BPC \tag{2}$$

where the terms of identity (1) differ from those of identity (2) by the amount of (corporate) gross self-financing (SF):

$$\begin{aligned} FA &= Y - C - T - SF \\ TDC &= I - SF + (G - T) \\ BPC &\equiv (X - M) \end{aligned}$$

If a certain amount of credit is extended (destroyed) to increase (decrease) the firm sector liquidity, the amount of credit and that of financial assets are increased (decreased) correspondingly. Taking into account capital movements from and to abroad we have that: capital inflows (CI) reduce the need for domestic credit:

$$TDC + CI = I - SF + (G-T)$$

and capital outflows (CO) the amount of domestic asset formation (DFA):

$$DFA + CO = Y - C - T - SF$$

We have then finally:

[15]The Federal Reserve Board announced in February 1983 that it will begin monitoring a comprehensive credit aggregate defined as the *total debt of domestic nonfinancial sectors*. This credit measure includes borrowing by private domestic nonfinancial sectors and by the federal, state, and local governments in U.S. markets and abroad; it excludes borrowing by foreign entities in the United States and corporate equities. The only difference with the definition of TDC is the inclusion in the U.S. aggregate of borrowing abroad.

$$\text{(3)} \qquad \begin{aligned} DFA &= TDC + BPC + (CI - CO) \\ &= TDC + BP \end{aligned}$$

where BP is the overall balance of payments (current account plus capital movements).

The fundamental justification of the idea of controlling total domestic credit is therefore to control the level of domestic uses of saving, that is the sum of investment plus the government deficit.[16] Financial asset formation is basically linked to saving formation in the private sector of the economy. The control of TDC affects the level of economic activity and through this the balance of payments.

Naturally, measures controlling the public deficit and private sector debt-financed expenditure influence the formation of saving; the negative influence restrictive measures have on the flow of saving is nonetheless only a fraction of the curbing of credit, partly because the increase in interest rates which accompanies credit restriction causes the saving to expand to a certain extent.

If the monetary authorities set the value of TDC, the adjustment of an external imbalance (i.e., between saving and investment) occurs in the market for goods and affects national production and income via the multiplier process. In terms of the usual IS-LM model, this implies that the authorities' measures act directly on the IS curve. The speed and accuracy of the adjustment depend on enterprises' initial liquidity position and their self-financing capacity.

More completely and explicitly a restriction of credit leads to an increase in the velocity of circulation of enterprises' liquid balances, with effects on interest rates. Firms buy fewer foreign assets and tend to raise more finance abroad; this has a positive effect on capital movements. The smaller amount of credit also tends to curb imports of raw materials and finished products and the build-up of stocks of domestic production. There is an immediate effect on the current account of the balance of payments. Another effect comes via a reduction in the level of economic activity as the scarcity of credit influences the demand for durable goods and fixed investment, including housing.

If fixed investment and inventory accumulation are covered by internal saving—this, however, is not the case in Italy—the credit restriction will only affect capital movements (and interest rates). In this case there is not much sense in trying to control the quantity of credit and it would be more effective to fix an intermediate objective directly in terms of interest rates.[17]

[16]A. Fazio, "Report on Italy" in M. Monti (Editor), *The New Inflation and Monetary Policy,* Proceedings of a Conference organized by the Banca Commerciale Italiana and the Department of Economics of the Università Bocconi in Milan, 1974, London, 1976.

[17]A. Fazio, "Monetary Base and the Control of Credit in Italy," Banca Nazionale del Lavoro *Quarterly Review*, June 1969.

In practice corporate saving, together with long-term credit, mainly finances fixed investment. Short-term credit covers mostly the acquisition of stocks of raw materials and finished products and financial assets. Consequently, measures to curb credit that focus primarily on bank credit will mainly influence firms' liquid assets, capital movements and inventories.

When the balance of payments is in equilibrium or in surplus, it is necessary all the same to monitor the conditions of financial equilibrium that are compatible with the desired (or accepted, for the inflationary component) rate of increase in nominal income; this in order to avoid the formation of excess liquidity that may raise the level of internal demand, and consequently lead to disequilibria of the opposite sign in the external accounts.

The amount of financial assets, which is the result of TDC expansion and the balance of payments, and of the economy's stock of assets at the start of the period, is an indicator of the economy's capacity to spend.

Whereas the effects of monetary policy are transmitted most strongly to the corporate sector via its impact on the flow of credit, the influence on households' behavior comes from the difference between the desired and actual stock of financial assets. In other words, the TDC approach can be interpreted within the framework of a stock-flow model that takes account of the effects of the accumulation of financial wealth.

This channel of monetary policy transmission presupposes a demand for (net) financial assets that is stable in relation to income, wealth and (real) interest rates. The literature does not provide a priori explanations of such stability that are as well-argued and convincing as those developed for the more traditional demand for money functions, but it can be rationalized on the basis of the hypothesis of a stable relationship between wealth and income, as is implicit in the life cycle theory.[18] If the "services" supplied by real goods and financial assets that make up individuals' wealth are not perfect substitutes, it can be postulated that there exist desired ratios with respect to income for the two kinds of assets. So that changes in the supply of financial assets will be reflected mostly in changes in income via changes in expenditure.[19]

In fact, the desired composition of wealth also responds to changes in the relative yields of financial assets and real goods. Presumably, however, the degree of substitutability between them is smaller than that between the various components of the financial portfolio. A high degree of substitutability between financial assets does not necessarily imply instability of the demand functions for narrower financial aggregates (such as money), provided the elasticities with respect to the interest rates on the other financial

[18]F. Modigliani, "The Life Cycle Hypothesis of Saving, the Demand for Wealth and the Supply of Capital," *Social Research*, XXX, Summer 1966.

[19]B. Friedman, "Debt and Economic Activity in the United States," NBER, Working Paper 704, June 1981.

assets are predictable. The empirical evidence regarding Italy appears to confirm that the interest rate elasticity of money is higher than that found for broader aggregates of financial assets.[20]

An appropriate level of the real interest rate can induce savers to hold a greater amount of financial wealth and in this way, at least in the short run, the effects of excess credit expansion on expenditure can be offset. However, during the 1970s, marked by large variations in inflation rates and repeated shocks in the supply of financial assets, the level of real interest rates necessary to induce the desired accumulation of financial assets in relation to income has progressively increased.

Of course the composition of financial assets is also important in the transmission mechanism since monetary impulses are propagated not only via wealth effects, but also via the chain of substitutions within the financial portfolio. The higher the proportion of money in total financial assets, the easier it is to finance expenditure. Although the links between money and income, for the reasons discussed above, are less strong in Italy than elsewhere, the authorities seek to maintain a structure of interest rates that will encourage a lengthening of the average maturity of financial assets. In terms of Hicks's analytical framework, this implies a gradual shift of the LM curve.

Total domestic credit is a mixed monetary and fiscal policy objective. The degree to which it can be controlled depends on the consistency of the two policies or on the ability of the central bank to offset deviations from the forecast of the public sector borrowing requirement, by variations of the opposite sign in the financing of the economy. Of course, a change in the composition of TDC will always affect the composition of demand, its level and other macroeconomic variables such as the balance of payments, because credit to the economy—mainly utilized by enterprises—has a more immediate effect on the level of output.

During the seventies, when the PSBR share of TDC, though tending to rise, averaged around 50 percent (Table 1) it was generally possible to offset deviations. The problem of offsetting arose primarily in connection with the cyclical and seasonal variations from the target in the borrowing requirement: a large end-of-year increase—caused, for example, by the advance payment of amounts due in the next financial year—might well cause the target for that period to be exceeded but, apart from short-term liquidity effects, this did not undermine the control of credit flows over the cycle as a whole.

But when the public component rose and settled at around two-thirds of TDC, the scope for offsetting action decreased dramatically. The control of TDC and of the formation of total financial assets is therefore closely linked to the possibility of keeping the public borrowing requirement in line

[20] C. Caranza, S. Micossi and M. Villani, "La domanda di moneta in Italia, 1963–1982," *Quaderni M3BI*, June 1982.

Table 1
Total Domestic Credit[1]

	Stocks			Flows		
Year	TDC/GDP %	Credit to the economy/TDC %	Bank loans/ credit to the economy %	TDC/GDP %	Credit to the economy/TDC %	Bank loans/ credit to the economy %
1960–64	88.6	63.7	56.5	11.1	81.9	52.1
1965–69	101.9	68.2	54.3	11.5	71.1	52.9
1970	108.5	68.6	55.7	12.9	61.7	64.9
1971	116.7	68.0	55.6	17.1	64.2	50.3
1972	126.7	67.2	56.0	20.3	63.3	60.0
1973	129.3	67.0	55.0	23.2	65.8	53.4
1974	123.9	65.6	57.3	19.2	58.7	73.6
1975	134.7	62.9	56.0	24.9	54.3	53.8
1976	129.5	61.4	57.9	21.7	58.3	69.7
1977	125.7	57.8	56.9	18.8	49.8	60.4
1978	129.7	53.4	56.2	22.2	35.6	55.8
1979	126.4	52.3	59.0	19.7	46.5	76.5
1980	119.5	51.2	60.5	18.7	46.1	70.3
1981	119.0	48.5	59.8	18.1	38.3	48.0
1982	123.0	45.6	56.8	21.4	32.4	35.1

(1) State sector domestic borrowing requirement *plus* banks' and medium-term credit institutions' loans to and bonds issued by enterprises and households.

with the limits initially fixed.

In the short term, in fact, the central bank can only control the supply of credit to the economy and the composition of the means of financing of the public sector's deficit. If there are no ceilings on bank lending, the increase in the potential supply of credit, as a result of a larger than expected increase in the borrowing requirement, can be offset by a rise in interest rates that will induce the public to buy more government securities.

If the deviations of PSBR from target are very large, it may become practically impossible to offset them completely by changing the amount of credit to the private sector. Via interest rate policy, saving can be stimulated and brought into line with the new level of the PSBR. Interest rates also affect the demand for credit by the private sector.

Compared with a situation in which it was possible to regulate the total amount of domestic credit, the central bank's control over the economy's capacity to spend has been considerably reduced by the preponderant share of the PSBR in the total credit flow.

The impact of an overshooting of the borrowing requirement directly affects enterprises' liquidity and the composition of their working capital; through expectations it can also cause an increase in households' propensity to spend. In principle, it is possible to imagine a situation in which it would be possible to control such an impact effect with sufficiently large and frequent changes in interest rates. The latter have actually been more variable in recent years in nearly all the major industrial countries, partly in connection with the greater volatility of expectations. Faced with the increase in the public sector's demand for credit, central banks have tried to restore their freedom to use interest rates through institutional reforms and reorganization of the technical procedures of monetary control. The new techniques for financing the Treasury introduced in July 1981 (the so-called "divorce" between the Bank of Italy and the Treasury) are part of this trend (see section 5).

However, if in theory there is a series of interest rate combinations permitting equilibrium to be maintained on the money and foreign exchange markets, in practice there are "steps" which may lead to crises. The variability of interest rates is, in fact, objectively restricted by the need to maintain orderly conditions on the financial and foreign exchange markets.

4. Three Periods of Monetary Restraint in the Last Decade: a Comparison.

The different emphasis the central bank has given to total domestic credit, its composition and interest rates in each phase of the cycle can be clearly seen by comparing the policies pursued during the three periods of monetary restriction in the last 10 years: those of 1974, 1976–77, and the last one that started in 1980.

In 1974, the decision to set an objective in terms of TDC was directly linked to the urgent need to reduce the country's external deficit, which had been seriously aggravated by the first oil crisis.

When the exclusive aim of monetary policy is to reduce the current deficit of the balance of payments, the credit aggregate being controlled must also include the financing that enterprises and the public sector raise abroad. At least, when fixing the desired expansion of TDC, account must also be taken of the inflows of capital attracted by the rise in interest rates. The more capital flows are sensitive to conditions in national and international credit markets, the more likely it is that the effects of the changed availability of credit and of portfolio adjustment will rapidly influence capital flows. In the (theoretical) limiting case of perfect capital mobility the impact of the restriction of credit is only felt on the foreign exchange market and the reduction in domestic credit is offset by inflows of capital.

The choice made in 1974 of a credit aggregate (TDC) that excluded foreign loans reflected the authorities' willingness to allow the restriction of credit to be offset in part by inflows of capital that would finance the oil deficit. On that occasion concern about checking the loss of official reserves made it advisable to take measures specifically designed to encourage inflows of foreign currency, such as the import deposit scheme.

Adjustment of the balance of payments on current account was the main aim of monetary policy after the first oil crisis. Between the second quarter of 1974 and the first of 1975 the rate of growth of TDC slightly exceeded 16 percent and was 2 points below the limit agreed upon with the IMF (Table 2). In 1974 the ratio of TDC to GDP declined to 19 percent, 4 points less than the year before. Specifically, the share of credit to enterprises fell from 15 to 11 percent of GDP and from 66 to 59 percent as a proportion of TDC (Table 1).

The balance of payments improved considerably and the rate of inflation declined by the end of 1975 to 11 percent, or less than half the value recorded the previous year. The level of economic activity also declined and GDP contracted by 3.5 percent in 1975.

During the restrictive phase of 1976–77, made necessary by the reappearance during 1975 of serious imbalances in public finances and by the deterioration of the external accounts, some aspects of the relationship between monetary policy and foreign debt policy were different and the equilibrium on the exchange rate markets carried relatively more weight. In the first place this was because fiscal and budget measures made an important contribution to the "real" adjustment. Moreover, the higher degree of indexation of the economy made it all the more necessary to avoid depreciations of the exchange rate that might have revived inflationary pressures.

The greater rigidity of indexation mechanisms deriving from the agreement that had been reached between employers and trade unions in 1975 made the economy much more vulnerable to destabilizing impulses from abroad. The mechanism for adjusting inflation rate differentials via the exchange rate was less easy to use in the new institutional context, in which gains in competitiveness stemming from a depreciation of the lira were

Table 2
Credit, Money and Real Aggregates
(Changes in billions of lire, % growth rates and % ratios of GDP)

Year	Total domestic credit objective	Δ%	actual	Δ%	State sector domestic borrowing requirement objective	actual	/GDP	Credit to the Economy objective	actual	Δ%	BoP current balance /GDP	GDP	Consumer prices[3]	M2	Financial assets[4]	/GDP[5]
												percent changes				
1974	22,400[1]	18.6	20,015[1]	16.6	9,200	8,796	7.9	—	12,513	16.1	−4.7	4.1	24.4	15.3	10.7	107.4
1975	24,700[2]	17.6	35,633[2]	25.4	8,000	14,237	11.4	—	16,936	18.8	−0.3	−3.6	11.3	23.5	20.9	110.7
1976	29,500	17.5	34,048	20.2	13,800	14,200	9.1	15,700	19,848	18.9	−1.5	5.9	22.0	20.8	20.4	106.5
1977	30,600	15.1	35,703	17.6	13,100	17,923	9.4	17,500	17,780	14.3	1.1	1.9	12.7	21.8	20.0	105.6
1978	38,000	12.9	49,240	20.6	—	31,707	14.3	—	17,533	12.7	2.4	2.7	11.6	23.0	24.8	111.0
1979	53,000	18.4	53,252	18.5	31,000	28,503	10.5	22,000	24,749	16.1	1.7	4.9	18.8	20.4	22.1	112.8
1980	59,300	17.4	63,150	18.5	37,900	34,008	10.0	21,400	29,142	16.3	−2.4	3.9	21.3	12.7	15.6	106.9
1981	64,500	16.0	72,771[6]	18.0	36,100	44,904	11.3	28,400	27,867[6]	13.4	−2.3	−0.2	18.1	9.9	16.7[6]	104.7[6]
1982	73,000	15.2	100,479[6]	21.0	43,000	67,964	14.5	30,000	32,515[6]	14.0	−1.6	−0.3	16.1	17.0	19.9[6]	106.2[6]

[1] April 1974–March 1975.
[2] April 1975–March 1976.
[3] Change during year.
[4] Economy's domestic financial assets, excluding shares.
[5] Average stocks as a ratio of nominal GDP.
[6] Corrected for the effect of the noninterest-bearing deposits on payments abroad.

rapidly cancelled by the spiral of wages and domestic prices.

Although a depreciation of the exchange rate to a more realistic level could not be avoided in the early months of 1976, an attempt was subsequently made to use exchange rate policy to help slow down domestic inflation. In particular, a compulsory deposit on foreign currency purchases was imposed for the second time.

By the end of 1976, bank credit ceilings which had been lifted in March 1975 (at the expiration of the IMF stand-by agreement) were reimposed. This time with the peculiarity of controlling only lire credits and exempting loans labelled in foreign currencies.

The large inflow of short-term capital through the banking system encouraged by this measure, helped stabilize the otherwise rapidly deteriorating exchange rate of the lira in the first half of 1977 (partly because of the lifting of the import deposit scheme) and consequently cool down inflationary pressures.

In relation to GDP, TDC declined from 25 to 22 percent between 1975 and 1976 and then another 3 points in the following year. Credit to the economy declined in relation to GDP from 13.5 percent in 1975 to 9.5 percent in 1977.

In April 1977 a new stand-by agreement was negotiated with the IMF within the framework of an economic stabilization program. As a consequence of the restriction of credit and the increase in taxation, domestic consumption and investment slowed down sharply. The GDP growth rate, which had been 6 percent in 1976, fell to 2 percent the following year; the current account of the balance of payments, negative by 1.5 percent of GDP in 1976, recorded a surplus in 1977, equal to around 1 percent of national income; the growth rate of consumer prices, which had risen to 22 percent in the course of 1976, fell to 13 in 1977.

The restrictive policies of 1974 and 1976–77 reduced the growth rates of domestic demand and income below the OECD average. As a result the growth rate of imports declined and that of exports increased, so that the current deficit caused by the first oil crisis, and equal to 5 percent of GDP in 1974, swung into a surplus equal to 2.5 percent of national income in 1978.

In 1979 consumption expanded under the stimulus of the growth in the public sector deficit, which had risen to nearly 15 percent of GDP in 1978. Investment also rose and this, together with the rise in exports, led to a revival of GDP growth, which reached 5 percent. This growth continued in the first part of 1980; in the year GDP expanded by about 4 percent.

In parallel with the growth in output, and in part as a result of the new increases in the price of oil, the rate of inflation, which had fallen below 12 percent during 1978, accelerated rapidly, especially after the middle of 1979. Monetary policy again adopted a restrictive stance in the autumn, but the 12-month rate of inflation of consumer prices rose, by the end of the year, to 19 percent. The balance of payments was still in surplus in the first half of the year, but deteriorated rapidly in the second, especially in the fourth quarter.

Monetary policy remained restrictive throughout 1980, and was progressively tightened in the following year. It was less effective, or at any rate its effects less rapid, than in the past in slowing down domestic demand and consequently curbing the external deficit and inflation. The reasons for this slower and weaker effect are basically: a) the enormous growth of the public sector deficit, b) the development of uncontrolled (and uncontrollable) forms of financial intermediations, and c) the extent and persistence of inflationary expectations.

As regards the first point, the PSBR rose from 10 percent of GDP in 1977 to 15 percent in 1978. In 1979, the ratio fell to 11 percent, but this reduction was primarily due to the cutback in capital grants to public sector firms, while the transfers and other current payments to households continued to increase, thus raising consumers' disposable income. In the next two years the PSBR remained close to 11 percent of GDP, but in 1982 the ratio jumped again up to the high values of 1978.

As already mentioned, in 1974 credit to the economy declined to 11 percent of GDP from the 15 percent recorded the year before. In 1977 the same ratio declined from 13 to 9.5 percent. Between 1979 and 1982, owing to the already low level in 1979, this ratio declined much more slowly: from 9 to 8.5 percent in 1980, and then proved impossible to push below 7 percent in 1981 and 1982.

In view of the reduction in the economy's share of TDC, an attempt in 1982 to offset the greater than expected growth in the PSBR by cutting the credit to the productive sector would have resulted in the latter receiving only 5,000 billion lire, or around 1 percent of GDP.

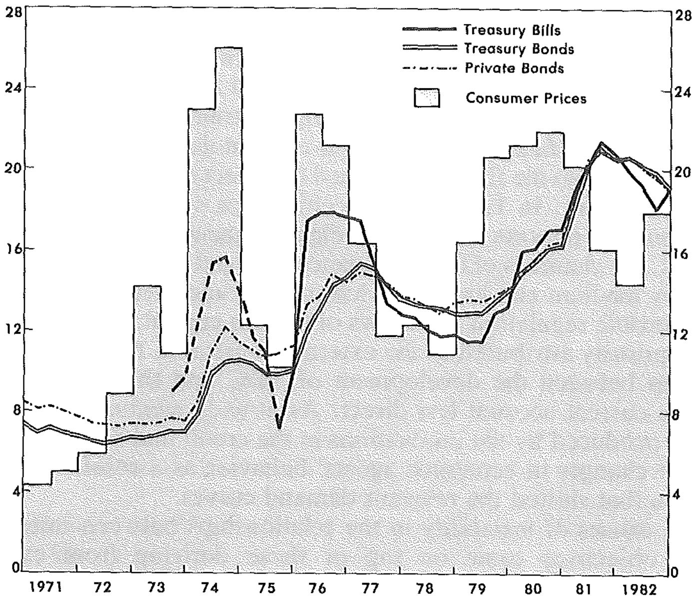
The other two reasons given for the course of the latest restrictive phase also played an important part.

Confronted with a prolonged period of monetary restriction, enterprises and banks sought to limit the use of the traditional channels of finance, controlled by the authorities, by developing new forms of intermediation, that link savers and enterprises directly, but were guaranteed in various ways by the banks themselves (see section 5). Enterprises, in turn, have reacted to monetary restriction by economizing their liquidity, thus increasing the velocity of circulation of money.

Finally, the prolonged period of inflation—in 1982 the purchasing power of the lira was about a quarter of what it had been in 1972—profoundly influenced economic agents' expectations. Households reduced their high propensity to save and increased their demand for durable goods. Enterprises also accelerated their fixed investments.

In 1974 and in 1977 inflation rates of over 20 percent were considered exceptional; this was no longer the case in the last three years. A greater degree of restriction and higher interest rates would therefore have been necessary. The above considerations and the problem of the stability of the financial markets made such a policy unadvisable.

The effect of the credit restriction was nonetheless felt by the economy, Interest Rates and Inflation



even if the PSBR continued to expand. In 1981 and in 1982 domestic demand and GDP recorded virtually zero growth. Inflation slowed down. There was not, however, a significant improvement in the balance of payments, because of the deterioration in the terms of trade produced by the appreciation of the dollar.

The greater difficulty the authorities encountered in controlling the total volume of credit in this restrictive phase made it necessary to adopt an interest rate policy that would limit the expansionary consequences for expenditure. During 1980 and 1981 interest rates on government securities rose until they became positive again in real terms. In 1974 and 1976, on the other hand, even at the moment of greatest restriction they had remained below the rate of inflation (Chart 1). The phase of rising interest rates in 1974 lasted nine months and in 1976 twelve; during the latest period of restriction it lasted much longer, from the last quarter of 1979 to the end of 1981.

The inversion of the yield curve, which was very pronounced in 1974 and in 1976–77, was much less marked in 1980 and the curve became flat in 1981 as a result of long-term rates being raised. This permitted a large volume of medium-term securities to be placed.

The greater recourse to instruments permitting an indirect control of credit flows, through their effect on the relative yields of financial assets, as well as the greater efficiency of the credit market, contributed to the increase in capital mobility. Another contributory factor was the relative stability of the exchange rate within the EMS.

As in 1976–77, a large-scale substitution of lira loans by foreign currency loans was a feature of the first part of the latest phase of tight monetary policy. The strong growth in bank loans in foreign currency and enterprises' and the public sector's direct borrowing abroad made it possible to avoid running down the reserves despite the large current account deficit.

This policy for financing the current-account deficit enabled the lira to remain stable within the EMS and limited the effect of the monetary restriction on investment. In 1981, after a ceiling was set on foreign currency loans to finance imports and the foreign payments deposit scheme was introduced, the channels of foreign finance changed, with bank loans being replaced by medium and long-term loans and trade credits.

The flexible regulation of inflows of foreign capital, depending on the degree of priority attributed to the external constraint, naturally made the relationship between the development of TDC and that of the external balance on current account less direct. As already mentioned, similar effects were produced by the innovations in the credit and financial markets and by the changes in economic agents' behavior as a result of inflation, phenomena that shifted the relevant demand curves.

These causes of instability in the relationships between intermediate and final objectives came on top of those deriving from exogenous shocks—such as changes in world demand, terms of trade or the distribution of income—that modified the assumptions upon which the maximum allowed expansion of TDC had been calculated.

To conclude, the greater instability both in the markets for credit and financial assets and in those for goods and labor, has made the link between TDC, the level of economic activity, the balance of payments and prices more complex. For similar reasons to those mentioned above, there was a weakening of the traditional links between intermediate and final objectives in nearly all the major countries, notwithstanding the variety of the intermediate objectives chosen.[21]

5. The Evolution of Instruments

The method of controlling domestic credit adopted in 1974 and in the subsequent 1976–77 restriction relied heavily on the use of ceilings for bank credit expansion. This was possible for three reasons: a) the share of TDC allocated to the private sector was sufficiently large; b) this credit was mostly intermediated by the banking system, since the crisis of the financial market had sharply reduced the scope for medium and long-term credit institutions and for the direct access of enterprises to capital markets; c) ceilings, applied for the first time in 1973, proved quite effective in curbing

[21]EEC Governors' Committee, "Special Report on Current Practice with Quantitative Intermediate Monetary Objectives in EEC Countries," February 1983.

the volume of bank lending.

The ceiling was originally introduced for selective purposes, at a time when banks were required by the authorities to increase considerably the amount of fixed bonds as a form of collateral reserve, but with the aim of channeling funds into medium-term credit institutions and finally to fixed investments. This tended to reduce the yield of bonds, and, given the amount of deposits, restricted the supply of loans. Because it was feared that an excessive reduction of credit to medium and small enterprises, would result, the ceiling was then imposed to limit the expansion of larger loans.[22]

The selective features originally present in the ceiling mechanism gave way in early 1974 to curbing the total amount of bank credit available to the economy. This also occurred in a period in which the Treasury deficit began to expand, with automatic effects on the monetary base, making it more difficult to control the level of bank intermediation by the traditional methods of reserve management. Other things being equal, the ceiling tended to produce an increase in bank lending rates and conversely a reduction in those on government securities. However, this distortion occurs only if the availability of the monetary base leads to a volume of bank intermediation that generates a supply of lending in excess of the ceiling. Otherwise, taking into account the level of demand for loans, the ceiling is inoperative, except for its effect on the distribution of market shares among banks.

As time passed, the proportion of credit flowing through the banking sector was progressively reduced. There was also an increase in the cost of controls in terms of allocative efficiency, while banks began to circumvent restrictions by various means. The prolonged application of ceilings, as noted in the previous paragraph, encouraged enterprises and intermediaries to seek alternative channels of finance, both domestically and abroad.

Developments of this kind have shown that the prolonged use of direct controls involves progressively increasing their restrictiveness and broadening their scope. Thus the ceilings were made increasingly restrictive by extending them to credits in foreign currency for financing imports, and compulsory interest-free deposits with the central bank were introduced for cases of excess lending. The scope of direct controls was also extended by regulating the issuing of bankers acceptances and extending reserve requirements to repurchase agreements. The supply of credit by the medium-term credit institutions was also rationed indirectly during some periods, by fixing an upper limit on the yield of their security issues. The effectiveness of this measure was reduced, however, by the institutions' development of variable rate instruments that enabled them to increase their intermediation substantially. The central bank had recourse to moral suasion in 1982, with the aim of curbing lending by medium-term credit institutions.

To reduce the erosion in the ability to exercise control on credit expansion, and gradually restore the financial system's freedom of action, the

[22] A. Fazio, "Monetary Policy," *Kredit and Kapital*, Heft 2, 1979.

authorities sought to develop methods that would reinforce the control over the creation of the monetary base. This was designed to allow the growth of monetary and credit aggregates to be better regulated, with administrative instruments being kept for use in emergencies. Consequently distortions would be attenuated and the impact effect of direct controls intensified.

This better control of the monetary base has resulted from the development, since the late seventies, of the Treasury bill market and has reduced the importance of the twist produced by the ceiling in the relative yields of the various components of banks' assets.

In conclusion, the mix of direct and indirect control instruments worked until the middle of 1983 as follows: the central bank intervened on the primary and secondary government security market to control the expansion of bank reserves and so the supply of total bank credit (i.e., loans plus bonds and Treasury bills), as well as the composition of the economy's financial assets (that is, the division between bank deposits and securities). The use of administrative instruments (credit ceilings) strengthened the control on the volume of credit and determined its composition.

The abolition of the ceiling on bank loans at the end of June 1983 has forced the monetary authorities to have recourse for controlling the flow of credit, primarily to market instruments. The return to a system of control resembling that used in Italy from the end of the war up to the early seventies, is now under way; some of the basic features of the new system can be foreseen.

In general, if the aim were to influence only money in the narrow sense, it would be more effective to exercise rigid control over the monetary base, and especially bank reserves. The changes that would ensue in the level and structure of interest rates as a result of the variation in the supply of money would gradually spread through the system, but the "closeness" of the instrument (the monetary base) to the objective (money) would make the authorities' interventions efficient.[23]

On the contrary, if the intermediate objective is total credit, it can be more efficient to influence the supply of credit, either by credit ceilings or by acting on the level of interest rates which regulate the demand for credit; credit is in turn directly related to investments, inventory accumulation and capital movements. Continuing to apply the logistic criterion of closeness between objective and instrument, this strategy tends to minimize the lags in the transmission of monetary policy impulses.[24]

The Bank of Italy tries to influence through its daily operations on the money market the level of the rate on repurchase agreements (up to a few weeks maturity) and the yield on Treasury bills. This latter rate influences

[23]OECD, *Budget Financing and Monetary Control,* Monetary Studies series, 1982.

[24]This approach tends to make the supply of bank reserves passive, at least in the short run. However this is true only when banks' assets are entirely made up by loans: the control of bank reserves remains crucial in controlling the amount and conditions of the remaining part of bank credit, made up of private and public securities.

the choice of the public between deposits and government securities, which is crucial to control, for any given PSBR, the monetary base and bank reserves. It also influences the choice of the banks between government and other securities, which determines the supply of (direct and indirect) bank credit to the private sector, for a given amount of deposits. In equilibrium, the intersection of the supply with the demand schedule for bank loans determines the bank lending rate and the division of bank credit between the public and the private sector.

When the differential between the bank deposit rate and that on Treasury bills widens (narrows) the public demand for Treasury bills increases (decreases) and bank intermediation falls (rises). The adjustment in banks' assets is achieved mainly through variations in their secondary liquidity in the form of Treasury bills, but their lending also varies, to an extent that depends on enterprises' demand for credit.

The effectiveness of the central bank's action on money market rates could be reduced if the banks react with deposit rate changes. In the end there would still be an increase in the average yield on financial assets, but with a smaller spread between the rates on the various assets and, with the same average rate, a composition of financial portfolios with money having greater weight (but a lower velocity of circulation because of the higher yield). In fact, traditionally, deposit rates have tended to be somewhat rigid, partly because the yields on a large proportion of bank assets do not fully adjust to increases in short-term rates.

The banks can from now on react more effectively to the disintermediation stemming from restrictive central bank action by offering the recently created negotiable certificates of deposit that would compete with Treasury bills. Banks could, in fact, raise the rates on these deposits, but in order to avoid losses they would also have to raise their lending rates. There would be a transition from a regime in which, as money market rates rise, the banks' funds gradually decline with deposit and lending rates slowly reacting, to one in which the effects on bank rates would be more immediate and the disintermediation less important.

The banks would also be led to react more promptly to money market conditions as a consequence of the lower level of secondary liquidity (Treasury bills) they would end up with. Without ceilings, this pattern, which enables the central bank to exert a direct influence on bank lending rates and hence on the *demand for credit*, would be preferable to the present one, in which the effect of restriction on the money market passes through the *demand for deposits*.

Values for intermediate and operating targets are determined within the framework of a detailed forecast of annual financial flows which covers banks' intermediation, the activity of medium-term credit institutions and the direct recourse to financial markets by public and private borrowers. An estimate is also made of the increase in the money supply considered to be consistent with such flows and in particular with the target for the credit to the economy. A programme for the monetary base creation is derived from this forecast of the increase in the money supply.[25]

The monthly operating targets for the monetary base that the central bank sets as a guide for its action in the money and foreign exchange markets do not constitute rigid constraints. They are aimed at with the discretion always necessary in monetary policy.

This is true both for the total amount of monetary base and its breakdown by sources. In theory, with a domestic credit intermediate objective the central bank should avoid offsetting variations in the foreign component of the base; in practice, since this component is highly variable, it could be destabilizing to allow it to produce its impact directly on bank reserves. Whenever the changes observed are not of a random or seasonal nature, the central bank engineers a variation in short-term interest rates in order to gradually produce the necessary change in the creation of the monetary base; this should also produce an improvement in the external imbalance as a result of capital inflows.

In the case of unforeseen changes in the Treasury borrowing requirement or of shifts in the public's demand for government securities, the central bank can again accept a divergence from its operational targets. In short, rather than allowing a restriction to be produced automatically via bank reserves, with the consequence of large swings in money market rates, the increase in the latter has to be regulated so as to produce a gradual restrictive effect on reserves and credit.

The task of controlling the domestic component of the base is made more difficult by the Treasury's direct access to the central bank's financing. The Treasury is, in fact, allowed to draw on its current account with the Bank of Italy up to a limit of 14 percent of government expenditures. Futhermore, when the Bank buys government securities at issue the borrowing margin is increased, since the value of the net purchases is credited to the Treasury's account. Since July 1981 the accepted practice whereby the Bank of Italy took up the securities not placed with the public or the banks has been terminated. The central bank intervenes at Treasury bill auctions, and buys other government securities at issue, only insofar as this is judged consistent with the control of the monetary base.

These new arrangements and the continuous improvement of the techniques of open market intervention have enhanced the central bank's capability of controlling bank reserves and short-term interest rates.

The large component of automatic monetary base creation through the Treasury's current account with the Bank of Italy has to be matched by a high coefficient of sterilization via the reserve requirement on bank deposits. The changes introduced at the end of 1982 in the reserve regulation will lead, when they are fully implemented, to an increase in the coefficient from around 15 to 22.5 percent of the stock of deposits, thus reducing the

[25] A. Fazio and S. Lo Faso, "The Control of Credit and Financial Intermediation in Italy," *Review of Economic Conditions in Italy*, October 1980.

value of the multiplier by a third.

It nonetheless needs to be considered that, while the new reserve regime will make this instrument more effective in the short run, in the medium run its cost in terms of the controllability of the system will be the encouragement of disintermediation, deriving from the increase of the "fiscal" effect of the reserve (equal to the difference between the market rate and that paid on the reserve itself).

6. Summary and Conclusions

During the last decade fixing the target for total domestic credit expansion has become a reference point for the whole economic policy, and the occasion for coordinating fiscal and monetary policies by forcing consistency between financing the public deficit and financing the private sector of the economy.[26]

In a system in which enterprises depend heavily on bank credit for inventories and working capital and on medium-term credit for investments, the control of total domestic credit affects the level of spending and the balance of payments considerably both directly and indirectly. A larger than desired expansion of total domestic credit, due to the public sector deficit, can be reconciled in the short run with the stability of the system by increasing the level of interest rates and restricting the access to credit by the private sector. It is not possible to rely indefinitely on higher real interest rates in order to keep the economic system afloat; there are thresholds in the process of portfolio adjustment beyond which an excessive formation of financial assets, as a counterpart of both private and public deficits, tends to spill over on to the level of demand for goods and purchase of foreign assets and hence to create foreign exchange and price pressures.

The control of domestic credit flowing to the private sector is an intermediate objective that the central bank seeks to achieve in the short term. This is accomplished either by administrative or by market instruments. The former, mostly under the form of bank credit ceilings, have proved to be quite effective in stabilizing the economy in periods of rapid inflationary pressures and of difficulties in the balance of payments.

The development of credit and financial markets and increasing allocative costs of credit ceilings has prompted the strengthening and the increased use of more market-oriented instruments of monetary control. In June 1983 the ceiling on bank loans, which was first used from July 1973 to March 1975 and then reintroduced at the end of 1976, was lifted. The achievement of credit and money targets was then promoted through action on the monetary base (the marginal reserve requirement for all bank deposits has been raised to 25 percent) which, in turn, must be consistent with a level and a structure of interest rates which allow the absorption of newly

[26]C.A. Ciampi, "Canoni e prassi nell'attività di banca centrale," *Intervento all' ISVEIMER*, gennaio 1983.

formed financial assets in the households' portfolios, and ensure their desired composition between money and securities. Interest rates also affect the demand for credit by enterprises.

Given the lags with which the demand for credit is affected by interest rates and the need for maintaining a strict control of credit flows to the private sector at a time in which PSBR is excessively large and still growing, the central bank has decided to continue a strict monitoring on bank loans even after the removal of quantitative ceilings. Banks have been asked to maintain the increase in lending within limits consistent with the intermediate objectives set by the monetary authorities, sharing with the central bank the responsibility of achieving macroeconomic objectives of economic and financial stability. Analogous requests for self-control in credit expansion have been made to medium-term credit institutions.

This safety-net may avoid, in the transition towards a more market-oriented design of monetary policy, too sharp fluctuations in interest rates and a destabilizing behavior by financial intermediaries and economic agents that would make it necessary to reintroduce more rigid and costly forms of monetary control.

A system of monetary control mostly based on market-oriented instruments will require further changes in the structure of the financial system, notably the development of money markets and perhaps a lower level of intermediation by the banking system. The basic conditions, however, for the workability of a system in which the use of the instruments of indirect control of credit ensures the achievement of monetary policy objectives remain a lower level of inflation and of the public sector deficit.

Discussion

Giacomo Vaciago*

Caranza and Fazio give an excellent account of the past, present, and future problems that confront monetary policy in Italy, and they explain in a very useful paper what has been the approach followed by the Bank of Italy and how—and why—this approach is now changing. I have to admit that I am in basic agreement with most of the Caranza-Fazio paper, and in fact with most of monetary policy in Italy. However, since my specific task as a discussant is to provide some critical comments, I have selected two topics which can be of some interest to this conference and which indicate that, after all, some disagreement is left.

An "IMF Syndrome"

If you compare monetary policy in Italy with recent experience in most other countries you would be struck by one feature. Italy is the only country which has continued to follow the IMF "letter of intent" approach even when the stand-bys expired and no "letters" were actually mailed to the IMF. This "IMF syndrome" is characterized by the following symptoms:

(i) The balance of payments, and not domestic inflation, is the main goal of monetary policy.

(ii) The appropriate monetary target is therefore some "domestic credit" aggregate.

(iii) The required value for this aggregate is not specified as a "target," or a "target range," but it is fixed as an annual "ceiling" (so many trillions lire), in the true IMF tradition.

Caranza and Fazio, in their discussion of actual monetary policy in the 1974–1982 period, point out that this approach was very effective on two occasions: the balance of payments crises of 1974 and of 1976. It was much less effective in the recent post-1979 period. And they give three reasons for this reduced effectiveness:

(i) The enormous expansion of the public deficit;

(ii) the development of new forms of financial intermediation which could not be checked;

(iii) the strength of inflationary expectations.

My reading of the 1979–1980 episode is different. For the public deficit, I have no difficulty in admitting that this is a problem in the Italian case. But it cannot be said that this was *the* problem in 1979–1980. As the data

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indicate (see Table 2 in the Caranza-Fazio paper), the public deficit exploded first in 1978 and then in 1982: which of the two should explain the reduced efficacy of monetary tightness in 1979–1980 (when in fact the public deficit was comfortably within its ceilings)? So we are left with the other two causes, inflation and financial innovations, for which the monetary authorities cannot put the entire blame on the public sector. In the 1979–1980 episode, monetary and credit tightness was less effective than in the two previous occasions because in this case a more "gradual" strategy was followed, i.e., a "credit crunch" was not planned. It was in fact bank credit that went much above its "ceiling" and forced new restrictive measures to be implemented in early 1981.

From that experience, I draw three conclusions:

(i) The IMF approach is useful when there is only a balance of payments problem. Then, a package of stabilization measures can be appropriate, and effective if applied with determination.

(ii) However, a ceiling on a "domestic credit" aggregate could be useful only if the goal is to finance a current account deficit through capital inflows (and thus protect official reserves). This was the main reason why in 1979–1980 domestic demand was not squeezed: its expansion was financed by borrowing abroad.

(iii) When inflation is the main problem, and monetary tightness is implemented with much "gradualism," there is going to be financial innovation that reduces the effectiveness of monetary and credit brakes.

From Credit Rationing to Market Controls

I turn now to the other part of the Caranza-Fazio paper where the authors explain how Italian monetary policy will change in the future. The changes appear to be limited to a choice of new instruments. But in fact I believe that eventually we will have to see major changes or no change at all.

Let me explain this drastic conclusion, by first recalling the analytical foundations of Italy's monetary policy.

Caranza and Fazio devote the first part of their paper to a presentation of a model of monetary policy which is based on the assumption—emphasized by Modigliani-Papademos (1980)—that the appropriate intermediate targets depend on the economy's financial structure. In the Italian case, credit flows and the stocks of financial assets—but not the money stock—are the relevant channels of monetary policy.

The money stock, and more generally portfolio or "substitution effects," are considered to be not very important due to the fact that money in Italy pays an interest which is market-determined. Financial markets are neither very developed nor perfect (i.e., competitive). Firms rely heavily on bank loans for their debt financing, while bank lending rates are not market-determined but are "administered prices."

The monetary policy transmission mechanism is therefore based on these two main channels:

(i) a ceiling on credit flows (on "total credit" or on "total domestic credit" according to the state of the balance of payments) is necessary to contain domestic demand. Due to market imperfections, the ceiling can be achieved more effectively through direct controls, i.e., by credit rationing.

(ii) If and when credit flows cannot be restrained and thus the supply of financial assets tends to increase rapidly, the households' propensity to save and to hold financial assets needs to be raised through an increase in *real* interest rates. The role of the stock of financial assets, as a guide for monetary policy, is due to the importance of "wealth effects."[1]

The "availability of credit" and "wealth effects" are now confirmed as the main channels of monetary policy also for the future. Caranza and Fazio explain, however, how the monetary policy *modus operandi* will change. Direct controls will be phased-out (this process has already started). Bank credit (and in fact total credit) will be kept under control by a closer check on monetary base creation and through its effects on the interest rate structure.

Caranza and Fazio point out, quite rightly, that the stability of the link connecting monetary base to total credit depends on a long list of factors which are not to be found, presently, in Italy's financial structure. There has to be a reduction in the size of the public deficit[2]; a more developed financial market; a reduction in the share of credit flows pertaining to the banks; and bank lending rates have to become market-determined and less "administered prices"[3]. If we can agree with this analysis—and with the proposed changes in the monetary policy *modus operandi*—two problems remain to be considered. The first problem is quite practical: what will the transmission mechanism be while these far-reaching changes in the financial structure are not yet achieved? Caranza and Fazio provide a reassuring note by stating that these new procedures do not allow any "fine tuning." But how is it that a reasonable "gross tuning" is also going to prevent an excessive degree of "gradualism"? Or, vice-versa, avoid the need for emergency measures?

The second problem has to do with the analytical scheme which was commented upon earlier. Is it true that credit, and not money, remains the

[1]See Vaciago (1978). Incidentally, is this effect the reason for the assumed relevance (see Friedman 1982) of "total nonfinancial debt" as a guide for monetary policy in the United States?

[2]And possibly another change in the Treasury-Bank of Italy relationship. Even after the 1981 "divorce" (the Bank of Italy is no longer compelled to buy all the Treasury Bills unsold at the monthly auctions) the Bank remains the Treasury's "lender of first resort" by providing—during each month—all the cash the Treasury needs. It is this mechanism which makes certain that the public sector in Italy can never be counted among the "fringe of unsatisfied borrowers."

[3]This factor was not mentioned by Caranza and Fazio but it seems to me essential in order for money market rates to impinge on bank credit.

relevant channel of monetary policy if the financial structure changes and those factors which made the credit aggregates more relevant are gradually disappearing?

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The Monetary Policy Decision Process in the United Kingdom

Geoffrey E. Wood*

The thing which has been, is that which shall be; and that which is done is that which shall be done; and there is no new thing under the sun.

Ecclesiastes 1:9

Economists outside government frequently criticize governments and central banks. The United Kingdom is no exception. Indeed, it may be a noteworthy example; in 1981, for example, some economists (e.g., Buiter and Miller, 1981) complained that monetary policy was too tight, while others (e.g., Batchelor, Griffiths, Phylaktis, and Wood, 1981) complained that policy was too expansionary. Missing from these and most other discussions of policy, however, was any analysis of *why* the monetary authorities acted as they did.

Few ascribe what they see as the failures of monetary policy to wickedness—although there are exceptions, of which Ham (1981) is a particularly vigorous example. Given that wickedness is ruled out, it is essential to analyze why the monetary authorities behave as they do. This will not necessarily justify their behavior—although it may reveal it to be the best that can be done given constraints on their action. Rather, understanding of why policy is conducted as it is, as well as of interest in itself, can be of assistance in improving the conduct of policy.

This paper attempts to further that process of understanding for the United Kingdom by considering six issues. First, the gradual change in the goals of monetary policy over the past 20 years is set out. Second, the formal aspects of the decision-making process are summarized. This will lead to the examination of three issues: how the target variable for monetary policy was chosen, how the techniques used to attain that target are constrained by the institutional setting, and how the techniques themselves

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constrain what the Authorities can do.[1]

What is Monetary Policy?

A useful starting point in discussion of the U.K. monetary policy-making process is to ask what monetary policy comprises. This is not simply to ask whether one means money stock policy, interest rate policy, or exchange rate policy. Because of the views of the U.K. monetary authorities on monetary control, the question can be rather wider than that.

> The main instrument (for controlling the money supply) must continue to be fiscal policy and interest rates. (Green paper on Monetary Control, CMND No. 7858, 1980.)

That makes it hard to distinguish between the "components" of economic policy. If fiscal policy is used to effect monetary policy changes, then the decision-making process of fiscal policy is relevant to the monetary policy decision process. How can one—indeed, should one try to—circumvent this problem?

In a study such as a paper (rather than a substantial volume), an argument can be put forward for neglecting the decision processes of taxing and expenditure. This argument mainly turns upon the distinction between long-term plans for monetary policy and its short-term operation. Fiscal policy can not be adjusted rapidly, or indeed, at all precisely. The short-term impact of tax changes on public sector borrowing (the PSBR) is uncertain; indeed, control of the PSBR even over a year is very imprecise. This is not really surprising, as the PSBR is the difference between tax revenue and government (public sector in U.K. terminology) expenditure, each of which is of the order of 40 percent of GNP.

Insofar as the interconnection between the PSBR and monetary policy is perceived as important, its importance is over the longer term. This was recognized by the Conservative Government elected in 1979, which saw need for long-term consistency between the PSBR over a series of years and their plans for money growth.[2] (As sometimes did their predecessors, albeit under IMF suasion.)

If we do not explore the factors motivating the desire of the government for long-term consistency of fiscal and monetary policy, we can regard fiscal and monetary policy as independent. Monetary policy is regarded as concerned with such matters as choice of monetary target, target range, (and indeed, of why one was chosen), and how it responds to the — in the short run independent—PBSR.[3] (A second point, reinforcing the decision to set to one side the determination of the PSBR, is that the taxing and spending policies of the government are arrived at by groups some of whom

[1]The term "Authorities" (always with a capital A) refers in the United Kingdom to the Treasury and the Bank of England as a collective.

[2]See the "Financial Statement and Budget Report," for 1980/81 particularly pages 16-19.

are only peripherally involved in policy over money stock and interest rates, and the subjects of pressures by interest groups which express, and probably have, no views on monetary matters.)

The Aims of Monetary Policy

(i) The present government has given a very clear statement of what it believes monetary policy can achieve.

> To reduce inflation it (i.e. the Government) will progressively reduce the rate of growth of the money stock . . . Control of the money supply will over a period of years reduce the rate of inflation. (Financial Statement and Budget Report, 1980-81, Part II paragraphs 2 and 3.)

This has not always been the aim of monetary policy, and nor has the quantity of money (or its growth rate) always been its concern. Arrival at the position stated above has been recent, and by an evolutionary process. In this section we outline that process. The process can, broadly speaking, be divided into two phases—before and after concern with some monetary quantity rather than some interest rates.

ii) Monetary Quantities

In the 1960s, in response to balance of payments pressure, Britain resorted to the IMF. In 1972 the response was different; sterling's peg was abandoned. On floating, the currency's value on the foreign exchange fell sharply, but by a modest amount. This was initially welcomed as part of the government's strategy to "go for growth," as a policy of excessive fiscal and monetary expansion was rather quaintly known. But by October 1976 the fall appeared excessive. Britain therefore once more borrowed from the IMF, and a constraint on monetary policy was imposed as a device by which the IMF could monitor the United Kingdom's efforts to repay this new, massive, borrowing.

This constraint was set in terms of "domestic credit expansion" rather than in terms of some measure of the total money stock, and was a ceiling rather than a target range. At the same time undertakings were made on the size of the public sector borrowing requirement and, much less publicized at the time, for the level of the effective exchange rate (see Foot, 1981), for the years in which the domestic credit expansion ceiling operated. The following identity links these two aggregates with gilt sales, bank lending, and external flows.

DCE = PSBR − Debt sales to the nonbank private sector + £ lending to the United Kingdom and overseas, where PSBR is the difference between public sector expenditure and tax revenue, and DCE is the domestic component of money growth.

A path for DCE is tantamount to a path for the balance of payments; and so long as sterling bank lending is matched by debt sales, the PSBR is broadly equal to the balance of payments.

The transition to announcing targets for a broad measure of the money stock, sterling M3, was effected in 1976. This occurred in two stages. In July the Chancellor (Mr. D. Healey) announced what £M3 "should" do. This became a formal target in November. These targets were not perceived as directly relevant to the balance of payments. Rather, the connection between monetary growth and inflation was increasingly recognized. This was not merely a change of fashion in economic theory. Empirical evidence of the existence of stable demand for money functions was broadcast from the Bank of England. (Goodhart and Crockett, 1970, and Price, 1972.) Further, targets were thought to be of value as a constraint on government. From 1976 targets were announced at six-monthly intervals. In the Budget of April 1978 the procedure was formalized so that one-year-forward plans were fixed and revised every six months. And in culmination of this process, in April 1980 targets were announced five years ahead. These later targets were not revised six-monthly. It should be noted that the target period never actually ends before the announcement of new targets. This is deliberate, to avoid having a month at the end of a target period when it is clear exactly how the Authorities have to behave; the removal of obfuscation associated with the move to targetry was not complete.

Hence, it can be maintained that although the present government has innovated by explicitly announcing monetary target ranges to reduce inflation, monetary constraints, albeit for a variety of purposes, had already been for some years an integral part of U.K. monetary policymaking. These were, it should be noted, originally "imported" at the IMF's prompting.

iii) Interest Rates

Until the adoption of a monetary target, the focus of the U.K. monetary policy was on the level and behavior of interest rates. Aside from the post-Second World War period of "cheap money" under Dalton (1945-47), what factors influenced the Authorities' interest rate policy? Except in times of balance of payments crisis, a consistent theme has been the importance of the public sector deficit. [3,4]

As can be seen from Table 1, the scale of the U.K. national debt is large by comparison with other major developed market economies. This large debt generates a continuous interest payment burden, and a proportion of the total matures each year and must be funded. In addition, the U.K. public sector tended to let current expenditure run ahead of income throughout the 1970s, (a practice continued so far in the 1980s) thus accu-

[3]This also sets aside recent work such as Sargent and Wallace (1981) which deals with the contribution of debt (other than money) to inflation. This is done simply because until 1981 the question was not even raised in discussion of U.K. monetary policy.

[4]In times of crisis, rates were pushed up to "defend the pound." Otherwise, their broad movements were in line with those of the rest of the world; interest rate policy comprised short-term rate manipulation about an externally created trend.

Table 1
National Debts as Percentages of GNP

	1968/9	1977/78
United Kingdom	59	42.5
Canada	29	25.7
United States	29	29.3
Italy	37.2	62.5
France	13	N.A.
Germany	13	13.8
Japan	6	22.3

Source: *Bank of England Quarterly Bulletin*, December 1973, p. 433 and IFS

mulating new debt. The deficits were only partly due to the fact that the economy was running at a higher rate of unemployment in the 1970s than in the 1950s and 1960s; even on a "full employment" basis the public sector was clearly a net borrower. (This is not so clearly true so far in the 1980s.)

The contributions of these factors to public sector borrowing in the financial years 1970-1 to 1978-9 are summarized in Table 2. Also summarized in that table are the chief sources of finance for the public sector deficit. The two crucial features of this are, first, the fact that most finance was raised from domestic rather than overseas sources, and that most domestic financing was effected through the issue of medium- and long-dated government stocks—"gilts" as they are termed—rather than Treasury bills or short-dated stock. This latter feature resulted from a self-imposed limitation. Treasury bills and government stock with less than one year to maturity were defined, under the terms of the Competition and Credit Control document (see below), as "reserve assets" on which the banking system could expand credit. Excessive expansion of the supply of Treasury bills or failure to fund maturing stock was therefore thought to be undesirable on the grounds that unrestrained provision of reserve assets would directly contribute to excessive money supply growth.

In practice the concern to maintain control of monetary growth was undermined by the tactics adopted by the Authorities in marketing medium- and long-term stock. The Authorities never (until very recently) put such stock out to tender. Instead a price is fixed for the stock; it is then sold at that price and any excess supply of the stock is bought in by the Bank of England. This residue or "tap" stock is subsequently released onto the market, usually in small quantities, at times when it can be absorbed at around the original supply price. The continuous existence of such an overhang is intended to stabilize prices, and make gilts an attractive and relatively riskless asset for a wide class of investor.[5]

[5]There have been in recent years occasional sales by tender but these have been viewed as experiments by both sellers and buyers.

Table 2
Financing the Public Sector £Million

Financial Year	PSBR actual	PSBR full employment	Debt Servicing	Overseas Finance	Domestic Finance Gilts	Domestic Finance other
1970/1	840	—	2129	—	728	—
1971/2	1024	—	2302	—	3019	—
1972/3	2498	—	2423	—	−1386	—
1973/4	4432	4421	3018	129	1662	−377
1974/5	7940	6760	3434	1517	2238	751
1975/6	10586	6211	4524	1163	4216	683
1976/7	8523	3757	5667	199	5958	−3301
1977/8	5597	−2054	7412	−4241	5868	−3442
1978/9	9282	182	9680	936	6146	−7480

Sources: *Financial Statistics, National Institute Economic Review*

Two problems inherent in the "tap" system have, however, quite often led to a magnification rather than a diminution of interest rate fluctuations.

First, the Authorities have to choose a price at which to market new stock. But the extent of demand for stock at each price is an imperfectly known stochastic quantity. For example the equation for demand for gilts in the model of the economy constructed by the U.K. Treasury at one time predicted the demand for gilts at any interest rate, with 95 percent confidence, to a margin of error of +£2.1 bil, which would at that time have represented almost 4 percent of the broad money stock, sterling M3. (See Griffiths, 1979.)

This plainly leaves room for mistakes to be made. This room is increased by there being a period of some days between the announcement of a stock and its sale. The price could thus be appropriate when announced, but wrong should there be some news which shifts the market before the day of sale. (It was one particularly notorious such event, the "Battle of Watling Street," 22nd February 1979, when there was a stampede—indeed a fight—for stock, which led the Bank to experiment with issues by tender, albeit tenders with a minimum price.)

How did the Bank respond when gilt sales were inadequate? They were concerned not to let bond yields move more than was necessary.

> . . . such a yield adjustment (or the policy action taken to forestall it) may be accepted in retrospect as having been necessary in the light of outside circumstances to maintain monetary control. But in other cases it may appear to have been part of a self-generating spiral, with the initial uncertainty causing an acceleration in sterling M3 which in turn affects expectations about interest (and possibly exchange) rates, leading eventually to upward adjustments of yields which are in excess of those justified by the underlying situation and which may subsequently therefore be reversed. The danger of such unnecessary disturbance and interest-rate fluctuations would be reduced if a somewhat smoother pattern of sales of gilt-edged stocks to the non-bank private sector could be achieved in the first place. (Bank of England, 1979.)

To that end, there were some innovations. First in time, and least successful in effect, variable coupon gilts were introduced. Their yield was related by a somewhat complex formula to the Treasury Bill rate, and this complexity deterred many purchasers. The stock for that reason ended up in the hands of the banking sector, and thus made no contribution to monetary control. Stocks which were partly paid on issue, the balance "payable in installments by reference to the Governments expected funding need" (Bank of England, 1979) were invented. Convertible stocks were used on a much greater scale.[6]

Despite these changes problems of monetary control remained. The Bank nonetheless resisted proposals that it should be willing to cut prices aggressively so as to sell stock.

[6]It is worth noting that the U.K. tax authorities make a distinction between capital gains and income, and tax the former at lower rates. This may well also have affected tactics in the gilts market.

> . . . the market in long-term debt is dominated by expectations of future prices, and is *therefore seriously likely to react perversely* to a movement of prices. (Treasury Evidence to Radcliffe Committee, emphasis added.)

Or in the Bank's words

> A difficulty with this approach (i.e., with cutting prices to sell stock) is that such behaviour, in the conditions of weakening confidence where it would be relevant, could tend to add to, rather than diminish, the uncertainties in the minds of investors. (Bank of England, 1979.)

The Bank used changes in Minimum Lending Rate (MLR) under such conditions. Such changes do, feeding through the yield curve, affect bond yields and can thus facilitate sales at reduced prices without the Bank cutting prices directly. It has nevertheless remained the Bank's position, that when they raise MLR at times of a monetary overshoot, they are not cutting prices to sell gilts. They defend this position on three grounds.

First,

> changes in MLR are made as a result of varying considerations not necessarily immediately related to developments in the gilt-edged market, and their effect on gilt-edged prices is indirect and may be greater or smaller depending on the surrounding market circumstances. (Bank of England, 1979.)

Second,

> . . . a change in the yield on a three-month bill from, for example, 9½% to 10% changes its price by only one tenth of a percentage point, while to secure a similar change in the yield on a 20-year stock would require a change in price of about 5%. Such changes in price imposed unilaterally by the authorities would involve heavy capital losses which operators would be likely to regard as beyond the normal hazards of business; and the only defence for the market-makers against such behaviour on the part of the authorities would be to narrow the market drastically whenever such conduct appeared to be in prospect. (Bank of England, 1979.)

And third, they argue that the MLR is raised at times of monetary overshoot to contain bank lending to the private sector; any gilt sales which result are simply a by-product of this exercise. Outsiders remain skeptical of this claim, however. First, there is little evidence that a rise in interest rates significantly reduces bank lending, indeed, in the short run (a quarter at least) the effect may be perverse, as borrowing is used to pay higher interest charges. Second, MLR increases have appeared when the public sector as well as the private sector has been a major contributor to money growth. (Although of course it is generally true that if private sector lending disappeared money growth would be within target.) Third, the Bank almost always takes the opportunity to sell gilts which an increase in MLR produces—it seldom spurns the "by-product." (Although it can be argued that such behavior is only prudent in view of likely future funding needs.) There is one notable recent exception—an exception which reinforces outsiders' disbelief of the Bank's statements on this matter. In October 1981

MLR was pushed up to 14 percent. It was generally the view in the markets that this was not enough to contain money growth or stop the slide of sterling, so there was no surge of gilts buying to tempt the Authorities. Accordingly, two weeks later MLR was pushed up to 16 percent. Buying of gilts started—and a new stock was issued.

And there is surely a question which reinforces still further the view that manipulation of short-term rates is used to sell gilts. If the Authorities use neither short rates nor long rates to control gilt sales, what do they use?

In any event, whether or not the Bank has been unwilling to change prices so as to encourage gilt sales, it has continued to seek *to appear* to be unwilling to behave in that way. It is therefore not surprising that various novel approaches to monetary control have been tried in an attempt to control the monetary consequences of fluctuations in gilt sales.[7]

Examination of these novel approaches sheds light on some of the Authorities' priorities; for control techniques are chosen, and are chosen not randomly but with the aim of attaining the Authorities' objectives. If there are two ways of attaining the same main objective of policy, choice between them will be influenced by how each assists attainment of subsidiary policy objectives. Before examining the techniques, though, it is useful to set out the institutional setting in which decisions are taken. This will help understand just why such techniques, often to the outside observer doomed from inception, were adopted.

The Process of Decision-Making

The three permanent participants in the process (i.e., excluding the changing army of government ministers and their special advisers) are the Treasury, the Bank of England, and the Government Broker. Constitutionally, all the power lies with the Government. This might suggest that the Treasury is the most important of the three permanent participants, as it works directly to and for the Chancellor of the Exchequer of the day. But most of the relevant information is in the hands of the Bank. This inevitably produces an effective relationship rather different—though perhaps no less unequal—than envisaged in law.

i) The Formal Framework

The "Government Broker" is the individual who is charged with mar-

[7]An additional problem arises because of the large unanticipatable fluctuations in government borrowing month by month. These can upset plans for gilt sales—but if allowed to have monetary consequences, intrinsically short term though they are, will cause interest rate volatility.

It can be objected that they *need* not cause such volatility, because the financial markets will realize they are short term. This is probably true; but since the markets have not been allowed to respond in that way, they will need time to learn. There may well be better monetary control techniques available; but there are problems, in addition to bureaucratic inertia, in moving them so long as the Authorities are heavy net sellers of stock.

keting of the government's debt (excluding Treasury bills). He is a partner in the private firm of Mullens and Co., as is his deputy, who is chosen with the aim of succeeding him in due course.[8] This arrangement, with Mullens or its predecessors, has prevailed since 1786. One of the Government Broker's main tasks in carrying out his role is to advise on the price at which stock should be sold, and the maturity to choose when selling it. He walks around (literally!) the market, consulting with stock jobbers (the market makers and position takers) and outside the market (by telephone or in person) consults with stockbrokers (who act for clients and take positions only on their own account, not as firms). He would also be consulted on such matters as deciding to issue new forms of stock (such as indexed stock). His views have some weight; changes of tactics can on occasions be seen quite clearly to follow a change of Government Broker.

The Bank of England, nationalized since 1946, has a dual role—it is at once the operating arm of the Government in the City, and the City representative in Whitehall. Legally, it is under the control of the Chancellor of the Exchequer, who also is supposedly in charge of the Treasury. (Sometimes, however, a Prime Minister takes his/her title of First Lord of the Treasury seriously; Edward Heath, whose Chancellor Anthony Barber was soon regarded by his civil servants as a mere cipher, is the leading example of this.) The Government appoints the Governor of the Bank and his deputy, and the 16 directors (of whom four are full-time "Executive Directors"). Both Governor and Deputy are appointed for five-year terms; the others for four-year terms. All are eligible for reappointment.[9]

iii) Operational Practice

The part of the Bank concerned with monetary policy (as opposed to regulation, supervision or running the Bank, for example) the Policy and Markets area, has eight divisions. They are as follows:

a) *Industrial Finance.* This is responsible for liaison with the private sector.

[8]This succession is usual but not inevitable. Recently, after the death in an accident of the Government Broker, his successor was the Senior Partner in the firm of Pember and Boyle. He gave up his partnership in that firm, and became a partner in Mullens and Co. Presumably this break with tradition occurred because the just deceased government broker had been in the post for only some two years, as had his deputy; the latter had less experience than is usual in the position before succeeding to the senior post.

[9]Whether a Government can dismiss a Governor is not clear. The issue surfaced with the recent announcement of a replacement for Gordon Richardson as Governor. The replacement, Robin Leigh-Pemberton, made himself unpopular with the opposition parties in Parliament by announcing that he was opposed to inflation, and some members of the main opposition party sought to dismiss him. The problem is that although the Governor is quite clearly chosen by the Government of the day, the appointment is nominally made by the Monarch. Therefore only the Monarch can dismiss the Governor. Presumably a Government which wished to do so would advise the Monarch of that desire and the Monarch would, in accordance with custom, act accordingly. But this chain of events is hypothetical, based on no precedent.

b) *Financial Statistics*—concerned with the collection of data. It also claims to comment on the data. This it may do within the Bank; its outside "comments" are usually just descriptions.
c) *Economics Division.* This analyzes developments in the economy, so as to inform, and formulate advice for, the Government.
d) *The Gilt-edged Division.* This is concerned with all operations of long-term borrowing.
e) *The Money-Markets Division.* This is responsible for the Bank's day-to-day operations in short-term money, for liaison with the main financial institutions, and for overseeing the short-term markets.
f) *Foreign Exchange Division.* This division operates the exchange equilization account, manages the U.K.'s reserves, and acts in the foreign exchange markets for the Bank's customers.
g) *A Territorial Division,* and
h) *An International Division.* Together, these last two monitor developments external to the United Kingdom.

The Policy and Markets area is at the centre of U.K. monetary control. It is coordinated by the Deputy Governor, who was assisted until the last "Economic Director" retired by the Home Finance Director, the Economic Director, and the Overseas Associate Director. (The Economic Director's replacement took much less interest in economic policy matters than did his predecessor, rather being particularly concerned with the provision of finance to industry.)

There are also two "Chief Advisers," one concerned with the real economy and the other monetary matters. To these two reports the Bank's Economics Division, wherein the bulk of the Bank's economists are concentrated.

It can be seen that the Bank is placed so as to have a central role in policymaking. It gathers information on the state of industry, analyzes the state of the economy, and is intimately concerned with the markets central to the conduct of monetary policy. With a central bank in such a position, and a Treasury (unlike the U.S. Treasury) with no direct relationship with any markets, it is not implausible to suggest that monetary policy is usually made by the Bank rather than the Treasury or Government. (The policy of the Administration elected in 1979 may appear an exception to this; the Bank has remained highly skeptical about this policy, an issue noted further below.)

This suggestion is still more plausible when the "monetary" strength of the Treasury is considered.

The Treasury

The Treasury's basis for contributing to economic policy is a model of the economy. This was until recently of the large "Keynesian" type, highly disaggregated by sector, with interest rates the channel of transmission of monetary policy. That in itself may be thought to have placed the Treasury at a disadvantage when contributing to monetary policy. (The model has been modified recently in an attempt to incorporate roles for the exchange rate, corporate liquidity, and personal wealth, thus continuing the tradition of constructing large-scale econometric models primarily in line with their operator's preconceptions.) Nonetheless, the Treasury's contribution is in anticipating the consequences of policy actions, and in formulating policy, rather than in carrying it out. They are just not equipped—nor indeed expected—to deal with arguments based on operational difficulties associated with particular policies.

Within this framework, the Treasury is divided into divisions broadly analogous to those of the Bank, one division being concerned with monetary policy and reporting to both the Government's Chief Economic Adviser and to the Head of the Domestic Economy Sector. The former is currently, and has normally been, an economist with an academic career (to which he often returns); the latter is a permanent civil servant, quite often of course one with an extensive background in economics.

The Treasury is thus placed to analyze the consequences of monetary policy, just as the Bank is, but can not really advise on its implementation. This position is confirmed by the supremacy of the Bank in debt management, a task which, it has been argued at several points in this essay, has overridden or at least circumscribed monetary policy.

The Choice of Monetary Target Variable

The above description of the formal setting, and the actual position of the Bank of England generally being supreme except when overridden by external events or a strong government view of monetary policy, is reinforced by examination of the present state of monetary policy discussion in the United Kingdom, and of how the choice of monetary target was made.

£M3 was chosen as the U.K. monetary indicator, or, as it is more usually called in the United Kingdom, monetary target. The target has been published since 1976. Originally it was published at six-month intervals. Then, in the April 1980 Budget, a succession of targets for the succeeding five years was announced. In this announcement the target was set in terms of £M3. There was, however a footnote to the table (in the financial statement accompanying the Budget) in which the series of ranges was set out.

This footnote observes:

> As the Green Paper on Monetary Control (CMND 7858) explains, the way in which the money supply is defined for target purposes may need to be adjusted from time to time as circumstances change.

Following that clue leads to a paragraph (number 10) in the introduction to the Green Paper, which summarizes why the target was set in terms of £M3. That paragraph is worth quoting extensively—not for what *is* there, but for what is *not.*

> If one aggregate is to be chosen for the target, there seems to be considerable agreement that £M3 bests suits the present circumstances of the United Kingdom. It is well understood in the markets. It indicates links with the other policies—fiscal policy, debt marketing policies, policies to restrain bank credit and exchange market management—and gives a general assurance that the macroeconomic policies available to the government will be used in a way which mutually support each other in the reduction of inflation. It is also relatively easy to define in terms of the banking system. . . .

What is notably missing is any statement that £M3 is more closely related to future inflation (the reduction of which was the explicitly stated objective of policy) than is any other monetary aggregate. And indeed, no published official studies seem to have addressed the question of whether that really is the case.

In fact, regarding £M3 (or a series closely related to it, such as M3) as the best measure of money in the United Kingdom is, certainly in official quarters, a long-standing tradition. For example, Bell and Berman (1956), wrote:

> The "money supply" is defined for the purpose of this article as: (i) estimated currency in circulation with the public (that is, other than with the banks); *plus* (ii) net deposits of London Clearing, Scottish and Northern Ireland banks (the domestic banks); *plus* (iii) deposits in sterling and foreign currencies of United Kingdom residents with accepting houses and overseas banks (excluding interbank deposits).

No justification is given for this choice of definition, apart from the aside that,

> Any definition of money becomes arbitrary as soon as the theoretical concept of money is widened beyond assets that serve primarily as a medium of exchange to include assets that serve primarily as a store of value.

This attachment to £M3 may have been the result of two factors.[10] First, it is related by an identity to variables with which the Authorities and in particular the Bank had been greatly concerned before they acquired interest in money stock control.

This identity is as follows:

Change in £M3 = Public Sector Borrowing Requirement (PSBR; i.e., the consolidated borrowing of central government, local government, and some nationalized industry borrowing).
− increase in public sector debt held by nonbank public

[10]Had the Authorities set out to construct a long run of monetary data, they would have been driven by a third factor to £M3 aggregate, for in the 19th century the data do not allow one to distinguish between interest-bearing time accounts and noninterest bearing demand accounts.

+ bank lending in £ to the private sector.
− net external flows to the private sector.
− growth in nondeposit liabilities of the banking system.

Second, the approach to monetary control also led towards £M3 as a target. The U.K. Authorities have never simply supplied the amount of reserves to the banking system which they thought would yield their desired money stock. Rather they first tried to set the interest rate which would make money demand equal to the amount they wished to supply. As was very lucidly described by the Governor of the Bank of England (1978) this approach broke down. The Authorities then fell back on another approach. They attempted to predict—at a given level of interest rates and the exchange rate—the growth of all items in their own balance sheet and in the consolidated balance sheet of the banking system *except* the money stock. If the forecast for all these items implies undesired money supply growth, the Authorities then have to adjust their policy instruments. Hence it follows that, to repeat the quotation from the Green Paper on Monetary Control (CMND 7858).

> The main instruments (of monetary control) must continue to be fiscal policy and interest rates.

Treating money growth as a residual from fiscal and debt policies does not necessarily lead to a broad aggregate; an identity can readily be constructed linking the monetary base (defined as notes and coin with the public and the commercial banks plus bankers' balances at the central bank) to fiscal and debt management policies.

Change in monetary base = PSBR − sales of government debt to private sector.
+ Increase in gold and foreign exchange reserves.

But in a system where that relationship is not allowed to lead to cash base control because of the effect it is feared such control would have on interest rate variability (see Goodhart, 1980), one is led very readily to focusing on and ultimately targeting on a broad aggregate.

This certainly seems consistent with the remarks about £M3 quoted above from the Monetary Control Green Paper. In any event, it is clear that £M3 was not chosen as the U.K. monetary indicator by the criterion one would expect—best indicating the effect of current monetary policy on future inflation. It may be the best available indicator; but its choice has not been justified in these terms by the Authorities.

It is therefore not surprising that the "considerable agreement that £M3 best suits the present circumstances of the United Kingdom" has come to an end, and that the position of £M3 as *the* U.K. monetary indicator was challenged.

This challenge has been of two rather different types. One type is quite happy to confine the debate over choice of monetary indicator to a choice between monetary aggregates. Allan Meltzer's (1981) paper is a challenge of this type. In that paper he argues that M1 is in the United Kingdom a better monetary indicator than £M3. If this is so, then, in the United Kingdom as in the United States (for example) a narrow monetary aggregate would better indicate the stance of monetary policy than would a broad aggregate.

The other type of challenge is very well illustrated by the *Bank of England Quarterly Bulletin* for March 1981, in its "Evaluation of Past Monetary Trends" (p. 18-19). After observing that over the past year both notes and coin in the hands of the public and M1 had grown moderately (by 7.2 percent and 5.8 percent respectively), while the growth of the broader aggregates had by any normal standards been rather rapid (£M3 grew by 18.5 percent) the Bank went on;

> The evidence, diverse as it is, of the monetary aggregates needs to be interpreted in the light of wider financial and economic indicators.

This clearly states that it is the Bank's belief that no monetary aggregate or set of aggregates can be a consistently useful monetary indicator. Indeed, the "Evaluation of Past Monetary Trends" concluded with a paragraph which implied that, despite the continued publication of a monetary target expressed in terms of a single monetary aggregate, this belief of the Bank's had been accepted and acted on by the Government.

> The decision in the context of the budget (i.e., that of March 1981) to reduce MLR from 14% to 12% was based therefore, as were the cuts in November and July last year, on a range of considerations going wider than the evidence of the monetary aggregates. Thus, in addition to a prospective slowing down in the growth of broad measures of money, the level of real interest rates, and developments in the economy more generally, were judged important.

That such a challenge by the Bank to the conduct of policy could be published supports the assessment of the relative positions of the Bank and Treasury in the area of monetary policy. (And that £M3 could "emerge" in such a way as a target certainly lends support to the view of the official who suggested that there is no monetary policymaking process.)

New Targets

In the April 1982 Budget, it became clear that the Bank had not only issued a challenge; if the challenge had led to a battle the Bank had won it. For 1981-82 there had been a target range of 6–10 percent growth for £M3. The outcome was that £M3 grew by 15 percent.

In his 1982 Budget, the Chancellor responded to that by announcing targets for a range of aggregates. M1, £M3, and PSL2 were all planned to grow within the range 8 to 12 percent over 1982-83, followed by 7 to 11 percent in 1983-84, and 6 to 10 percent in 1984-85.

In 1982-83, the outcome was, for the first time, within the target range—and was so for every aggregate. Curiously, this seems to have been accompanied by a waning of confidence in target-setting; for while the target for 1983-84 was confirmed in the 1983 Budget as being what had been announced in the 1982 statement, the targets for subsequent years, set out in the "Financial Statement and Budget Report" which accompanies the Chancellor's Budget speech, were described as being "illustrative"—of what was not specified. The waning of confidence of the previous year seemed to carry forward.

It should also be observed that at the same time as announcing targets for a range of aggregates, no information was given on what would be done were one aggregate ouside the range and the others inside. And the inconsistency does not end there; for in both his 1982 and 1983 Budget Statements the Chancellor warned that M1 was expected to exceed its target growth rate in the earlier part of the year. Such an announcement is, of course, in keeping with the spirit of reducing uncertainty which is behind the announcement of monetary targets and thereby in some contrast with other parts of the statements.

How these targets evolved is a process consistent with the importance ascribed to the Bank of England in the decision process; and the announcement of an expected transitory overshoot in M1 is fully consistent with the Bank's concern over debt management—for, if the market believes that the overshoot will be transitory, there would be little sharp upward pressure on the yields of government securities. The comments are an interesting precedent, perhaps a new instrument in the debt management tool kit.

Control Techniques

Adding further support to the assessment of the importance of the Bank relative to the Treasury and of the importance given by the Bank to bond market stabilization is the series of ad hoc control techniques that have been used through the years.

While maintaining their strongly interventionist posture in the market for government bonds, the Authorities embarked on two initiatives aimed at allowing greater scope for the unimpeded working of markets. The first of these initiatives, the introduction of the regulatory framework of the Competition and Credit Control document in 1971, was born of the dissatisfaction with the directives to, and controls over, banks' asset growth which typified monetary policy in the 1960s. The second was the adoption of preannounced targets for monetary growth from 1976.

Controls on bank lending had grown up in the 1960s for want of any effective alternative. More natural devices such as the restriction of supplies of cash reserves or the imposition of tight reserve ratios were ruled out by the Authorities' tactics in the gilts market. The knowledge that the

Authorities stood ready to trade in large quantities of stock at around its current price made medium- and long-dated stock close substitutes for bills and bank deposits with the Bank of England, and the Authorities rarely made use of their capacity to call for Special Deposits with the Bank of England when a squeeze on banks seemed desirable. The instruments used—ceilings on bank lending—seemed to work to a limited extent, but caused disintermediation and impaired competition and efficiency within an already oligopolistic banking structure. The Authorities' view of just how severe were the anticompetition effects was implied in a speech by the Governor of the Bank of England who preceded Mr. Gordon (now Lord) Richardson.

> . . . basically what we have in mind *is a system under which the allocation of credit is determined primarily by its cost*. . . . What we are therefore adopting is a new approach to credit control designed to permit the price mechanism to function efficiently in the allocation of credit and to free the banks from rigidities and restraints which have for far too long inhibited them from efficiently fulfilling their intermediary role in the financial system. (Address by L. K. O'Brien, Governor of the Bank of England, May 28th, 1971. Emphasis added.)

The Competition and Credit Control reforms which were a response to these concerns had four main features. First, the authorities formally withdrew their unconditional undertaking to support the gilts market. Second, a new minimum balance sheet ratio (8:1)—between eligible liabilities and reserve assets—was specified for the London and Scottish clearing banks, (as the main U.K. banks are known because of their joint ownership of the Cheque Clearing system), and extended to certain other financial institutions. (How many clearing banks there are depends on the degree of independence ascribed to the Scottish and regional subsidiaries of the London Clearing banks.)

Until August 1981 these eligible liabilities covered current and deposit accounts including certificates of deposits, and also net interbank transactions. Reserve assets cover some liquid liabilities of the monetary authorities—principally Treasury bills and gilt-edged stock with less than one year to maturity. They did not include cash, but *did* include a substantial private sector liability—money at call with the discount market. Third, the authorities signalled their intention of reactivating the use of special deposits. Fourth, the clearing bank cartel was supposedly ended.

There were, however, major weaknesses in this new system. These are further indications of the attitudes of the Authorities.

Most obvious, the supply of reserve assets could not effectively be restricted since banks could at any time create a call money deposit by inducing the discount houses to hold bank bills. The Bank of England did introduce a requirement that at least 50 percent of discount house assets should consist of eligible public sector debt (defined as Treasury bills, central government bonds, local authority bills and bonds, and a particular issue of bills of the British Steel Corporation) but this created a fresh problem. It led to a "false market" in Treasury bills, so that their rate often moved quite distinctly from other rates in the market. As MLR was linked to the Treasury bill rate, MLR was in turn dragged out of line with market rates.

More important, however, were the Authorities' failures of nerve in making credit and bond markets competitive, with freely moving interest rates.

One notorious result of this ambivalence towards competition was the phenomenon known as "round tripping." Because the main clearing banks were very reluctant to move—and particularly to raise—their base rates for loans (a result of pressure on them from politicians) there were often opportunities for prime commercial companies to borrow in the capital markets, or from the banking system itself, and redeposit the loan with the banking system at a profit, or at very low cost.

Not surprisingly when such opportunities were present bank lending to the U.K. private sector, and consequently money growth, exploded. The peak of money growth was in July 1973 when the annual growth rate of £M3 was 52.9 percent. Of course such borrowing opportunities did not last long, and when they reversed so did the burst of money growth. Money growth was thus very volatile. In an attempt to depoliticise interest rate changes the Authorities had in 1971 surrendered their discretion over the rediscount rate, formerly Bank Rate, but now called Minimum Lending Rate. This was pegged ½ percent above the market determined Treasury bill discount rate. Since the clearing banks' base rate for lending was effectively fixed at a markup on MLR this might have encouraged more frequent, market-determined movements in base rates. But in the event, political considerations, essentially the desire to protect mortgage holders, (over 95 percent of U.K. mortgages are floating rates) still restricted MLR movements, and the formula was abandoned in 1977.

Second, because of the Authorities' attempts to "administer" the gilts market calls for special deposits tended to be made when the price set for gilt sales produced an inadequate or excessive volume of buying. Monetary over or undershoots were, however, endemic to the system.

The problems culminated in the reintroduction, in December 1973, of direct controls on bank operations, the "Supplementary Special Deposits" Scheme. These avowedly temporary controls operated from then, with short breaks in 1975 and 1978, until the scheme was abolished in 1980. The distinguishing feature of the supplementary special deposit scheme, known as the corset, is that, unlike the controls of the 1960s, it constrains bank liability expansion rather than bank asset expansion. Like the earlier scheme, however, it encouraged disintermediation and introduced distortions into credit markets.

The scheme set a limit on the expansion of the interest-bearing portion of banks' eligible liabilities from some specified base. Banks overstepping that limit were required to lodge noninterest-bearing supplementary special deposits with the Bank of England. The scale of these deposits varied directly with the excess growth in interest-bearing liabilities.

As will be observed, the scheme was initially introduced at a time when there was no published commitment to control either DCE or money growth. When introduced it was in fact not intended as a device for the implementation of long-term monetary control. It was intended to inhibit banks from bidding for funds, thus prevent round tripping by removing the scope for profit to which it was the response, and thereby smooth money growth.

The conjunction of the corset with monetary targets did however prove self-defeating, for the anticipatory possibilities opened up by the existence of preannounced monetary targets made the corset ineffective as a means of control over money growth. Further the disintermediation caused by the corset devalued the usefulness of sterling M3 as a measure of monetary growth.

These features did not, however, lead to the abolition of the corset. This did not happen until after the aboliton of exchange controls (in October 1979), an event which not only opened up still further ways of evading the corset, but made it impossible to quantify the extent of the evasion.

Responses to Failure

The Authorities recognized the failure, and did something about it. What they did was not, however, a reform of the system. Rather there was adjustment to existing policies. Interest rate stabilization was still important. The Authorities had been willing to use interest rates to control money growth—but the system of setting MLR had not proved satisfactory. To quote:

> . . . the announced MLR attracted a degree of public attention that had become detrimental to monetary control. Declared changes in MLR tended to be political events of considerable significance for the government. (Allen, 1983)

Linking MLR to Treasury bill rates had also produced problems, as noted earlier, and it was observed that another possibility, influencing interest rates through open market operations without changes in MLR, had its own difficulties. Bank base rates (which determine rates for lending at overdraft) were related to MLR. If market rates rose above them, there was round tripping, so that the aggregates did not move as intended.

Rather than give up setting rates, it was decided (1980) to stop announcing where they had been set. The Bank now deals in bills in the market rather than lends directly to the discount houses at administered rates; and it no longer tries to create a shortage of funds in the money market (the objective of which was to increase its control of rates).[11]

[11]It is sometimes asserted that the Authorities deal in the market "at market prices." This is tautologous, or misleading, or both. It is tautologous in that in the absence of price discrimination they must deal at market prices. It is misleading if it is intended to imply that they do not affect market prices—for by the act of dealing they shift the supply curve.

> These changes mean that interest rates at which the Bank supplies cash to the market, or withdraw cash from the market, are no longer *directly administered* by the Bank. (Allen, 1983, emphasis added).

Controls over a quantity—the monetary base somehow defined—were eschewed, both because the relationship between the base and the broader aggregates was not known, and because it might have resulted in "frequent upward or downward spirals in interest rates." (Allen, 1983)

The failure of the "corset" was thus met with a move to greater flexibility of interest rates. But attempts to influence rates were not forsaken, and the Bank made it clear that it was always possible that they would revert to rate setting. The response was reform, not revolution.

Summary and Conclusions

This paper has two interrelated themes. One has been that whether monetary policy was directed towards the behavior of the stock of money, or an attempt to set noninflationary interest rates, it has always been constrained by the desire to stabilize interest rates which resulted from the pressure to market government debt.

The second theme has been how, until recently at any rate, monetary policy has largely been made by the Bank of England. This has been partly the result simply of the concentration of expertise on monetary policy in the Bank, and partly of the fact that the Bank has been the Government's point of contact with the financial markets. The Bank has been the primary channel of information, and the primary agency charged with the marketing of Government debt. Only in times of crisis or of a deliberate break with past policies, when claims to expertise based on experience can reasonably be set aside, has the Bank been overridden. In general the Bank has played *a* major part in determining the objectives of monetary policy, and *the* major part in deciding how policy is to be conducted so as to attain these objectives.

Some years ago, Richard Sayers (1970) described a particular event in the monetary policy of the 1930s as ". . . illuminating on the ways of the Bank: its determined exercise of all the power derived from its position in financial markets. . . ." It would be hard to better that as a short appraisal of the current monetary policymaking process in the United Kingdom.

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Discussion

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Introduction

I am happy to say that, with the exception of a few relatively minor details, there is no disagreement between Geoffrey Wood and myself on the factual background. The objective of his paper, however, is to probe behind the historical account of what happened to seek to explain why it happened, i.e., to examine the decision-making process. Geoffrey is an acute and critical observer of the monetary scene, but I have to say that my own impressions and interpretation of the decision-making process quite often differ from his, if only in emphasis.

I intend to review three main topics, all of which are discussed by Geoffrey. These are:

(i) the constitutional position of the Bank, and in particular its relationship with the Treasury
(ii) the choice of target aggregate
(iii) the choice of control techniques.

The Constitutional Position of the Bank

Geoffrey sets out the constitutional and structural relationships between the Government, in this case primarily the Chancellor of the Exchequer, Her Majesty's Treasury (HMT) and the Bank. In my own view, he does not attach sufficient importance to the constitutional framework, wherein the power to take policy decisions in the United Kingdom resides firmly with the Government. This may be, in part, because he seeks, early in his paper, to define the ambit of monetary policy rather narrowly, to exclude the overlap between fiscal and monetary policy.

In those countries, unlike the United Kingdom, where the central banks retain a greater degree of formal independence, the central bank will often feel an acute sensitivity to seek to construct and to present monetary policy in such a way as not to conflict with the political domain of the government. This has some practical consequences. For example, it would be hard for an independent central bank to adopt specific nominal income objectives—as has been currently advocated in some quarters—since these might clash with the forecasts deriving from government sources. Similarly, it can be politically difficult for a central bank to take a decision to vary interest rates simply on the grounds that this would seem to be appropriate for the achievement of the ultimate objectives of policy, such as reasonably

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full employment and stable prices, since the pursuit of such objectives is, surely, a "political" decision.

It, therefore, becomes easier for a central bank, particularly if invested with formal independence, if it can undertake its market operations, and affect market prices, in the pursuit of a separate intermediate objective, which has been specifically allocated to it to control. In this respect, the attempt to maintain a pegged exchange rate, or to achieve a domestic monetary target, or some combination of these, provides a suitable framework for central bank operations. Moreover, it will obviously be the more helpful in such a case if the monetary aggregate chosen as the (main) target is susceptible to the market operations and instruments which the central bank can utilize, and is not more closely influenced by other policies, e.g., fiscal policy, under wider government control. Such considerations can, perhaps, play some role in leading central banks with more formal independence to prefer to target narrower monetary targets, where the interest elasticity has been greater, and the effects of public sector deficits and debt management on monetary growth less demonstrable.

Nevertheless, this still leaves the problem of achieving consistency between the two main arms of fiscal and monetary policies. Even if the (intermediate) objectives of such policies are so defined as to prevent any overt clash, and to retain formal independence, one still finds it commonplace in many countries for central bankers to be complaining about the defects of fiscal policy and for finance ministers to be complaining about the conduct of monetary policy. Although that syndrome is not entirely unknown in the United Kingdom, the constitutional position of the government as responsible for all macroeconomic policy does mean that discussions about the mix and consistencies of policy are more internalized in the United Kingdom. Moreover, specific discussion of the balance of policies has been consciously aided in the United Kingdom by the adoption of a broad monetary target, £M3, whose counterparts reflect developments in the various arms of policy, as Geoffrey recognizes. Thus, one can construct an accounting identity, as follows:

Δ£M3 = Public sector borrowing requirement (PSBR) - debt sales to nonbank public + bank lending to the private sector + external flows.

Obviously, the PSBR reflects fiscal policies, public sector debt sales reflect debt management, bank lending is influenced by interest rates and credit policies, and external flows are affected, inter alia, by intervention. The choice of such a broad monetary target and its analysis in terms of the monetary counterparts help to encourage ex ante consistency of policies and to lead to coordination between HMT and the Bank.

It is a common, and quite entertaining, spectator sport to try to elicit differences and rivalries between HMT and the Bank, to suggest that one institution dominates the other in some respects. Geoffrey has enjoyed playing this game. Although his view, that the Bank has generally had the upper hand in the debates in the area of monetary policy, might be expected to please a central banker, I have to say that I recognize neither such a battleground, nor the depiction of "winners" and "losers," in this way.

In particular, his account exaggerates the extent of rivalry by understating the distinct differences of function and roles between the two institutions, which differences make them more easily complements than potential substitutes and rivals. The Treasury is a very small, but elite, body which specializes in general analysis and broad policy advice. To suggest that its "basis for contributing to economic policy is a model of the economy" is to misrepresent and to undervalue the wealth of analytic ability in HMT; their intellectual abilities are formidable, and their contribution is *not* limited to the operation of a formal (though continuously evolving) model, far from it. While it is generally—though not invariably—the case that the manpower that they can devote to specifically monetary issues, and their experience of financial operations, is less than in the Bank, they have the countervailing advantage of covering the full range of macroeconomic subjects, of being the focal point for consideration of such policy issues with other governmental departments, and of a close and continuous direct access to the Chancellor.

Geoffrey is on rather firmer ground—probably the result of personal observation from the period when he worked in the Bank—when he notes that the strength of the Bank has lain in its operational expertise in financial markets. Although the Bank also has an economic model[1] and analytical capacities, it has always emphasized that it is a working bank, though indeed a rather special one, undertaking the crucial market operations for the authorities as a whole in the gilts market, the money market, and the foreign exchange market. In this respect the Bank plays a much larger market role than do certain other central banks where some of these markets are less developed than in the United Kingdom, and/or some of these market functions are undertaken by the Finance Ministry/Treasury itself. It is, indeed, the case that the intimate concern of the Bank with these crucial markets is central to its position, and this position does give it experience and influence, though the extent of such influence, and the manner in which it is deployed, depends, of course, on the key senior personalities, in the Bank and at HMT and No. 10 Downing Street, involved.

But Geoffrey goes on to argue that "With a central bank in such a position, and a Treasury (unlike the U.S. Treasury) with no relationship with any markets, it is not implausible to suggest that monetary policy is usually made by the Bank rather than the Treasury or Government." Apart

[1] With the overall threads of strategic policymaking concentrated in the government in the United Kingdom, there is effectively only room for one main model as the basis for policy-making and forecasting—and by law governmental forecasts for the main features of the U.K. economy have to be published twice a year. Inevitably, the Treasury model provides the basis for this. In these circumstances the role of the Bank economic model is somewhat circumscribed.

from the fact that the claim of "no relationship" would be misleading if it suggested that the Government and HMT never sought to inform themselves of the working of these markets and of market opinion save second-hand through Bank advice, it does *not* follow that the overall strategic direction of monetary policy has been determined by technical market considerations. The crucial policy steps taken while I have been at the Bank (e.g., the application to the IMF and the tightening of policies in 1968/69; the go-for-growth in 1972/73; the abandonment of the pegged exchange rate in 1972; the reliance on incomes policies and the disinclination to adopt quantitative monetary targets, 1974/76; the second application to the IMF and the adoption of quantitative monetary targets in 1976; the abolition of exchange control in 1979; the adoption of the Medium Term Financial Strategy in 1980, etc, etc), have all been essentially major political decisions, in which more technical market considerations have played a generally rather minor role. Among the major policy issues, only in the case of the debates on money control *techniques*, discussed further below, have technical market considerations played a major role.

The Choice of Target Aggregate

Geoffrey discusses the choice of £M3 as the main monetary target over the period 1976–82. Although he notes, in his reference to Bell and Berman, the long-standing tradition in the United Kingdom of looking primarily at a broad monetary definition, encompassing all bank deposits held by UK residents, Geoffrey mainly refers to subsequent documentation, e.g., the Green Paper on Monetary Control (1980), for the official reasons for the choice of that aggregate.

In fact, £M3 had already been used, internally, as the main quantitative monetary focus for attention for some years before then. It is, perhaps, worth recounting some of the reasons for that choice, which was effectively made prior to 1976. When the authorities first began to concern themselves with quantitative developments in the monetary aggregates, during the course of the late 1960s and early 1970s, early econometric studies, including those in the Bank of England, suggested that there was not much difference between the characteristics of the demand-for-money functions of narrow (M1) and broad (M3) money. Both relationships appeared quite well-fitting and stable. Admittedly, the interest elasticity of M1 was generally somewhat higher, but the difference was not enormous and the significance of the interest rate term was not noticeably higher. Moreover, the actual M1 series was more erratic, reacting more sharply to periodic cash flows relating to tax payments, wage and salary payments, and more sensitive to, somewhat arbitrary, adjustments for items in transit (float). So the purely statistical quality of the M3 series was superior.

In any case, initial official involvement with quantitative monetary analysis was occasioned by the application to the IMF in 1968, and by their requirement that the United Kingdom adopt domestic credit expansion

(DCE) ceilings. In the U.K. context this meant defining, measuring and analyzing DCE in terms of the credit counterparts, already mentioned: so the first context, in which quantitative monetary analysis was used, predisposed the authorities to pay most attention to broad monetary aggregates, and, as Geoffrey noted, this reflected an even longer tradition. In addition, the value of this approach in constraining fiscal and monetary policies—especially perhaps the former—into ex ante consistency was soon noted and appreciated. The need to restrain the PSBR to a level which could be financed in a nonmonetary manner provided the Treasury with another argument against spending ministries.

So, from the outset in the late 1960s, a broad definition of money was regarded, internally at least, as the main focus of interest among the various monetary aggregates. Then in 1972–73, the demand function for broad money "broke down"—the previous significant interest elasticity, and the stability and reasonable values of the other coefficients, disappeared. As Geoffrey notes, we no longer could vary interest rates in order to bring about adjustments in M3 via the demand for money function. Why did we not then abandon M3, or £M3, and shift to M1 as the target variable, where the demand function, and interest elasticity within it, seemed to retain its previous econometric stability? First, the experience of the mid-1970s, with an upsurge in M3 in 1972/73 neatly preceding an upsurge in inflation in 1974/75, persuaded many observers that M3 was, indeed, *the* crucial monetary variable. After the collapse of the Heath government, it allowed his political opponents to blame the inflation of the mid-1970s on Heath's prior monetary mismanagement. Moreover, quite a number—though not all—of econometric exercises linking monetary growth with subsequent changes in nominal incomes and prices, undertaken both within the Bank and by academics—including some by Geoffrey and his colleagues—found a closer (but not very close) link for broad money, than for the narrower aggregates.[2]

Second, the argument about the value of targeting broad money in order to retain ex ante consistency among policies through the counterpart analysis remained; and, as Geoffrey notes rather elliptically, the same analysis gave the authorities an indication of how they might hope to control £M3 via fiscal policy and debt management, as well as by varying interest rates.

Third, the case for shifting to M1 rested rather heavily on the superior performance of its econometrically fitted demand function. After the collapse of the M3 demand function—and indeed a number of other key

[2] Geoffrey is critical of the absence of published official studies examining the relationship of monetary aggregates to future inflation. As he knows, such studies have been carried out in both the Bank and HMT; and they have been made available in research papers (T. C. Mills). But not only is the methodology subject to some doubt, and the results not strikingly clear-cut, but, more important, for the reasons discussed above the authorities have been loathe to place that much weight on purely econometric findings. Once, indeed often, bitten—twice shy.

functional relationships in other fields—in the early 1970s, the authorities regarded reliance on econometric findings with more than a little skepticism.

I would, however, particularly emphasize here the first of these reasons, that informed commentators, among academics, in the City, in Parliament, in the Press, overwhelmingly claimed during the mid-1970s that M3 (or later £M3) was the most important monetary variable. The authorities can try to influence the climate of opinion, but equally their own actions have to take account of that climate. Geoffrey and some of his colleagues at the City University are among those who have been most vociferous in arguing that the authorities should be controlling £M3. Perhaps he does not realize that when he quotes the comments of the authorities about £M3 suiting "the present circumstances of the United Kingdom" and being "well understood in the market," that his own efforts helped to create the climate that caused this to be so.

The Choice of Control Techniques

(i) The gilt market and debt management

Monetary economists in general, and monetarists in particular, have found it difficult to comprehend the rationale for the form or nature of the authorities' operations in the gilts market; indeed it is something of a red rag to the monetarist bull, and Geoffrey duly charges to the attack in the beginning and again towards the end of his paper. He recognizes that the earlier enormous weight of the existing national debt, though diminishing steadily in proportion to national incomes until the mid-1970s, and the very high fiscal deficits in nominal terms since that date—together with the continuing struggle to achieve restrictive monetary targets when other counterparts to monetary growth were so expansionary—have led the Bank to feel that it was almost always[3] in a difficult, defensive position, being forced—and seen to be so—to fund vast sums in often difficult market conditions. What he does not also note here is that the apparent failure of the growth of bank lending to the private sector to respond quickly or reliably to interest rate changes (direct controls having been abandoned) together with the lags, and other problems, involved in adjusting fiscal policy (which he does mention), throws virtually all the weight of short-

[3] There have been just a few occasional periods in recent years when monetary growth was below the upper limit, and the forecasts indicated a low PSBR in the coming month(s), when it was decided consciously to reduce funding in the interests, for example, of bringing down long-term interest rates, lowering the costs of funding and reviving the corporate debenture market. Only too often the PSBR forecast has then turned out far too optimistic, and the intentional funding pause then led to revived monetary resurgence. The market operators in the Bank sometimes feel that the authorities as a whole have not sufficiently appreciated that one should try to set and operate targets so as normally to be towards the *lower* end of the target range.

term monetary control onto debt management. Public sector debt and debt management extend, of course, beyond the gilts market. A large proportion of both the stock and the flow of such debt has been represented by national savings and by local authority debt. Until recently the former was characterized by sticky interest rates, while the latter has not been directly controllable by the Bank, so that these other forms of public sector debt were not generally managed effectively to control monetary growth. This put even greater pressure on debt management operations in the gilts markets.

In fact, such gilt-market operations have been undertaken with considerable, indeed remarkable, success to offset fluctuations in the other counterparts to monetary growth. Indeed the flexibility of debt management has brought about an even more successful record than would have been achieved by a preordained series of regular monthly sales if set at the beginning of each year on the basis of the then forecasts.[4] I am sorry that monetary commentators do not recognize just how good the record of debt management has been.

Nevertheless, monetary growth has remained erratic and for most of the period in excess of targets. Apart from the unpredictable vagaries of short-term fluctuations in the various other counterparts, which it is generally accepted will lead to short-term monetary disturbances, many monetary economists and most monetarists cannot see why the Bank does not simply sell whatever volume of gilts is required to achieve a stable monetary growth by accepting the price that the market requires to buy the necessary volume of debt. Since the demand curve is not observable, such commentators, including Geoffrey, advocate auction tenders.

They then go on to argue that the authorities' reluctance to go far down this road reflects an (excessive) concern for interest rate stability. Indeed, there *is* a desire to maintain stable markets, but the Bank's approach, as set out most clearly in the Bank of England Quarterly Bulletin article of June 1979, also reflects a crucial assessment that the extra control over debt sales, and monetary aggregates, from moving to an auction system, or consciously trying to vary gilt prices more aggressively, would be nugatory and very possibly perverse. An attempt by the Bank aggressively to lower gilts prices would simply cause the market generally to fall in line without stimulating more demand, while the greater volatility of yields would serve to deter investors. Moreover, U.K. experience of free tenders (i.e., those without arranged minimum prices or outside underwriting as effectively occurs in the United States and Canada) in those cases where such tenders seemed appropriate (e.g., for the first issues of indexed gilts, since the existing market was barely existent, and so estimation of a reasonable striking price level hard to make) has not been such as to lead to a belief that such free tenders could be much more widely used as the staple

[4] This claim is documented in Chapter 4, "Bank Lending and Monetary Control," in *Monetary Theory and Practice: The U.K. Experience*, Macmillan, to be published in late 1983.

method of raising funds for Her Majesty's Government (HMG) in the gilts market.

(ii) Monetary base control

In several respects the debate over monetary base control is an extension of the previous discussion over debt management, since many of the same arguments, pro and con, are introduced. In this instance, again, monetarists, such as Geoffrey, find it hard to understand why the authorities do not seek to achieve a closer control over the total of the monetary base, i.e., the liabilities of the central bank (or of some elements of the base, including banks' reserves but perhaps excluding currency in the hands of the public). They accept, I think, that this would lead, in the short run at least, to greater interest rate variability in the money market (though not necessarily in the bond market), but they regard this as a small price to pay in order to achieve greater control over monetary growth.

This case has been pressed upon the authorities, notably after the election of 1979 when several of the advisers of the in-coming government were monetarist. The issue was studied at some length by the Treasury and the Bank, and the conclusions reported in the Green Paper on Monetary Control (Cmnd 7858); the detailed discussion, and analysis, of the various alternative forms of monetary base control is to be found set out at length in Appendix B of the Green Paper.

In so far as control over the monetary base is to be pursued only over a *medium* term, say six months, horizon, then short-term deviations from its desired target path provide an indication to the authorities of the need to tighten, or to relax, and in the process to change interest rates. In this respect targeting the monetary base over the medium, or longer, term is not significantly different in form from targeting any other monetary aggregate. The question that then arises is whether the monetary base, which in the United Kingdom consists primarily (90 percent) of currency in the hands of the public, would be more suitable for this purpose than other, broader, monetary aggregates, e.g., in terms of stable relationship with nominal incomes, controllability, etc. While some econometric studies of this, e.g., Lothian and Darby, have arrived at an affirmative answer, most other studies have continued to suggest that there is more information in the developments of the wider monetary aggregates.

The particular distinction of monetary base control is that it is possible, in theory, to control the base over a much shorter horizon: indeed it is even possible to conceive of a regime in which the base is increased by a constant amount every day. The shorter the horizon over which monetary aggregates are quantitatively regulated, however, the more the day-to-day fluctuations in financial conditions materialize in the form of interest rate disturbances rather than in accommodating monetary fluctuations. Given the large scale of short-term monetary shocks, e.g., arising from erratic and seasonal fluctuations in cash flows, and the extent of inertia, the lags, in adjusting financial positions, the extent of variation in interest rates resulting from the attempt to control short-term growth in the monetary base could be extreme. Such extreme fluctuations in interest rates would then in turn affect future desired monetary dispositions, so the dynamic stability of the system would be questionable. Furthermore, any such increase in interest rate volatility would, over the longer term, induce major structural changes, since financial intermediaries and their clients would have to adjust and to adapt to the new system. Any such move towards closer short-term control over the monetary base would, therefore, lead to greater instability of interest rates immediately, and to consequential structural changes in the financial system in the longer term. Whether there would be any offsetting benefits in terms of greater control over the monetary aggregates or, more important, over the course of nominal incomes, to offset against these likely costs is debatable. It is certainly my own view that such tighter monetary base control would be inadvisable.

Conclusion

Geoffrey himself emphasizes two themes in his own summary and conclusions: first that the authorities' concern to control monetary growth has always been tempered by the desire to stabilize interest rates; second that monetary policy "has largely been made by the Bank of England." With respect to the first theme, it is the case that the authorities in general, and the Bank in particular, believe that in certain instances, relating mainly to gilt operations and monetary base control, the costs in the form of interest rate instability of the changes advocated by monetarists would outweigh any benefits, which we doubt exist, from greater control. That said, however, an international comparison—which I have undertaken elsewhere—of the response of short-term interest rates to divergences of monetary growth from target shows that the U.K. authorities have generally responded *more* sharply than other major central banks.[5]

As to the second theme, I have tried to emphasize that in the United Kingdom the overall threads of strategic macroeconomic policy, including monetary policy, are unusually centralized in the hands of the government. In some particular cases, e.g., in the discussion of structural changes to financial markets or institutions, the closer practical experience of the Bank will, naturally, carry a lot of weight. But most of the crucial policy steps, as outlined earlier, have been essentially major political decisions, in which such technical considerations have played a generally rather minor role.

[5] In Appendix 1 to Chapter 4, Ibid.

The Political Economy of Central Banking in the United States or Quis Custodiet Ipsos Custodes

James S. Duesenberry*

The fact that monetary policy can be strongly influenced by political considerations has long been recognized. The topic has increased in importance with the rise of monetarism. Theories that attach great importance to money supply require some explanation of changes in money supply. Gold flows and institutional changes provide easy explanations for some noteworthy historical episodes but they cannot explain the behavior of those central banks that can control the money supply. Hence the emphasis on politics. The movements of money supply can be explained in terms of political events and provide an exogenous driving force for the system. A whole literature on electoral cycles has begun to develop. In this paper I shall argue that central bank policy in the United States is indeed influenced by political considerations. In Section I, I have sketched out the ways in which the Federal Reserve System is exposed to political forces. I have also indicated some of the intellectual, ideological and economic interest forces which work through those channels.

In Section II, I have argued that postwar Federal Reserve policy has to be interpreted in terms of modes of operation developed to conserve the System's power to influence events when it is important to do so. Much of the System's behavior can be understood as defense against attacks by populists and monetarists. In my view, simple election buying has played a minor role. In Section III, I review some recent proposals for the use of new monetary aggregates. I argue that those proposals make more political than economic sense.

I.

Central banks play an ambiguous role in almost any political system. Many of them—the Bank of England in particular—originated as private or quasi-private institutions. When the Federal Reserve System was founded, it was given the form of a set of private corporations.

The quasi-private form reflected, among other things, the public's dissatisfaction with treasury currency which had often been associated with war and inflation. Moreover, the notion that the central bank should play

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an important role in the government's macroeconomic policy is a relatively recent one. Indeed, the notion that a government *should have* a macroeconomic policy is a relatively recent one. If a central bank's principal task is to maintain currency convertibility and act as lender of last resort, the government may have no need to worry about it. That is especially true if the government is not accustomed to take praise or blame for the inscrutable mysteries of the business cycle.

Since the great depression of the 1930s, and the second world war, governments have taken on responsibility for maintaining prosperity and "full employment," together with price stability. They expect to receive praise for prosperity and blame for recession, unemployment, or inflation. Since they have accepted these often conflicting responsibilities, governments need all the help they can get. Nothing can be more galling than to be blamed for the results of actions taken by an independent central bank. It might not be so bad if the bank could be given responsibility and made to take any blame connected with the often unpleasant tasks of monetary management. But if the blame cannot be avoided anyway, governments feel that they might as well make the decisions that will affect their ability to survive the next election.

In many countries, then, the desire of governments to control central banks has been in conflict with the established traditions of independence in the case of the older central banks and with more general notions that central bank independence helps to insure a "sound currency," prevent inflation, and sometimes to insure convertibility and stable exchange rates.

The result is a spectrum of arrangements. At one end are central banks that are in essentially the same position as any other government department. The governor may have freedom to carry out routine operations but the prime minister and cabinet make the major policy decisions. More commonly some form of compromise arrangement has been worked out. The Finance Minister may have veto power over central bank decisions, or it may be easy for the government to remove the governor from office. At the other end of the spectrum the central bank is said to be "independent" of the government. As in other cases the form is not the whole story. Whatever the formal arrangement, political forces are at work that can make a formally independent bank subservient to the government in power, or conversely give great power and influence to a central bank management that is controlled by the cabinet.

The Federal Reserve System is a case in point. It has an elaborate structure intended to make it "independent of political influence." The Governors are appointed for long terms (14 years). The Chairman has only a four-year term but it is not coterminous with the presidential term. The System is financed from the profits on its own operations. To the vexation of some congressmen the System cannot be coerced by the power of the purse. The elaborate regional System, though conceived for other reasons, has proved to be a valuable political aid. The use of local boards of directors keeps the presidents and governors in touch with local business opinion. Counting branches, there are over two hundred directors at any time. Since most of them have been selected as leading citizens, their influence in support of System policy can be considerable. Moreover, past directors constitute a body of local alumni who can be expected to support the System's independence and to be sympathetic to its policies.

Finally, of course, the Fed has the support of large industrial and trade firms. Among the managerial class the Fed is regarded as a defense against the spendthrift tendencies of government. The idea that the power to print money should be put into the hands of those who love to spend it is repugnant to them and they support the Fed's independence even when it hurts.

Nonetheless, the Fed is vulnerable to attack from many directions. It may be useful to consider first the levers that may be used to control or influence Federal Reserve policy without regard to the purposes for which those levers may be used. We can then consider the substance of the "political" issues facing the Fed.

At first glance the appointment process seems to be the point at which Federal Reserve policy can be influenced. The President can appoint Federal Reserve Governors (subject to Senate approval). Counting regular appointments at the end of Governors' terms, as well as replacements for resignations, a President has the opportunity to appoint two to four Governors in a presidential term. A two-term President may, by the end of his second term, have appointed most of the Board.

Moreover, it may be supposed that some governors concerned with reappointment will adjust their views to suit those of the President. In fact, the appointment process seems to influence the System only in a very general way. Presidents, very naturally, tend to appoint governors whose views are consistent with their own. The result is that the Board is philosophically a kind of moving average of the last three administrations. But there is not much indication that appointments have been made to gain short-run political advantage for the President. Two considerations limit that possibility. First, the visibility of the Board and the confirmation process make it difficult for the President to use Federal Reserve appointments to reward his friends and supporters. When monetary policy is not controversial, some nonentities have been appointed to the Board, but in the last two decades that has seldom occurred. The Board has been accorded enough importance to prevent the appointment of "political hacks." At the same time presidents have not appointed governors on account of their views on specific issues. The political disadvantages of appearing to try to "pack the Board" have apparently outweighed any gain from moving one vote in a Board of seven and an FOMC of twelve.

If one cannot reward friends or exert significant short-run influence on Federal Reserve decisions, one might as well take the high road and make appointments which look respectable. That may explain why a number of Federal Reserve staff members and other economists have been appointed in the last couple of decades.

The President's power to appoint the Chairman is a different matter.

Since the Chairman can carry much more weight than the other Board members, he will be important to the President. Any President will want to have a Chairman sympathetic to his views. President Truman refused to reappoint Chairman Eccles, a man of considerable stature within the government. Eccles, it may be noted, remained on the Board and continued to campaign for more flexible interest rates. Chairman McCabe, who succeeded Eccles, departed in the dispute over interest rate policy. His successor, William MacChesney Martin, managed to build his own prestige while adjusting his views in such a way as to serve with five presidents over a period of 20 years. I will discuss Martin's policies later on.

At this point we need only note that Martin gave great prestige to the Chairman's role in international as well as domestic financial matters. By doing so, he narrowed the President's options in the appointment of a chairman. The President is constrained to appoint someone who is, first of all, a person of considerable stature in some way, in government, or as a banker, or business manager. Moreover, there must be some basis for the claim that he has some experience with the problems before the Federal Reserve. Of the last three chairmen, two have been economists with very substantial experience in government. The third, William Miller, was well-known as an outstanding business executive. He would not, however, have been eligible except for the fact that he had studied Federal Reserve problems under President Morris.

The fact that President Carter did not wish to reappoint Arthur Burns for reasons of political economic incompatibility indicates that the Chairmanship is a focus of political influence on the Federal Reserve. The fact that Carter appointed Chairman Volcker when Miller moved to the Treasury indicates the limitations on the President's freedom. Chairman Volcker had served in both the Kennedy and Nixon administrations and was President of the Federal Reserve Bank of New York. Those credentials representing high technical capacity, political neutrality, and "sound judgment" are exactly the ones that make for an acceptable nominee for Federal Reserve Chairman. The President may have to choose between someone he will like and someone that the congressional committees and the financial community will like.

The appointment process is a lever by which the President may influence federal policy. The power of the purse is usually the major weapon of the Congress in influencing government agencies. Many congressmen are annoyed by the fact that the Fed pays its operating expenses out of the earnings on its portfolio of government bonds. Expenditures of funds that come from the Treasury in the guise of interest payments, without a congressional vote, are bound to annoy the Congress. The Congress has been reduced to harrassment tactics such as verbal abuse or foot-dragging on technical issues or limiting the Fed's power to erect new buildings. The congressional committees spend a great deal of time and use a great deal of Federal Reserve governors' time without contributing much to monetary policy. The Congressmen alternate between using the hearings for speeches for home consumption and asking questions of the "Answer yes or no, do you still beat your wife?" type. The Federal Reserve people deliver bland pronouncements designed to reveal as little as possible. The whole process could be written off as a ridiculous combat of low politics against defensive bureaucrats except for the fact that some communication takes place.

Congressmen always think that agencies, especially those with great power and budgetary independence, ought to be brought under control and made "accountable" to either the President or the Congress. That feeling is even stronger when the Congressman in question dislikes what the agency does or feels that his constituents will blame him for the consequences. As long as the Congress disagrees about the alternative, the Fed is fairly safe, but if the hearing process indicates widespread dislike for the Fed's activities, it is time to be cautious. The whole committee process may be like John Connally's comment on the late Wright Patman—"He is like a cross-eyed discus thrower. He doesn't set any records but he sure keeps the crowd on its toes."

Petty harrassment about audits, buildings, and other minor matters is merely an outlet for congressional frustration but a more serious threat is always in the background. The Federal Reserve Act is, as congressmen never tire of pointing out, an act of the Congress. What the Congress has created, it can destroy. If it wishes to do so, the Congress can put monetary control in the hands of the Treasury or create an entirely new agency.

So drastic a change in our monetary constitution could be brought about only under very special, probably disastrous, circumstances. But the Congress can curtail the independence of the Fed in a variety of other ways. It could require Congressional authorization for Federal Reserve expenditures. Such requirements already exist for FSLIC, another self-financed agency. Alternatively, the Secretary of the Treasury could be given a vote, or more than one, on the Board. The regional system could be replaced with a more centralized one, thus wiping out one of the Fed's political assets.

An alternative approach is to require "coordination between monetary and fiscal policy." That idea appeals to many Congressmen because they see in it an opportunity for the Congress to get into the act. Not every one feels that increasing executive power is to be desired.

I do not propose to discuss the substance of these proposals at this point. For the moment, I merely wish to note that the Congress has many ways to reduce the Fed's power, if enough members are unhappy with Fed policy. Of course, the administration can exert influence by supporting attacks on the Fed or threatening to do so. Alternatively, they may support the Fed or promise to do so in return for cooperation.

So far I have only considered the ways in which the other branches of government can exert influence or pressure on the Fed. That is, of course, a narrow view for two reasons. It would be going too far to assert that the other branches will use the power I have described only to carry out the "will of the people" if they can find out what it is. But it can be said that neither the Congress nor the executive is likely to attack an agency with a powerful constituency and great prestige unless they can see another powerful constituency anxious to make changes in the System and willing to give strong support to those who do.

Persons who speak of political influences on the Fed seem most concerned with those influences that are directly concerned with electoral politics. Accordingly, I will deal with them first even though I believe that other types of political concerns may be more important. The simplest kind of political analysis asserts that the Fed stimulates the economy just before election in order to help the incumbents (President or Congress) get reelected. If the Board and FOMC were all appointed by the incumbent, that would be plausible. But given the process described above, it is a proposition that can only apply to the Chairman. Even then, the Chairman must induce the members of the Board and the FOMC to go along. One can readily believe that a chairman friendly to the incumbent president may talk himself and his colleagues into a somewhat more expansive policy than would otherwise be the case. But given the structure of the System I can see room for little more without open conflict which would probably be counterproductive for the candidate.

At the moment I content myself with that observation. Later on I shall comment on some of the "election cycle" theories. Meanwhile, we need to consider the special influence of the housing and home finance lobbies or what might be called the "real estate connection." In the United States questions relating to housing finance have played a major role in monetary politics for many years. Residential construction makes up about 4 percent of GNP and employs directly and indirectly millions of people. It is, of course, spread throughout the country. A high proportion of Americans own their own homes and in a country with high mobility several million homes are sold every year. The availability and cost of credit are therefore matters of interest to much of the population. Much of the credit for home finance has been provided by thrift institutions.

Anyone connected with construction or real estate sales or development must take an interest in political affairs. The problems connected with building codes, zoning, and taxation constantly arise. Those considerations have resulted in the development of powerful lobbies representing the interests of the housing industry and the thrift institutions. They have strengthened their hand as well as generated some business by supporting the cause of low-income housing (so long as it results in new building). By identifying all housing with housing for the poor, the housing lobby has enlisted the support of liberal politicians who might otherwise not be interested. At the same time it happens that this politically powerful industry, dependent on a steady supply of mortgage credit, has suffered more from variations in credit rationing than any other. Monetary restraint has been very largely housing restraint. One might expect a type of investment which is so heavily dependent on credit to be especially vulnerable to fluctuations in real interest rates. But until after 1979, real interest rates in the United

States did not move very much. Mortgage rates hardly kept pace with changes in inflation so that the net movements in real rates were small. Sharp increases in short-term interest rates did cause disintermediation and reduced residential construction in each of the credit crunches.

The pressures of electoral politics and the politics of housing finance are easy to understand. Ideological politics are uncommon in the United States but money is an exception. Paper or deposit monies seem to involve making something out of nothing. Usury is a controversial question through much of the world. Even Freud wrote an essay on "The Love of Gold."

In the United States, controversy between the populists and the sound money men has been a feature of political life almost since the founding of the Republic. In earlier times the gold standard versus silver was the focus of controversy. For a time the convertibility of greenbacks was the big question. The structure of the Federal Reserve reflects, in part, populist fears of financial power concentrated in New York, together with sound money fears of direct government control, especially by Democrats.

Populism is not easy to define but it reflects a fear of the power of big business as well as big government. Indeed, populists are often, not without some reason, fearful of an alliance between the two. Since populism is mainly a movement of small farmers and small businessmen, the availability of cheap credit is a major concern. It has been a southern and western movement and had its greatest strength when congressional seniority gave great power to otherwise undistinguished Congressmen from the one party in the south. They had great influence at the end of World War II and together with President Truman, who had a populist background, prevented any change in short-term interest rates until 1951 and made the Fed wary about raising interest rates for many years afterward.

Of course, the populists have never had the field to themselves. The financial community and the managers of large business have always been concerned with "money." Stable prices and stable exchange rates have been viewed as "good things" in themselves. Self-interest is involved, but not necessarily of the short-run immediate profit type. Banks have not always enjoyed tight money periods, and the interest of large businesses in either high interest rates or stable, sometimes overvalued, exchange rates, is not so clear. The self-interest of the management and financial community in sound money is in the connection between stable government, stable prices, and exchange rates. In the 19th century strong governments had stable prices, stayed on the gold standard and paid their debts like respectable middle class households. The "ruling classes" have acquired a more sophisticated view of things but have never really got rid of the idea that a well-run country should have stable prices and avoid exchange depreciation. If, as often happens, rising interest rates or limited money supply are the recommended cure for inflation, they are willing to support them. It may be worth noting that when populists become concerned with inflation, they propose price control as an alternative to monetary restraint. The sound money contingent would bear a good deal of monetary pain to avoid that.

Though I have labeled them as ideological, the two groups I have just described are essentially pragmatic. The ideological character of the academic views on monetary policy is more clearly marked. The monetarists and Keynesians have carried on an intense controversy for many years. The academic camps and others have made some uneasy alliances but only for tactical purposes.

The Keynesians have, in fact, been allied at times with both camps. Since Keynesian methodology accommodates a fairly broad range of views of scientific issues as well as on values and policy a number of conservative Keynesians have allied themselves with and even become leaders of the "sound money" forces. On the other hand, "liberal" Keynesians who are more concerned with full employment and growth than with price stability have often been allied with politicians of somewhat populist persuasion.

Monetarists have a scientific doctrine, a set of values, and some beliefs about how monetary politics work. I shall say something later about their scientific doctrine. At the moment it is their values and politics that matter. Generally speaking, monetarists seem to have a low opinion of government and all its works. At the same time, they have great concern for price stability. Finally, they reluctantly conclude that money will not run itself—everything else will, but not money. Accordingly, it is necessary to provide a stable money supply in a way that minimizes the opportunity for pernicious government meddling.

In a practical context the main thrust of monetarism has been to argue against active measures to prevent or recover from recessions and to argue that money growth should not accommodate price increases due to supply shocks. That position has, of course, often put the monetarists at odds with most politicians. In recent years, however, they have acquired a certain popularity as a result of public disenchantment with all other proposals for inflation control.

A final problem in defining the nature of the political forces affecting monetary policy is the politics of the policymakers. Every officeholder or prospective officeholder has to adjust his statements and actions to the political environment in which he operates. There are, of course, notable examples of chameleon politicians who have no substantive interest in the problems in which they deal, but are only concerned with the effect of the votes they cast and the positions they take on their prospects for getting elected or reelected. More commonly, we suppose that they have genuine beliefs and values but are forced to compromise for "political reasons." If they agree with us, they simply act virtuously, but if we are disappointed in their actions, we say that they made a political compromise.

II.

It has often been suggested that the political forces just described express themselves in terms of specific actions, e.g., a shift to more rapid money growth in the months before a Presidential election or a change in Federal Reserve policy coincidental with a change of Presidents. Such things probably occur at times, though the evidence for them is not overwhelming. In my view, however, political forces have conditioned Federal Reserve policy in a deeper and more fundamental sense than is suggested by the examples given above. I shall argue that the operating modes, e.g., use of free reserves and federal funds targets have had a political function which is as important as, or more important than, their economic function. I shall argue that the targets in use most of the time until 1979 have served to preserve the Federal Reserve System's political capital until needed for a major anti-inflation action. I shall then argue that the timing and duration of the exceptions to the target procedures have been influenced by political forces in fairly specific and visible ways.

For most of the last 30 years Federal Reserve policy has followed a pattern that can be described as "accommodation punctuated by occasional panic." In periods of moderate expansion the reserve base and discount rate have been managed so as to "accommodate" expansion of nominal demand with a very moderate and gradual rise in short-term interest rates. In those periods policy answers Chairman Martin's "leaning against the wind" description.

At times, however, an actual increase in the inflation rate or some indication that strong demand would lead to more inflationary pressure has led the Federal Reserve to shift quickly to a very restrictive policy. At other times the Fed has shifted in the opposite direction in response to the onset of a recession.

At one time, those three policy postures and some variants were well-described in official Federal Reserve terminology. Directives and other Federal Reserve statements spoke of "accommodation" or of open market operations directed toward "maintenance of current money market conditions." The leaning against the wind posture was described as one in which open market operations were to be aimed at producing "somewhat firmer" conditions. While the latter statement usually indicated a desire for some gradual rise in interest rates, it was also intended to indicate a desire to reduce bank liquidity and perhaps to increase member bank borrowing from the Fed.

In the periods of full accommodation, or nearly full accommodation, money supply growth was largely determined by growth of demand for money, since the Fed supplied the reserves required to meet the demand for money at its interest rate target (explicit or implicit). Given the very low short-term interest elasticity of demand for money, the effects of relatively modest changes in interest rates on money demand were small compared to those generated by rising income. Accordingly, the money supply was in large measure endogenous.

A large number of studies—many of them by monetarists—testify to the method used during most of the 1970s. For the better part of the decade, the FOMC established a narrow target level for the funds rate and the actual rate was within the band almost every month. The FOMC also set targets for monetary aggregates. When, as usually happened, actual money growth deviated from target, the FOMC adjusted the funds rate upward. However, the adjustments were so small as to have little influence. Adjustments were also made in response to movements of unemployment and inflation rate.

Given the rather small size of the funds rate adjustments, the System behaved very much as it had when Chairman Martin spoke of leaning against the breeze. With the exception of a few months in 1974 (described below) money supply was largely endogenous—driven by the growth of demand until late 1979. The discount rate generally followed in the wake of the funds rate. Because of the use of explicit funds rates targets, the method in use in the 1970s was more clearly understandable than the comparable one used from the accord until the end of 1965. I have described it first because the earlier method is easier to understand in light of its successor.

During the 1950s and 1960s, the FOMC used the language of "active ease," "firmer conditions" and so on but it also made use of "free reserves" targets. Policy could be described in terms of directives to conduct open market operations in such a way as to cause a rise or fall in free reserves. In a remarkable exercise of patience and ingenuity Brunner and Meltzer calibrated the picturesque verbiage of the FOMC directives and plotted them on a chart, also showing the movements of free reserves. The chart shows clearly that vague language was translated into relatively precise action.

The Board of Governors also moved the discount rate—generally following the Treasury bill rate. The method was much maligned, especially by monetarists. Considered as a system for controlling money supply, it was certainly not effective. But considered as a system for controlling short-term interest rates and exerting some pressure on changes in bank liquidity and on bank lending policy it made a good deal of sense.

On the upswing the supply of unborrowed reserves could be made to grow a little less than the amount required to meet the demand for bank reserves at the initial Treasury bill rate. The Treasury bill rate would rise, and banks would reduce excess reserves, and increase borrowing as the bill rate rose above discount rate. But because of the rationing procedures used at the discount window only a limited amount could be borrowed.

By choosing different combinations of unborrowed reserves and discount rate, the FOMC and Board of Governors together could manage the level of free reserves (and more importantly of borrowing) and the level of short-term market rates separately. The borrowing position was taken to be a measure of the pressure on banks to sell liquid assets to meet loan demand in excess of deposit growth. It was assumed that because banks had no alternative sources of funds, they would tighten credit standards when their liquidity reserves were seen to be declining.

The significance of these liquidity pressure considerations may be doubted, though they would have been considered perfectly reasonable in banking circles in the late 50s. Indeed, the negotiable certificates of deposit and renewed interest of commercial banks in time deposits were the commercial banks' response to pressures of loan demand in excess of deposit growth in the 50s. The development of new sources of funds rendered free reserves as such obsolete as a measure of monetary tightness. It remained true, however, that the Fed could raise the interest rate by a two-step process. In step 1, growth of unborrowed reserves was limited, forcing up the Treasury bill rate. Banks borrowed more as the bill rate-discount rate spread increased, but that was incidental. In step 2, the discount rate was raised "to follow the market." It was thus made to appear that the Fed was manipulating the mysterious quantity called "free reserves" which was understood to have something to do with bank liquidity and willingness to lend. However, the Fed did not say anything about interest rates until it was deemed necessary to raise the discount rate to keep it in line with the market.

The use of free reserves targets and "market oriented" discount rate changes had a "scientific" background in the Federal Reserve view of how banks operated. As noted above, it had some support from the verbal testimony of bank officers.

At the same time, it met the political needs of the system. The shift from the low-pegged interest rates of the war and early postwar years to significantly higher ones and the acceptance of gradual changes in interest rates as a means of controlling inflation was perceived as a delicate task. The need for arguments like the "lock in" effect indicates the Fed's concern to allay fears that use of interest rates to control demand would require very high and possibly rapidly changing rates.

The approach used in the 1970s, though similar in many respects, had a different political rationale. The populist monster had become less fierce, but monetarists had become much more effective. Congressmen were able to express their dislike of Federal Reserve independence by demanding that the Fed report its targets for growth of monetary aggregates to congressional committees. They finally succeeded in forcing the Fed to do so. At the same time monetarism grew more popular among economists and increased in influence within the System.

The target and rate adjustment system used during the Burns regime appeared to give the monetarists a victory. But Burns, like Martin, was no more of a monetarist than he was a Keynesian. As monetarists have often noted, with considerable annoyance, control of the money supply in the seventies was no tighter than it had been in the fifties and early sixties. The only consequence of the Federal Reserve bow to monetarism of the seventies was to cause some aberrations in policy in response to random variations in money demand.

Another aspect of Federal Reserve policy was the emphasis on gradualism. The gradualism in question was interest rate gradualism. It was certainly motivated by concern for the stability of financial markets as well as by a concern about populist reaction to sharp changes in interest rates.

There was, however, another factor—admission of limited forecasting power. Anyone who thinks about making monetary policy in terms of national income analysis will find that he faces a very difficult task. The policymakers must face three facts. First, central bank action affects economic activity and prices with a long lag. Any estimate of the consequences of policy action must be based on forecasts of economic events over the next year or two. Second, economic forecasts are subject to considerable error. Forecasts of the differential effect of economic policy actions are subject to even greater error. Third, it is costly in both political and economic terms to change the direction of policy very frequently. Those considerations all lead one to conclude that gradual policy adjustments based on forecasts will give the best result most of the time. Only occasionally will oil shocks or wars lead to a very sharp change in policy. That view is, I think, supported by optimal control theory models.

Since the end of World War II, monetary policy during economic expansions has been characterized by the kind of partial accommodation described above. On several occasions, however, i.e., in 1966, 1969, 1974, and 1979 policy has shifted to severe restraint. In those instances there was good reason for serious concern with inflationary pressures. In each case a sharp rise in interest rates disrupted the mortgage market and brought on a recession. In the first three instances the policy was reversed fairly soon after the onset of the recession.

Political issues arise with respect to the timing of the shift toward restraint and the timing of the shift toward easier money. Political forces clearly affected monetary policy during the Johnson administration. The President had made his objections to rising interest rates clear even before he engaged in a public dispute with Chairman Martin. After that affair in late 1965 new arrangements for consultation were made. Reserve growth was limited in the spring and summer of 1965. That led to a burst of disintermediation, a decline in home construction, and the mini recession or "welcome slowdown" of 1967. The slowdown and a momentary reduction in the rate of price increase provided an excuse for a shift to a more accommodative policy. President Johnson's commitment to support a tax increase provided further justification for the action.

In fact, however, the tax increase did not occur until mid-1968. Meanwhile, accommodating monetary policy and expansive fiscal policy caused new inflationary pressures. In the light of hindsight, it seems clear that monetary restraint should not have been given up so readily. There were forecasting errors, especially in 1968, and errors of judgment as to the objective effect of the problems of the thrift institutions. Everyone was too optimistic about early passage of the tax surcharge and about the effect of the wage price guideposts. At the same time there were powerful political forces at work. The construction and thrift industries made themselves felt on Capitol Hill and in the White House. Johnson's acceptance of the tax surcharge was as much influenced by dislike of tight money as by dislike of inflation. At the same time the Federal Reserve wished to avoid a direct confrontation with the President. By participating in planning for the surcharge, they moved closer to the administration and were inhibited in shifting to a strongly restrictive policy.

When at last the Fed did shift toward restraint, the surcharge and the belated change in monetary policy brought on a mild recession in 1970–71. As in earlier cases the Federal Reserve moved to expand money supply and reduce short-term interest rates as soon as the downturn began. The new President had no desire to fight inflation by recession and high unemployment. Indeed, there were few who did. Chairman Burns strongly advocated price controls rather than fiscal and monetary restraint as the remedy for inflation.

The decision to go for price controls and economic expansion surely reflected the political concerns of those involved. The experience of 1957–61 (when unemployment averaged 2 percent higher than in the preceding four years) could be taken to show that inflation can be slowed by a recession but that the recession must be prolonged. It could also be taken to show the high political cost of prolonged slack. Chairman Burns had not shown any enthusiasm for the use of unemployment as a price stabilizer when he advised the Vice President to press the Fed for expansion in 1960. His attitude was apparently unchanged when he urged price controls and expansion a decade later.

The Burns regime has supplied one of the more definite allegations of political influence on monetary policy. The money supply grew rapidly in 1972. It has been argued that money growth was accelerated to improve President Nixon's reelection prospects. In fact, however, funds rate adjustments in 1972 do not appear at all abnormal. It was the expansion of the economy, not the election, which caused the money growth.

The Fed pursued a policy of pseudomonetarism and interest rate gradualism until the end of 1979. In spite of severe criticism, the gradualism dominated the monetarism.

In late 1979 a policy of severe restraint was adopted. The FOMC announced that it would adhere much more closely to its announced targets for monetary aggregates. Given the level of those targets the new policy implied that real output growth must halt unless the inflation rate declined. However, the implication was not spelled out in Federal Reserve statements. In spite of some wavering in 1980, the record shows that on the whole M1 did follow the target path until mid-1982.

The peculiarity of this performance arises from the fact that few of the Federal Reserve Bank Presidents and none of the Governors had previously shown much attachment to monetarism. One can only attribute the apparent mass conversion to the need for some device to cover the severe and prolonged restraint required to bring down the inflation rate.

The use of monetarism by the Fed as a cover for a severely restrictive policy was a triumph of political astuteness as well as an act of courage. It did, however, have some unfortunate implications for the future. By mid-1982, the time to lower interest rates had clearly come. The inflation rate had declined, unemployment was at record levels, thrift institutions were on the verge of failure and LDC debt problems threatened to cause a worldwide financial crisis. Very wisely the Fed bailed out and caused short-term interest rates to drop sharply in August of 1982.

Given the circumstances, only diehard monetarists were inclined to be critical at the time. However, the Fed, instead of announcing that it had lost its faith in monetarism, proclaimed a temporary suspension of the use of M1 targets on the ground that institutional changes would make M1 velocity very unstable during the next few months. That was certainly true and was well received at the time. Once recovery got well under way, however, monetarist demands for a return to M1 targets became much stronger. So far the Fed has resisted and kept short-term interest rates in a fairly narrow range. Given the present uncertainty, that is not an unreasonable posture from a discretionary point of view. A continuing mild recovery, a resolution of fiscal issues, and a period of low inflation would permit a gradual decline in interest rates regardless of the behavior of M1 or other aggregates.

If, however, we should have a relatively strong recovery with some acceleration of price increases and a continuation of the recent rapid increase in M1, there will be a real dilemma for monetary policy. In those circumstances pressures would be very strong for a return to M1 targeting. Since no one has the vaguest idea how long it will be before M1 demand settles down, such a policy would be very dangerous. Although it could be changed again in the right circumstances, there is always some lag in reaching that kind of decision.

III.

In view of the unstable behavior of the traditional monetary aggregates some economists have proposed the use of such broad financial aggregates as total liquid assets or total debt. Before considering the potential use of new aggregates it may be useful to say a word about the logic of target proposals derived from the traditional monetarist point of view. The monetarist argument may be divided into two parts. First, it can be argued that the best way to achieve both price stability and stable growth of real output is to stabilize the growth of nominal GNP. Second, it is argued that the way to control nominal GNP is to control a monetary aggregate. Those who propose the use of new aggregates accept the first proposal but differ on the second.

The view that we should try to stabilize the growth of nominal GNP can be defended in two ways. One can argue that prices are sufficiently flexible to keep actual output close to potential, provided that nominal GNP grows steadily. Prices pivot on the base of a fixed or predetermined nominal GNP. Many pragmatic neoclassical economists worked to improve monetary institutions to stabilize money supply growth. Others apparently thought that it might be necessary to adjust the money supply to offset undesirable changes in velocity.

A more tactical argument for the use of nominal GNP targets or for upper limits on nominal GNP growth is to provide a rationale for anti-inflationary action. At times it may be important to establish a barrier against increases in the rate of inflation regardless of cause. In that case, a commitment to a path or upper limit for nominal GNP growth will trigger restrictive action whenever the price level or real output increases faster than expected. It is important to note that this view can be accepted as an *end* of policy by people who do not accept monetarist analysis of the *means* for controlling nominal GNP. Indeed, some well-known Keynesians have taken that view. One might call the position in question "nominalism." Monetarists would then be a sect within the broader nominalist church.

A Keynesian nominalist might advocate a variety of measures to control nominal GNP. Indeed, all the usual instruments could be used with a nominal, instead of a real, GNP objective. However, one might also suppose that for the purpose of controlling nominal GNP, it would be desirable to avoid all sorts of indexing. For those who play textbook games with IS-LM curves and aggregate demand curves, it will be apparent at once that a fixed dollar budget is likely to be a major element in the aggregate demand curve.

Old-fashioned monetarist nominalists have supposed that nominal GNP could be controlled by fixing nominal money supply. They have argued that the money supply has played the central role in determining the movements of nominal GNP. In fact, hardly anyone wants to deny that money plays an important role in economic events. No one denies that monetary problems played an important role in supporting speculative booms and causing financial panics in prewar business cycles. Few would deny the role played by credit crunches in the postwar recessions. Nor would anyone deny that without an accommodating monetary policy the inflationary impulses from the Vietnam War or from supply shocks would have worked out differently. Indeed, our experience since 1979 is a demonstration of the power of money.

Nonetheless, monetarists themselves have argued, as I noted earlier, that for three-quarters of the time, money has been actively determined by Federal Reserve policy and in that time has accounted for much of the variance of nominal GNP from its trend. The record shows that when money growth does not accommodate the demand generated by other factors, it can act as an effective brake—though often jolting the passengers rather badly. There is, however, no reliable evidence that M1 can (under the best of circumstances) be a reliable instrument for generating a steadily growing nominal GNP.

The Keynesian critique of the causal significance of observed relations between money and nominal GNP has been strongly reinforced by the instability of the relation between M1 and GNP. That has led some economists to argue that we should accept the "nominalist" goal of steady growth of nominal GNP but seek to achieve it by any means available.

From an economic point of view, nominal GNP targets are unsatisfactory because they are based on an arbitrary tradeoff between inflation and output in the short run. They have value mainly because of their simplicity and because at times a firm commitment against rising rates of inflation is required.

If we were to make a serious effort to coordinate monetary and fiscal policy, a good case could be made for seeking to reach agreement on nominal GNP goals simply because they provide a language related to the units in which both bank reserves and budgets are expressed. However, it would be unwise for the central bank to announce nominal GNP goals unilaterally. Such a move at times put the bank in direct conflict with the administration's announced policy goals. Moreover, it brings the conflict between output growth and price increases nearer the surface. In fact, just because nominal GNP goals might make a good vehicle for coordinating monetary and fiscal policy, they make a bad vehicle for a central bank which knows that the President, rather than the Board Chairman, will make coordinating decisions.

New Aggregates

In response to recent instability of monetary aggregates it has been suggested that new and much broader aggregates should be adopted as targets for Federal Reserve policy. The two prime candidates are "Total Liquid Assets" and "Nonfinancial Debt." Both have had relatively stable ratios to nominal GNP and might therefore be thought to be effective instruments for controlling GNP. One can also make arguments which provide a rationale for the role of these aggregates in controlling the economy. In the case of liquid assets the argument is straightforward. According to the "portfolio approach" to asset management, the supply of liquid assets plays a critical role in determining asset prices. Asset prices in turn play a central role in decisions with respect to saving and investment and therefore in aggregate demand determination. All one has to do is to substitute liquid assets for money in the writings of either Tobin or Milton Friedman or Brunner and Meltzer and one has the story.

It would not be difficult to produce a rationale for an upper limit on the ratio of private debt to GNP but the ratio which is stable in the data includes government debt. No one has come up with a good rationale for that kind of regularity. Still it exists and may be another example of the proposition that economics consists of elegant theories which do not fit the facts and empirical rules for which there is no explanation.

In discussion of monetary aggregates it is necessary to distinguish the use of aggregates for control from their use as proxies for or predictors of nominal GNP.

No one has ever controlled total debt or total liquid assets, and no one knows how they could be controlled in any direct way. So far as one can tell total debt and total liquid assets are related to GNP and its components. Any factor which affects spending is likely to affect the demand for liquid assets. The market is likely to respond through intermediation and other changes in methods of finance. If the authorities succeed in controlling the established patterns of intermediation, there may be a change in term structure. Alternatively credit rationing may limit the growth of GNP and maintain the ratio by holding down the denominator.

Monetary aggregates may be used to predict rather than to control nominal GNP. It can be shown that total debt forecasts nominal GNP as well as or better than M1. In view of the recent instability of demand for M1 it has been proposed that debt be used instead of M1 as a predictor of GNP. Alternatively it has been suggested that both should be used. Debt would provide a "second opinion." Two may be better than one but the second opinion approach looks very much like a rather simple form of forecasting by financial leading indicators. Finally, debt or liquid assets may be used as proxies for nominal GNP.

Those who argue that the central bank should announce target paths for variables such as debt and liquid assets are obviously students of the political economy of central banking. They propose to set target paths for variables that appear to move with GNP. Those variables are simply proxies for GNP. In effect, then, it is proposed that the central bank should control GNP.

They also propose to do it in a way which looks like monetarism. Moreover, the indirect formulation reduces the likelihood of direct conflict between the announced targets of the administration and those of the Fed.

There are, however, some serious dangers in a commitment to new monetary aggregates. First, as already noted, no one knows why the ratio of total debt to GNP has remained stable in the postwar period. It is not one of nature's constants and has shown a good deal of variation from place to place and time to time. The liquid asset ratio moved a good deal last year, the debt ratio may be next. Second, the Fed has no idea how to control either debt or nominal GNP with any precision. Promising to do something one does not know how to do does not seem a very wise course to me.

What should be done? We must start from the proposition that our quantitative knowledge of how the economy works and of how to control it is sadly limited. We cannot perform the "fine tuning" which econometric models once appeared to promise. Nor do we know how to design a satisfactory automatic pilot. The fact is that no matter how the public relations are handled, the makers of monetary policy will have to feel their way, moving cautiously until the need for drastic action becomes obvious. In my view, the little that we know still tells us that interest rate gradualism, guided by all available signals indicating the probably course of prices and outputs, is the best procedure. Three important changes from past procedure can be made. First, interest rates can be moved over a wider range than in earlier times. The market has become used to rate variation and will not panic over small movements. Second, real rates, though hard to calibrate, are the important thing and should be emphasized in discussion of rate policy. Third, the public is better informed and the press is trying to make news out of monetary policy. The Fed should give up its sibyline stance and try to explain what it is doing. Why should the interpretation of monetary policy be left to brokers? At the moment it is important to discuss policy in terms of the changes in real interest rates and the allocational issues posed by the budget. Honesty may not always be the best policy but in the current circumstances it may be worth a try.

Discussion

Frank E. Morris*

Unlike most central banks, which are responsible to the Executive, the Federal Reserve is a creature of the Legislature. As such, the Federal Reserve cannot follow, *for any extended period of time*, a policy that is not acceptable to the Congress. For shorter periods, the Federal Reserve can establish policies unpopular with the Congress, and for longer periods the Federal Reserve can follow policies that the Congress could not bring itself to vote for, but that it finds tolerable, if only barely tolerable. The Congress is typically a slow-moving body. Normally, it takes a considerable time for a consensus to develop on any policy issue. Within this time frame the Federal Reserve has freedom to impose policies that it might not be able to adhere to for long. The scope for independent action by the Federal Reserve is, thus, very important even though it is constrained.

William McChesney Martin, Chairman of the Federal Reserve Board for an unprecedented (and not likely to be repeated) 19 years, used to describe the Federal Reserve as "independent within the government, but not independent *of* the government." By this rather obscure statement, I think he meant the constrained sort of independence described above.

A case in point is the dramatic action taken by the Federal Reserve in October 1979 in response both to an acceleration of inflation domestically and an impending collapse of the dollar on the foreign exchange market. The Federal Reserve had the power to act in that situation without prior consultation with the Executive or the Congress. It was quite another matter, however, to adhere to a very restrictive policy for the three years following the October 1979 actions. This was possible only because an anti-inflation constituency had developed for the first time in the United States. The average citizen had chosen to give inflation control number one policy priority for the first time in anyone's memory, and was willing to accept some considerable sacrifices in terms of output and employment to get inflation under control. The Congress, sensing this, permitted the Federal Reserve to follow during the 1979–82 period a much more restrictive policy than it would have accepted in any prior period.

One might ask why the Federal Reserve did not move this vigorously against inflation prior to 1979. The answer, I believe, is that it could not have. In the absence of a strong anti-inflationary constituency, which did not exist in the United States before 1979, such a vigorous anti-inflationary policy could not have been sustained. Without such a constituency, the special interest groups mentioned by Professor Duesenberry, particularly

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what he calls the "real estate connection," would have had a much greater influence on the Congress. So would the populist forces that tend to look upon high interest rates as solely a function of the greed of bankers. In the post-1979 period the influence of these groups was submerged by the new anti-inflationary constituency and, despite a 10 percent unemployment rate, their influence remains submerged.

I am pleased that Professor Duesenberry has thrown cold water on the mythology that the Federal Reserve has stimulated the economy prior to elections in order to help incumbents get reelected. The most discussed case is the Presidential election year of 1972. In retrospect it is undeniable that monetary policy was too expansionary in 1972, but the causation was not a desire on the part of the Federal Reserve to reelect President Nixon. As one who *both* attended every FOMC meeting in 1972 and voted against the reelection of Nixon, I can assure you that nothing of the kind happened. The policy mistake was due to a misestimate of the natural rate of unemployment. The unemployment rate in mid-1972 was 5.6 percent, with the consensus at the time that the natural rate of unemployment was 4 percent to 4½ percent. It was only much later that the consensus was changed and it was realized that we had had in mid-1972 little room in the economy for an expansionary policy.

Professor Duesenberry concludes his paper by discussing the issue of the appropriate targets for monetary policy, and it is only here that we have some differences. Money supply targeting has provided a considerable amount of political sheltering for monetary policy. There is a broad public understanding of the concept that the growth of the money supply must be gradually decelerated if inflation is to be brought under control. Congressional oversight of policy in focusing on monetary growth rates has, more or less automatically, been induced to view the appropriateness of policy from a longer run point of view than if attention had been focused on interest rates, which was the principal focus of earlier years. This was a very constructive change in the orientation of Congressional oversight, and is not something that the Federal Reserve should willingly seek to change.

In referring to the decision of the FOMC to move to monetary targeting, Professor Duesenberry says: "The peculiarity of this performance arises from the fact that few of the Federal Reserve Bank presidents and none of the Governors had previously shown much attachment to monetarism. One can only attribute the apparent mass conversion to the need for some device to cover the severe and prolonged restraint required to bring down the inflation rate."

He is giving us too much credit for political astuteness. We did not know in October 1979 that we would be following a very restrictive policy for most of the next three years, nor did we appreciate then the political sheltering that the move to monetary targeting would provide.

The October 1979 decision reflected a response to the failure of the policy of interest rate gradualism. The policy had been successful in earlier years because of the vulnerability of the thrift institutions to relatively small interest rate changes. When market rates moved above the ceiling rate on thrift deposits, funds would flow out and the availability of mortgage money would shrink. The decline in the housing industry would soon cool off the economy.

However, once the thrift industry received authority to pay market rates of interest on certain accounts, as it did in 1978, the prompt response of the housing industry to small interest rate changes was lost. Mortgage money would be available at a price.

The basic problem of interest rate gradualism was that the Committee never knew how much of a change in interest rates was required to meet our economic objectives. It did know that major moves in interest rates would make sizable waves in financial markets. As a consequence, although interest rates were usually moving in the right direction, the amplitude of the changes was typically too small to have the desired result.

The shift to monetary targeting was seen by most of the FOMC members as a device to deal with this problem. The FOMC manager was instructed to follow a reserve path designed to produce the desired growth in the money supply. He was given an interest rate constraint, but typically it was 400 to 500 basis points centered on the existing rate. The Committee voted for a money growth path and was prepared to accept, within broad limits, whatever interest rate levels fell out of that path. As a consequence, interest rates moved much more rapidly than could have occurred under the earlier regime.

Ironically, this switch to monetary targeting occurred precisely at the time that we would have increasing difficulties in measuring the money supply.

The rationale for controlling money is that the rate of growth of transactions balances is predictably related to the nominal GNP. The problem is that financial innovation has made it impossible to measure transactions balances in the United States, i.e., to differentiate transactions balances from short-term investment balances. It is not surprising, therefore that what we call M1 today, which includes large and growing amounts of interest-earning assets, should behave differently relative to the nominal GNP from the old M1, none of which was interest-bearing.

If our measure of the money supply is no longer predictably related to the nominal GNP, it is no longer suitable as an intermediate target of monetary policy. Among the suggested alternatives are to target on the nominal GNP, to target broader monetary and financial aggregates which are both predictably related to the nominal GNP and unaffected by financial innovation or, as Professor Duesenberry recommends, to return to interest rate gradualism.

Duesenberry correctly assessed the problems in adopting a nominal GNP target when he wrote: "It would be unwise for the central bank to announce nominal GNP goals unilaterally. Such a move would at times put the bank in direct conflict with the administration's announced policy goals. Moreover, it brings the conflict between output growth and price increases nearer the surface."

I think his judgment is faulty, however, when he proposes returning to interest rate gradualism. I see no reason to believe that it would be more successful now than it was in the late seventies. Until we return to the kind of economy in which small changes in interest rates can produce large changes in real economic activity, interest rate gradualism is likely to again produce procyclical policy.

In my judgment, the proper response is to move to the broader aggregates as intermediate targets, specifically, M3, total liquid assets and total domestic nonfinancial debt.

Part II
Comparative and International Analyses of Monetary Policy

Determinants of Monetary Policy in France, The Federal Republic of Germany, Italy and the United Kingdom: A Comparative Analysis

Donald R. Hodgman and Robert W. Resek*

This paper is motivated by interest in the actual decision processes and observed behavior of national monetary authorities in view of the importance of national monetary policies both for domestic economic performance and for international monetary and economic cooperation. In this paper we present and interpret policy reaction functions for the monetary authorities of France, the Federal Republic of Germany, Italy, and the United Kingdom. These functions for particular countries have been developed with due attention to specific national characteristics of the monetary policy decision process, to the setting provided by national financial institutions and markets, and to the selection of policy instruments, or proxies for these, appropriate to the practices of specific national monetary authorities. We have had to omit much of this relevant background material from this paper owing to limitations of space. We hope this omission will be compensated in some degree by materials presented in papers devoted to individual countries in this conference.

As is well known, a single-equation policy reaction function can be regarded formally as a reduced form in which the coefficients are combinations of parameters from the authorities' preference function and from the structural equation model of the economy assumed to be employed by the authorities in making decisions. One important implication of this view is that changes in parameters of a policy reaction function cannot be assigned unambiguously to changes in preferences versus changes in parameters of the authorities' economic model unless the model is fully known to the investigator. This is a counsel of perfection which we are unable to fulfill. Moreover, it seems clear that such a formalized view of the monetary authorities' decision process departs from reality both in its emphasis on the precision of the authorities' preference patterns and the certainty of their knowledge of their own economy and its relations with the rest of the world.

In our view the actual decision process is surrounded by uncertainty and thus involves reliance on judgment and application of standard proce-

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dures which are altered only if policy results are clearly unsatisfactory when judged by the authorities' customary criteria. Thus, we present policy reaction functions as a step in the search for quantifiable patterns of monetary policy behavior. The quantified policy reaction functions thus may serve as a check on more qualitative descriptions of the monetary policy decision process and may help to focus the search for factors—socio-political, economic and international—that account for the differences in monetary policy behavior over time and between countries.

Each of the next four sections of this paper presents and discusses one or more policy reaction functions for the monetary authorities of a specific country. A concluding section offers some cross-country comparisons, brief comments on the phenomenon of regime changes and some observations on the international implications of national behavior patterns.

I. France

In France monetary policy decisions take place within a system of national economic management in which the central government plays an exceptionally strong role. Control over financial flows by means of monetary and credit policies, budgetary policies, direct administrative controls on the activities of financial institutions and markets, and foreign exchange controls are among the principal means employed by government ministries and the Banque de France to manage the French economy. Direct controls by the Banque de France and the relevant government ministries often are used to regulate both the quantity of credit flowing through various financial institutions and markets and the interest rates paid or charged. Many interest rates are regulated so that they move little, if at all, in response to market forces. The French financial system is segmented by regulations and administrative controls in order to limit the effect that pressures generated in one market by government policy and private behavior will have in other markets. Access to the capital market is controlled by the Ministry of Finance.

Three primary concerns have dominated French monetary policy during the years 1964–81 covered in this study. The first is the development and restructuring of the French economy, especially industry. The second is the desire to maintain a level of domestic prices and interest rates that would contribute to the international competitiveness of French firms and the stability of the French banking system. The third is management of the French balance of payments and the foreign exchange value of the franc without jeopardizing domestic interest rate, credit allocation and money stock objectives.

The French monetary authorities, defined to include the Ministries of Finance and of the Economy as well as the Banque de France, have a wide variety of policy instruments at their disposal. We have chosen to concentrate on two instruments: the control exercised by the Banque de France over short-term money market rates and its power to set ceiling rates for bank credit expansion. Control over money market interest rates has been directed primarily at the external sector objectives of the balance of payments and the franc exchange rate. Ceilings on bank credit expansion have been used primarily to control the banking system's contribution to growth of the money stock while seeking to minimize interest rate effects.

Policy Reaction Function for the Money Market Rate

Our reaction function for the money market rate (Table 1) regresses the quarterly average for the overnight money market rate, IBRQ, (closely controlled by the Banque de France) on the annual percentage rate of change in the spot franc/mark exchange rate, $\ln(FRDMXRQ_t/FRDMXRQ_{t-4})$, the annual percentage rate of change in the consumer price index, $\ln(CPIFQ_{t-1}/CPIFQ_{t-5})$, and in an industrial production index, $\ln(IPIC_{t-1}/IPIC_{t-5})$, the three-month Eurodollar rate in London, $REDQ_{t-1}$, and the government budget deficit, $GDEF_{t-1}$.

Our data permit us to estimate the equation for the period 1964.2–82.1. Chow tests indicate significant differences in coefficients between the periods 64.2–74.3, 74.4–81.1 and 81.2–82.1. President Mitterand was elected in May 1981 so that the period 81.2–82.1 may be considered the initial phase of the Mitterand policy regime. We have too few data observations in

Table 1
Policy Reaction Functions for the Banque de France

Instrument variable:	$IBRQ_t$	$IBRQ_t$	$CRAT_t$
Period:	1964.2–74.3 (REGIME I)	1974.4–81.1 (REGIME II)	1973.1–81.1
Explanatory variables:			
$\ln(FRDMXRQ_t/FRDMXRQ_{t-4})$	.91099 (.28222)	14.852 (2.8825)	5.5828 (7.1953)
$\ln(CPIFQ_{t-1}/CPIFQ_{t-5})$	40.682 (4.0725)	69.967 (4.1646)	—
$REDQ_{t-1}$	.73365 (5.6875)	.22546 (2.5482)	.11072 (5.8252)
RUQ_{t-1}	—	—	−.0058251 (−3.9046)
$\ln(IPIC70_{t-1}/IPIC70_{t-5})$	−.32226 (.079128)	6.9663 (.94339)	7.0102 (2.2560)
$GDEF_{t-1}$	.023923 (.63247)	−.00048118 (−.046104)	—
CONSTANT	−.39057 (−.62655)	−.71058 (−.45901)	.67225 (2.2096)
AR^2	87.91	71.86	75.45
Durbin-Watson	1.1007	.90283	1.5076

t-ratio in ( )

this period for reliable estimation. We have chosen to present regression results for the two earlier periods. We treat the Mitterand period by means of an out-of-sample forecast based on coefficients for the period 74.4–81.1. This forecast can be compared to the actual time path of IBRQ in Chart 1.

The timing of the regime change between the period 64.2–74.3 and that of 74.4–81.1 together with ways in which coefficients on explanatory variables behave between the two periods point to changes in international monetary arrangements as a possible primary cause of the regime change. The earlier period falls largely in the international fixed exchange rate regime under Bretton Woods. On March 19, 1973 France, Germany, Denmark and the Benelux countries began their joint float relative to the dollar. Current account deficits in the balance of payments began to constrain French monetary policy in 1974. The franc was in and out of the European joint float twice, was subject to managed floating from 76.6 to 79.3 and entered the European Monetary System (EMS) as this came into operation on March 13, 1979. The Barre government was formed in March 1976. In September 1976 the monetary authorities began setting formal monetary targets.

The replacement of the Bretton Woods system by the European joint float is consistent with a reorientation of French policy from a franc-dollar, FF/$, to a franc-mark, FF/DM objective and with a decline in the importance of the Eurodollar rate as an influence on IBRQ. Regression tests revealed no significant relationship between IBRQ and annual percentage changes in FF/$ or FF/DM exchange rates for the 64.2–74.3 period, a result consistent with successful international efforts to stabilize exchange rates under the Bretton Woods system. In the period 74.4–81.1 the FF/$ is insignificant as is consistent with its reduced importance as a policy guide (this regression not shown in Table 1) while the FF/DM variable becomes significant with an appropriate positive sign. The Eurodollar rate is statistically significant in both periods but less so and with a lower positive coefficient in the later period.

The annual inflation rate in the consumer price index is significant with an appropriate positive sign in both periods with a higher coefficient in the later period. The level of unemployment (not presented in Table 1) and the industrial production index as cyclical indicators are insignificant in both periods. These results largely, but not entirely, support the official French emphasis on the external orientation of policy control over money market rates of interest. The government budget deficit lacks a significant relationship to IBRQ in both periods. The French policy of operating a government budget in approximate balance for most years during 64.2–81.1 appears to have freed monetary policy from significant expansionary pressure from this source.

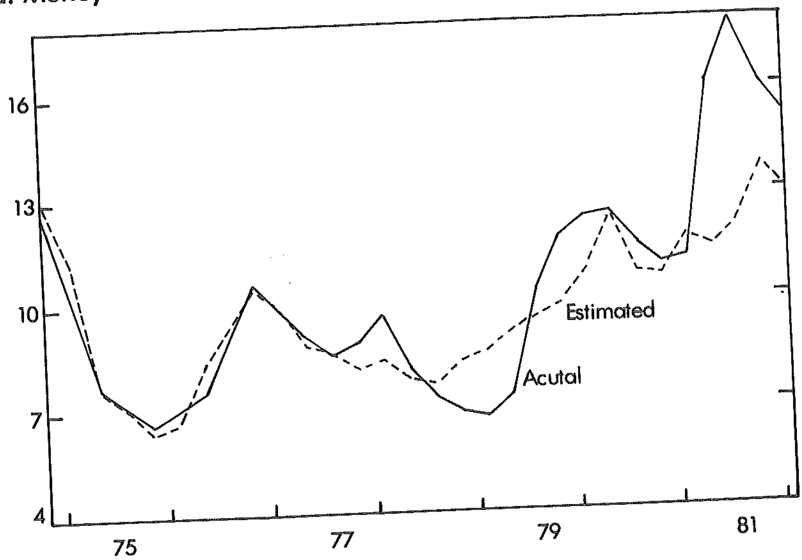
Policy Reaction Function for Bank Credit Ceilings

French authorities stress the role of ceilings on the rate of bank credit expansion as the key policy instrument for controlling the money supply.

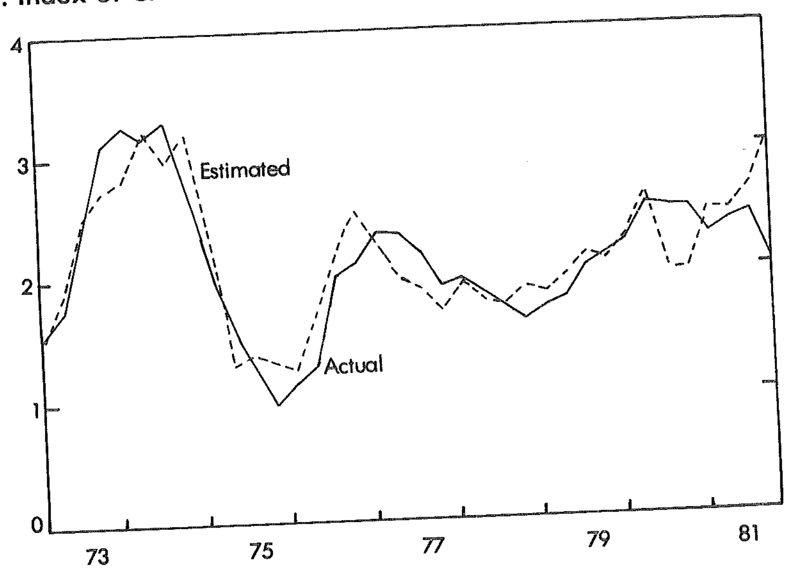
Chart 1

France

a. Money Market Overnight Rate - Quarterly Average (IBRQ)



b. Index of Credit Rationing Intensity (CRAT)



We have not attempted to develop independently an appropriate measure of the credit rationing policy instrument, a research task of substantial complexity. Instead we represent this instrument by a measure of credit rationing developed by economists at the Banque de France and available to us for the period 1973.1–81.4. This indicator, CRAT, is methodologically and statistically complex in its construction, is scaled continuously from 0 to 4, and is an index of the effective intensity of credit rationing rather than a clear-cut policy indicator, since it incorporates various measures of the restraint experienced by banks, firms and individuals in response to different ceilings and associated penalties. Thus, CRAT is a jointly determined variable and cannot be regarded as an instrument fully controlled by the central bank. Despite these serious reservations we present the CRAT regression in Table 1 so as to have some evidence, although flawed, on a key policy technique of the Banque de France. The period covered, 1973.1–81.4, is nearly identical to that of Regime II for IBRQ.

Four explanatory variables are significant with theoretically reasonable signs. The intensity of credit rationing increases with the annual percentage change in the FF/DM exchange rate, with the annual rate of inflation in consumer prices and with an increase in the Eurodollar rate. Credit rationing declines when unemployment levels rise. The FF/DM exchange rate and the Eurodollar rate clearly are externally oriented variables. The level of unemployment is domestically oriented. The increase in CRAT with the inflation rate may be motivated either by concern for domestic inflation control, per se, or by the implications of domestic inflation for reducing the international competitiveness of the French economy.

Neither the annual percentage change in the industrial production index nor the government budget deficit (whether or not seasonally adjusted) exerted a significant influence on CRAT. Attempts to relate CRAT to the liquidity ratio, M_2/GDP, watched attentively by the French monetary authorities, produced significant but negative coefficients suggesting a reverse causal relationship. All three of these variables were dropped from the regression.

The socialist government formed by President Mitterand following his election in May 1981 announced a shift in macroeconomic policy objectives toward greater emphasis on expansion of production and employment. The new government also nationalized additional banks and industrial firms, implemented new tax and transfer payment policies to redistribute income from higher to lower income recipients, and raised minimum wages. These policies signaled a reduced emphasis on the external constraint imposed by the French commitment to relatively fixed exchange rates within the EMS and thus a reduced concern with the condition of the French balance of payments and exchange rate. Subsequent developments have included speculative capital outflows, deterioration of the current account and three devaluations of the EMS central rate for the French franc on October 4, 1981, February 22, 1982 and March 21, 1983. There has also been a marked increase in the size of the government budget deficit relative to GDP.

These developments appear to mark a definite change in policy regime under the Mitterand government. Because of data limitations we have chosen to examine this issue statistically by means of out-of-sample forecasts for CRAT and IBRQ included in Chart 1 and by means of tests of statistical significance. Our data for IBRQ and its explanatory variables extend through 1982.1; our series for CRAT ends with 1981.4. Visual inspection of Chart 1a for IBRQ reveals a gross underestimation of the rise in IBRQ in 81.1 and 81.2 when the French monetary authorities raised money market rates sharply to resist speculation against the franc. A Chow test using our limited data also indicates a statistically significant regime change for IBRQ beginning 1981.2. Chart 1b for CRAT also reveals forecasting error although less than that for IBRQ. A test of statistical significance designed to allow for the very few observations available for CRAT in 1981 is marginally significant but best regarded as inconclusive. Both our forecast underestimate for the rise in IBRQ and overestimate for CRAT probably result primarily from the inability of our policy reaction functions to reflect adequately the strength of the authorities' response to the large and sudden capital outflow following formation of the Mitterand government and announcement of its policies. The authorities raised IBRQ to combat the capital outflow. The accompanying decline in CRAT reflects measures taken to ease the resulting tightness in credit markets oriented to the needs of the domestic economy. The third devaluation of the franc in March 1983 and the adoption of austerity measures of wage, price, and tax policy testify to the difficulty, while maintaining an open economy, of isolating internal and external effects of policy measures from each other even by extensive use of direct controls on capital flows and in domestic credit markets.

II. The Federal Republic of Germany

This section formulates, estimates, and interprets a policy reaction function for the Deutsche Bundesbank. The policy indicator used as dependent variable is the money market three-month loan rate (quarterly average of daily quotations).

The Deutsche Bundesbank has a variety of policy instruments at its disposition. Its primary instruments of monetary policy include its lending rates (the discount and Lombard rates), quantitative limits to banks' access to rediscount and Lombard credit, the power to change minimum reserve ratios for banks, open market operations in the money and bond markets, repurchase agreements and intervention in the foreign exchange markets including the use of favorable terms for forward cover of exchange risk when engaged in swaps with banks. The overall policy effect of these instruments can be conveniently summarized by their influence on interest rates that prevail in the money market. For example, a recent article in the *Monthly Report* of the central bank states:

The reason for the Bundesbank's strong influence on the formation of interest rates in the money market is that virtually all banks conduct business with the Bundesbank and that normally no bank is prepared to pay more in the money market than it has to pay at the Bundesbank under roughly the same conditions; nor is it as a rule willing to lend money at lower rates than those paid on funds invested at the Bundesbank.[1]

The Interest Rate Policy Reaction Function

The policy goals espoused by the Bundesbank are the standard central bank goals of price stability, cyclical stabilization of output and employment, and external equilibrium as reflected in the balance of payments or in exchange rate movements. Thus, Bundesbank interest rate policy should respond to the domestically oriented measures of price inflation, unemployment and capacity utilization and to the externally oriented measures of exchange rate movements, foreign interest rates, and deficits or surpluses in the German balance of payments. National budget deficits or surpluses also may exert an influence if the central bank resists the monetization of government debt by refusing to accommodate the issue of additional debt through expansion of the money supply.

Table 2 presents interest rate policy reaction functions based on quarterly data for the period 1968.2–81.4. Application of an F-statistic test rejected the null hypothesis that coefficients on the explanatory variables were constant over the entire period, 1968.2–81.4. Instead the test served to identify two sub-periods or policy regimes between which Bundesbank behavioral responses to changes in goal variables were significantly different. Regime I covers the period 1968.2–74.3, Regime II the period 1974.4–81.4. Two developments may help to account for these distinct policy regimes. The first is the transition from the pegged exchange rate system under Bretton Woods to its more flexible successor. This transition was spread over the interval from late 1971 to March 1973 at which time floating relative to the U.S. dollar started in earnest, albeit modified by German membership in the European "snake." The second development was the more or less concurrent shift of Bundesbank policy from its orientation to banks' "free liquid reserves" to "the central bank money stock," a gradual shift that culminated in the first announcement in December 1974 of growth targets for the central bank money stock. For comparative purposes Table 2 presents one interest rate policy reaction function for the entire period 1968.2–81.4 and one for each of the shorter policy regime periods.

Two domestically oriented goal variables exert the anticipated influence on the central bank policy instrument represented by the three-month money market loan rate, (LR3MOSQ). LR3MOSQ responds positively to

[1]Deutsche Bundesbank, *Monthly Report,* Vol. 30, No. 4, April 1978, p. 12.

Table 2
Policy Reaction Function for the Deutsche Bundesbank
(Dependent variable is three-month money market rate, quarterly average, LR3MOSQ)

Period:	1968.2–1981.4	1968.2–1974.3 (REGIME I)	1974.4–1981.4 (REGIME II)
Explanatory variables:			
$\ln(CPI76_{t-1}/CPI76_{t-5})$	89.632	64.206	57.795
	(8.8209)	(4.6222)	(3.5996)
MDLSPRQ5[1]	−4.3097	−14.828	6.3856
	(−1.9818)	(−4.2279)	(2.4726)
MDLSPRQ6[2]	9.4176	3.3763	12.216
	(3.5386)	(.52082)	(4.9310)
$CAPUTB_{t-1}$	.39272	.28208	.38500
	(9.5007)	(2.9637)	(4.7696)
$REDQ_{t-1}$	.46104	.67362	.37691
	(8.7128)	(5.6501)	(6.4437)
CONSTANT	−33.985	−25.538	−30.813
	(−9.6775)	(−3.1455)	(−4.8146)
ADJ. R^2	86.13	87.21	93.07
DURBIN-WATSON	1.2415	1.4477	1.7925

[1]MDLSPRQ5 is the annual percentage change in the DM/$ exchange rate, $\ln(DM/\$_t / DM/\$_{t-4})$, when the seasonally adjusted current account in the balance of payments is >0. Note that an upward revaluation of the DM results in a negative ln and vice versa so that implications of the signs on coefficients for MDLSPRQ5 and 6 for the effect on LR3MOSQ are reversed.

[2]MDLSPRQ6 is the annual percentage change in the DM/$ exchange rate when the current account in the balance of payments is ≤ 0.

t-ratio in ( )

changes in the inflation rate. Similar results for Regimes I and II and for the overall period substantiate the Bundesbank's reputation for exhibiting special concern for domestic price stability as a policy objective.

The rate of capacity utilization in German industry, (CAPUTB), also evoked a positive response from Bundesbank interest rate policy in both policy regimes and for the overall period. Both the size of the coefficient and the statistical significance for capacity utilization are higher for the more recent policy regime during which the German economy experienced greater variability in capacity utilization than in the earlier period of steadier growth with little underutilization of capacity.

Over the period covered no statistically significant relationship was discovered between the unemployment rate and LR3MOSQ. This may be explained by the relatively low unemployment rate in Germany for much of the period covered in the analysis. In any event the rate of capacity utilization in industry proved to be a much superior cyclical indicator so far as the response of the Bundesbank was concerned.

The federal government budget deficit also failed to qualify as a significant influence on Bundesbank interest rate policy and was dropped from the regression. Various explanations are possible. In the German federal system the central government budget does not play the dominant role in budget policy that it does in certain other countries in view of the importance of the Lander and local government budgets in the more decentralized German system. It is also possible that Bundesbank policy does not respond in any systematic way to budgetary policy either because of priorities accorded to other goal criteria or because budgetary policy is coordinated with monetary objectives in the planning process and by administrative means rather than by market processes.

The externally oriented variables examined for an influence on Bundesbank interest rate policy are the DM/$ exchange rate, the Eurodollar rate and the current account deficit or surplus in the balance of payments. Bundesbank interest rate policy responded systematically to the rate on three-month Eurodollar deposits over the entire period 1968.2–81.4. The influence of the Eurodollar rate on LR3MOSQ is significantly less in Regime II under a more flexible DM/$ exchange rate policy than under Regime I when defense of a pegged exchange rate was the norm. An attempt was made to adjust the Eurodollar rate for anticipated percentage changes in the spot DM/$ exchange rate using the actual change that occurred to represent the anticipated change assuming perfect foresight. This substitution, tested for the entire period 1968.2–81.4, substantially reduced both the adjusted R^2 for the regression and the t-ratio for the Eurodollar rate and was therefore abandoned in favor of the unadjusted Eurodollar rate as reported above.

The response of Bundesbank interest rate policy to the German balance of payments situation as reflected in the current account balance or in changes in the DM/$ exchange rate was more complex. No significant effect of the current account balance, per se, whether or not seasonally adjusted, could be found on LR3MOSQ in the estimated reaction functions. Moreover, devaluations or revaluations of the DM relative to the U.S. dollar did not appear to exert a significant and theoretically meaningful influence on Bundesbank policy until a distinction was made between Bundesbank reactions in calendar quarters during which the current account was in surplus and those in which the current account was in deficit. This was accomplished by multiplying the annual percentage change in the DM/$ exchange rate, $\ln(DM/\$_t / DM/\$_{t-4})$, by a dummy variable based on the current calendar quarter's seasonally adjusted condition of the current account. This procedure resulted in the two exchange rate variables presented in Table 1 (MDLSPRQ5 and MDLSPRQ6) and defined in footnotes one and two to that table. Use of an appropriate F-test verified the statistical significance of splitting the DM/$ exchange rate variable in this way. Estimation of the resulting reaction function for the two distinct policy regimes then yielded the statistically significant and theoretically meaningful coefficients on the exchange rate variable shown in Table 2.

Under a "fixed" exchange rate during policy Regime I the principal movements of the DM/$ exchange rate were periodic up-valuations responding to persistent current account surpluses and speculative inflows of capital. In its attempt to control the domestic money stock the Bundesbank responded by restrictive domestic policy reflected in the level of the three-month money market loan rate. Thus, revaluation of the DM relative to the dollar typically was associated with a rise in LR3MOSQ. Note that periods of current account deficit during policy Regime I were so rare that the coefficient on MDLSPRQ6, while positive, is not significantly different from zero.

Under a more flexible exchange rate policy during Regime II, (1974.4–81.4), there is a significant inverse relation (see footnotes to Table 1) between movements in the DM/$ exchange rate and the three-month money market rate. An appreciation of the DM relative to the dollar leads to a reduction in LR3MOSQ while a depreciation of the DM leads to a rise in LR3MOSQ. Moreover, the response of the policy instrument to the movements in the DM/$ exchange rate is stronger and more significant during periods of current account deficit than during periods of current account surplus. The pattern of policy response during policy Regime II implies the goal of partial stabilization of the DM/$ exchange rate.

The priority goal of minimizing domestic price inflation helps to interpret the policy responses of LR3MOSQ to percentage changes in the DM/$ exchange rate under both the fixed and flexible exchange rate policy regimes. Under fixed exchange rates domestic instruments of control over the money stock were used in attempts to offset monetary growth through the balance of payments. Under the regime of flexible exchange rates there is a partial tradeoff between control over the domestic money supply and exchange rate flexibility. The choice made by the German authorities typically has been guided by their judgment of the implication for domestic price stability. Thus, Dr. Otmar Emminger, then President of the Deutsche Bundesbank, wrote in the bank's *Monthly Report* for June 1978:

> For the monetary policy of the Bundesbank the suspension of the obligation to purchase dollars in the spring of 1973 represented a profound change in basic monetary conditions. It released the Bundesbank from the necessity to create central bank money involuntarily via purchases of foreign exchange, i.e. monetary policy was better protected against external influences.[2]

Later in the same article Emminger referred to the overshooting of domestic monetary growth targets in 1976 and 1977 for cyclical reasons and in the winter of 1977/78 owing to intervention in the foreign exchange market to steady the value of the DM. Again he emphasized the criterion of domestic price stability:

> One of the reasons why the overshooting of the quantitative monetary target could be tolerated in the above cases is that it was not to be feared in either case that *the primary objective, namely of curbing price*

[2]Ibid., No. 6, June 1978, pp. 9–10.

> *inflation*, would be endangered. As regards the foreign exchange interventions in the winter of 1977/78 the simultaneous appreciation of the Deutsche Mark acted as a brake on domestic price rises. Thus, foreign exchange interventions that are accompanied by an (unavoidable) upward movement of the Deutsche Mark must be judged differently, in terms of stabilization policy, from foreign exchange interventions under a system of fixed exchange rates. [Italics added].[3]

A later staff article in the March 1981 *Monthly Report* devoted to "The Balance of Payments and Monetary Policy" makes a related but opposite point concerning the need to raise domestic interest rates to resist an excessive *depreciation* of the DM even though domestic economic conditions of a cyclical nature might favor monetary ease and lower interest rates.

> Of course, the persistently high level of interest rates in Germany poses additional problems for the domestic economy. But under present conditions [i.e. current account deficit and depreciating DM/$ exchange rate, D.H. and R.R.] the Bundesbank has no real alternative to its monetary policy. The final objective of its policy, in accordance with its statutory mandate, is to maintain price stability.[4]

These views of German monetary authorities lend credence to the estimated policy reaction functions presented in Table 2.

III. Italy

The key *domestic* economic goals of the Italian monetary authorities may be presumed to be to sustain real economic growth and to contribute to cyclical stabilization of the economy so as to limit unemployment and low use of industrial capacity. Stability of the domestic price level, while hypothetically an important policy goal for purely domestic reasons, may be of secondary importance in Italy. Wage indexation has partially protected workers from loss of real income due to price inflation while a policy of low or negative *real* interest rates to favor business and government borrowing has had support through political and government channels. On the other hand, in an economy as open as the Italian economy the condition of the balance of payments and exchange rate must be a constant preoccupation of the monetary authorities. This implies concern with relative price trends, interest rate differentials, the external value of the lira and the surplus or deficit in the balance of payments, especially the current account.

In view of the large variety of policy instruments available to the Italian authorities the task of choosing an appropriate instrument for a policy reaction function is especially complex. Among the candidates are the cen-

[3]Ibid.
[4]Ibid., Vol. 33, No. 3, p. 9.

tral bank's discount rate, its intervention rate in the Treasury bill market, the obligatory cash reserve requirement, the security investment requirement, the ceiling rates of expansion stipulated for bank loans, the regulation of the net foreign position of commercial banks and special deposits at the central bank as a stipulated percentage of import payments.

Our prime candidate for the best *indicator* of the policy intentions of the Italian monetary authorities is the monetary base. Although this is not strictly a policy instrument, per se, there are two good reasons for choosing it: (1) its movement over time incorporates the influence of a number of the policy instruments used by the Banca d'Italia though certainly not all, and (2) in Banca d'Italia doctrine the monetary base has been regarded as the key monetary aggregate through which the monetary authorities should attempt to exert their influence on the economy.[5]

The prominence accorded since 1974 to "total domestic credit," (TDC), as an intermediate target might suggest its use as a policy indicator rather than the monetary base.[6] We reject this alternative. In the central bank's efforts to achieve domestic and balance of payments goals, control of TDC can be shown to be a distinctly second-best alternative to control of the monetary base and money supply. Efforts to control TDC involve various direct administrative measures (for example, quotas on rediscounting, ceilings on bank loan expansion, setting of minimum marginal security reserve requirements, controls over international capital movements). TDC targets have replaced monetary base control as a stated objective because under government policy the Banca d'Italia has been constrained from permitting interest rates to rise to market clearing levels implied by monetary base control geared to domestic and balance of payments objectives. In the context of freely adjusting credit markets and interest rates, control of the monetary base would remove the raison d'être of the TDC intermediate target. Control of TDC does not guarantee control of the monetary base and money supply which is essential for achieving longer term goals for real economic growth, moderating domestic inflation and achieving equilibrium in the balance of payments. Thus, monetary base control may reasonably be viewed as a Banca d'Italia policy indicator while TDC is better understood as an intermediate target designed for specific Italian conditions.

Since 1974 the Banca d'Italia has sought progressively to widen its discretionary limits with regard to interest rate policy and thus to be able to rely more on market forces and less on administrative measures in implementing monetary policy. Thus, for this more recent period it may be reasonable to estimate a policy reaction function using an appropriate interest rate as the Banca d'Italia's instrument variable. This approach is undertaken following that for the monetary base.

[5]Cotula, C. (1977) and S. Micossi, p. 142; Fazio, A. (1969).

[6](1) Banca d'Italia (1982) by C. Caranza, S. Micossi and M. Villani; (2) Caranza, C. (1977) and T. Padoa-Schioppa; (3) Caranza, C. (1981); (4) Cotula, F. (1977) and S. Micossi.

Table 3
Policy Reaction Functions for the Banca d'Italia

Instrument variable:	(a) ln(MBTOT3)	(a) ln(MBTOT3)	(b) RTBA
Period:	1964.4–74.4 (REGIME I)	1975.1–81.3 (REGIME II)	1974.1–81.3
Explanatory variables:			
$\ln(GDP75_{t-1})$	.25792 (1.9628)	−.33450 (−.79330)	—
$\ln(PWORLD_{t-1})$	1.1761 (4.7815)	.80949 (2.7039)	—
$GDEF_t$	.0000620 (4.6136)	.00000484 (1.7901)	.000246 (4.1826)
$REDQ_{t-1}$	−.00853 (−2.5461)	−.00618 (−2.3285)	—
$\ln(XRITUS_{t-3}/XRITUS_t)$	.47686 (3.1479)	.13206 (2.0617)	−14.863 (−6.4915)
$\ln(LIDMXR_{t-3}/LIDMXR_t)$	—	—	−9.8859 (−2.4241)
$\ln(MBTOT3_{t-1})$	.30120 (2.6662)	.63154 (4.6257)	—
$\ln(CPI3_t/CPI3_{t-4})$	—	—	44.969 (6.8578)
$\ln(GDP75_{t-1}/GDP75_{t-5})$	—	—	12.053 (2.0474)
CONSTANT	−1.2860 (−1.3908)	4.0249 (.97026)	3.7847 (3.2158)
ADJ. R^2	99.50	99.22	84.62
Durbin-Watson	2.5656	2.1555	1.3354

t-ratio in ( )

Reaction Function for the Monetary Base

Table 3(a) presents empirical results for the monetary base policy reaction function. We think of a higher world price level, PWORLD, and a higher level of real GDP, GDP75, as permissive of a higher level of monetary base with its attendant effect on the domestic price level. Although the Banca d'Italia employs various controls over capital flows there may be some response to the differential between domestic and foreign interest rates. To represent this influence we add the Eurodollar rate, $REDQ_{t-1}$, to the function. Next there is the requirement that the government deficit be financed subject to a ceiling constraint on interest rates. This constraint frequently has required the Banca d'Italia to exceed its preferred expansion of the monetary base. Thus, the government deficit, GDEF, is added to the policy reaction function. A balance of payments crisis accompanied by devaluation of the lira, emergency borrowing abroad, and negotiating pressure by official foreign lenders can strengthen central bank and government forces favoring more restrictive monetary and fiscal policies in the aftermath of such a crisis. To test for this influence a variable expressing variation in the lira/$ exchange rate, $\ln(XRITUS_{t-3}/XRITUS_t)$ is added to the reaction function. The lagged value of the monetary base also is included as a regressor.

Use of a Chow test indicates a regime change distinguishing the period 1964.4–74.4 from 1975.1–81.3. Among the likely explanations for the change in regime three are most plausible: (1) the transition to a more flexible exchange rate regime, (2) a change in policy in response to the oil price shock, and (3) a reorientation of domestic monetary policy beginning in 1974 at which time the Banca d'Italia began to exercise greater discretion over the Treasury bill auction rate as an instrument of policy, partly in response to conditions negotiated with the IMF in obtaining a standby credit.

Real GDP is significant at the .06 level with the expected sign in the earlier regime but not in the later one. The world price level is significant with the correct sign in both regimes but less so and with a lower coefficient in the 1975.1–81.3 regime. GDEF is significant at the .01 level in Regime I and at the .10 level in Regime II. This result is consistent with the greater discretion exercised by the Banca d'Italia in the later period.

Both the Eurodollar rate and the percentage change in the lira/$ exchange rate are significant at the .05 level in both regimes but with smaller coefficients in the later period under more flexible exchange rates.

Explanatory variables which were tested and dropped for lack of significance included various versions of the Treasury bill auction rate, hours lost through short time as a measure of unemployment, a measure of capacity utilization in Italian industry and various measures derived from the balance of payments. In the policy reaction function for the *Deutsche Bundesbank* the percentage change in the U.S. dollar exchange rate was found to be much more significant at times when the current account of the balance of payments was in deficit. This possibility was explored for Italy, but an F-test indicated no significant difference in explanatory power compared to that when the current account multiplicative dummy was omitted.

Reaction Function for the Auction Rate on Treasury Bills

Since 1974 various reforms centered on the organization of the money market, techniques of financing the Treasury deficit and the responsibilities of the Banca d'Italia in these areas have resulted in somewhat greater latitude for the Banca d'Italia to exercise its influence on interest rate levels as a principal instrument of monetary policy.[7] The economic developments to which the Bank's interest rate policy may be expected to respond are similar to those already discussed for the monetary base as policy indicator.

[7]Hodgman (1974), pp. 97–102; Hodgman (1976), p. 30; Caranza (1981), p. 3; Ciampi (1982).

The auction rate on Treasury bills, RTBA, taken as policy instrument should move to counter cyclical swings in output and employment. It should rise to counteract weakness in the balance of payments. It should respond to movements in the lira/$ or lira/DM exchange rate, the latter because of Italy's membership in the EMS. A measure of the government deficit may be included to test for offsetting or accommodating response by the Banca d'Italia.

Table 3(b) presents an estimated policy reaction function with the Treasury bill auction rate, RTBA, as dependent variable. The period 1974.1–81.3 approximates that for the second regime identified for the monetary base policy reaction function. Explanatory variables found to be significant at the .05 level with the theoretically expected sign are the annual rate of domestic price inflation measured by the consumer price index, $\ln(CPI3_t/CPI3_{t-4})$, the annual rate of growth in real GDP, $\ln(GDP75_{t-1}/GDP75_{t-5})$, the size of the government deficit, $GDEF_t$, the percentage rate of change in the lira/$ exchange rate, $\ln(XRITUS_{t-3}/XRITUS_t)$, and the percentage rate of change in the lira/DM exchange rate, $\ln(LIDMXR_{t-3}/LIDMXR_t)$. The rate of utilization of industrial capacity, with various lags, and hours lost through short time were tried as cyclical indicators and discarded for lack of significance.

In contrast to results for France, Germany, and the United Kingdom the Italian reaction function for the interest rate policy instrument did not exhibit a statistically significant and theoretically meaningful response to the Eurodollar rate. This was so both for the Eurodollar rate lagged one quarter and for the contemporary Eurodollar rate adjusted for the expected percentage change in the lira/$ exchange rate. In the latter case the actual percentage change in the lira/$ exchange rate was used to represent the expected percentage change, a procedure implying perfect foresight. The lack of significance for these versions of the Eurodollar rate suggests that Italian exchange controls may have been relatively effective in inhibiting undesired capital flows related to possibilities for interest rate arbitrage.

IV. The United Kingdom

Our investigation of the policy reactions of the Bank of England covers the period 1965.2–82.3. This extended period is marked by six general elections involving three swings between Labor and Conservative governments and by a variety of developments in the theory, techniques, and circumstances that help to determine monetary policy. A brief review of salient developments provides relevant background and motivation for the policy reaction function which we present in this section.

Over much of this period monetary policy in Britain found its intellectual orientation in Keynesian macroeconomic theory and in a Radcliffian view of the role of money in the economy. Full employment and the welfare state were the guiding principles for macroeconomic policy. The task of economic stabilization was assigned to government budgetary and tax measures following well-known Keynesian principles of aggregate demand management. The Bank of England had responsibility for managing the government debt, for interest rate policy, and for using monetary management together with exchange controls to manage the balance of payments and exchange rate.

Interest rate policy focused on two objectives. Short-term interest rates through maturities of about three months were attached to the central bank's discount rate (Bank rate) by a variety of formulae and well-understood practices. The primary purpose of changes in Bank rate and its coterie of dependent rates of interest was to influence short-term capital flows so as to equilibrate the balance of payments. The other interest rate goal was to stabilize the prices and rates of return on gilt-edged stocks (long-term government bonds).

During most of the period until the mid-1970s official opinion both in the Bank and the Treasury attached little or no significance to growth in the money stock for its influence on the price level and inflation, on the competitiveness of the British economy in world markets and hence the balance of payments, or on the ability of the Bank to manage prices and yields on gilt-edged stocks. The prevailing official view was that wage settlements together with productivity determined cost-price levels to which monetary policy had to adjust while budgetary policy regulated aggregate demand to achieve full employment. The implications of public sector deficits (the so-called Public Sector Borrowing Requirement, PSBR) for the ability of the central bank to control the money stock at low interest rates received little emphasis in official thinking.

Under the Heath government (June 1970–February 1974) there were three developments of particular relevance for monetary policy: the reform of the system of monetary and credit controls in September 1971 known as "Competition and Credit Control," the move from a fixed exchange rate to managed floating for the pound sterling on June 23, 1972, and the return to direct controls applied to banks in the form of the Supplementary Special Deposits technique introduced in December 1973. Despite these various changes in technique, a qualitative appraisal of the period suggests no major changes in the basic objectives or instruments of monetary policy.

The Labor government returned to power in February 1974 and governed until the Conservative election victory on May 4, 1979. These years witnessed the rise in importance of the monetary aggregate, sterling M_3, £M_3, as an intermediate target for monetary policy, partly under pressure from the IMF to which the British government had turned for a large stand-by credit to bolster the pound in 1976. Growth in £M_3 became a publicly announced target for monetary policy beginning in 1976. Nevertheless, no basic changes in the techniques or guiding theories for monetary policy occurred during these years of the Labor government.

The Thatcher government came to power with the Conservative election victory of May 4, 1979. The main elements of the macroeconomic policy approach of the Thatcher government are well-known and will not be restated here save to recall a few features relating most directly to monetary policy. Both the techniques and the declared goals of monetary policy have been modified under the Thatcher economic program. Exchange controls were abolished in a series of steps extending from June to December 1979. The Supplementary Special Deposits Scheme, previously used to limit the growth in bank loanable funds, was abandoned in June 1980. The Government has made commitments to bring down the rate of growth in £M_3 in successive fiscal years and has emphasized the relationship between PSBR and past excessive growth in £M_3 accompanied by high nominal interest rates. The Government has accorded top priority to control of inflation with employment, the balance of payments and the exchange rate reduced to secondary importance.

To de-emphasize the role of the Bank of England in determining interest rates, the Bank in June 1980 ended its previous practice of posting continuously its Minimum Lending Rate. A new reform of monetary policy techniques became effective on August 20, 1981 putting in place a system of cash reserve requirements for a broadened list of banks and deposit-taking institutions, increasing the Bank of England's reliance on open market operations in contrast to direct lending to banks and emphasizing the desirability of greater flexibility and responsiveness of short-term interest rates to market forces. If the intent of the new policies is fulfilled in practice, the policy behavior of the monetary authorities should exhibit significantly different patterns beginning in 1979 or 1980.

We have experimented with two types of reaction functions for the Bank of England. In the first we regard Bank rate, BRQ, as the instrument under the control of the authorities. We treat Minimum Lending Rate, MLRQ, as an extension of Bank rate. Moreover, to be able to incorporate additional quarters in our regression for the Thatcher years we have created proxy values for BRQ for the calendar quarters 1981.3–82.3 using the earlier observed relationship between BRQ and the three-month interbank lending rate for this purpose.

Our second type of reaction function regards credit extended to the domestic economy by the Bank of England (conceptually the Bank's domestic credit contribution to the monetary base), as a policy instrument under the Bank's control. We comment below on our unsatisfactory attempts to estimate a reaction function for this "policy instrument."

Policy Reaction Function for Bank Rate

In the light of qualitative evidence we regard BRQ as the policy instrument used primarily to influence the balance of payments and exchange rate. Explanatory variables intended to test this orientation included in our regression presented in Table 4 are the quarterly changes in official borrowing abroad, $(OBA_{t-1} - OBA_{t-2})$, and in official reserves, $(OFRES_{t-1} - OFRES_{t-2})$, and the Eurodollar rate, $REDQ_{t-1}$, all lagged one quarter.

We include the annual rate of inflation in consumer prices, $\ln(CPIQ_{t-1}/CPIQ_{t-5})$ to test for a possible orientation of BRQ to domestic goal variables. We examine also the possibility that PSBRQ exerts an interest rate effect and thus may not be fully accommodated by an expansion of central bank credit to the economy. The regression includes also the lagged value of the dependent variable.

In Table 4 we present estimates for the period 1965.2–79.1 and separately for the 14 initial quarters of the Thatcher period. A Chow test for a regime change in regression coefficients that might have occurred in association with the reform in monetary techniques announced in "Competition and Credit Control" in September 1971 or following floating of the pound from June 1972 to the present was not significant. Therefore, we present a single reaction function for the period 1965.2–79.1.

Both qualitative evidence and a Chow test suggest a significant change in regression coefficients for the 14 initial quarters of the Thatcher government. Moreover, in Chart 2 we compare an out-of-sample forecast for BRQ with its actual values (some of which are proxies based on IBRQ). The poor fit of forecast with actual values for BRQ also indicates that the prior regression coefficients do not hold. Indeed, the reaction function estimated for the 14 quarters, 1979.2–82.3, has no statistically significant coefficients and is essentially unreliable. We comment further on this problem below.

Table 4
Policy Reaction Function for the Bank of England

Instrument variable:	BRQ_t	BRQ_t
Period:	1965.2–1979.1	1979.2–1982.3
Explanatory variables:		
$PSBRQ_{t-1}$	.00055331	−.00016946
	(3.0694)	(−.98782)
$\ln(CPIQ_{t-1}/CPIQ_{t-5})$	−2.9304	28.375
	(−.70302)	(1.1095)
$OBA_{t-1} - OBA_{t-2}$	.00024683	−.00090019
	(1.6043)	(−1.4737)
$OFRES_{t-1} - OFRES_{t-2}$	−.00032676	.00014305
	(−2.7292)	(.78738)
$REDQ_{t-1}$	.16880	−.039646
	(2.1621)	(−.25383)
BRQ_{t-1}	.67483	.25496
	(7.3180)	(.44446)
CONSTANT	1.2998	7.3918
	(2.0877)	(1.2099)
ADJ. R^2	81.86	44.61
Durbin-Watson	2.0522	1.3686

t-ratio in ( )

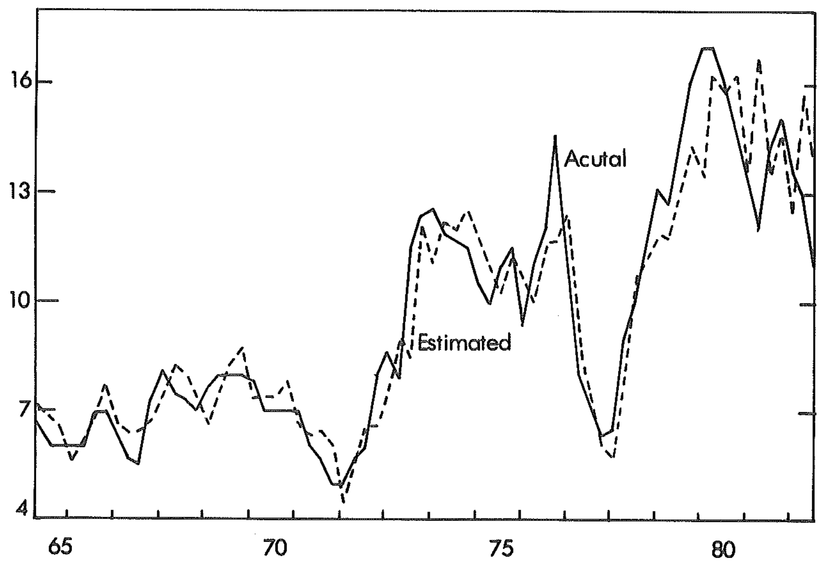
In the period 1965.2–79.1 BRQ exhibits a statistically significant response to three variables in addition to its own lagged value and the constant term. The coefficient for the Eurodollar rate is positive and that for the change in official reserves is negative as expected; that for the change in official borrowing abroad has the expected positive sign but is not significant at the .05 level. PSBRQ exerts a significant positive influence on BRQ suggesting less than full accommodation by the central bank to an increase in PSBRQ. The level of unemployment was dropped from the regression after several attempts yielded either insignificant or perverse coefficients.

Our out-of-sample forecast for the Thatcher period performs very badly as does our estimated reaction function for that period. We are unable to allocate responsibility for this failure among such possible causes as altered priorities among policy goals, misspecification and data problems. In the data category we may mention an exaggeration of PSBRQ in 1981.2 due to the civil servants' strike and new methods for valuing official foreign exchange reserves and official borrowing abroad applied after end-March 1979. Thus, we have no clear *quantitative* evidence as to whether or not monetary policy reactions changed in conformity with stated policy goals under the Thatcher government.

Chart 2

United Kingdom

Bank Rate or Minimum Lending Rate - Quarterly Average (BRQ)



An Alternative Policy Reaction Function for the Bank of England

If BRQ is oriented primarily to managing the balance of payments and the exchange rate, what policy reactions does the Bank of England display to domestic economic and socio-political developments? What policy instrument or instruments does the Bank use for this purpose? In this section we comment briefly on our approach and unsatisfactory results relating to these questions.

We have experimented with a variable constructed quarterly from elements in the balance sheet of the Bank of England and intended to represent the extension of credit to the domestic economy by the Bank. Our measure for this "instrument" is the sum of government and "other" securities held in the Banking and Issues Departments of the Bank plus discounts and advances less supplementary special deposits required of banks, all designated as DCMSD. We regressed the level of this variable on PSBRQ, the annual inflation rate in consumer prices, changes in official borrowing abroad, changes in official foreign exchange reserves, the level of unemployment and its own lagged value. We estimated this regression with and without deflation of $DCMSD_t$, $DCMSD_{t-1}$, and $PSBRQ_t$ by the consumer price index and separately for the pre-Thatcher period, 1965.2–79.1 and for 14 quarters of the Thatcher period, 1979.2–82.3.

In both the deflated and undeflated versions PSBRQ had a positive and significant coefficient in the pre-Thatcher period and lacked significance in the Thatcher period while the externally oriented explanatory variables—change in official reserves and in official borrowing abroad—lacked significance in all versions. Other aspects of the resulting regressions were more problematic. Accordingly we record this effort here merely to indicate the direction of our thinking and to acknowledge an unfinished task for the future.

Concluding Comments

In conclusion we comment briefly on three aspects of our study of monetary policy reaction functions that merit emphasis: namely, observed differences in national patterns of policy behavior, the issue of regime changes, and the more general theme of socio-political influences on monetary policy.

French monetary policy appears to have been concerned primarily with domestic inflation and with managing the balance of payments and exchange rate. From qualitative evidence we know that France has sought to keep domestic interest rates relatively low and stable and to use monetary and budgetary policy to allocate credit to priority goals. It has attempted to specialize the policy instruments of money market rates and of credit rationing respectively to balance of payments and domestic money stock controls and to build barriers between their international and domestic effects by means of direct controls. Evidence from the policy reaction functions shows that such specialization of function and segmentation of markets is incomplete. Two other quantitative results are of interest. Since late 1974 the FF/DM exchange rate has superseded the FF/$ exchange rate in influencing French monetary policy. Also, until 1979, at least, the government deficit in France appears not to have exerted a significant influence on monetary policy.

Our quantitative results support the standard view that German monetary policy has reacted strongly and systematically to domestic inflation and to changes in capacity utilization in industry. It has also been sensitive to the DM/$ exchange rate and the Eurodollar rate. Since the mid-1970s a case can be made that the DM exchange rate is the key exchange rate influence for the French and Italian monetary authorities (somewhat less for the Italian) whereas the DM/$ rate is the key one for the German monetary authorities. Over the period studied the central government budget had no significant influence on German monetary policy.

In Italy monetary base policy continues to respond positively to the government budget deficit but with sharply reduced significance in the period since 1975. This may result from increased discretion exercised by the Banca d'Italia over short-term interest rates beginning in 1974. This trend, if continued and strengthened, could end the Italian authorities' emphasis on credit ceilings and control over total domestic credit in contrast to monetary base control as key techniques of monetary policy. Much depends on the socio-political forces that favor low or negative real rates of interest in Italy. The reaction function for the Treasury bill auction rate is fairly conventional, responding in a stabilizing way to both domestic and external policy goals.

In the United Kingdom Bank rate has responded primarily to the Eurodollar rate, to changes in official reserves, and to the public sector borrowing requirement. There is suggestive though not definitive evidence that the systematic influence of PSBR on the Bank of England's provision of credit to the domestic economy during the pre-Thatcher period has disappeared in the Thatcher period. These responses, at least until the election of the Thatcher government, are consistent with a primarily passive domestic role for monetary policy and with the orientation of Bank rate to the task of external equilibrium.

The regime changes identified by Chow tests for France, Italy, and Germany in late 1974 can scarcely be coincidental. By contrast we find no regime change for monetary policy in the United Kingdom in the mid-1970s. We mention as mere speculations three factors that may help to explain these patterns. One factor is the move from fixed to flexible exchange rates for the world monetary system following the demise of the Bretton Woods system. This does not explain the absence of a regime change in the United Kingdom. A second factor may be differences in the duration and degree of commitment to the European joint float relative to the dollar. France and Italy were in the "snake" for varying periods and are full members of the European Monetary System. The German mark has been continuously the key currency both in the snake and in the EMS. The pound, by contrast, left the snake rather promptly in June 1972 and has not rejoined the joint float. Finally, there is the possibility that changes in policy reaction functions were in part due to the oil price shock of 1973–74 and subsequent adjustments to it and that this shock was cushioned for the United Kingdom by its North Sea oil production.

One of our purposes in studying the policy reactions of national monetary authorities has been to discover how, if at all, socio-political forces affect monetary policy. We have no hard quantitative evidence to report on this issue such as the influence of approaching elections, opinion survey measures of approval or disapproval of government policies and performance, changing composition of legislatures in elections, strikes, or other quantifiable "political" variables.[8] We do have some preliminary views to share.

Behind some variables typically labeled as "economic" there are barely concealed socio-political forces. The size of the government or public sector deficit and the manner of its financing (for example, whether or not constrained by interest rate ceilings) is one such variable. The issue of inflation versus unemployment has deep political roots. It is useful to distinguish between fundamental political forces and alignments as these influence persistent strategic features of policy behavior such as those just mentioned and shorter term, more tactical influences such as opinion polls, shifts in the composition of legislatures not accompanied by changes in the party in control of the executive functions of government, and even strikes or high levels of unemployment. The tactical forces may have gradual and subtle influences on monetary policy that are difficult or impossible to capture in the kind of quantitative work we have performed. They may, of course, accumulate to break forth in a major political event that sends a clear demand for change in policy orientation. These discrete political events may then produce regime changes in monetary policy reaction functions of the type we would expect to find associated with the elections of Thatcher, Mitterand, and Reagan.

Any scheme of international monetary cooperation such as the European Monetary System or less formal commitments to monetary cooperation or harmonization, much less monetary unification, must be compatible with the deeply embedded, slowly changing and nationally diverse socio-political forces that help to define the persistent, strategic themes of national monetary policies. The degree of international monetary cooperation defined in operational and technical terms that can be achieved and made to work is limited by the degree of convergence in favorable domestic political forces in the cooperating countries. Thus, it is not so much the "political will" as the "political feasibility" of various schemes of international monetary cooperation that determines their acceptability and practicality.

[8]See, however, the paper by John T. Woolley in this volume.

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NOTE: A statistical appendix giving data definitions and sources is available upon request to the authors at Bureau of Economic and Business Research, University of Illinois, U.-C., 428 Commerce West, 1206 South Sixth Street, Champaign, Illinois, 61820, U.S.A.

Discussion

Tommaso Padoa-Schioppa*

I have to confess that I have always regarded the study of reaction functions as something like peeping through a keyhole: on the one side of the door there are people doing "interesting things"; on the other side somebody (an economist) is trying to catch the secret of what is happening. Like many others, when I was young, in my early days in a central bank, I was on the "watching" side. Today I am more on the side of "being watched." This is how I explain to myself the sense of both guilt and embarrassment that I feel when dealing with reaction functions. And things are further complicated by my experience in an international organization, where the keyhole is used not only to peep but also to whisper advice to those who are busy inside. This is why I would like to suggest that next time not only economists and political scientists should be invited to the conference, but also psychologists.

Trying to overcome these complexes, I would say that a paper that uses reaction functions to analyze the policy behavior of a set of closely integrated countries raises problems at various levels. In the first place there are the problems posed by the use of reaction functions in general. Second, there are the questions related to the particular specifications and results presented by the authors. If one then moves from a separate to a joint consideration of the countries examined (an exercise which I would have liked the paper to carry out more thoroughly), interesting problems and insights emerge of a comparative nature. Finally, there are policy issues specifically due to the close economic and monetary interdependence between the countries considered. I shall make brief remarks on each of these four headings.

1. Reaction functions in general

Under this heading I shall just mention a few problems without going into them in detail, since I know the general issues involved in the use of reaction functions have been raised already. I see three problems in particular.

First, the difficulty of disentangling the role played by targets from that played by constraints when analyzing the behavior of the authorities. As Hodgman and Resek say in the introduction to their paper, the coefficients relating instruments to targets in a single equation reaction function do not

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provide direct information about the authorities' preferences; their changes over time depend on changes in both policy options and economic constraints.

Second, the impossibility of observing the desired values for the ultimate targets. According to the classical Theil approach, the authorities are assumed to react to deviations of target variables from their desired values. However, since in most cases the latter are unobservable, actual values of the ultimate goals often appear on the right-hand side of the reaction function as such.

Third, the hypothesis of invariance of the desired values for the ultimate targets. The problem I have just mentioned is commonly dealt with by assuming that the desired values set by policymakers are constant over the estimation period. This assumption is also made by Hodgman and Resek since they do not explicitly define desired values for policy targets. However, there is no doubt but that the attitude of policymakers towards price stability and full employment has changed. To give just two examples, a few years ago a 13 percent target for the rate of inflation in Italy would have sounded far from "desirable," and the fact that the number of unemployed workers within the EEC was forecast to reach three million was perceived as coming dangerously close to a critical threshold.

Thus the hypothesis of invariance of the desired values set for those variables seems unacceptable to me. In the functions presented by Hodgman and Resek this problem is compounded by the fact that some explanatory variables enter into these equations as levels rather than as ratios or rates of change. In fact, whether or not the desired value for, say, the *rate* of unemployment can be legitimately viewed as constant over time, there is no doubt but that the desired *level* of unemployment cannot be realistically kept constant. Similarly, the relevant fiscal variable should be the ratio of the deficit to GNP or, possibly, to the private sector's saving rather than its level as such; by the same token, the level of official foreign reserves may reasonably be scaled by, say, the value of imports and so on.

2. The reaction functions presented in the paper

I will touch upon the choice of instruments and targets, leaving aside the issues of a strictly econometric nature.

First, let us look at the choice of policy tools. If the reaction function is to unveil the intentions of policymakers, the variable on the left-hand side should fall under the direct and exclusive control of the central bank. In some of the equations estimated in this paper the dependent variable is indeed an instrument (as in the case of the United Kingdom); in other cases, though, the "instruments" chosen are jointly determined by the central bank and by market forces. When the dependent variable is removed from the central bank's control, and an operating target is chosen as a proxy for an instrument (with, for example, the monetary base replacing open market operations or a money market interest rate replacing the rate of discount) it becomes hard to assess whether we are observing the outcome of a reaction on the part of the authorities or the causes of that reaction.

As an extreme example, I would take the reaction function for credit ceilings in France. The results obtained for that equation cannot be properly considered as a means of detecting the way in which such an administrative tool is manoeuvred over time. The negative coefficient found for unemployment, for example, can suggest either that the limits for the growth in bank credit are set so as to stabilize real economic activity or that the expost degree of credit rationing is inversely related to demand pressures. In the light of the puzzling results obtained when the ratio of M2 to GDP is included on the right-hand side of the equation, I would suggest that the latter hypothesis is more likely than the former one.

Next, take the two functions proposed for Italy. Here the Eurodollar rate seems to exert a significant negative impact on the monetary base while it plays no role in the equation estimated for the auction rate for Treasury bills. Now, both the monetary base and the Treasury bill rate are escaping from the exclusive influence of the Bank of Italy. If the coefficient in the monetary base equation were to be viewed as a reaction of the central bank to a change in foreign interest rates in order to avoid undesirable capital flows, the existence of such a policy should be found in the interest rate equation as well. The lack of reaction on the part of the latter may simply show that demand and supply conditions on the market for short-term public debt made it impossible to affect the auction rate in the desired way. At the other extreme, one may argue, as Hodgman and Resek do, that the existence of administrative controls on capital flows sheltered domestic interest rates from the behavior of foreign rates; however, if this is the case, the inverse relationship observed between the monetary base and the Eurodollar rate loses much of its informational content.

Turning to the explanatory variables, I note that intermediate targets never appear on the right-hand side of the equations, except in the unsuccessful attempt made with the M2-to-GDP ratio in the case of France.

Here two issues are really involved: one relates to intermediate targets as such; the other refers to "targetry." On the first issue, the decision to rule out intermediate targets can be justified by assuming that these variables do not belong to the authorities' preference function and that their behavior is only important when the information concerning the performance of final objectives is lacking; if this is the case, then intermediate targets are redundant once the values of ultimate goals are known with a reasonably short lag. One may have doubts (as I personally do) about the validity of this assumption, but in any case, such doubts would lead to an improvement in the specification and not to a fundamental reconsideration of the approach.

"Targetry" poses more serious problems. Even though the four countries examined in the paper have practiced "targetry" in a fairly flexible way, the announcement of monetary and credit growth targets starting in the mid-1970s did indeed affect the role played by intermediate objectives in explaining the authorities' behavior. The importance they attached to the credibility of their policies may have resulted in intermediate targets entering the welfare function, and, more importantly, have led to a shift to a longer time horizon for the attainment of the desired values for final goals, and to a faster reaction to deviations of intermediate targets from their desired paths.

Here, I wonder whether "targetry" does not shake the very foundation of an approach based on quarterly reaction functions.

If the choice between inflation and unemployment is made once a year and embodied in a monetary or credit target, what is the sense of exploring the criteria according to which instruments are adjusted quarterly to those variables? Should we not consider these reaction functions as the relic of the past era of fine tuning? This objection would be even more valid if central banks sought to achieve a constant rate of growth in monetary aggregates. In practice, of course, they do not follow a Friedmanite rule.

If one wants to understand the conduct of monetary policy over the past few years, the role of targetry should not be overlooked.

3. Cross-country comparisons

Two results that are common to the countries under review should be emphasized.

The first concerns shifts in the reaction functions. I was expecting the equations describing the behavior of central banks with respect to the performance of final goals to exhibit a considerably higher degree of instability over the mid 1960-early 1980s period than the one detected by Hodgman and Resek. The 1971 reform of monetary control techniques in the United Kingdom; the growth of the money market and the reduced importance of rediscount policy in France, starting in the early 1970s, and the introduction of monetary targeting at the beginning of the Barre Government in 1976; and the enhancement of the Bundesbank's discretionary power in granting credit facilities to the banking system that followed the suspension of Lombard loans in February 1981 are just a few examples of possible causes of shifts in the conduct of central banks' operations. And even from my own experience of the years spent in a central bank I have the impression that much more was "going on" than the few shifts identified by Hodgman and Resek. Let me suggest a few alternative explanations for this puzzling result. A first explanation could be that *these* particular reaction functions do not capture some shifts that actually occurred (I wonder in this connection whether the use of monthly rather than quarterly data might be of some help).

As a second explanation, however, I would suggest the priority attached to the attainment of a goal that I will loosely refer to as the maintenance of "orderly market conditions." This objective is difficult to define and tends not to be explicitly considered as in the paper. In practice, however, it has a very important role in the deliberations of the central bank and it may constrain the possibility of the monetary authorities to alter their conduct significantly in the light of the behavior of "ultimate" economic variables. Thus, many of the shifts and structural changes we have experienced throughout the years refer to the institutional, regulatory, and technical conditions under which instruments are manoeuvred; they may represent upstream factors with respect to the dependent variables appearing in Hodgman and Resek equations.

Finally, one could suggest yet another conclusion. True, in a democratic society the preferences of governments basically conform to those of the people by whom they were elected; however, while we are probably still inclined to believe that, say, election of a "conservative" government will lead to a more restrictive monetary policy than election of a "progressive" government, the results obtained by Hodgman and Resek could be interpreted as an indication that social pressures, political preferences, ideology, and economic doctrines are not all that important in defining the weights to be attached to different policy goals.

The second result concerns the role of the DM. The estimates suggest that starting in 1975 interest rate policy in Italy and in France was significantly affected by the movements of their currencies against the DM, while the importance of the Eurodollar rate diminished. The pound/DM exchange rate does not appear in the reaction function for the United Kingdom; however, this variable seems to have been less unstable than the pound/dollar exchange rate since the end of 1977, with the exception of the second half of 1980 and the first half of 1981.

These observations confirm the shift that occurred over the 1970s between the U.S. currency and the DM. As further evidence of the growing importance of the latter, one can cite the marked increase in the DM's share of total official holdings of foreign exchange : this share rose from slightly less than 3 percent in 1973 to 11 percent in 1981–1982 for the industrial countries as a whole. Some scraps of evidence regarding the use of the DM as an invoicing currency lead to the same conclusion.

The increasing importance of the German currency is far from surprising. It suggests that the links between the countries examined in the paper cannot be overlooked when analyzing the behavior of the individual monetary authorities.

4. Interdependence and coordination.

The countries under review are not four economically unrelated countries in the world, as Bolivia, Denmark, Mali, and Korea would be. While none of them, taken individually, can be thought of as a truly "optimal currency area," the European Community, of which they are the largest part, can be viewed as such more legitimately.

As a consequence, even if national monetary authorities succeeded in choosing a policy which is perfectly appropriate for the individual country, the definition of an optimal policy for the area as a whole is an additional task to be undertaken.

This stimulates reflection on how one could describe the policy process of the integrated area using the conceptual framework of "objectives and instruments" that underlies the reaction functions approach. Let me try to draw from my experience with the European Communities to sketch the main features of such a process. Two goals are important at the Community level: first, the maintenance of the open trade system in the area; second, the pursuit of convergence towards monetary stability. With a certain degree of simplification one could say that the two critical variables corresponding to these directives are *real* and *nominal* exchange rates. Turning to the policy tools, coordination of national financial policies and adjustments of the central parities within the EMS are the two basic instruments the Community can use. In my view, the principal merits of realignments lie in the fact that they provide the national monetary authorities with an opportunity to check the consistency between exchange rate policy and overall economic policy.

I am aware of the somewhat provocative nature of this remark; the definition of a reaction function for the Community (or, more generally for a group of strongly interdependent countries) may indeed turn out to be a rather difficult task to carry out. I believe, however, that we would all benefit from the attempt.

Political Factors in Monetary Policy

John T. Woolley*

Almost all observers agree that in some sense political factors matter in the conduct of monetary policy. There is much less agreement as to which political factors are most important, or as to exactly how those factors influence monetary policy. In this essay, I will advance a rudimentary typology of political factors that have been of interest to students of the conduct of economic policy. I will then examine in some detail the consequences of a subset of those factors for policy in three countries: Britain, France, and Germany. I conclude with a broader discussion of the importance of political factors and how they might be studied.

I. A Rudimentary Typology of Political Factors

The first distinction that I wish to draw is between factors that directly involve the legally constituted process of governing and other factors, that, while important for governing, are more accurately conceived as characteristics of the nongovernmental organization of society. This is, of course, the familiar distinction between "state" and "society." The second distinction is between slowly and rapidly changing political factors. This, also familiar, is the distinction between structural and variable factors. Where the line is drawn between state and society is, as we shall see, extremely important, and appears to have significant consequences for monetary policy. Politics involves the use of authority to resolve distributional issues, and it is clear that decisions about the range of societal affairs subjected to authoritative (as opposed to market) decisions are fundamental political decisions. We should not fail to recognize that monetary policy is both constrained by those decisions and may be part of a continuing process of remaking or refining those decisions.,

Illustrative examples of these four categories of political factors are presented in Table 1. Each type is numbered moving clockwise from the upper left quadrant. Most casual references to "politics" are references to *type I politics*, or variable governmental politics. Because type I politics figures prominently below, discussion here is quite brief. I distinguish three major subcategories within type I politics. First, there is the politics involved in determining the official ruling party or coalition. For Britain, France, and Germany, this means partisan electoral competition. Second,

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Table 1
A Rudimentary Typology of Political Factors of Interest to Students of Macroeconomic Policy

	Governmental	Nongovernmental
Variable	Type I Election Contests Dynamics of Public Opinion Legislative Politics Bureaucratic Politics Interest Group Politics	Type II Wage Bargaining Strike Behavior Business Confidence
Structural	Type IV Division of Power between Executive and Legislature Structure and Control of Public Bureaucracy Central Bank Independence	Type III Degree of Unionization Links of Parties and Unions Organization of Business Sector Financial Structure National Preferences for Inflation/Unemployment

there is within-state conflict and bargaining over the definition of specific policy actions. This includes legislative and bureaucratic politics. Students of bureaucratic politics typically assume that agencies strive to establish and defend a sphere of autonomy in policymaking and control of their budget. A variation on this theme is Suleiman's analysis of the strategies used by the French *Inspecteurs des Finances* to protect the dominant position of their *grand corps* (Suleiman, 1974, 1978).

The third subcategory of type I politics is interest group politics, including the study of "policy networks" or "issue networks" (e.g., Heclo 1978). The focus here is on the ways various societal interests mobilize their resources to influence governmental decisions by acting directly on the decision-making process. The literature on interest groups and macroeconomic policy is slender at best. However, in all three countries we observe that interest rates are politically sensitive, and that groups such as homebuilders and consumer-durables manufacturers are harmed by high interest rates—as are their employees and consumers who are prevented from making purchases. These groups may try to put pressure on monetary policymakers.[1]

Type II politics, or variable nongovernmental politics, also involves the behavior of interest groups, but unlike the interest group behavior in type I politics, this behavior is not explicitly intended to influence public decisions. Nonetheless, these behaviors and their consequences reveal the relative power and cohesion of different interests in society. In this sense they are political and may have an important, though indirect, impact on eco-

[1]In addition to this kind of ordinary interest group effort to influence policy decisions, type I politics can incorporate another. In the U.S. context, at least, conflicts among contending groups of economists for influence over policy can be usefully conceived of as analogous to interest group politics (Woolley, 1982).

nomic policy. The most familiar examples are labor-management bargaining and strike behavior. Such behavior has been studied by Gordon (1977; also Sachs, 1979) for example, in his comparison of wage-push and monetarist explanations of inflation. Wage push could, for instance, lead to an increased demand for money. Aronson (1977) argues that through market innovations banks create pressure for central bank actions that banks could not achieve by direct pressure in type I politics. Several investigators have been interested in strike behavior and economic performance (e.g., Hibbs, 1977b; Laidler, 1976), but few have examined the impact of this kind of behavior on monetary policy.

Structural nongovernmental politics, *type III politics*, refers to the relatively constant characteristics of societal interests: how they are organized or how they relate to one another. Distinct national preferences about macroeconomic performance, if they exist, would be included here. The obvious example is the reputed German aversion to inflation. Other type III political characteristics that have been of interest to students of economic policy have to do with the structure and organization of labor and capital. What share of the labor force is unionized? Is labor internally fragmented or is it unified in a single, dominant confederation? Is the major labor confederation closely linked to a major political party? Similar questions of organization might be asked about all major societal interests. Katzenstein (1977) advanced an explanation of foreign economic policy in which the degree of centralization of nongovernmental groups accounts both for the choice of policy instruments and for policy actions.

For two reasons type III politics is relevant to an analysis of macroeconomic policymaking. First, the more centralized and cohesively organized a major interest is, the more capable it is of dominating at least one potential governing coalition and, thus, of decisively shaping macroeconomic policy. Second, the more centralized and cohesively organized a major interest is, the more likely it is to be able to defend its interests successfully in private sector bargaining (type II politics). This in turn implies that if macroeconomic policy is to stabilize the economy significantly, costs associated with policy must fall more heavily on less well-organized groups.

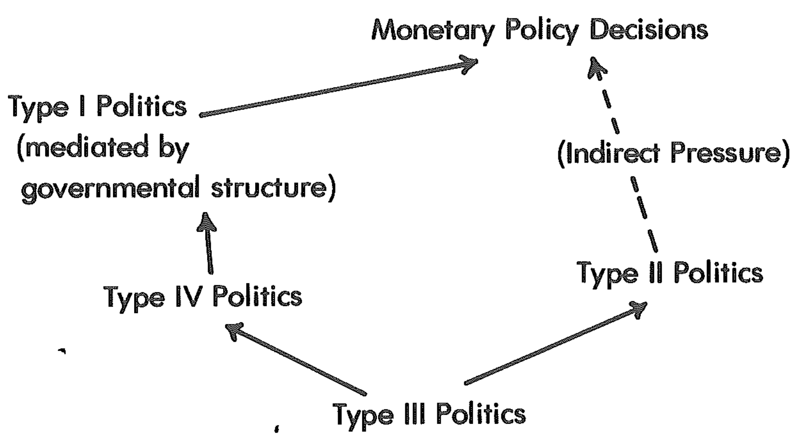
While these are the most familiar ways that type III politics has been brought into the study of macroeconomic policy, other structural features might be considered here with equal justification and with equal or greater significance for monetary policy. For example, one might consider the characteristics of financial institutions and the financial market. The broader the financial markets, the more monetary policy can be conducted primarily through open market operations rather than with various forms of credit allocation. A reliance on open market operations helps to depoliticize monetary policy decisions (Woolley, 1977). The greater the specialization of financial institutions (e.g., the more they are limited to particular kinds of portfolios, such as mortgages), the more likely that some class of institutions will find it difficult to adjust to rapidly changing economic circumstances, and the more likely that these groups will seek governmental protection.[2]

Type IV politics, or structural government policies, is, like type I politics, close to the commonsense notion of politics. This includes such constitutional characteristics as the relative power of the head of government and the legislative body, the rules governing electoral competition, the degree of central bureaucratic control, and, of particular interest in the present context, the formal relationship of central bank and government. Does fluctuating support in parliament predictably lead to accommodation of dissident views by the prime minister (chancellor, president)? Are members of legislative bodies limited in their access to policymakers in central banks, or, as in the United States, are they in the position to subject central bankers to public hearings, to require frequent reports, and, potentially, to change central bank law despite opposition of the head of government?

The linkages between these various kinds of politics and monetary policy decisions are, of course, complicated. I suggest one possible set of linkages in Figure 1. Whether, and how, type I politics affects monetary

Figure 1

Relationships Between Different Kinds of Political Factors and Monetary Policy Decisions



[2]An additional kind of structural nongovernmental politics that has been regarded as very important by many political scientists is the degree of corporatism. Making decisions through corporatist bargaining, that is, through councils constituted on the basis of interests rather than through legislatures, may make it easier to reach decisions on distributive questions. However, at least one study has produced rather negative results with respect to macroeconomic performance (Schmidt, 1982). None of the countries in this study is characterized by high levels of corporatist intermediations such as that observed in Austria or Sweden, but Germany is frequently considered to have moderately high levels of corporatism. France is, by contrast, a country in which corporatist intermediation has been relatively weak throughout the past 20 years, and in Britain previously moderate levels of corporatism have been weakening.

policy should be determined substantially by type IV politics—government structure. This is discussed in detail below. All the other kinds of politics may also have an influence on type I politics, and thus at one remove, an impact on monetary policy decisions—examples have been suggested above. Type II politics, itself a reflection of type III politics, may have an indirect impact on monetary policy when it leads to changes in the behavior of economic variables being monitored by the central bank. And there are feedbacks. For example, structural change may be the result of type I politics.

Type I Politics and Reaction Functions

The largest body of research on economic policy involves what I call type I politics, and I shall emphasize type I politics in this essay. Type I politics is of special interest to researchers since the variable nature of politics facilitates quantitative time-series analysis within single countries. A wide variety of hypotheses about politics of types I and II can be tested in the reaction function framework (Alt and Woolley, 1982).

Given the logic of reaction function framework, to include explicit measures of type I politics in reaction functions involves making assumptions that policymakers often find offensive. This is not a good reason to reject those assumptions, of course, but it is a good reason to think clearly before adopting them. Normally, one conceives of the right-hand variables in the reaction function as representing some sort of policy targets which are combined and weighted in an optimizing process by policymakers. To include political variables is to suggest that central bankers make policy decisions with explicit, type I political objectives in mind. Since most central bankers prefer to think of themselves as neutral technocrats, this assumption would be quickly rejected by most of them, especially with regard to partisan competition. A less controversial assumption would be that political variables are not necessarily targets themselves, but stand for another objective—institutional autonomy and integrity. Failing to respond to political conditions could threaten this underlying "true" objective. Analytically, it is reasonable to regard the actual institutional locus of monetary authority as ambiguous. If central bankers have a relatively modest level of independence in policy choice, then "the monetary authority" is much more broadly comprised than just the central bank, and political targets are quite appropriately included, as such, in a reaction function.

II. Political Structure and the Impact of Type I Politics

As indicated in Figure 1, I conceive of the impact of type I politics on monetary policy as being mediated through the political structure. By this I mean that the statutory position of the central bank together with other structural features of politics determines the degree to which central banks are exposed to the pressures of type I politics. Students of the Federal

Reserve have argued that independence from conventional budget processes and appointments for long terms in office help to guarantee Federal Reserve independence from the President and the Congress. In fact, major central banks differ very little in terms of these kinds of structural differences—certainly not enough to account for any pronounced difference in macroeconomic performance (Woolley, 1984a).

Arguably more important is the degree to which legislation clearly defines certain policy priorities for the central bank. Clear statutory guidance appears to reduce the scope for short-term political influence (Parkin and Bade, 1978). The Bundesbank, for example, is explicitly charged with making inflation its first priority, unlike the other two banks. Also important are differences in the degree to which central banks control all of the instruments relevant to monetary policy, such as financial institution regulation, administered interest rates, mechanisms for credit allocation. In this respect, the Bank of France shares authority with other institutions more than does the Bank of England which, in turn, shares authority more than does the Bundesbank. To reduce this kind of interdependence is, by definition, to enhance autonomy. Functional independence is not equal to an ability to resist pressures from other actors, but it does reduce the number of occasions requiring negotiation and possible compromise.

On a day-to-day basis, the most important structural features are those facilitating or impeding actors who want to try to punish a central bank for actions they oppose. The United States is relatively unusual in the degree to which the legislature can independently initiate an attack on the central bank. Unlike the United States, in the countries examined here, no viable attack on the central bank is possible without at least the acquiescence of the head of government. Even in Germany, where Bundestag committees and members have some legislative initiative, legislation is overwhelmingly dominated by the leadership of the majority party (or coalition). When public power is less fragmented than in the United States, type I political pressures on central banks are channeled almost exclusively through the head of government and his chief economic ministers. Thus, the central bank has an even greater incentive to be cooperative with the head of government in these European cases than in the United States. In the United States, independent congressional power greatly complicates any presidential effort to punish or restrict the Federal Reserve while simultaneously inviting interest groups to lobby for congressional action.

Finally, the less the state is involved in investment decisions and capital allocation, the more market forces may be expected to support central bank autonomy. This flows from the assumption that markets react strongly against government policy actions that are viewed as being incorrect or inadequate to deal with the current conjuncture. This also relies on the assumption that central banks are more likely than not to be advocates of the kinds of policies viewed as "correct" by market participants. Government policies that are motivated by a desire to maintain high levels of popularity may be viewed with hostility in the market. If the state's role in financing investment and allocating capital is relatively small, then adverse market reactions would mean that policies designed to curry popular favor might result in worse economic performance than would an apparently less popular policy. Consequently, in such a situation governments would learn that they have to choose between trying to expand the role of the state in order better to control financial flows, and trying to follow the kinds of policies central banks advocate. Where the government role in financial life is relatively restricted, as is the case in the United States and Germany, there is no realistic short-run option of expanding the role of the state. This is a strong reinforcement for central bank autonomy. This would be less the case in Britain; still less in France.

III. Type I Politics and the Conduct of Monetary Policy

Given the preceding discussion, one expects to find close relations between government and central bank in all three of these countries. However, given the differences in domestic market structures and political structures, the ability of governments effectively to sustain pressures on the central bank would appear to be greatest in France and least in Germany, with Britain somewhere in between.

To investigate the impact of some aspects of type I politics on monetary policy, I have estimated a series of reaction functions which incorporate dummy variables reflecting changes in party, changes in head of government, and the occurrence of elections. I have also introduced measures of government popularity and measures of group pressure. The estimates show that type I political events do have an impact on monetary policy in each of these three countries. However, there are important differences that appear to reflect the structural differences discussed above.

The models include the economic variables from the models estimated and discussed by Hodgman and Resek (HR) for this same conference. Some differences should be noted: the most recent observations in the data set I worked with end four to eight quarters before those in the HR data set. This difference occasionally leads to estimates of different coefficients. Second, in order to maximize the opportunity for testing various hypotheses, I have not examined the separate regime periods estimated by HR. Note, however, that the dates HR identify for regime changes coincide almost precisely with important political transitions in each of the countries. This suggests that political and economic events are thoroughly intertwined. Finally, I have further truncated the estimation period in the German case by excluding the few observations prior to the beginning of the SPD-dominated governments in 1969.[3] The estimating strategy I used, adding political variables one at a time to the basic HR models, was intend-

[3]The models for the Bank of England produce marginally more satisfactory results with the contemporary rather than lagged value for PSBR, which was used in all models reported here. Dates for estimating periods are for Britain, 65:2–80:4; Germany, 69:3–80:1; France 64:2–80:4.

ed to increase the opportunity for finding significant coefficients. In order to correct for first-order autocorrelation, all German and French models were estimated by the two-step full transform method (essentially equivalent to the Cochrane-Orcutt method).

Government Popularity and Monetary Policy

The fundamental argument in much of the writing on the politics of macroeconomic policy is that governments are essentially popularity maximizers. For example, in many widely cited works, Frey and Schneider (1978a, 1978b, 1979) assume that governments have some minimal level of popularity which they strive to maintain at all times. When governments are below their target popularity level, they take steps to increase their popularity. Above that level, there is no reason to expect that any relationships should hold.

While I know of no models explaining government popularity that include interest rates as determinants of levels of public support, I have estimated relatively simple models (not reported here), in which the interest rate enters with the appropriate (negative) sign and usually at significant levels. Thus, it would appear that governments have ample incentive to manipulate interest rates for purposes of maintaining their popularity. Interest rates have functional relationships to the variables that are typically viewed as determinants of public support (e.g., economic growth, inflation) and they appear to have a direct impact on popularity as well.

Popularity is measured in the British and German cases by responses to standard voting intention survey questions for the *previous* quarter (with contemporary values inserted for the first quarter of a government term). In the French case, the measure is the response to a question asking whether or not the respondent is satisfied with the job the President (or Prime Minister) is doing.[4] In an effort to be faithful to the logic of the Frey-Schneider approach, I arbitrarily defined the target popularity level for the sample period as the average level for the period.

The popularity variable is called POP. POP2, equal to POP–MEAN (POP), measures the deviation of popularity from the implicit target popularity level. POPDEF1, for periods of popularity deficit, is equal to -1(POP2) if POP2 is equal to or less than 0, (else $=0$). POPSUR1, for periods of popularity surplus, is equal to POP2 if POP2 is greater than 0 (else $=0$). Entering POPSUR1 and POPDEF1 simultaneously in the basic HR interest rate model for each country tests whether governments lower the interest rate in response to an increasing popularity deficit, and what, if any, systematic responses there are to popularity surpluses. Of course, if

[4]The data for Germany and Britain were provided in part by Thomas Yantek, and the data for France in part by Michael Lewis-Beck. The Yantek and Lewis-Beck sets have been extended to early 1982. The British data are Gallup poll data on voting intentions and are published in the *Gallup Poll Index*. The French data are the IFOP series on approval published regularly in *France-Soir*.

central banks are politically independent, we should find no relationship at all.

Coefficients of POPDEF1 and POPSUR1 for each country are presented in Table 2. (Full regression results for each model for each country are reported in appendixes.) The Bank of England and Bundesbank coefficients have the same signs but only the coefficients for the Bank of England are significant. As expected, increases in POPDEF1 result in decreases in the interest rate. This relationship is quite strong for the Bank of England. However, the surprise is that the same result seems to hold for popularity surplus—i.e., the higher the surplus the *lower* the interest rate. For this to be true it must be the case that governments try to push above-average popularity rates higher. It would also mean, however, that if a government experienced a decline in popularity that left it still above average, it would respond by *raising* the interest rate. This odd result, of course, is entailed by the linear model and need not be assumed in future efforts.

The French case is more perplexing. If the results are to be believed—and they are relatively strong for the period of popularity deficit—the response of the French authorities to a popularity deficit has been to drive interest rates *up*. When there is a popularity surplus, we see the same pattern as in the British and German cases—although at lower levels of significance: a popularity surplus is reinforced by further interest rate reductions. One may reasonably suppose that this finding is simply further confirmation that lower rates lead to higher popularity. In the French case, both interest rates and popularity tend to move parallel over relatively long periods so that casual priority cannot be established merely by lagging popularity one period.

Table 2
Government Popularity and the Conduct of Monetary Policy
Coefficients on Popularity Variables Added to the Basic HR Model

	POPDEF	POPSUR
Bank of England		
	−0.160	−0.130
	(−3.091)	(−2.535)
Bank of France		
Presidential Popularity	0.0925	−0.0233
	(1.725)	(−0.487)
Prime Ministerial Popularity	0.076	(−0.056)
	(1.758)	(−1.311)
Bundesbank		
	−0.0904	−0.194
	(−0.781)	(−1.726)

t-statistics in ( ).

On the whole, these findings must be viewed as rather weak support for the Frey-Schneider view. Only in the British case is there a significant reaction to POPDEF in the predicted direction. Contrary to our expectation that there would be no relationship in periods of popularity surplus, there are relatively strong coefficients, all with similar signs.

Elections and the Political Business Cycle

The classic political business cycle hypothesis, as discussed by Nordhaus (1975) and Tufte (1978), proposes that governments destabilize the economy for the purpose of bolstering their reelection chances. Depending on the assumptions one makes about the perceptions and preferences of voters, these cycles may have the long-run result of putting the economy in a worse position that it would be in otherwise (Alt and Chrystal, 1983). A second kind of politically related change in economic policy is post-election change that I shall refer to as the mandate hypothesis. Governments may or may not try to manipulate the economy prior to elections so as to further their reelection prospects, but after the elections government policy should reflect whatever mandate the government believes it has received. Hibb's (1977a) findings that unemployment rates are significantly reduced by left-oriented governments in the United States and Britain is one example of research showing the apparent importance of the change in mandate for the conduct of economic policy. There is another possibilty, of course. If central banks are truly independent, there should be no variation in monetary policy associated with elections.

In order to investigate the link between elections and monetary policy in the reaction function framework, I have defined dummy variables representing the four quarters prior to and the four quarters immediately following each national election. (The electoral quarter is included in one or the other of these depending on whether the election occurred nearer the beginning or the end of the quarter.) If elections occur in rapid succession, the variable extends only up to the next election. These variables were run separately and in various combinations as additions to the basic HR models.

In none of these countries are election dates absolutely fixed, so elections may occur either as responses to crises or at times governments view as most advantageous. Since it is implausible to suppose that political business cycle behavior will occur prior to crisis elections, those cases are omitted from the analysis of preelection behavior. In Britain, both 1974 elections were crisis elections, but Labor governments chose the dates for other elections—quite badly for them as it turned out in 1970 and 1979. In France, the National Assembly election of 1968 was a crisis election as were the presidential elections of 1969 and 1974; one was forced by DeGaulle's resignation, the other by Pompidou's death. In Germany, the election of 1969 should be classified as a crisis election; the FDP switched coalition partners to join the SPD. The SPD selected the time for the 1972 election;

the 1976 election was held as scheduled.

The coefficients presented in Table 3 fail, with one exception, to confirm the central proposition of the political business cycle hypothesis. Except for the German election of 1972, there is no indication that interest rates in any of these countries were moved prior to elections in a fashion significantly different than would have been expected given the responses of officials throughout the entire estimating period. Only one of the two SPD-called elections fits the political business cycle hypothesis, but given the expectations outlined above and the extensive anecdotal evidence to that effect that the Bundesbank is very independent, it is surprising that the only significant preelection coefficient is found in the German case.

Table 3
Preelection Conduct of Monetary Policy, Noncrisis Elections
(Sign of Coefficient on Preelection Dummy Variable Added to HR Model)

Year	Bank of England	Year	Bank of France	Year	Bundesbank
	Parliament		National Assembly		Bundestag
66	−0.273 (−0.452)	67	−0.085 (−0.130)	72	−1.542 (−2.235)
70	−0.820 (−1.291)	73	−0.064 (−0.097)	76	0.324 (0.385)
79	0.591 (0.825)	78	0.560 (0.863)		
			Presidential		
		65	−0.111 (−0.170)		
		81	−0.045 (−0.051)		

t-statistics in ( ).

While most governments do not try, or are unable, to drive interest rates down for political reasons prior to elections, there is much stronger indication that decisive policy moves do follow elections as suggested by the mandate hypothesis (see Table 4). The dummy variable used here takes the value 1 in the four quarters after the election, else 0. The idea underlying this definition is that the attempt to pursue a mandate is a brief one, and that after four quarters more usual forces dominate monetary policy. In Britain, the Labor governments of the mid-1970s reduced interest rates significantly following both elections. In France each National Assembly election since 1968 was followed by a substantial move in interest rates. In the elections of 1968 and 1973, when the center-right coalition won comfortable victories, there immediately followed a more restrictive monetary policy. In 1978, however, the center-right barely won—mostly because of deep divisions on the left—and that election was followed by a significant decrease in interest rates.

Table 4
Post-election Conduct of Monetary Policy All Elections
(Coefficient of Post-election Dummy Variable Added to HR Model)

Year	Bank of England	Year	Bank of France	Year	Bundesbank
	Labor Victories		National Assembly		Bundestag
66	−0.242 (−0.409)	67	−0.180 (−0.274)	69	1.0335 (1.055)
741	−1.578 (−2.537)	68	1.195 (1.957)	72	2.633 (3.557)
742	−1.114 (−1.693)	73	1.505 (2.385)	76	0.612 (0.778)
		78	−1.333 (−2.208)		
Conservative Victories					
70	−0.440 (−0.746)				
			Presidential Elections		
79	2.065 (3.133)	65	−0.027 (−0.041)		
		69	−0.3216 (−0.458)		
		74	0.9812 (1.354)		
	Conservative Incumbents 0.389 (1.237)		Giscard −3.325 (3.454)		Schmidt −0.781 (−0.929)
			Pompidou −1.277 (−2.365)		

t-test in ( ).

French presidential elections as separate events have no significant monetary policy repercussions. While it is clear that the President is the dominant policymaker in economic policy, Suleiman (1980) observes that the President's freedom of action is more constrained by the need for support in the National Assembly than is often supposed. Thus, it is not surprising that Presidents elected in 1969 and 1974, in years *following* National Assembly victories that had been triumphs for the predecessors, did not make innovations in monetary policy.

In the German case, there is only one significant "mandate" coefficient, and this is again for the 1972 election. This sharp and significant increase in the interest rate is exactly the pattern we would expect in a political business cycle. However, the fact that German monetary policy reveals less "mandate behavior" than seen in the other two cases is consistent with our expectations about Bundesbank independence and suggests that further close examination of the 1972 period would be valuable.

Executive Politics. Despite the fact that French presidential elections have not provoked separate decisive moves in monetary policy, we do find that presidential terms have been characterized by distinctive impacts on monetary policy. This again was tested with a dummy variable, in this case an intercept shift taking the value of 1 for Pompidou's presidency (else 0) and another taking the value of 1 for Giscard's presidency (else 0). Since there is no dummy variable for DeGaulle, the Pompidou and Giscard variables may be interpreted as deviations from the implicit DeGaulle constant. The results show surprisingly strong negative coefficients for both the Pompidou and Giscard terms (Table 4). The results indicate that the interbank rate was on average some 1.3 percentage points lower during Pompidou's presidency than would have been suggested by economic targets alone, and was some 3.3 percentage points lower during Giscard's presidency. The popularity of French presidents has steadily trended downward during the period under examination, and it is generally recognized that Giscard hoped for some time that he could alter French political alignments by establishing a moderate centrist coalition independent of extreme left and right. The negative coefficients on the Pompidou and Giscard variables suggest a general strategy of trying to preserve overall popularity levels. The Giscard result is consistent with his strategy of trying to construct a centrist electoral coalition, perhaps by appealing for support with moderate interest rates.

There are no similar distinctive periods in the other two countries. In Britain, it is true as one would expect that the Conservatives have tended to keep interest rates higher than has Labor, although this difference is significant only at about a .2 level. In Germany, despite the fact that Schmidt also experienced a steady decline in popularity, there is no significant difference between the conduct of monetary policy during his chancellorship and that of Willy Brandt.

Group Interests and Monetary Policy: Politics Types I and II

With minor exceptions in recent years, the history of monetary politics in the United States since WWII has been different from most U.S. policy arenas in that most of the affected interest groups have had relatively low access to the individuals most directly concerned with monetary policy. Federal Reserve officials have had close and continuing interactions only with representatives from the financial sector. This same kind of insulation from interest group pressures appears to be the case in Britain, France, and Germany as well.

However, this relative insulation does not foreclose the possibility that specific groups achieve an indirect impact by pressuring other government officials or that the importance of the group for economic performance means that its views are still taken into account in policymaking even without their exerting any pressure. In the United States, groups harmed by interest rate fluctuations typically seek redress through Congress, which, albeit ineffectually, predictably tries to find a whip for flogging the Fed whenever interest rates are high (Woolley, 1984b).

British Mortgage Rate: Type I Politics

I have examined the question of sensitivity about interest rates only in the case of Britain. In interviews in 1982, various British officials referred to the political sensitivity of mortgage rates, which are adjustable. Increases in mortgage rates are believed to be intensely disliked, and thus, to result in pressure on the central bank to reduce (or not to raise) the bank rate (or MLR) as pressure builds for an increase in mortgage rates. In order to test for the independent effect of this phenomenon on monetary policy, I constructed a variable, MTGPRESS which is equal to the difference between the current quarterly rate on long-term gilt-edge securities and the mortgage rate. As this difference increases, I assume that pressure to raise the mortgage rate increases as well. If this results in pressure to reduce the MLR, we should find a negative coefficient on MTGPRESS. In fact, the coefficient is *positive* and significantly so (b = 0.244 (2.271)). This occurs, of course, in the presence of the conventional economic reasons for increasing interest rates. One hesitates to infer that rather than exhibiting special sensitivity for mortgagors, the Bank of England tries to make them worse off. More likely, the anecdotal evidence should be examined more closely. Several different kinds of policy actions can delay an increase in the mortgage rate (for example, increasing subsidies to lenders), so that Bank rate would not necessarily reflect this pressure. Not all increases are resisted, and not all resistance is of the same type. These reaction functions are not sufficiently sensitive to pick up those differences.

Business Confidence: Type II Politics.

It is a staple of much contemporary political-economic analysis that governments are obliged to grant special standing to the desires of business. In *Politics and Markets,* Lindblom (1976) made his now-familiar claim that business has a "privileged position" in private-enterprise market-oriented economies. Given the rather mediocre results for measures of general government popularity (only in Britain did monetary policy respond as expected to a popularity deficit), it is interesting to inquire whether monetary policy is more responsive, as Lindblom might suggest, to the condition of business confidence. Our expectations would be essentially identical to those discussed above for the case of popularity. When there is a confidence deficit (when business confidence is below average), governments would take action to boost confidence by lowering interest rates. In periods of surplus, our expectations are again not so clear, but one might anticipate a *negative* association. This could indicate that governments take advantage of periods of relative optimism to stabilize the economy by raising interest rates, or that governments try to stabilize business optimism itself. The latter explanation might be called the Martin hypothesis in recognition of former Federal Reserve Chairman William McChesney Martin's oft-quoted characterization of the role of the Federal Reserve as being "to take away the punch bowl just when the party really gets going."

Following Lindblom again, we should expect that between countries the degree of attention to business confidence will vary with the degree of public sector involvement in capital allocation and credit markets. The greater the dependence on private markets, the greater the sensitivity to business confidence. Thus, sensitivity should be greatest in Germany and least in France, with Britain somewhere in between.

The data on business confidence in all three countries are drawn from relatively lengthy time series of surveys of the outlook of entrepreneurs for the next few months (often a calendar quarter). The survey results are usually interpreted as revealing the degree of optimism of entrepreneurs. By convention, the results are reported as the difference between the percent responding positively and the percent responding negatively to questions about the future. Thus, these series cycle between some positive number of around 40 when optimism is high and an equivalent negative figure when pessimism is predominant.[5] This is the measure of business confidence used here, introduced with a one-quarter lag.

The basic confidence measure is labeled CONF. The target confidence level is defined as the mean of CONF, and periods of surplus and deficit are defined by CONF2, equal to CONF-MEAN(CONF). BUSDEF1, for periods of confidence deficit, is equal to -1(CONF2) if CONF2 is less than or equal to 0 (else $=$ 0). BUSSUR1, for period of confidence surplus, is equal to CONF2 if CONF2 is greater than 0.

The signs on the coefficients when both BUSSUR1 and BUSDEF1 are entered in the basic HR model are, unlike the case of popularity, exactly as expected in all three countries (see Table 5). Furthermore, the relative sensitivity of policy to business confidence in the three cases is also exactly as expected. The most significant coefficient on BUSDEF1 occurs in the German case—where POPDEF1 had no statistically significant coefficient. The next most significant coefficient occurs in the British case but this coefficient is less significant than the British coefficient on POPDEF1. In France, the results are weak but have the correct sign, which was not the case with POPDEF1. The Martin hypothesis fits in Britain and France, but not in Germany, where confidence surplus produces no systematic response.

[5]For Britain the data are the "optimism" series from the CBI Industrial Trends Survey Data series. The series was provided directly by the CBI. Missing values are replaced with the mean of adjacent observations. For France, data are quarterly averages of the monthly surveys in the "production prévue" series from the INSEE enquête mensuelle auprès des chefs d'entreprises industrielles, "ensemble des branches." For the period since 1969, this series is published in *Tendences de la Conjoncture;* earlier data are found in *Etudes et Conjoncture: Supplément.* The German data are quarterly averages of monthly observations from the IFO series "Geschaeftserwartungen fuer die naechsten 6 Monate: Investionsguter" and were provided by the Bundesbank.

Table 5
Business Confidence and the Conduct of Monetary Policy (Confidence Measures Added to Basic HR Model)

	BUSSUR1 (Confidence surplus)	BUSDEF1 (Confidence deficit)
Bundesbank		
	0.0212 (0.729)	−0.0636 (−2.305)
Bank of England		
	0.0228 (2.518)	−0.0147 (−1.746)
Bank of France		
	0.0313 (1.253)	−0.0209 (−1.127)

t-statistics in ( ).

This brief excursion into the implications of "group politics" for monetary policy provides support for the notion that monetary politics is not interest-group politics. Monetary policy does attend to the needs of business, but the degree to which this is true depends on the role of the state in society.

The Complete Models

Given the many aspects of politics that we have not been able to examine, it is clearly premature to speak of having a fully specified political model of monetary policy decisions. However, it is possible at this point to advance a model for each country that includes the most promising variables identified in the previous sections. These models are quite good in terms of accounting for variation in the interest rate instrument used by each central bank (see Table 6). When compared to models for the same periods consisting only of economic variables, (see Appendices A, B, C) the addition of political variables results in substantial increases in variance explained (measured by adjusted R^2) especially in Germany and France. In terms of the political variables involved, each model is distinct. Each model consistently reflects structural differences between the countries that are familiar and that have usually been judged to be important. In this regard, the specification of political variables appears to be correct.[6]

[6]It is certainly true that the popularity and business confidence variables are not strictly speaking exogenous. It is not my contention that these quantities are unrelated to the economic variables included. It is clearly the case, however, that the included economic variables do not do a particularly good job of accounting for variation in either popularity or business confidence. It is possible then that both variables convey additional valuable information about the condition of the political economy to policymakers, and the models estimated here suggest that this is the case.

Table 6
Full Models Incorporating All Relevant Political Variables

Bank of England (65Q2 – 80Q4)

$$
\begin{array}{llllll}
\mathrm{BRQ} = 0.482 & + & 0.00031\ \mathrm{DOBA} & - & 0.0034\ \mathrm{DOFRES} & + \ 0.775\ \mathrm{BRQ1} \\
\quad (0.877) & & (2.469) & & (-3.937) & \quad (10.371) \\
\quad +0.197\ \mathrm{REDQ1} & - & 0.758\ \mathrm{DCPI} & + & 0.00032\ \mathrm{PSBRQ} & \\
\quad (3.080) & & (-0.234) & & (2.924) & \\
\quad -0.128\ \mathrm{POPDEF1} & - & 0.0335\ \mathrm{POPSUR1} & - & 0.0162\ \mathrm{BUSDEF1} & \\
\quad (-2.636) & & (-0.675) & & (-2.118) & \\
\quad +0.0222\ \mathrm{BUSSUR1} & + & 1.421\ \mathrm{POST79} & & & \\
\quad (2.574) & & (2.368) & & &
\end{array}
$$

$\bar{R}^2 = .91$ DW = 2.053

Bank of France* (64Q2 – 80Q4)

$$
\begin{array}{llllll}
\mathrm{IBRQ} = 1.388 & = & 12.789\ \mathrm{DFRDMXRQ} & + & 60.185\ \mathrm{DCPI} \\
\quad (3.227) & & (6.246) & & (4.308) \\
\quad +0.289\ \mathrm{REDQ1} & + & 0.012\ \mathrm{GDEF1} & + & 1.184\ \mathrm{DIPIC70} \\
\quad (4.603) & & (1.533) & & (1.515) \\
\quad +1.039\ \mathrm{POST68} & + & 1.395\ \mathrm{POST73} & - & 1.156\ \mathrm{POST78} \\
\quad (1.813) & & (2.483) & & (-2.055) \\
\quad -0.889\ \mathrm{POMPIDOU} & - & 1.338\ \mathrm{GISCARD} & & \\
\quad (-1.684) & & (-1.261) & &
\end{array}
$$

$\bar{R}^2 = .86$

Bundesbank* (64Q2 – 80Q4)

$$
\begin{array}{llllll}
\mathrm{LR3MOSQ} = -36.805 & + & 117.882\ \mathrm{DCPI76} & - & 6.976\ \mathrm{MDLSPRQ5} \\
\quad (-13.777) & & (7.203) & & (-2.520) \\
\quad -9.003\ \mathrm{MDLSPRQ6} & + & 0.432\ \mathrm{CAPUTB1} & + & 0.266\ \mathrm{REDQ1} \\
\quad (-1.816) & & (14.154) & & (4.152 \\
\quad -1.923\ \mathrm{PRE72} & + & 0.603\ \mathrm{POST72} & + & 0.0001\ \mathrm{BUSSUR1} \\
\quad (-3.629) & & (0.571) & & (0.004) \\
\quad -0.0720\ \mathrm{BUSDEF1} & & & & \\
\quad (-3.195) & & & &
\end{array}
$$

$\bar{R}^2 = .95$

t-statistics in ( ).
*Models corrected for first-order autocorrelation by two-step full transform method.

The model for Germany includes the political cycle dummy variables for the 1972 elections and the measures of business confidence. In the full model, the "mandate" variable, POST72, proves to be insignificant, leaving only two significant political variables, one for the PRE72 election period, and one for the response to business confidence deficits. These results are, overall, a strong confirmation of Bundesbank independence from type I politics. It is also a striking confirmation of the importance of business confidence in the conduct of monetary policy in market-dominated systems, exactly as Lindblom's hypothesis would lead us to expect. This type II political effect is, of course, fundamental to stability and growth in this kind of political economy.

The British model differs from the German principally by including popularity variables. With the exception of the POST79 variable (marking the onset of the Thatcher regime) no "mandate" variables are significant when the popularity measures are included. The coefficient on the popularity surplus (POPSUR1) is insignificant in the full model—as we had originally anticipated under the Frey-Schneider hypothesis. When there is a business confidence surplus, the Bank of England raises interest rates, either in order to take advantage of permissive political conditions or in an effort to stabilize the animal spirits of entrepreneurs, as suggested by the Martin hypothesis. In sharp contrast to models showing significant interparty differences in British economic policy, this model suggests that prior to Thatcher, monetary policy varied little between Labor and Conservative governments. The implicit partisan competition model that is consistent with these findings is, of course, the Downsian model of highly similar parties competing only at the margin for popular and business support.

The political components of the French model are all "political mandate" variables. Three periods immediately following legislative elections were characterized by distinctive and dissimilar moves in the monetary policy instrument. The presidential terms of Pompidou and Giscard also have had distinctive moderating effects on monetary policy, although the Giscard coefficient is not significant in the full model. These findings are consistent with the conventional image of the French political system as one which is not obliged to be particularly sensitive to ongoing expressions either of popular or of business sentiment. The Constitution of the Fifth Republic was intended to enhance governmental stability by reducing vulnerability to swings in public opinion. A very large public sector together with a strong, centralized state bureaucracy would be expected to reduce the need for altering public sector actions in the face of private sector views. This is not an image of an independent central bank so much as an insulated public sector.

IV. Conclusion: Politics Reflected in Reaction Functions

There is much to be said for resisting the temptation to turn an investigation such as this into a contest between politics and economics. While electoral politics plays an identifiable role in monetary policy in Britain and France, it is a role that is merely an addition to many other factors—most of which we conventionally think of as economic. However, in this respect, monetary policy is no different from other kinds of public policy. It is a very rare occasion when the outcome of electoral politics is a drastic transformation of policy. Such changes are usually limited to one or two selected policy areas that newly elected officials decide to treat as worthy of major investments of time and energy. More typically, after some years of struggle accompanying the initial policy action, a kind of political equilibrium tends to persist, altered in only minor ways as a result of subsequent partisan changes. Interests and ideologies grow up around these policy equilibria making for a rigid formula that can be changed substantially only when crises are perceived.

For a full understanding of the political meaning of the reaction functions that I have presented, we would need additional information that is much less easily obtained. We would need to know much more, in some detail, about the consequences for various sectors and groups of changes in both the policy instrument and the policy targets. We would need an elaborate and politically sensitive structural model of the political economy. The forecasting models in use today are for the most part inappropriate for this kind of task. The objective of such an ideal model would be to reveal in detail the various implications of the policy actions that policymakers take. We could than know the consequences for particular groups or economic sectors if the central bank moved its interest rate a certain amount. We would also know exactly how far that action went toward stabilizing the many targets included in the reaction function. One could objectively analyze the political meaning of the entire reaction function because one could say clearly exactly what kinds of consequences were being avoided by policymakers.

Such a model does not exist and would probably prove impossible to construct. However, it is still possible that portions of such a model could be developed, at least qualitatively. It is also possible that central bankers and others involved with monetary policy might be persuaded to reveal more about their own judgments as to the possible consequences of following a very different policy from the ones they have selected. If we are to move further toward understanding the political and social antecedents of monetary policy, we cannot avoid the need to advance explicit interpretations of the ways policy routines of the sort modeled in reaction functions reflect and reinforce an existing political solution for society.

In such research, one should be prepared for the possibility that monetary authorities may not try to anticipate in any detail the consequences of their actions that are more than a step or two removed from the actions themselves. One should also be prepared for the possibility that monetary authorities, rather like "satisficing" actors described by Herbert Simon, ordinarily consider a range of possible policy actions that is relatively narrow and bounded by rough rules of thumb (e.g., "if we let interest rates move up that much we'd have chaos in the markets"). Given the nature of things, such rules are largely nonfalsifiable. Such rules make it unnecessary to attempt to project consequences in very much detail; such projections would in any case be of dubious value since the alternatives of interest are, more likely than not, well outside the range of previous experience.

In short, there is no reason *a priori* why we should expect policymakers themselves to be able to articulate, even in conditions congenial to frank reflection, the political formulae that underly their behaviors. What we can predict, I suspect with very high levels of certainty, is that central bankers rarely propose dramatic changes in monetary policy; the reasons for this are as much political as economic: uncharted economic ground is strewn with political hazards. The fact that this conservativism is usually not recognized as reinforcing a political formula should not obscure its political nature for outside analysts.

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Appendix A.
All British Models
Dependent Variable = BRQ (65Q2 – 80Q4)

	Intercept	BRQ1	DOBA	DOFRES	REDQ1	DCPI	PSBRQ	POLITICAL	VARIABLES	$\overline{R^2}$	DW
								POPSUR1	POPDEF1		
1.	1.043	0.785	0.00033	−0.00025	0.223	−5.337	0.00032	−0.130	−0.160	.88	1.832
	(2.088)	(9.976)	(2.355)	(−2.781)	(3.108)	(−1.518)	(2.529)	(−2.535)	(−3.091)		
								PRE66			
2.	0.556	0.746	0.00024	−0.00027	0.217	−2.430	0.00037	−0.273		.86	1.790
	(1.063)	(8.988)	(1.611)	(−2.838)	(2.741)	(−0.654)	(2.783)	(−0.453)			
								PRE70			
3.	0.457	0.730	0.00021	−0.00027	0.257	−2.383	0.00034	−0.820		.88	1.812
	(0.934)	(8.879)	(1.413)	(−2.886)	(3.200)	(−0.657)	(2.529)	(−1.291)			
								PRE79			
4.	0.463	0.745	0.00024	−0.00024	0.218	−1.695	0.00034	0.591		.86	1.806
	(0.937)	(9.048)	(1.657)	(−2.488)	(2.815)	(−0.459)	(2.482)	(0.825)			
								POST66			
5.	0.534	0.742	0.00024	−0.00027	0.233	−2.436	0.00038	−0.242		.86	1.786
	(1.042)	(8.975)	(1.614)	(−2.856)	(2.886)	(−0.653)	(2.799)	(−0.409)			
								POST741			
6.	0.108	0.714	0.00036	−0.00032	0.298	−0.459	0.00036	−1.578		.89	1.985
	(0.219)	(9.020)	(2.432)	(−3.473)	(3.783)	(−0.129)	(2.841)	(−2.537)			
								POST742			
7.	0.385	0.703	0.00030	−0.00031	0.255	0.581	0.00039	−1.114		.88	1.904
	(0.789)	(8.382)	(2.000)	(−3.276)	(3.287)	(0.148)	(2.979)	(−1.693)			
								ALL CONSERVATIVE			
8.	0.473	0.747	0.00028	−0.00026	0.205	−2.414	0.00038	0.389		.88	1.186
	(0.965)	(9.140)	(1.869)	(−2.931)	(2.632)	(−0.665)	(2.857)	(1.237)			
								POST70			
9.	0.542	0.736	0.00022	−0.00027	0.228	−2.003	0.000364	−0.440		.86	1.798
	(1.081)	(8.885)	(1.463)	(−2.852)	(2.952)	(−0.547)	(2.708)	(−0.746)			

								POST79			
10.	1.240	0.667	0.00032	−0.00039	0.172	0.485	0.00034	2.065		.89	2.070
	(2.395)	(8.332)	(2.294)	(−4.099)	(2.350)	(0.139)	(2.722)	(3.133)			
								BUSSUR1	BUSDEF1		
11.	−0.194	0.779	0.00020	−0.00029	0.241	−0.9334	0.00041	0.0228	−0.0147	.90	1.793
	(−0.396)	(10.330)	(1.474)	(−3.339)	(3.419)	(−0.274)	(3.341)	(2.518)	(−1.746)		
								MTGPRESS			
12.	0.398	0.788	0.00011	−0.00016	0.195	−6.087	0.00032	0.244		.88	1.766
	(0.836)	(9.648)	(0.752)	(−1.577)	(2.599)	(−1.554)	(2.488)	(2.271)			
13.	0.481	0.742	0.00024	−0.00027	0.225	−2.161	0.00037			.87	1.782
	(0.977)	(9.047)	(1.611)	(−2.873)	(2.926)	(−0.593)	(2.814)				

t-statistics in ( )

Variable List, Economic Variables

Bank of England

BRQ = Bank Rate
BRQ1 = Bank Rate lagged one quarter
DOBA = Change over prior quarter in official borrowing abroad, lagged one quarter
DOFRES = Change over prior quarter in official reserves lagged one quarter
DCPI = Percentage change over four quarters in consumer price index, lagged one quarter ($1n(CPI_{t-1}/CPI_{t-5})$)
PSBR = Public sector borrowing requirement, current quarter

Bundesbank

LR3MOSQ = Three month money-market loan rate
DCPI76 = Percentage change over four quarters in consumer price index, lagged one quarter (base 1976) ($1n(CPI_{t-1}/CPI_{t-5})$)
MDLSPRQ5 = Percentage change over four quarters in DM/$ exchange rate when seasonally adjusted current account balance of payments is greater than 0.
MDLSPRQ6 = Same as MDLSPRQ5 when current account balance of payments is less than or equal to 0.
CAPUTB1 = Rate of capacity utilization lagged one quarter.
REDQ1 = Eurodollar rate lagged one quarter.

Bank of France

IBRQ = Quarterly average for overnight money market rate
DFRDMXRQ = Percentage change over four quarters in the spot exchange rate, French Franc/DM.
DCPI = Percentage change over four quarters in the consumer price index, lagged one quarter ($1n(CPI_{t-1}/CPI_{t-5})$)
REDQ1 = Eurodollar rate lagged one quarter
GDEF1 = Government budget deficit lagged one quarter
DIPIC70 = Percentage change over four quarters in industrial production index (base 1970), lagged one quarter.

Appendix B: All German Models*
Dependent Variable = LR3MOSQ (69Q3 − 80Q1)

	Intercept	DCPI76	MDLSPRQ5	MDLSPRQ6	CAPUTB1	REDQ1	POLITICAL VARIABLES		$\bar{R}^2$
							POPDEF1	POPSUR1	
1.	−36.814	93.646	−5.850	−6.051	0.442	0.288	−0.090	−0.194	.75
	(−6.144)	(5.825)	(−2.077)	(−1.041)	(5.877)	(2.815)	(−0.781)	(−1.726)	
							PRE 72		
2.	−36.065	99.549	−6.155	−6.593	0.424	0.305	−1.547		.82
	(−8.931)	(7.243)	(−2.397)	(−1.115)	(8.687)	(3.547)	(−2.235)		
							PRE 76		
3.	−34.112	91.512	−6.080	−5.403	0.396	0.379	0.324		.73
	(−6.761)	(5.626)	(−1.970)	(−0.890)	(6.623)	(4.119)	(0.385)		
							POST 69		
4.	−30.509	99.146	−5.534	−4.286	0.350	0.362	1.033		.71
	(5.640)	(5.260)	(−1.960)	(−0.748)	(5.271)	(3.819)	(1.055)		
							POST 72		
5.	−31.545	72.157	−1.375	−3.005	0.375	0.403	2.633		.87
	(−8.637)	(5.407)	(−0.521)	(−0.529)	(8.725)	(5.726)	(3.557)		
							POST 76		
6.	−33.472	92.860	−5.274	−3.950	0.387	0.393	0.612		.71
	(−6.438)	(5.350)	(−1.848)	(−0.675)	(6.292)	(4.036)	(0.778)		
							BUSSUR1	BUSDEF1	
7.	−33.924	109.581	−6.640	−4.494	0.391	0.358	0.021	−0.064	.83
	(−8.577)	(7.717)	(−2.681)	(−0.805)	(8.159)	(4.689)	(0.729)	(−2.305)	
							SCHMIDT		
8.	−26.084	93.443	−6.630	−6.347	0.299	0.430	−0.781		.73
	(−3.259)	(5.255)	(−2.486)	(−1.253)	(3.230)	(4.124)	(−0.929)		
9.	−31.558	89.412	−5.368	−4.612	0.368	0.374			.68
	(−5.921)	(4.946)	(−1.881)	(−0.820)	(5.771)	(3.842)			

t-statistics in ( ).
*All models corrected for first-order autocorrelation by two-step full transform method.

Appendix C: All French Models†
Dependent Variable = IBRQ (69Q2 − 80Q4)

	Intercept	DFRDMXRQ	DCPI	REDQ1	GDEF1	DIPIC70	POLITICAL VARIABLES		$\bar{R}^2$
1.	1.980	9.104	41.628	0.315	0.012	1.071			.66
	(3.422)	(3.903)	(5.378)	(4.018)	(1.610)	(1.472)			
							PPDEF1*	PPSUR1	
2.	2.333	8.448	34.480	0.315	0.011	1.018	0.093	−0.023	.67
	(3.749)	(3.616)	(4.080)	(4.107)	(1.468)	(1.396)	(1.725)	(−0.487)	
							PMDEF1**	PMSUR1	
3.	2.632	9.450	33.361	0.310	0.014	0.801	0.076	−0.056	.65
	(3.680)	(3.914)	(3.888)	(3.786)	(1.727)	(0.940)	(1.758)	(−1.311)	
							PRE65		
4.	2.005	9.080	41.413	0.314	0.012	1.071	−0.111		.65
	(3.355)	(3.854)	(5.235)	(3.981)	(1.595)	(1.460)	(−0.170)		
							PRE67		
5.	1.992	9.090	41.404	0.316	0.012	1.070	−0.085		.65
	(3.390)	(3.386)	(5.180)	(3.975)	(1.595)	(1.458)	(−0.130)		
							PRE73		
6.	1.982	9.140	41.693	0.314	0.012	1.080	−0.064		.65
	(3.374)	(3.862)	(5.368)	(3.916)	(1.595)	(1.461)	(−0.097)		
							PRE78		
7.	1.935	8.910	40.584	0.326	0.011	1.052	0.560		.65
	(3.364)	(3.791)	(5.194)	(4.111)	(1.538)	(1.438)	(0.863)		
							PRE81		
8.	1.954	9.186	41.690	0.317	0.012	1.069	−0.045		.66
	(3.205)	(3.872)	(5.346)	(3.847)	(1.496)	(1.426)	(−0.051)		
							POST67		
9.	2.01	9.066	41.281	0.314	0.012	1.079	−0.180		.65
	(3.387)	(3.846)	(5.231)	(3.987)	(1.600)	(1.469)	(−0.274)		
							POST68		
10.	1.716	10.418	43.006	0.321	0.012	1.105	1.195		.73
	(3.369)	(4.690)	(6.269)	(4.359)	(1.603)	(1.464)	(1.957)		

							POST73		
11.	1.980	8.890	45.282	0.271	0.012	1.120	1.505		.68
	(3.577)	(3.955)	(5.956)	(3.495)	(1.712)	(1.596)	(2.385)		
							POST78		
12.	1.825	9.572	41.933	0.340	0.012	1.071	−1.333		.73
	(3.655)	(4.359)	(6.207)	(4.644)	(1.569)	(1.428)	(−2.208)		
							POST65		
13.	1.985	9.099	41.562	0.315	0.012	1.071	−0.027		.65
	(3.351)	(3.860)	(5.214)	(3.980)	(1.595)	(1.459)	(−0.041)		
							POST69		
14.	1.958	9.593	41.093	0.322	0.012	1.078	−0.322		.65
	(3.407)	(3.808)	(5.258)	(4.030)	(1.587)	(1.466)	(−0.458)		
							POST74		
15.	2.213	10.071	37.968	0.305	0.011	1.038	0.981		.65
	(3.687)	(4.115)	(4.618)	(3.904)	(1.504)	(1.443)	(1.354)		
							BUSSUR1	BUSDEF1	
16.	1.664	8.346	48.460	0.288	0.012	1.246	0.031	−0.021	.67
	(2.794)	(3.552)	(5.668)	(3.636)	(1.670)	(1.695)	(1.253)	(−1.127)	
							POMPIDOU	GISCARD	
17.	1.058	12.890	83.990	0.257	0.012	1.175	−1.277	−3.375	.77
	(2.075)	(5.745)	(6.087)	(3.548)	(1.628)	(1.581)	(−2.365)	(−3.451)	

t-statistics in ( ).

†All models corrected for first-order autocorrelation by two-step full transform method.

*Presidential Popularity

*Prime Ministerial Popularity

Discussion

Marcello de Cecco

Economists seem to elicit from political scientists the same deference they themselves accord physicists—at least this is what can be inferred from the present fashion in political science of "reaction functions" employed to analyze the relevance of political variables. Reaction functions have enjoyed a varying degree of popularity in economics, beginning in the late fifties and early sixties. They then came under heavy fire and they were not used for a while. Now they seem to be in fashion again.

I will, in my comment on Mr. Woolley's paper, abstain from remarks on the econometric techniques he used. They apply to all analyses based on reaction functions, and they can be more adequately made by econometrician specialists, who are present at this Conference, and will no doubt explain them much better than I could. However, as Albert Hirschman wrote more than a decade ago, "There are serious pitfalls in any transfer of analytical tools and modes of reasoning developed within one discipline to another." (*Bias for Hope,* New Haven: Yale University Press, 1971, p. 3–4). This is particularly true when the transfer involves tools whose adequacy and precision have been heavily criticized.

I will thus limit myself to comments on the models of political and economic behavior on which Mr. Woolley bases his analysis. But most users of reaction functions fail to recontruct complete models from their reduced form equations. Still, it is the exact knowledge of this process which may be crucial.

My main point relates to the apparent "closedness" of Woolley's models of monetary policy determination. This policy variable is the interest rate throughout. And, among the determinants of interest rate dynamics, he seems to have elected not to include the interest rates prevailing on world financial markets. If he restricted his modeling to American monetary policy, his choice of determinants, of independent variables, could be justified somewhat. But the core of his analysis is the study of European countries like France, Germany, and Great Britain. And, in their cases, autarchic independent variables cannot possibly explain the whole of monetary policy changes. This prima facie conclusion rests on the whole body of international economic doctrine. Mr. Woolley should prove that what happens in the rest of the world does not matter, and that only varying combinations of domestic political determinants influence monetary policy in these countries.

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To be perfectly honest, one could say that Mr. Woolley introduces an international determinant by choosing what he calls "business confidence" as a determinant of monetary policy. If business confidence in the actions of a government declines, there will be capital exports and a consequent impact on the spot and forward exchange rates of the currency in question. Reequiliberating monetary policy changes will follow, as a result. Ever since the time Montesquieu first noticed it, business has been able to influence government policies by exporting capital and thus exerting pressure on interest rates. But I do not think this is the model Mr. Woolley has in mind when he chooses "business confidence" as an independent variable in the monetary authorities' reaction function. The monetary authorities of his models thus remain altogether impervious to what happens in the rest of the world.

I do not want to blow this illustration out of proportion. But I think it is an extremely important one, especially if we pay attention to the time period Woolley's analysis embraces. This is the period when the trade integration of Europe takes place, and, at the same time, world financial integration is proceeding apace. I presume one could have extracted quite good mileage from comparing the dynamics of the relative openness of those countries and its effect of their monetary policies in the period under review. One could then measure the relative importance of this variable with that of the various political variables, to find the three countries' degree of independence from exogenous variables. To put my criticism more vividly, it could very well be that German monetary authorities are better able than their British colleagues to resist policy changes dictated by politicians whose eyes are fixed on opinion polls. Nevertheless, both monetary authorities may be equally unable to resist the influence of policy changes dictated by politicians whose eyes are fixed on opinion polls. Nevertheless, both monetary authorities may be equally unable to resist the influence of policy changes dictated by American politicians whose eyes are fixed on opinion polls, changes whose effects are transmitted to the rest of the world through the international financial market.

Are such "exogenous shocks" to be considered really exogenous? Or should American political influence be included as an independent variable in the reaction functions of other countries' monetary authorities?

We could, of course, assume all this away by assuming that it has the same impact on all countries. But is this really justifiable? Or are American policy changes more important to German monetary policy than they are to French monetary policy? If this were true, it might very well be that Woolley's results could be falsified to a notable extent by the undetected presence of the "exogenous" variable which exerts its influence differently on different countries. Woolley's aim in this paper seems to have been to discover the relative influence of politicians and pressure groups on monetary policymaking in different countries. Relative autonomy from "exogenous" policy changes, I believe, is at least as important as relative autonomy from domestic political and pressure group influence.

Exchange Market Intervention in Four European Countries

Donald V. Coes*

The major industrialized nations have now had a decade of experience with floating exchange rates. Although many of the concerns about potential instability associated with greater flexibility appear in retrospect to have been exaggerated, so too were some of the optimistic expectations that flexible rates would relax some of the constraints imposed on macroeconomic policy in an open economy. The governments of all the major economies have felt compelled to intervene in exchange markets, in some cases relatively infrequently, and in others more or less constantly.

The resulting system of "managed floating" consequently bears only a limited resemblance to textbook models of flexible rate regimes or even to earlier periods such as the 1920s, when intervention was much less frequent. The recognition that the level of exchange market intervention may be regarded as a policy tool has changed the character of the discussion of appropriate exchange rate policy from the traditional dichotomous fixed-versus-flexible rates choice to that of determining the appropriate degree of official intervention in exchange markets. There is obviously no a priori theoretical presumption that the optimal policy would lie at either extreme of the continuum between full intervention (fixed rates) and zero intervention. Theoretical work on this question (Boyer, 1978; Turnovsky, 1983; Black 1983) has been limited by the stringency of the assumptions necessary to specify solvable models. It does suggest, however, that the optimal degree of intervention will depend on the structure of the economy, the type and source of shocks to which it is exposed, and the particular objectives of policymakers and the amount of information available to them and to other market participants.

In this context empirical investigation of recent experience with intervention may provide us with a better understanding of the choices and constraints policymakers perceive in deciding whether and how much to intervene than would theory alone. The experience of the four major Western European economies, France, West Germany, Italy, and the United Kingdom, is particularly interesting in this respect, since they present a rather wide range of approaches to exchange market policy over time and among each other.

In the first part of this paper I develop a simple framework for the

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examination of potential determinants of exchange market intervention. This approach is then applied in econometric estimates for the four countries for the 1973-1982 period and selected subperiods. Despite a number of difficulties with the definition, specification, and measurement of such a relationship, the results show that exchange rate policy in all four countries appears to have been motivated by resistance to short- to intermediate-run changes in the nominal exchange rate. Given the frequently stated aims of monetary authorities in "countering disorder" and resisting "erratic fluctuations" and exchange rate movements "which bear no relation to the fundamentals,"[1] this result is hardly surprising. A more subtle question is whether there are differing perceptions, both across countries and over time, of what constitute departures from "equilibrium" rates. Although our results suggest this may be the case, they also provide support for the view that central banks usually regard any change in the nominal rate as a move away from equilibrium. Of parallel interest are the variations in the degree to which monetary authorities may have used exchange rate policy for macroeconomic objectives, rather than simply for "smoothing" exchange rate movements. Although the evidence here is far from satisfactory, it does suggest that in several countries, the objectives of price stability, international competitiveness in goods markets, and possibly employment may have also played a role in exchange rate policy, at least in particular periods.

The second part of the paper addresses the questions of why monetary authorities wish to reduce exchange rate instability and whether or not they have succeeded in doing so. Despite widespread official abhorrence of "disorderly markets" and exchange rate volatility, it is not clear that the reduction of exchange rate uncertainty should necessarily be a primary policy objective, particularly if the suppression of uncertainty in the exchange market merely transfers the effects of shocks to other markets, such as the labor market, which may be less suited to handling risks.

Even if we accept greater exchange rate stability as a goal, however, there remains the question of the extent to which monetary authorities have actually attained this goal. The primary difficulty in answering this question is that of defining "instability" in an operational and economically meaningful way. Several approaches, each having specific limitations, are used in Part II. They tend to show mixed results for central banks' interventions in the past decade in terms of their effects in reducing exchange rate uncertainty. It appears difficult, however, to characterize the present situation as a "mismanaged float," as some critics of central bank policy have argued. Our examination of the data suggests that central banks have not had a destabilizing role, with the possible exception of the initial periods of the float, and that their performance may have improved in recent years.

[1]A number of these aims are discussed in the recent Report of the Working Group on Exchange Market Intervention, established at the Versailles summit in June 1982.

I. An Empirical Examination of the Determinants of Intervention

A. Variable definition and model specification

Exchange market intervention by central banks is easier to define in principle than it is to measure in practice. In theory, the purchases or sales of foreign exchange undertaken either by monetary authorities or on their behalf to influence the exchange rate, either in the sense of maintaining it at a given level or moving it toward a level desired by the monetary authorities, could be regarded as the measure of exchange market intervention. In several countries, notably the United States and West Germany, reported changes in official reserves of foreign exchange, net of SDRs and gold, probably come reasonably close to the true level of intervention for most of the period, once allowance is made for the interest earnings on the stock of reserves. In the German case, however, swaps between the Bundesbank and commercial banks after 1979 may produce variations in official reserves which do not reflect direct market intervention.

The situation is considerably more complicated in France, the United Kingdom, and perhaps most of all in Italy. In these countries changes in reserves do not fully reflect intervention for several reasons. Most important is the practice of using government-controlled entities to engage in transactions in exchange markets. In addition, in France and in Italy, the government in effect manages the foreign exchange positions of the commercial banks.[2]

For our purposes, these complications are important in the sense that they create a presumption that the true level of official intervention will be understated when published official reserve data are used. It seems plausible to assume, however, that hidden or "off-the-books" intervention would usually have the same sign as reported reserve changes, so that the latter figure might be regarded as a proxy for the true level of intervention. There is little doubt, however, that it is an imperfect one; the poor fit several of the regressions reported below probably derives primarily from this source.

The approach used in this study does not distinguish between sterilized and unsterilized exchange market intervention, as it does not directly enter the single-equation model explaining intervention used here. The distinction would in principle be relevant, however, to the long-run effects of intervention on the real exchange rate if we were to attempt to explain intervention as part of a larger structural model, since intervention-induced changes in the monetary base could have price level effects. In this case it would appear reasonable to assume that the relation between several of the potential explanatory variables and the intervention decision would be affected by the degree to which the intervention was sterilized.

[2]One of the most extensive investigations made by an academic researcher of various ways in which intervention may be partially obscured in the published data was made by Taylor (1983).

A number of variables might be considered as potential determinants of the level of intervention. If the monetary authorities regard one of their principal objectives as the maintenance of "stability," then both the actual exchange rate and some equilibrium rate from which it is perceived to have departed should affect the intervention level. Although the choice of the former is straightforward, we have no direct observation of the rate which the authorities regard as an "equilibrium" one. A number of alternatives suggest themselves, and in fact one of the interesting results in the estimates reported below is that the authorities' perceptions of departures from the equilibrium rate may differ among countries.

The simplest model is that any departure from the prevailing nominal rate is a disturbance which the authorities resist. In this case the equilibrium rate is simply the current rate lagged one time period. Such an approach is equivalent to static expectations with respect to the nominal exchange rate, and in a world with differential rates of inflation might be regarded as embodying a form of money illusion.

A theoretically more satisfactory approach is suggested by the distinction between "expected" and "unexpected" exchange and interest rate changes used by Isard (1979), Dornbusch (1980) and others. If interest rate differentials between the home and foreign currency correspond to the expected rate of depreciation of the home currency, then "unexpected" exchange rate changes would be equal to observed changes minus the amount embodied in the interest rate differential. This approach has been used by Dornbusch (1980) in explaining German intervention in the dollar/DM market, and would appear appropriate when the degree of capital mobility between the two currencies is high, as would be the case for the dollar/DM rate or the dollar/sterling rate.

An alternative approach, potentially more robust to restrictions on the degree of capital mobility, exploits the idea of long-run purchasing power parity. In this view, expressed in a relative form, changes in the exchange rate over a long period should correspond to differential price level changes in the two currencies, so that the expected depreciation (appreciation) of the home currency would equal the positive (negative) difference between the home and foreign inflation rate. Although this approach does not require a high degree of capital mobility, it has other drawbacks. It is equivalent to assuming static expectations with respect to the real exchange rate. Differential rates of productivity growth, demand changes, and currency portfolio shifts could all compromise the validity of this approach. In addition, it raises the practical question of which price index to use as a measure of inflation. All three of the approaches discussed here were used in the estimates reported or summarized below, since each provides a plausible explanation for monetary authorities' perceptions of departures from an "equilibrium" rate.

As noted earlier, one of the interesting questions which arises in an examination of intervention experience is the degree to which other objectives besides "stability" have affected central bank intervention decisions.

Although we might assemble a rather long list of potential variables, including possible noneconomic ones, the estimates in this paper use only a few.

If the monetary authorities regard their trade balance or current account as responsive to exchange rate changes, then one obvious use of exchange market intervention is to pursue a kind of "beggar-thy-neighbor" policy of real depreciation when unemployment rates rise above politically acceptable levels. This view would argue for the inclusion of the unemployment rate or a related measure of labor and/or factor market pressure in general as one of the determinants of the intervention level. An alternative approach would treat the current account balance or the trade balance as an intermediate target which is positively related to the level of goods market pressure and employment. In this case a deterioration in the current account would lead to intervention to drive down the relative price of the home currency, and hence to purchases of other currencies by the central bank.

From a central bank point of view, one of the major macroeconomic targets is the maintenance of domestic price level stability. In some cases, for example Germany, the central bank is formally charged with this responsibility.[3] In these circumstances, an increase in the domestic price level would induce the monetary authorities to use the exchange maket as a partial "safety valve" by promoting real appreciation to lower the world price component of the domestic price level. In an economy with a relatively greater tolerance for inflation, however, the anti-inflationary effect of real appreciation might be outweighed by concern over the maintenance of international competitiveness in the face of a rising domestic price level.

The preceding discussion may now be summarized in the general form of the intervention equation

$$(1)\ \mathrm{ITV} = f\,[\,(E/\bar{E}),\ U,\ \dot{P}]$$

where ITV is the level of intervention, E the actual nominal exchange rate and $\bar{E}$ the "equilibrium" rate, U the unemployment rate, and $\dot{P}$ the rate of inflation. In the estimates below a log-linear form of (1) was adopted, in the form

$$(1')\ \ln \mathrm{ITV} = a + b_1(\dot{e}-\bar{e}) + b_2 U + b_3 \dot{P}$$

where $\dot{e}$ is the logarithmic change in E.

As noted above $\dot{\bar{e}}$ may be determined in several different ways. The dependent variable was defined as the percentage change in reported official foreign exchange reserves between periods, minus the increase in reserves due to accrued interest. The latter was calculated by multiplying the lagged reserve stock by the U.S. Treasury bill rate. The exchange rate used was an index of the value of the home currency, so that a rise in E ($\dot{e} > 0$) corresponds to an appreciation of the home currency. Both a dollar-based index and the IMF's multilateral weighted effective exchange rate were

[3]The priority given to price stability is discussed in a recent paper by Hodgman (1983).

used. The unemployment rate was measured as a percentage of the civilian labor force, except in the case of France. Since a published rate was not available in this case, the log of the total number of registered unemployed was used. The inflation variable was calculated from the consumer price index.

B. Estimates for the four countries

Equation (1′) was estimated for the four countries of our study. Quarterly data were used for the most part, with monthly estimates made in a few cases as noted. Data sources are discussed in the appendix.

As noted in the preceding section, our maintained hypothesis is that a rise in the value of the home currency above its "equilibrium" rate ($\dot{e} > \bar{e}$) will be resisted, leading to purchases (sales) of foreign (home) currency. Thus we would expect the exchange rate change coefficient b_1 to be positive. As unemployment increases, a "beggar-thy-neighbor" policy would imply intervention to induce a real depreciation (hence purchases of foreign currency). Thus the unemployment rate coefficient b_2 should be positive if this effect exists. The expected sign of the inflation coefficient (b_3) is ambiguous. If concern with domestic inflation dominates preoccupation with international competitiveness in goods markets, we would expect the central bank to induce a real appreciation, hence selling foreign currency. In this case b_3 would be negative. If competition is relatively more important, and monetary authorities believe that nominal exchange change is lagging behind the inflation differential, then b_3 could be positive.

Initial estimates using ordinary least squares showed a significant level of first order serial correlation, positive in the French and British data and negative in the Italian case. All equations (including the German ones, in which the problem appeared less serious) were therefore reestimated using the Cochrane-Orcutt transformation. The estimates for the entire period run from 1973–III through 1982–II except as noted. Table 1 reports the results for the entire period, using three different measures of e. In the first case (model A), the authorities are assumed to regard any departure of the rate as a movement from equilibrium, so that the explanatory variable in this case is the total percentage change in the exchange rate. In models B and C, the short-run interest differential and the wholesale price index change are used respectively. The t-statistics for each coefficient are shown in parentheses below the coefficient.

A number of features of the equations should be noted. First, regressions for the entire period can at best explain only about 40 percent of the variation in intervention. In one case (model C for France) the equation is not significant at the 5 percent level. There appear to be several reasons for this, in addition to the data problems mentioned earlier. The model is not explaining the behavior of a large group of decisionmakers like consumers, but the discretionary behavior of a few central bank authorities. It would be naive to expect that a linear rule like (1′) would be anything more than a

Table 1
Estimates of Exchange Market Intervention

	Constant	b_1 $(\dot{e}-\dot{\bar{e}})$	b_2 (U)	b_3 (P)	R^2
France [73:3–82:2]					
(A)	−.16	.50	.04	−.11	
	(.40)	(3.14)	(.54)	(.09)	.32
(B)	−.20	.43	.04	−.05	
	(.46)	(2.73)	(.56)	(.04)	.29
(C)	−.03	.31	.02	−.26	
	(.08)	(1.57)	(.18)	(.10)	.19
Germany [73:3–82:4]					
(A)	.03	.15	−.00	−.94	
	(.78)	(2.59)	(.08)	(1.91)	.32
(B)	.04	.14	.01	−.97	
	(.80)	(2.51)	(.14)	(1.97)	.31
(C)	.05	.15	−.00	−.96	
	(1.34)	(2.73)	(.39)	(1.98)	.33
Italy [73:4–82:2]					
(A)	−.12	.43	−.04	2.31	
	(.35)	(1.73)	(.52)	(2.46)	.34
(B)	−.17	.49	−.03	2.29	
	(.52)	(2.08)	(.41)	(2.54)	.36
(C)	−.10	.60	−.04	2.07	
	(.32)	(2.15)	(.60)	(2.36)	.37
United Kingdom [73:2–82:3]					
(A)	.09	.38	−.01	−.48	
	(1.12)	(3.54)	(.99)	(1.51)	.40
(B)	.08	.36	−.01	−.51	
	(.95)	(3.39)	(.79)	(1.56)	.38
(C)	.10	.37	−.01	−.65	
	(1.23)	(3.74)	(1.11)	(2.07)	.40

rough first approximation. In addition, there is evidence, which I discuss below, that structural changes occurred during the time period of these regressions. When the model is estimated for subperiods, or when potential structural shifts are permitted, the explanatory power of the model improves.

Despite the poor overall quality of many of the estimates, "leaning against the wind" or central bank resistance to market changes in the rate comes through strongly. For the decade as a whole, the unemployment coefficient b_2 is not significant for any of the four countries. Despite record levels of unemployment during part of the period, our estimates suggest that the monetary authorities in the four countries made no attempt to pursue "beggar-thy-neighbor" policies. Given the fear in the early seventies that the breakdown of the Bretton Woods system might lead to competitive devaluations in the presence of flexible rates and high unemployment, this is a reassuring conclusion. As is shown in more detail below, however, the unemployment coefficient may have been significant in certain subperiods in several countries.

The inflation coefficient, b_3, shows a marked difference among the four countries. It is strongly and significantly negative in Germany. This is consistent with a monetary and exchange market policy which places a high priority on domestic price level stability. In France and the United Kingdom it also has a negative sign, but is not strongly significant in either country. Italy constitutes an interesting exception, showing the opposite pattern from the German one. The positive and significant coefficient in this case must be treated with some caution, due to the poor quality of the Italian intervention data. Nevertheless, it is a plausible result when the potentially greater tolerance of the Italian economy to inflation and its generally weak payments position during much of the past decade are considered.[4]

Comparison of the three alternative specifications for exchange rate change permits us to address the issue of whether central banks differ in their concept of "disequilibrium." In the French case there is a noticeable deterioration in the size and significance of the b_1 coefficient when models B and C are used. In other words, the greatest explanatory power comes from a model which postulates that the French monetary authorities regard any departure of the nominal rate from the preceding period as a movement to be resisted. In this case, the equilibrium rate is simply the rate in the past.

This does not appear to be the case in the other three countries. Differences in b_1 among the three models are small and not significant. In all three cases the price differential model (C) appears slightly superior, suggestive of some attention to inflation differentials in formulating intervention policy, but the data are simply not adequate to discriminate among the alternative models.

A remaining possibility is that monetary authorities use past interest rate or inflation differentials as a guide to changes in the equilibrium rate. Regressions embodying this hypothesis were tested for the four countries, using lagged values of the inflation differential or the interest differential and current exchange rate changes. The results were not significantly different from those reported here.

C. Extensions of the basic model

The regressions reported in Table 1 form part of a larger set which were estimated but for lack of space are only summarized here. Among the issues addressed in different specifications were simultaneity, time lags, and a number of alternative explanatory variables. The basic model was also tested over subperiods of the past decade, corresponding in the French, German, and Italian cases to the periods before and after the establishment

[4]Compared to the other three economies, the degree of inflation indexation in the Italian economy is much higher. Some of the macroeconomic implications have been examined by Modigliani and Padoa-Schioppa (1978).

of the European Monetary System, and in the British case to the periods before and after the recuperation of sterling in late 1976.

Potential simultaneity might compromise single equation estimates of the model (equation 1′) if intervention actions have a contemporaneous effect on private participants in the exchange market. In an attempt to deal with this potential problem, the current account balance and the inflation rate were treated as exogenous variables in two-stage least squares estimates, correcting for first order serial correlation. The exchange rate and the level of intervention were both treated as endogenous variables under this specification. The resulting coefficient estimates for exchange rate change in the determination of the intervention level were not significantly different from those of the single equation estimates. This result should be treated with caution, however, due to the difficulty of finding adequate instruments for such a procedure.

When lagged values of the inflation rate and the unemployment rate were substituted for contemporaneous values, there was a slight deterioration in the explanatory power of the model for Italy, an improvement in the French case, and little change for either the United Kingdom or Germany. This particular issue was not explored further, but it is clear that lags in the collection of data and their processing and interpretation by monetary authorities might justify lagging the macroeconomic variables in equation (1′) It does not seem reasonable, however, to lag the exchange rate variable in a quarterly model, since it is observed by the central bank without a time lag.

The regressions in Table 1 all used an index of the bilateral U.S. dollar/home currency rate in the construction of the exchange rate change variable. In several European countries, particularly France and Italy, more attention may have been given to other bilateral rates, even before the EMS began to operate. All regressions were therefore reestimated using an index of the exchange rate based on the IMF's Multilateral Exchange Rate Model. The results were generally poor, even in the French and Italian cases, although "leaning against the wind" ($b_1 > 0$) continued to be strongly significant in most estimates. A potential explanation for this result is that monetary authorities can much more easily observe a bilateral rate than they can an effective rate like that of the MERM. An alternative approach, not attempted in this study, would be to use more than one bilateral rate as explanatory variables.

As was noted earlier, the current account might be used as an explanatory variable in place of the unemployment rate. This specification was tried for all four countries. Like the unemployment rate, it was not significant in any of them. It is possible that its explanatory power might be enhanced if a distinction were made between expected and unexpected changes in the current account along the lines suggested by Dornbusch (1980). In the Italian case, one further specification change was made, under the assumption that the available quarterly unemployment rate used in the basic model might be a poor indicator of the underlying level of excess demand or supply in factor markets. The rate of utilization of industrial capacity, a series provided by the Banca d'Italia, was substituted for the unemployment rate. Like the latter, its coefficient was not significantly different from zero.

Comparison of the three models for each country suggests that the monetary authorities' perception of the "equilibrium" exchange rate is approximated about as well by the preceding period's rate as it is by a rate based on either interest or inflation differentials. This conclusion was generally borne out in a further test, using a more complex model of equilibrium exchange rate determination, based on a well-known model of J.A. Frankel. If we assume long-run relative purchasing power parity and a stable demand for money, then the equilibrium exchange rate may be expressed in log form as[5]

$$(2)\ \dot{\bar{e}} = \dot{p}^* - \dot{p} = (\dot{m}^*-\dot{m}) - \phi(\dot{y}^*-\dot{y}) + \lambda(\dot{r}^*-\dot{r})$$

Ignoring macroeconomic effects on intervention like inflation or unemployment, this yields an intervention equation of the form

$$(3)\ \ln ITV = c_1\dot{e} + c_2(\dot{m}^*-\dot{m}) + c_3(\dot{y}^*-\dot{y}) + c_4(\dot{r}^*-\dot{r})$$

If intervention is proportional to the gap between actual E and equilibrium E, or $\Theta(\dot{e}-\dot{\bar{e}})$, then $c_1 = -c_2 = \Theta$ and $c_3 = \Theta\phi$ and $c_4 = -\Theta\lambda$. Equation (3) was estimated with and without the linear restriction $c_1 = -c_2$ for all four countries. Sources of the "rest-of-world" variables $\dot{m}^*$, $\dot{y}^*$, and $\dot{r}^*$ are discussed in the data appendix. Only in the United Kingdom case were the results an improvement over the naive $\dot{\bar{e}} = 0$ model. In the other countries the effects of the monetary growth, income growth, and long-run interest rate differentials were usually of the theoretically correct sign, but not significant.

It was noted earlier that there are good a priori reasons to expect structural changes in the intervention behavior of monetary authorities over the floating rate period from 1973-1982. In France, Germany, and Italy the formal intervention commitments of membership in the European Monetary System, which began operating in March 1979, could be expected to have a marked effect on intervention policies in all three countries.[6] In the United Kingdom, the end of the long decline in the pound in late 1976, following borrowing from the IMF and other monetary authorities, appears to mark a turning point in British exchange rate policy.

Two sets of estimates, corresponding respectively to pre- and post-EMS for the first three countries and to the pre- and post-sterling reversal

[5]As the exchange rate used in this study is an index of the value of the home currency, rather than the domestic price of a unit of foreign currency, as in Frankel's model, the logarithmic change in the equilibrium rate is the difference between the log change in the foreign price level and the domestic one, rather than vice-versa.

[6]The introduction of the intervention commitments under the EMS may have introduced a degree of real exchange rate fixing. For a development of this argument, see Thygesen (1981).

Table 2
Intervention Estimates for Specific Subperiods

	constant	b_1 $(\dot{e}\text{-}\bar{\dot{e}})$	b_2 (U)	b_3 $(\dot{P})$	R^2
France					
[73:3–79:1]	−1.65	.43	.31	2.84	
	(2.41)	(2.12)	(2.51)	(1.52)	.43
[79:2–82:2]	3.17	.26	−.59	−1.28	
	(2.02)	(1.27)	(1.98)	(.51)	.56
Germany					
[73:3–79:1]	−.02	.23	.01	−.74	
	(.54)	(3.78)	(1.48)	(1.62)	.56
[79:2–82:4]	.09	−.05	−.01	−1.57	
	(1.05)	(.53)	(1.01)	(1.23)	.16
Italy					
[73:4–79:1]	−1.38	.48	.28	3.42	
	(3.23)	(1.43)	(2.83)	(3.11)	.51
[79:2–82:2]	.29	.23	.06	−.15	
	(.55)	(1.19)	(.67)	(.13)	.17
United Kingdom					
[73:2–76:3]	.08	.41	.00	−.50	
	(.78)	(1.75)	(.00)	(1.37)	.45
[76:4–82:3]	−.04	.32	.01	−.35	
	(.46)	(2.60)	(.60)	(.87)	.48

in late 1976 are summarized in Table 2. The estimates shown in Table 2 are for model (A), in which the exchange rate change variable is not adjusted. Estimates for the other two models were made for the same time periods, but are not reported here, since they differed little from those shown. As can be seen from the first three sets of regressions, there is a noticeable change in the model with the inception of the EMS, with a virtual breakdown in the Italian and German cases. With the exception of Germany in the post-EMS period, however, "leaning against the wind" appears to be well supported by the data.

In none of the four countries, however, does the effect appear as strong as was the case in the earlier part of the floating rate period. The unemployment coefficient, b_2, is significantly positive for France and Italy in the earlier period. In none of the three EMS members do "beggar-thy-neighbor" effects appear in the post-1979 period. The anti-inflationary element of German intervention policy still appears in the latter period, but it is not significant. Among the four countries, only the estimate for the United Kingdom appears stable over the whole period. A Rao-Chow test for equality of the coefficients in this case does not reject the hypothesis of stability.

The generally weaker explanatory power of the exchange rate change variable in the three EMS members after 1978 is consistent with the new EMS intervention rules. As the explanatory variable is the bilateral dollar/

Table 3
Real and Nominal Exchange Rate Change

Real		France	Germany	Italy	United Kingdom
[Jan 71–Mar 73]	m	1.49	3.22	−0.40	−0.01
	sd	3.40	2.49	1.83	5.10
[Apr 73–Dec 76]	m	1.34	2.06	−6.32	−3.31
	sd	7.72	7.42	6.50	6.30
[Jan 77–Feb 79]	m	−0.31	2.23	−0.44	1.08
	sd	4.53	2.35	3.05	5.34
[Mar 79–Dec 82]	m	−2.26	−3.38	0.12	5.98
	sd	5.58	6.55	5.50	9.97
Nominal					
[Jan 71–Mar 73]	m	0.69	2.71	−1.06	−3.07
	sd	2.99	2.46	1.59	4.47
[Apr 73–Dec 76]	m	0.91	6.07	−11.37	−9.11
	sd	8.01	6.55	7.10	5.83
[Jan 77–Feb 79]	m	−1.77	6.66	−7.17	−2.55
	sd	4.11	2.26	3.70	6.27
[Mar 79–Dec 82]	m	−4.77	0.69	−6.97	2.94
	sd	6.50	6.30	5.55	8.51

home currency rate, a reduced emphasis on this rate in central banks' intervention decisions would explain the fall in the size and significance of the b coefficient among the three EMS members.

II. Intervention and Exchange Rate Uncertainty

The results of Part I provide strong support for the view that central bank intervention policy in the four countries during the past decade placed a heavy emphasis on exchange rate stability. What is less clear is whether the goal was stability in the nominal rate or in a real rate, adjusted for inflation differentials among countries. The data does not permit us to discriminate satisfactorily among these possibilities (models A and C above), but it does suggest that French policy may have been more nominally oriented, while in the other countries an inflation-adjusted target rate does a marginally better job explaining intervention. Our estimates suggest, moreover, that although apparently less important than exchange rate variability, macroeconomic considerations like inflation may have influenced intervention policy in several cases.

Under these circumstances, when the objectives of central bank policymakers vary over country and over time, we cannot really pass judgment on their success (or failure), despite a long tradition of such exercises among academics. Given the central role that avoidance of exchange rate volatility appears to have played in intervention policy over the last decade, it is worthwhile examining both nominal and real exchange rate variability in the four countries. Table 3 reports the percentage change in both rates over

12 months, based on monthly data from January 1970 through December 1982. The nominal rate is the IMF's index of the effective exchange rate, while the real rate is the index multiplied by the ratio of the domestic consumer price index to the IMF's aggregate CPI for the industrial countries. The use of these particular variables and time periods rests on several considerations.

The use of bilateral rates would tend to exaggerate rate variability, which could reflect movements in either currency. Although effective rates do not eliminate the problem completely, it is alleviated. The choice of the CPI rather than the WPI is due to the greater coverage of the former index. If exchange rate variability is an important phenomenon at a microeconomic level, then it is desirable to include nontradables, for which the CPI is a better proxy. In this sense we can link changes in the real exchange rate to changes in the relative price of tradables to nontradables.

The choice of a 12-month period is in part arbitrary, but is based on the assumption that in goods and factor markets exchange rate changes of a shorter duration may be less serious for firms and consumers than are longer ones. This is due in part to the fact that forward cover for periods of a year or more is difficult to obtain; in addition, the reduction of exchange risk in trade through leading and lagging and other forms of adjustment of the net foreign currency position may be practical for short periods, but becomes increasingly difficult as the time period lengthens. Mean percentage changes in real and nominal rates, as well as their standard deviations, are shown in the table for four periods, the first corresponding to the period immediately preceding generalized floating in March 1973 and the last since the start of the EMS.

Examination of the table shows that real and nominal variability are rather closely related. Interpreted another way, there is rather meager evidence of much of a purchasing power parity effect at work during the past decade. If it had held even moderately strongly, changes in real rates would have been much smaller in relation to nominal rate changes. Only the Italian case shows a substantial gap between nominal and real change. This situation provides some clue to our results in Part I: if central banks target on past nominal rates (model A) rather than an inflation-adjusted rate (model C), it may simply be due to the rather weak performance of PPP in exchange rate determination, a fact well documented by J.A. Frenkel (1981) and others. Hence intervention policies which were targeted at stabilization of the nominal rate, as appears to have been the case in France, would in fact have partially stabilized the real rate as well, since little of the movement in the nominal rate can be explained be inflation differentials.

If exchange rates moved fairly smoothly at rates corresponding to interest rate differentials or other factors, then the means reported in the table might still have the same magnitudes, but the standard deviations would be small. Their size could be regarded as a measure of exchange rate uncertainty, if we assume that the "fundamentals" behind the trend (mean) are approximately known. As is clear from the table, uncertainty defined in this way worsened after 1973 and after some decline in the 1977-79 period, appears to have risen once more. With the exception of the United Kingdom in the most recent period, real exchange rate uncertainty appears to have been roughly comparable among the four countries in each period since 1973.

It does not appear possible to construe the data of Table 3 to argue that official intervention had either strong stabilizing or destabilizing effects on exchange rates, either nominal or real. Although the uncertainty attaching to both nominal and real rates clearly increased after 1973, the return to a form of limited fixing under the EMS rules does not appear to have reduced either real or nominal rate uncertainty in the three members in comparison to the preceding period.

One interesting, if somewhat controversial approach to answering the question of whether official intervention has been stabilizing or destabilizing is the "profitability" criterion recently used by Taylor (1982, 1983). In essence, this criterion derives from Friedman's (1953) well-known argument that speculators who make profits by buying low and selling high will tend to stabilize prices, since their purchases will occur in periods of lower prices and sales during higher ones. Using this method Taylor calculated that the central banks of the four countries lost about $8.3 billion in intervention between April 1973 and the end of 1979. He concluded that the net effect of official intervention was thus destabilizing.

The profitability criterion has a number of drawbacks, some of which have been pointed out recently by Mayer and Taguchi (1983). Perhaps the most serious of them is that the criterion is highly sensitive to the choice of exchange rate used to calculate profits or losses if the central bank were actually to liquidate its foreign exchange position. In addition, to be strictly correct, it must take into account the interest differential between the two currencies, which in turn must equal trend appreciation or depreciation of one currency against the other. As this last requirement is unlikely to hold, except in an economy with perfect foresight, the usefulness of the criterion is limited.

Despite these rather severe limitations, application of the criterion may be a useful exercise. Using reported changes in official reserves, average monthly spot rates, and the interest differential between the U.S. Treasury bill rate and comparable local ones, I made a number of sample calculations for the four countries, assuming a zero net foreign currency position at the beginning of the period. As the results are highly sensitive to the end period exchange rate, they do not appear very meaningful in themselves and are not reported here. Several characteristics of the calculations, however, are worth noting. In several cases, most prominently in the United Kingdom and on a smaller scale in Italy, the losses appear attributable to periods when the central bank resisted what in retrospect may have been a change in "fundamentals," rather than the consequence of shorter term "smoothing" operations. One further feature is the extent to which time has healed some old wounds; the recent sharp rise in the dollar turns a number of losses which were large at the time Taylor made his calculations into substantial profits. It is just as difficult to attribute these profits to central bank success at stabilization, however, as it is to link past losses to destabilizing intervention.

Even if we were to conclude, however, that central banks can provide a greater degree of exchange rate stability through official intervention, there remains the question of how high a priority greater stability should receive among policymakers' goals. A greater degree of exchange rate fixing transfers the disturbance in the exchange rate to one in the money supply. Although sterilization may partially offset this, the composition effects may have real effects, in addition to the problems arising from potential limits to the degree sterilization is possible. Viewed in this larger context, the choice of the level of official intervention in exchange markets is a choice about which markets or sectors of the economy will bear the consequences of a shock.

An adequate answer to this question would require us to specify in considerable detail the links between markets and the ways in which individual participants in these markets bear or avoid risk. The fact that "leaning against the wind" is perhaps the single most important feature of central bank intervention policy suggests that monetary authorities believe exchange rate variability has real costs for participants in the exchange market. Whether or not this is in fact so is essentially an empirical question. In countries in which the combination of high inflation and nominal fixing once created a high degree of real exchange rate uncertainty, as was the case in several Latin American economies, the adoption of a crawling peg and the consequent reduction of real exchange rate uncertainty have had important real effects.[7] Evidence that exchange rate uncertainty matters this much in Europe and the industrialized countries as a whole is harder to come by; in one of the few empirical studies addressing this question Hooper and Kohlhagen (1978) concluded that exchange risk had no significant quantity effect on trade, despite a significant price effect.

Summary and Conclusions

The most prominent common feature of official intervention in the exchange markets in France, Germany, Italy, and the United Kingdom in the past decade of floating is resistance to short- and intermediate-run movements in exchange rates, or "leaning against the wind." Although this implies a judgment that the actual rate has departed from a target or equilibrium rate, an examination of the data does not indicate with any clarity how monetary authorities define this equilibrium rate. Macroeconomic goals such as price stability may have played a role in intervention policy in some cases, but beggar-thy-neighbor use of the exchange market for domes-

[7]The Brazilian experience after its adoption of a crawling peg in 1968 is discussed by Coes (1981).

tic employment purposes does not appear to have been a problem in the past decade.

Despite their clear preference for greater exchange rate stability, the evidence that central banks' intervention policies have actually provided it is not clear. Exchange rate uncertainty, both nominal and real, increased after 1973, and has not diminished noticeably with the advent of the EMS. Attempts to judge the performance of central bank intervention policies on the basis of profitability lead to ambiguous answers, due to the problem of choosing the appropriate end period valuation rate.

Finally, even when intervention may have diminished exchange rate uncertainty, it is not clear that the uncertainty has not simply been displaced to other markets. A fuller answer to this question, which must come from both theoretical modeling and empirical investigation of the way markets bear and allocate exchange risk, is central to any evaluation of official intervention policies.

Data Appendix

The quarterly and monthly data used in this study came primarily from the IMF tape (April 1981) and was updated through 1982 using various issues of the IMF's *International Financial Statistics*. Exchange rate series used were the index of the average rate (ahx) and the effective rate (ahm). Official foreign exchange holdings net of gold, SDRs and the Fund position (series 1dd) were not adjusted for swaps or concealed intervention. Series 63 and 64 were used for wholesale and consumer prices. Interest rate series used were the call rate (60b) and the long-term public authorities rate (61), as well as 60c (U.S. Treasury bill rate). The domestic money supply was the adjusted series (34b) and national product at 1975 prices the series (99ar). The "rest of world" money supply was the money supply for the industrial countries (code 110) of the IMF tape. "World" income was based on an index of industrial countries' exports plus imports deflated by the U.S. WPI. "World" interest rates and wholesale prices were respectively a weighted average of the long-term rates (series 61) and wholesale prices (63) for the United States, Japan, Germany, France, the United Kingdom, and Italy, with the respective weights 0.45, 0.18, 0.13, 0.10, 0.08, and 0.06. The weights were based on 1975 GDP as reported in the World Bank's *World Development Report* (1981). Unemployment rates were taken from various issues of the OECD's *Main Economic Indicators*. For France the total number of registered unemployed was used.

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Discussion

Norman S. Fieleke*

The always controversial issue of exchange market intervention has become even more controversial because of the relatively high exchange value of the dollar. Controversy over intervention policy at the 1982 Versailles summit induced the seven participating governments to commission a study on their recent experience with intervention, and the resulting report of the study group was released last April.[1] Included in the report is a statement of the objectives that the various countries have sought to attain by means of intervention. The stated objectives run the gamut from "countering disorder" to "buying time for reassessment of economic policy." However, the report does not present any empirical tests which would allow us to rank these objectives in terms of their ability to explain the intervention which has taken place; there is no guidance on the quantitative importance of the various reasons for intervention. This omission points up the need for studies such as the one undertaken by Don Coes.

As Coes recognizes, there is no presumption that a country should choose between the polar extremes of either a fixed or a freely floating exchange rate. On the contrary, the optimal arrangement might entail a different degree of flexibility between every pair of currencies. Traditionally, what is really involved here are differing degrees of monetary union; foreign exchange intervention is simply a form of monetary policy, and a truly fixed exchange rate arrangement is tantamount to a monetary union.[2]

Contrary to this traditional viewpoint, exchange market intervention need not be a form of monetary policy. Of course, definitions are inherently arbitrary, but I think it is useful to propose the following distinction: exchange market intervention is equivalent to monetary policy only if the intervention is allowed to change the monetary base; by contrast, if intervention is sterilized so that it does not affect the monetary base, then intervention is separate and distinct from monetary policy.[3]

This distinction between sterilized and unsterilized intervention is disregarded in much of the empirical research on intervention reaction functions, including the research of Coes. It is to be hoped that monetary

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[1] *Report of the Working Group on Exchange Market Intervention*, March 1983.

[2] Jacob A. Frenkel and Joshua Aizenman, "Aspects of the Optimal Management of Exchange Rates," *Journal of International Economics*, vol. 13 (November 1982), p. 254.

[3] See Michael Dooley, "An Analysis of Exchange Market Intervention of Industrial and Developing Countries," International Monetary Fund, *Staff Papers*, vol. 29 (June 1982), pp. 233-69. As pointed out in the *Report of the Working Group* (p. 6), intervention which does not affect the base may nonetheless affect other monetary aggregates.

authorities know the difference between sterilized and unsterilized intervention. If they do, it is not likely that they will undertake sterilized intervention for the same reasons and to the same degree that they undertake unsterilized intervention, even in the short run. Therefore, the dependent variable in the reaction function should be either sterilized intervention or unsterilized intervention; it should not be a hybrid.

An illustration of this point may be helpful. Suppose the German central bank wanted to retard a depreciation of the mark against the dollar. A sale of dollars in exchange for marks that was allowed to reduce the German monetary base would obviously be more effective in supporting the mark than a sale of dollars whose monetary base effect was offset by something like a central bank purchase of a mark-denominated security. Thus the German central bank presumably would undertake less intervention if it were permitting the monetary base effect, so that the coefficient for the exchange rate in the reaction function would vary depending upon the change to be allowed in the monetary base.

Of course, there are other problems in defining intervention, as Coes points out. Aside from such definitional problems, another major hurdle confronts all those who attempt to discern the nature of intervention reaction functions. This hurdle is the difficulty of modeling the process of exchange rate determination.

There is no dearth of models of the exchange rate. The sizable variation in exchange rates together with the macroeconomic importance of the exchange rate made it inevitable that economists would devote considerable effort to constructing models to explain exchange rate movements. One result is that the number of published exchange rate models, or model variations, must by now exceed the number of currencies in the world. Prior to the breakdown of the Bretton Woods system, no self-respecting international economist would be caught without his own proposal for international monetary reform; now the same economist must have his own model of the exchange rate.

The multiplicity of competing models testifies not merely to our fractiousness but to our failure to explain the process of exchange rate determination. A recent study by Meese and Rogoff concludes that representative exchange rate models forecast no better out of sample than a random walk model.[4] The absence of a reliable exchange rate model makes it difficult for Coes to succeed in explaining why central banks intervene as they do in the foreign exchange markets.

The problem is one of avoiding bias and inconsistency arising from simultaneity, from the fact that intervention not only responds to exchange rate movements but may influence them at the same time. In an effort to deal with this problem, Coes adopts a two-stage least squares technique,

[4] Richard A. Meese and Kenneth Rogoff, "Empirical Exchange Rate Models of the Seventies: Do They Fit Out of Sample?," *Journal of International Economics*, vol. 14 (February 1983), pp. 3-24.

but his use of the technique is handicapped by the lack of a reliable model setting forth the exogenous determinants of exchange rate movements.[5] As a result, we cannot be very confident that the estimated response of intervention to exchange rate movements is free from bias or inconsistency.

Some other difficulties also arise from the lack of a reliable model of the exchange rate. Because we cannot model the "long-run" equilibrium exchange rate, it is not possible to test whether the monetary authorities intervene in order to smooth out deviations from that rate. Nor is it easy to determine whether intervention is a response to unexpected changes in the exchange rate, since we cannot estimate what changes were expected. On this matter, Coes follows the lead of Dornbusch in taking the interest differential as an index of expected exchange rate change. This procedure presumes that there is no foreign exchange risk premium, a question on which the jury is still out.

Aside from the modeling of exchange rates, some other questions are raised by Coes's reaction functions. For example, is it reasonable to represent international competitiveness simply by the domestic rate of inflation, or would it be better to use the differential between domestic and foreign inflation? In this connection, Coes's statistical results indicate that before 1979 the Italian authorities typically sold their own currency when the Italian rate of inflation accelerated, and he suggests that the motivation was to remain competitive. Perhaps so, but it does seem a bit out of character for a central banker to take pains to depreciate his currency in the foreign exchanges when internal inflation is rising. One wonders what is the estimated coefficient on inflation lagged one period, since, as Coes points out, inflation data may not be available to the authorities for the period in which intervention occurs.

The chief conclusion which Coes draws from the reaction functions is that the monetary authorities lean against the wind, or intervene so as to resist change in the exchange rate in the short run. This conclusion holds for France, Germany, Italy, and the United Kingdom if all nine years are included in the sample; but if these nine years are broken into subperiods it seems that Italy never leaned against the wind and that France and Germany abandoned the practice after entering the EMS.

Other studies have also found that intervention has resisted exchange rate change (other things equal).[6] International sanction for such interven-

[5] For another effort to cope with this problem, see Peter J. Quirk, "Exchange Rate Policy in Japan: Leaning Against the Wind," International Monetary Fund, *Staff Papers*, Vol. XXIV (November 1977), pp. 653-61.

[6] For example, see: Rudiger Dornbusch, "Exchange Rate Economics: Where Do We Stand?" *Brookings Papers on Economic Activity*, 1:1980, pp. 173-76; David Longworth, "Canadian Intervention in the Foreign Exchange Market: A Note," *The Review of Economics and Statistics*, vol. 62 (May 1980), pp. 284-87; Quirk, "Exchange Rate Policy . . ."; and Jacques R. Artus, "Exchange Rate Stability and Managed Floating: The Experience of the Federal Republic of Germany," International Monetary Fund, *Staff Papers*, vol. XXIII (July 1976), pp. 312-33.

tion policy can be inferred from the following published IMF principle:[7] "A member should intervene in the exchange market if necessary to counter disorderly conditions which may be characterized inter alia by disruptive short-term movements in the exchange value of its currency." On the other hand, leaning hard and long against the wind would run afoul of another IMF principle, to wit: " . . .the Fund shall consider the following developments as among those which might indicate the need for discussion with a member: (i) protracted large-scale intervention in one direction . . . ."

Principles aside, if it is true that monetary authorities commonly resist exchange rate change, the logic for such behavior is not altogether clear. Unless the objective is to maintain a fixed exchange rate and intervention policy is supported by monetary policy, one wonders why officialdom should *persistently* favor what the market did last month over what it is doing this month.

This is not to deny that intervention might be appropriate to resist overshooting or destabilizing speculation when those phenomena could be identified. Given the high variability of exchange rates in recent years, it seems that significant overshooting of long-run equilibrium rates must have occurred on a number of occasions. An overshoot which disappears only over an extended period might impose significant adjustment or unemployment costs on industries most affected by the accompanying shifts in relative prices.

The variability of exchange rates is addressed in the last section of Coes's paper, where measures of 12 month variation are presented for each of the four currencies under consideration. These data are consistent with a growing body of evidence showing that real as well as nominal exchange rates have varied substantially since the advent of widespread managed floating. However, we should bear in mind that much of the period since March 1973 may have been unrepresentative, since the world economy was subjected to two severe oil shocks. Indeed, perusal of Coes's data reveals that during the sub-period when the world was relatively free of oil shock effects, from January 1977 through February 1979, the variation in real exchange rates was not much different from what it had been in the period before widespread floating. The data are also consistent with the view that overshooting can result from real disturbances as well as from monetary disturbances.[8]

In conclusion, Coes recites the interesting point that even when intervention diminishes exchange rate uncertainty, the net effect may be merely to shift the uncertainty to other markets. Let us consider another elementary but sometimes overlooked aspect of intervention. It is commonly be-

[7] Quotations are from Executive Board Decision No. 5392—(77/63), adopted April 29, 1977, *Selected Decisions of the International Monetary Fund and Selected Documents*, Ninth Issue (Washington, 1981), page 10.

[8] See Jagdeep S. Bhandari, "An Alternative Theory of Exchange Rate Dynamics," *The Quarterly Journal of Economics*, vol. 98 (May 1983), pp. 337-48.

lieved that changes in basic monetary policy lead to exchange rate overshooting. The country whose monetary policy had changed could intervene to reduce the overshoot, but unsterilized intervention—the kind sure to be effective—would simply amount to a reversal of the monetary policy change.

Monetary Authorities' Reaction Functions and the European Monetary System

Giorgio Basevi, Michele Calzolari, and Caterina Colombo*

1. Introduction

This is the third piece of research in a project aimed at modeling foreign exchange rates determination and monetary authorities' policy reaction functions for a representative set of countries belonging to the European Monetary System.[1] Relative to our preceding contributions[2], the present one is characterized by three main features. First, the theoretical model is modified by considering that imperfect international assets substitutability—represented by a risk factor in the relation between the forward exchange rate and the rationally expected future spot rate—requires the introduction of an additional reaction function for the monetary authorities. Second, we enlarge the number of countries considered—which in our previous work on the EMS were only three (Germany, Italy, and Belgium)—to a larger set. To keep using the same suggestive terminology of our last paper, the present larger set of countries is made up of the "leader of the system," of two large and possibly "unfaithful members" of the system, and of two small and likely more "faithful followers" of the rules of the game and of the leader's policy.

Third, the present work introduces new variables in the specification of the reaction functions and attempts to improve on the measurement of those already used in the previous work. Moreover, we hope that the econo-

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[1]The basic exchange rate model that underlies the reaction functions analyzed here was presented at the conference on Exchange Rate Theory and Practice organized by the National Bureau of Economic Research in Bellagio, January 26-28, 1982, and is to be published by the University of Chicago Press in a conference volume edited by J. Bilson and R. Marston. A first set of results on European monetary authorities' reaction functions were presented at conferences on The Political Economy of Monetary Policy in Western Europe held at the University of Illinois, Urbana-Champaign on November 18-20, 1981, and on Exchange Rates in Multicountry Econometric Models, held at the University of Leuven on November 26-28, 1981; these are to be published by Macmillan in a conference volume edited by P. De Grauwe and T. Peeters.

[2]Basevi and Calzolari (1981), (1982).

metric treatment of the model is improved by considering two different sample periods for the change of regime due to the passage from the European snake experience to the EMS experience. We still leave to future research consistent estimation of each country's two reaction functions.

Finally, the present paper provides new material for testing the various hypotheses made in our previous work: the extension of the sample period to more recent months, the enlargement of the set of countries, and what we consider improvements in model building and measurement of variables, should provide a sounder basis for judging the validity of our theoretical framework, behavioral assumptions, and design of institutional characteristics.

2. Theoretical Framework

The theoretical framework used in our preceding papers in order to model the determination of exchange rates was based on a multilateral version of the Dornbusch-Frankel theory (Dornbusch (1976), Frankel (1979)). In addition, however, we did not make the extreme assumption of perfect international bond substitutability: instead of imposing equality between closed and open interest rates parity—or, in other words, instead of assuming that the forward exchange rate equals the expected future spot rate and this is an unbiased predictor of the actual future spot exchange rate—we allowed for a wedge between the two rates. This, however, was left exogenous in our preceding work. Modern international portfolio theory identifies this wedge as a risk premium, whose magnitude and evolution depends upon the relative supply of outside assets on the part of the governments whose currencies are involved in the exchange rate. While at the theoretical level research along this line is fruitfully developing, econometric work has not yet provided to our knowledge very satisfactory results. (Frankel (1982), Colombo (1983)).

In order to determine the risk factor as a function of the relative supplies of outside assets, we follow the approach chosen in our first paper on the monetary authorities' reaction functions, and we now attempt to endogenize not only the determination of the internal supply of base money (or of its "price," i.e., the short-term rate of interest), but also of its external supply which originates from the authorities' intervention in the foreign exchange markets (or of its "price," i.e., the actual change in the spot exchange rate).

In other words, our version of the Dornbusch-Frankel model remains valid for the determination of the exchange rates, provided these are taken to be the forward exchange rates. However, because of the risk element (imperfect substitutability), forward exchange rates are no longer representative of rationally expected future spot rates. Thus, in order to determine the latter, and hence implicitly the risk factor which makes them diverge from the former, we introduce a second reaction function—in addition to the one already specified for the short-term rates of interest.[3] This reaction function is meant to capture the authorities' behaviour in the foreign exchange markets, and therefore their contribution to the supply of outside assets through the foreign exchange window.

3. Institutional Characteristics

As we already pointed out in our previous work, it is honest to recognize that in empirical cross-country comparisons of monetary authorities' reaction functions a compromise has to be struck between the need to portray the specific features of every country's political, economic, and institutional characteristics, and the constraint of designing the countries' functions in a way similar enough to allow for international comparisons. While faced with this problem, in our compromise specification of the functions we also want to preserve the features that are of particular interest to our purpose, namely the general specification of the multilateral constraints under which the set of countries here examined have had to operate, if and when they were members of the European "snake" arrangements and, currently, of the European Monetary System.

Before going into the details of the specification for the authorities' reaction functions, we thus want to emphasize that we do not view every country in our system as being on the same level with respect to such functions. We envisage the existence of five subsets in our set of countries and currencies. The first consists of the "nth country," which we take to be the United States. For this country's authorities we do not specify any reaction function and thus, at least theoretically, we consider them free to set their own control variables at unspecified levels, presumably with a view to either nationalistic or worldwide objectives, or both.

The second subset of countries also contains only one element, which is taken to be Germany. We consider this country as the monetary leader of the regional (European) subsystem: a leader which "de facto" if not "de jure" has been in charge of the subsystem exchange rate policy vis-à-vis the rest of the world (essentially with respect to the currency of the overall system leader, i.e., the dollar).[4]

[3]We are grateful to R. Filosa for having clarified this point in his discussion of our previous work.

[4]This leader role that Germany may be alleged to have played was indeed behind much of the debate that accompanied the conversion from the bilateral-only exchange rate constraints of the "snake" to the bilateral plus the ECU-based indicator of divergence constraints that characterize the European Monetary System. For more details on the EMS, see Deutsche Bundesbank (1979).

The third level of countries in our system contains the "faithful" members of the snake and the EMS. They are a set of relatively small countries, belonging in practice to a D-mark area. The Netherlands, Belgium-Luxembourg, and Denmark have, with some reservations for the latter two, been part of this group, which is defined by the fact that its members have generally and continuously played according to the rules of the game.

The fourth set contains the other three main countries of Western Europe—France, Italy, and the United Kingdom. These countries have never or not continously been members of the successive European exchange rate arrangements, and the two of them who now are full members of the EMS are relatively more inclined to use the exceptional rule of the game (i.e., a parity change), rather than the normal ones (monetary policy and exchange market intervention).

Finally, there is the rest of the world, which in our exchange rate model is left exogenous.

Having thus chosen on the basis of "a priori" knowledge of historical and institutional elements a stratification of our set of countries, we then had to compromise between other country-specific characteristics and the need for cross-country homogeneity in the specification of reaction functions.

4. The Reaction Functions.

As already pointed out in section 2, two reaction functions are necessary to close our model under the assumption of imperfect assets substitutability and managed foreign exchange markets. The first one refers to the control of the domestic source of the monetary base, or alternatively to the control of the short-term rate of interest. The convenience of cross-country homogeneity has induced us to choose for all countries here analyzed the same type of dependent variable, i.e., the short-term rate of interest, even though we are aware that different institutional characteristics may suggest different monetary control variables for the various countries of our model.

On the other hand, with respect to the reaction functions describing foreign exchange market intervention, we first considered using changes in international reserves as the dependent variable in these functions. However, even with carefully constructed series on foreign exchange intervention based on data for the various components of international reserves as published by the International Monetary Fund, *International Financial Statistics*, the results of our preliminary estimates based on such series were very poor. This is not surprising, as it is well known that actual figures on foreign exchange intervention are far from being represented by published data on changes of international reserves. The use of foreign exchange obtained through compensatory loans, intra-period swaps between central banks, exchange rate valuation problems, etc. are just a few of the many conceptual and statistical pitfalls that make it practically impossible in our view to arrive at a reasonable series of data on foreign exchange intervention without the inside knowledge of central banks' figures. Thus, while waiting for the day when these data might be consistently published by the central banks of the main countries, we had to choose an alternative way, and one analagous to that followed for the first set of reaction functions—i.e., the interest rate functions. In other words, we selected the "price" rather than the "quantity" variable as dependent or control variable. In the case of the first set of reaction functions this meant using the interest rate; in the present case, this means taking the change in the exchange rate rather than the change in reserves as the dependent variable.

The next question is what exchange rate to consider in this set of reaction functions. Both a priori theoretical considerations and preliminary results obtained on the various possible alternatives, induced us to a choice which makes use of the stratification of countries described in the preceding section with respect to their different roles in the European monetary arrangements.

In principle, at least four interesting choices of exchange rates could be used as dependent variables. The first one is each country's exchange rate vis-à-vis the dollar; this choice could be implemented for every one of the five countries that are currently present in our model with own reaction functions, i.e., Germany, France, Italy, Belgium-Luxembourg, the Netherlands.

The second choice is to use each country's effective exchange rate, such as measured by the IMF-MERM rate. This also could be done for all five countries in the model.

A third choice, apparently more in line with the institutional characteristics and economic realities of the European monetary arrangements, would make use of the exchange rate vis-à-vis the D-mark, for all countries except Germany, and of the D-mark/dollar rate for Germany. This choice is clearly an extreme one in terms of the leader's role that it attributes to Germany and its currency. It does not seem to us realistic; moreover, it does not make full use of the changes in institutional characteristics and constraints that occurred during the sample period, which spans from the early seventies and the "snake" experience, to the early eighties and the EMS experience.

A fourth choice, and our preferred one, is to split the sample period into two subperiods in order to take into account the likely change in behavior due to change in institutional regimes. The first subperiod goes up to the inception of the EMS (March 1979); the second one corresponds to the EMS and reaches the end of 1982. For both subperiods we present a first version of reaction functions, where the equations for France and Italy (the "unfaithful" members) are specified with the respective exchange rates in terms of the dollar, whereas the equations for Belgium and the Netherlands (the "faithful" members) are specified with their exchange rates vis-à-vis the D-mark as dependent variables.

In both periods, we intend to attribute to Germany's monetary authorities an exchange rate reaction function specified in terms of the D-mark/dollar rate. While this choice clearly emphasizes the leading role of Germany in setting the overall European relation vis-à-vis the dollar, it does not prejudge one of the hypotheses that were already submitted to test in our previous work, namely that the mechanism of the indicator of divergence based on the ECU has reduced the freedom that Germany might have enjoyed during the snake period to set the dollar policy for the whole of the snake area. However, for reasons of time and space, we have decided to leave to further research the estimation of the German reaction function vis-à-vis the U.S. dollar. This in fact, as it involves perhaps the most important exchange rate in the whole international monetary system, clearly requires an explicit treatment of at least one reaction function for the U.S. authorities—i.e., the one concerning its short-term interest rate—and possibly two for the periods in which the American authorities seemed to have abandoned their traditional attitude of benign neglect with respect to their exchange rate. In any case, the model would be enlarged beyond its present limited scope, which is to throw light on some aspects of the working of the European Monetary System.

Finally, a fifth choice, which we actually followed as a second version of the four countries' reaction function here analyzed, is to use for all of them their currency rate vis-à-vis the ECU as dependent variable. While not arguing that the authorities really take this rate as their actual control variable when intervening, we present for the period of the EMS a set of estimates expressed in these terms in order to allow a more homogeneous four-country comparison of their respective reaction to the EMS constraints.

5. Specification and Estimation of the Interest Rate Reaction Functions.

As already explained in section 2, our model requires two reaction functions describing the behavior of each country's monetary authorities. The first set of these functions are specified with the short-term rate of interest as the dependent variable, and have already been studied in our previous work. The new estimates here presented are applied to a larger set of countries (five instead of three), have been updated to the end of 1982, and incorporate a few improvements in specification. Since we did it already elsewhere, we do not go here again into the details of their theoretical underpinnings. The general form of these functions is the following:

$$\log(1+i) = \alpha_0 - \alpha_1 \log(R/M) + \alpha_2 \log(1+\mathring{p}) + \alpha_3 \log(y/\bar{y})$$

$$+ \alpha_4 \log (1+i^*) - \alpha_5 \log (1+s) - \alpha_6 \log (RSV)$$
$$+ \alpha_7 \log (MARGIN) - \alpha_8 \log (100+EMS) - \alpha_9\, PAR$$

The first three variables refer to the three basic objectives of each country's monetary reaction function: the relative stock of international reserves (with R, the reserves, deflated by the value of imports), the rate of price inflation ($\mathring{p}$), and the pressure of aggregate demand ($y/\bar{y}$). The fourth variable is the foreign short-term rate of interest.

The next two variables refer to the objective of gaining competitiveness within the limits allowed by favorable developments between third currencies exchange rates. Thus the variable "s" measures the spread between the country's effective real exchange rate and its trend: a positive value means a relatively overvalued currency, which explains the negative sign of the coefficient under the assumption that the authorities relax monetary policy (i.e., lower the interest rate) when their currency is overvalued. This policy is reinforced when the foreign exchange rates move in a way that enlarges the spread between the currencies of the country's export markets and those of the country's import markets. Such a development is measured by RSV, which is the ratio of the effective exchange rate weighted with export shares and the effective exchange rate weighted with import shares. The negative sign of its coefficient means that the widening of this spread allows the authorities to relax monetary policy in order to gain competitiveness through the resulting exchange depreciation. From our reading of the Italian, and possibly of the French experience, it seems that, in the opinion of the authorities, this strategy does not conflict with the objective of fighting inflation, as they tend to give more weight to the reduction of imported inflation brought about by appreciation vis-à-vis currencies important on the import side than to the pressure of demand on prices induced by depreciation vis-à-vis currencies important on the export side.

The final three variables refer to the institutional constraints of the European "snake" and the EMS, and the sign of their respective coefficients must be understood in light of their definitions as explained in the notes to Tables 1–5.

We have assumed that, except for the introduction of a new variable for the EMS period, the reaction functions for the short-term rates of interest are not structurally affected by the institutional change due to the inception of the EMS. Thus, contrary to what we do for the exchange rates reaction functions, we estimate this first set over the whole sample period from 1972 to 1982.

The results presented in this table generally confirm those already obtained in Basevi and Calzolari (1981). With respect to the internal objectives of controlling price inflation and the gap in aggregate demand, we may notice that the coefficient of $\mathring{p}$ ranks highest for Germany and lowest for Italy, with the Dutch estimate statistically insignificantly different from

Table 1
Monetary authorities' reaction functions in domestic money markets (1972.1–1982.12). Monthly observations.

Countries \ Explanatory variables	C	MARGIN	PAR	EMS	s	i*	R/M	$\mathring{p}$	$y/\bar{y}$	RSV	R^2	RHO	D.W.
Germany	2.533	−0.002	(−)	−0.549	−0.025	0.213	(−)	9.128	0.334	(−)	0.82	0.40	1.96
	(2.6)	(0.1)		(2.6)	(0.5)	(2.6)		(6.1)	(4.2)				
The Netherlands	2.339	0.0005	−0.133	−0.484	−0.344	−0.025	−0.042	(−)	0.094	(−)	0.80	0.79	2.50
	(1.1)	(0.2)	(2.5)	(1.0)	(1.9)	(0.2)	(2.1)		(2.1)				
Belgium	0.329	0.015	−0.0005	−0.047	(−)	0.115	−0.094	3.089	0.298	(−)	0.85	0.63	1.98
	(1.3)	(1.3)	(0.1)	(0.8)		(1.4)	(4.3)	(2.6)	(3.3)				
France	4.777	−0.003	−0.006	−1.016	−0.102	0.112	−0.002	5.468	0.075	−1.582	0.96	0.99	1.56
	(3.7)	(0.6)	(2.4)	(3.7)	(1.6)	(1.8)	(0.5)	(2.6)	(0.6)	(2.2)			
Italy	−0.633	−0.004	−0.001	−0.163	−0.275	0.059	−0.011	2.890	0.151	−0.450	0.98	0.98	1.46
	(0.4)	(0.7)	(0.7)	(0.5)	(4.1)	(0.9)	(2.3)	(4.2)	(2.2)	(1.7)			

Table 2
Monetary authorities' reaction functions in foreign exchange markets — Period of the European "snake": (1972.1–1979.2). Monthly observations.

Explanatory variables / Countries and dep. variable	C	MARGIN	PAR	$(D\dot{M}/\$)$	s	(i − i*)	R/M	R^2	RHO	D.W.
France	0.015	−0.133	0.011	0.727	0.113	(−)	−0.010	0.70	0.33	1.91
$(F\dot{F}/\$)$		(2.5)	(0.8)	(1.1)	(12.5)	(2.2)		(1.9)		
Italy	0.019	(−)	(−)	0.362	0.093	−0.070	−0.006	0.44	(−)	1.42
$(L\dot{T}/\$)$		(2.2)			(5.6)	(1.2)	(1.0)	(1.7)		
The Netherlands	(−)	−0.120	0.014	−0.145	0.025	−0.083	−0.010	0.49	0.23	1.84
$(Fl/\dot{D}M)$		(1.9)	(4.0)	(4.9)	(0.7)	(3.3)	(0.9)			
Belgium	0.017	−0.068	0.007	−0.145	−0.042	−0.115	−0.019	0.47	0.24	1.82
$(BF/\dot{D}M)$	(1.5)	(0.8)	(1.8)	(5.5)	(0.9)	(3.3)	(1.5)			

Table 3
Monetary authorities' reaction functions in foreign exchange markets — Period of the EMS: (1979.3–1982.12). Monthly observations.

Explanatory variables / Countries and dep. variable	C	MARGIN	PAR	EMS	$(\dot{\mathrm{DM}}/\$)$	s	$(i-i^*)$	R/M	R^2	RHO	D.W.
France	(−)	−0.004	0.025	0.005	0.929	−0.022	−0.044	−0.014	0.96	−0.45	2.13
$(\dot{\mathrm{FF}}/\$)$		(0.7)	(7.9)	(2.1)	(25.4)	(0.8)	(0.9)	(1.8)			
Italy	(−)	−0.018	0.007	0.003	0.773	0.189	−0.138	−0.009	0.93	(−)	2.16
$(\dot{\mathrm{LT}}/\$)$		(2.2)	(2.3)	(4.6)	(17.1)	(2.6)	(2.7)	(4.0)			
The Netherlands	(−)	−0.001	(−)	0.0005	−0.056	0.056	−0.206	(−)	0.49	0.63	1.97
$(\dot{\mathrm{Fl}}/\mathrm{DM})$		(2.4)		(1.4)	(3.1)	(1.3)	(3.7)				
Belgium	(−)	−0.015	0.008	0.015	−0.109	0.030	−0.229	−0.104	0.38	0.32	1.96
$(\dot{\mathrm{BF}}/\mathrm{DM})$		(1.6)	(2.1)	(2.0)	(2.0)	(0.4)	(2.2)	(1.7)			

Table 4
Elasticities of each currency exchange rate in terms of U.S. dollar with respect to the D-mark exchange rate in terms of the U.S. dollar.

Countries Period	France	Italy	Netherlands	Belgium
"Snake" period	0.73	0.36	0.85	0.85
EMS period	0.93	0.77	0.94	0.89

zero in earlier estimates and thus dropped from the one here presented. The coefficients for $y/\bar{y}$ are all significant at the 5 percent confidence level, except for France, and rank highest for Germany and lowest for the Netherlands.

These results suggest that Germany tends to bend its monetary control instruments more towards the objectives of internal equilibrium as compared to what her European partners do.

Four variables describe external objectives in this first set of reaction functions. With respect to the foreign interest rate (which is the U.S. rate for Germany, France, Italy, and the German rate for the Netherlands and Belgium) the estimated coefficients are statistically significant only for Germany and France, with the German coefficient about twice the value of the French one. As for the ratio of international reserves to the flow of imports, the coefficients are significant except for Germany and France. With further data refinement, this variable may however acquire a more significant role. The (s) variable has significant coefficients for France, Italy, and the Netherlands. The RSV variable was introduced only in the Italian and French equations because our "a priori" information that it has been an important objective for these countries' authorities. Its coefficient is statistically more significant and higher in value for France than for Italy.

Finally, a set of three variables is meant to capture the external institutional constraints. The distance from the bilateral margins of maximum admissible fluctuation between a country's currency and each currency of its partners in the "snake" and in the EMS exchange rate agreements is measured by MARGIN. This variable, however, in no case appears with a statistically significant coefficient, thus suggesting that the monetary instrument was generally not used for the purpose of keeping the exchange rate within its margins. On the other hand, when the EMS variable starts to play its role during the latter part of the sample period, it affects significantly the reaction functions of Germany and France, but not those of the other three EMS partners. This is a first suggestion that the new constraint imposed by the EMS relative to the "snake" arrangements has put some significant pressure on Germany's monetary policy, and less so on France's policy; while either because not a deviating country (the Netherlands and less so Belgium) or because of more readiness to change parity (Italy), the indica-

Table 5
Monetary authorities' reaction functions in foreign exchange markets — Period of the EMS: (1979.3–1982.12). Monthly observations.

Explanatory variables / Countries and dep. variables	C	MARG	PAR	EMS	(DṀ/$)	PPP	(i − i*)	R/M	R^2	RHO	D.W.
France (FF/ĖCU)	(−)	−0.006 (1.0)	0.017 (5.0)	0.003 (1.4)	0.054 (1.6)	0.032 (0.9)	−0.044 (0.5)	−0.011 (1.4)	0.52	(−)	2.15
Italy (LT/ĖCU)	(−)	−0.010 (1.6)	0.002 (1.0)	0.002 (2.2)	−0.059 (1.7)	0.160 (2.7)	−0.129 (1.5)	−0.004 (1.8)	0.24	(−)	1.84
The Netherlands (FI/ĖCU)	(−)	−0.002 (2.1)	0.003 (2.0)	0.0001 (0.1)	0.063 (2.6)	0.095 (2.4)	(−)	−0.003 (0.4)	0.50	0.31	1.99
Belgium (BF/ĖCU)	(−)	−0.015 (1.9)	0.006 (2.1)	0.012 (1.9)	0.015 (0.3)	0.086 (1.3)	−0.224 (2.6)	−0.101 (1.9)	0.41	0.41	1.91

Notes to Tables 1-5

OLS estimates; t-values in parentheses; a dot over a variable indicates a rate of change.
Definition of variables:

Dependent variable in Table 1 = short-term rate of interest, averages of period. In interpreting the coefficient of $\mathring{p}$ it must be considered that the inflation rate is per month.

Dependent variables in Tables 2, 3, and 5 = rates of change of market exchange rates, averages of period. In interpreting the coefficient of the interest rate differential it must be considered that the exchange rate changes are per month rates.

MARGIN = $\left[\prod_{j \neq i}(e_{ij}/\bar{e}_{ij})\right]^{\frac{2}{n-1}}$ with e_{ij} and $\bar{e}_{ij}$ being the market exchange rate and parity between currencies i and j.

EMS = indicator of divergence of the ECU market rate from the ECU central rate of each currency participating in the European Monetary System, expressed as a percentage of the maximum permissible difference.

s = standardized errors of actual from fitted values of a time-trend regression of the real effective exchange rate of each currency in terms of that country's wholesale prices.

i* = U.S. short-term interest rate, for Italy and France; German short-term interest rate, for the Netherlands and Belgium; ECU-weighted interest rate for all countries in table 5; averages of period.

R = net foreign reserves of monetary authorities plus commercial banks (for Belgium, and Germany, central bank's reserves only); in terms of domestic currency, end of period values.

M = domestic currency value of merchandise imports, corrected for trend.

p = consumer price index.

y = index of industrial production, seasonally adjusted.

$\bar{y}$ = time-trended index of industrial production.

RSV = ratio of export-weighted to import weighted effective exchange rates.

PAR = dummy variable taking a value of +1 when the currency's parity is increased (a devaluation), and a value of −1 when the parity is decreased (a revaluation).

The variables MARGIN, R/M, $\mathring{p}$, y/$\bar{y}$ influence the dependent variables with distributed lags; the reported coefficients are the sums of the lagged coefficients.

tor of divergence did not influence much the monetary policy of these three countries. This interpretation, however, is not fully supported by the PAR variable, which is a dummy for changes of parities vis-à-vis the ECU, and whose coefficient is significant only for France and the Netherlands.

6. Specification and Estimation of the Exchange Rate Reaction Functions

Our main interest in the present work is, however, the analysis of a second set of reaction functions, namely those for the authorities' intervention in exchange markets. For reasons already explained, these are expressed in terms of the "price" variable, i.e., the exchange rate, as the control variable. The general specificiation is the following:

$$\mathring{e} = \beta_0 - \beta_1 \log(R/M) \pm \beta_2\mathring{e}^* - \beta_3 \log\left(\tfrac{1+i}{1+i^*}\right) + \beta_4 \log(1+s)$$
$$- \beta_5 \log(\text{MARGIN}) + \beta_6 \log(100+\text{EMS}) + \beta_7\,\text{PAR}$$

This equation is estimated over two separate sample periods: the first one (1972.1-1979.2) refers to the "snake" period, the second one (1979.3-1982.12) refers to the EMS period. During both subperiods, we have grouped the four countries into two subsets. For the first one—which is made up of France and Italy—the dependent variable is the rate of change in their exchange rate vis-à-vis the U.S. dollar. This implies that for these two countries the interest rate differential is referred to the U.S. interest rate; in addition, the exogenous exchange rate ($\mathring{e}^*$, i.e., the rate of change of the DM/$ rate) should normally enter with a positive sign. This means that the lira and the French franc generally appreciate vis-à-vis the dollar when the same happens to the DM; however, the size of the coefficient is expected to be smaller than unity, as these currencies generally follow the D-mark only part of the way in its movements vis-à-vis the dollar.

The second group of countries—made up of the Netherlands and Belgium—has the change in their exchange rate vis-à-vis the DM as a dependent variable. In this case, therefore, the interest rate differential is with respect to Germany, and the change in the DM/$ rate is expected to have a negative coefficient, meaning that when the DM appreciates vis-à-vis the dollar, these currencies generally depreciate vis-à-vis the DM.

As for the signs of the coefficients of the other variables, the negative one for reserves is clear enough: when these are small, the authorities allow their currency to depreciate (an upward movement in the rate). The interest rate differential should have a negative coefficient. In fact, it must first be clear that the relation between the change in the exchange rate and this differential does not reflect interest rate parity, but the authorities' reaction to foreign interest rates: if it were an interest rate parity, the exchange rate change should be moved forward one period and the coefficient would be positive and close to unity (equal to unity under the assumption of unbiased prediction of future spot exchange rates and no risk premium). Here instead, we assume that the authorities adopt a "leaning against the wind" strategy, contrasting the market anticipation of a future depreciation (as represented by a positive interest rate differential) by intervening and moving the exchange rate in the opposite direction.

The expected sign for the coefficient of the spread from the trend of the real exchange rate (s) implies that, when a currency is overvalued, the authorities allow it to depreciate. As for the MARGIN and EMS variables, the signs of their coefficients in this equation should be opposite to those in the interest rate equation: in fact, the normal rule of the game is to keep their own currency within the margins and/or limits of divergence characterizing the "snake" and EMS regimes. Thus, when the MARGIN or the EMS variables denote that the currency is reaching its upward limit[5], the authori-

[5]Note that because of the way in which the data on the indicator of divergence (EMS) are published in our source, its positive values indicate a strong currency situation. The opposite is true for the MARGIN variable, which is a measure of distance from the bilateral margins, with exchange rates and parities measured in the usual way.

ties may try to reverse this movement by lowering the interest rate (a negative movement) or by intervening in the foreign exchange markets and depreciating the currency (a positive movement).

However, while intervention to defend the parity was the normal rule in the "snake" and still is in the EMS, the "exceptional" option was and is to change the parity. Thus the expected sign for the coefficient of the dummy variable PAR is positive. It should be noted at this point that when this dummy plays its role, the EMS variable is silenced by a corresponding dummy.

The estimation results are presented in Tables 2 and 3. Considering the first period (Table 2) Italy was almost never in the "snake" system, while France moved in and out twice, staying in only for short periods. In addition, the "exceptional" rule of the game (parities realignment) was used a few times by all members. It is therefore understandable that the variable MARGIN does not appear in the Italian reaction function and has low statistical significance for France. However, its significance is low also for Belgium; this seems to indicate that the "normal" rule was not predominant in that period with respect to management of their exchange rates for these latter two countries. As for the Netherlands, the comparison of Tables 1 and 2 seems to indicate, on the basis of the t-values for the coefficients of the MARGIN variable, that the authorities followed the normal rule more by the use of exchange market intervention than by the use of monetary policy. On the other hand, the "exceptional" rule (measured by PAR) is significant for the Netherlands and Belgium, the only two countries of our set which continuously took part in the system during that period.

Considering now the EMS period, the results of Table 3 indicate that the MARGIN coefficient is significant for Italy, the Netherlands and Belgium, and is highest for Italy followed by Belgium. This is possibly due to the fact that the guilder quietly cruised within the band of bilateral margins during most of that period. More interestingly, the indicator of divergence has its highest significance for Italy, followed by Belgium and France; the value of its coefficient is by far the highest for Belgium, thus suggesting that this country has been the one most stringently constrained in its exchange rate policy by the EMS arrangements. The PAR variable is significant for France, Italy, and Belgium, and important particularly in the case of France.

Besides the external institutional constraints discussed above, the authorities kept an eye on competitiveness. Given the larger size of France and Italy, we would expect in their case more significant and larger coefficients for the variable (s)—i.e., the "parity spreads" variable—relative to the Belgian and Dutch cases. In other words, we would expect that France and Italy could manage their exchange rate more effectively in order to improve their competitiveness. While this seems to be true for the "snake" period, it is not confirmed by the estimates of Table 3, where only Italy has a significant and high coefficient for the (s) variable.

An interesting cross-country comparison can be made with regard to the exogenous exchange rate between the D-mark and the U.S. dollar. Although the Belgian and Dutch functions are estimated with respect to their DM rates as dependent variables, we can easily compute the implicit elasticity of their dollar rate with respect to the DM/$ rate, and thus compare these results with the corresponding elasticities for France and Italy. These are shown in Table 4 and indicate that Italy has always been the country dragging its feet in following the D-mark movements vis-à-vis the dollar. Belgium and the Netherlands have generally been more inclined to follow the German lead. However, possibly because of the exceptional revaluation of the dollar during most of the EMS period, all countries have tended to cluster more around the D-mark in its dollar policy, relative to what they were doing during the "snake" period. This fact may also be indicative of a stronger coherence of the five countries exchange rate policy during the EMS period (up to the end of 1982) relative to the "snake" period.

In the spirit of cross-country comparisons and EMS evaluation, we also decided to specify all four countries' exchange market reaction functions vis-à-vis one same currency, namely the ECU. The results are presented in Table 5. Comparing the coefficients of the EMS variable, we notice again that the Netherlands do not appear to have had problems with the indicator of divergence, while Belgium reacts more strongly to this variable than France and Italy.

6. Concluding Remarks.

In this paper we have compared two sets of reaction functions for the main EMS participating countries in terms of their monetary and exchange rate policies. While the results obtained generally confirm our "a priori" interpretation of institutional characteristics and rules of the game, more econometric research appears necessary and is on our agenda.

The main extension which ought to be made concerns the need to estimate each country's pair of reaction functions by simultaneous estimation techniques.

On a different but no less important ground, we expect that useful information and possibly more significant estimates should result from having access to reliable data on central banks' intervention in foreign exchange markets. This, in fact, would allow an alternative and probably more satisfactory estimation of the reaction functions describing their behavior in these markets.

Data Sources

All data are from the IFS tapes of the International Monetary Fund, except for the indicator of divergence and parities, which are taken from the Statistical Supplement of the *Monthly Report* of the Deutsche Bundesbank; the weights in RSV are taken from Banca d'Italia (1979) for the Italian variable, and from an unpublished document of that same bank for the French variable.

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Discussion

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I have no basic reservations as to how the paper carries on its main task: namely the comparison of exchange rate and monetary policy of five representative European countries in the "snake" and EMS periods. I think that the authors have successfully fitted the very different institutional and structural characteristics of the countries involved under their basic scheme. They have also overcome difficult problems on data availability devising effective ways of measuring a host of factors that every expert would like to have investigated in a comparison of this sort. Results are informative and appear in accordance with what most observers would accept as the reality of European exchange rate arrangements.

As a result my remarks will be directed to an issue which the authors seem to have not considered explicitly. I am referring to the conceptual nature of the policy reaction functions that the paper attempts to estimate and their proper use in conjunction with the rest of the model.

In the literature there are two basic approaches to the problem of reaction function specification. The first is to follow a "revealed preference" strategy, trying to relate actual policy actions and declared intentions and objectives of the policy authorities. In this case no common knowledge, or belief, of the underlying model of exchange rate determination needs to be assumed between the investigator and the policy authorities themselves. Results may be informative of actual rather than declared objectives of the policy authorities and the simultaneous estimation of structural and policy reactions equations is an effective device to reduce inconsistency in the parameter estimates. The second approach would instead follow an optimization strategy. In this case the specification must be totally dependent on the underlying model. Common knowledge will be assumed. Results may indicate the degree of consistency of actual policy actions and what the underlying model suggests.

Both approaches have their validity. I would assume that the first is more apt for carrying on policy analysis of actual historical periods, while the second is best suited to the construction of models aimed at simulation of policy alternatives.

The present paper takes a middle ground between these two strategies and assumes the ability to serve both. In fact it is largely based on considerations stemming from a revealed preference scheme while, on the other hand, it is meant to be part of a more general policy model of the European countries belonging to EMS. As a result, difficulties in operating and interpreting the results may be expected beyond this stage of research.

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Do Macroeconomic Policy Decisions Affect the Private Sector Ex Ante? — The EEC Experience with Crowding Out

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and Stephen M. Miller*

1. Introduction

The history of the European Economic Community (EEC) is replete with attempts to bring about fuller integration of Member States. The process has been slow; reversals have occurred. Nevertheless, the Community today is closer to achieving the goal of an integrated community than at its inception. Pessimists argue that the goal is unachievable because Member States will not relinquish the necessary power. Optimists, on the other hand, argue that the process is necessarily slow and painful.

The process of evolving into an economic union requires continuing concern about policy coordination and policy convergence. The establishment of fixed parities between currencies necessitates a convergence of monetary policies or, in the absence of such convergence, frequent realignment of parities. A convergence of monetary policies entails, in the long run, a convergence of budget policies. Convergent monetary policies probably are unsustainable if countries run widely differing budget deficits. That is, the larger a budget deficit is, the more likely it is to be monetized.

What are the potential costs and benefits to members of an economic union from the convergence of budget policies? One part of the answer depends upon each country's experience with crowding out. If increases in public demand largely crowd out private demand, then budget discipline only affects the division of existing output between the public and private sectors. If crowding out is small or nonexistent, then budget discipline has implications for a country's total output. In such a situation, a country might be reluctant to reduce the size of government expenditure and absorb

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the implied reduction in output growth.

This paper has two focuses. First, Section II examines some of the issues in, and the structure of, macroeconomic policy coordination in the EEC. Second, the paper explores the EEC experience with crowding out. Section III provides the theoretical background and Section IV presents and evaluates the empirical results. The findings of the empirical investigation provide some information relating to macroeconomic policy coordination. These issues are considered in the conclusion, Section V.

II. Macroeconomic Policy Coordination in the EEC

One of the most important economic, and political, events in the post-World War II European period has been the establishment and continued development of the EEC. This paper begins by examining the unique concern and the need within the EEC to establish policy coordination among the Member States. The basic rules of economic policy coordination are contained within the Treaty of Rome[1] and in certain subsequent decisions of the Council of Ministers.[2]

In a reaffirmation of the desire to move toward an economic union, the Council of Ministers in 1974 agreed to target on a "convergence of the economic policies" of Member States. To facilitate this policy convergence, the Council of Finance Ministers meets each month and three times a year takes positions on economic policy to be followed by the Community and each Member State; guidelines are proposed by the European Commission.

The most formal act of macroeconomic policy coordination occurs during the fourth quarter of each year, when the Council adopts an annual report on the economic situation within the Community and establishes the economic policy guidelines to be pursued by Member States during the ensuing year. The annual report is a proposal developed by the Commission with inputs from the Economic Policy Committee. The European Parliament and the Economic and Social Committee have to react with opinions before the Council adopts its text. This annual report contains policy recommendations for both the Community and Member States. The goal is to achieve greater stability, growth, and convergence within the Community.

At the spring meeting, the Council reviews the policy stance adopted in the annual report and, acting again upon Commission proposals, it decides whether the prior guidelines need to be changed.

At the summer meeting, the Council establishes budget guidelines for

[1]General coordination of economic policy is detailed in Articles 103 and 145. Monetary and exchange rate policy coordination receive special treatment in Articles 104, 105, and 107.

[2]For example, the Neumark Report published in 1963 recommended the harmonization of national tax programs (e.g., adoption of a value-added tax with uniform rates across Member States). Further, the Werner Report published in 1970 outlined the steps for achieving a monetary union by 1980.

Member States for the following year. They are based on short-term forecasts and include developments in government expenditure and revenue, the nature and extent of budget surpluses or deficits, and in the case of deficits, the method of financing.

Developments in Monetary Policy and the European Monetary System

The need to coordinate national monetary and exchange rate policy is linked to these policies' effects on the balance of payments. The Convergence Decision of 1974 reaffirmed the commitment to economic integration and monetary union. The vision of a monetary union contained in the Werner Report suffered various reversals as the world adjusted to the breakdown of the Bretton Woods System. Eventually, a regional European Monetary System (EMS) was created to establish some intra-European monetary organization in the floating world.

The EMS is the most recent and most ambitious scheme that aims to stabilize Member States' exchange rates. Its success is, of course, intimately tied to the degree of macroeconomic policy coordination.[3] It is generally agreed that during the first two years of EMS operation, nominal exchange rate variability was significantly reduced and needed central rate adjustments were infrequent and adopted smoothly.[4] Since 1981, the EMS has been passing through a hazardous phase. There have been three realignments of central rates between October 1981 and June 1982; this led to substantial changes in bilateral rates. As a result, a marked divergence has taken place in nominal exchange rate movements. Whatever the root cause of this instability, there is general agreement that the success of realignment and the restoration of greater EMS stability require domestic stabilization measures in the weak-currency countries.

The Commission submitted proposals for improving the EMS to the Council in March 1980. These proposals focused on the potential functions of the European Currency Unit (ECU), on the establishment of the European Monetary Fund (EMF), on the relationship of the EMS to the rest of the world, and on related institutional questions. The goal was to move from the existing scheme of policy coordination by Member States to Community level policy actions. The ECU has the potential for

(i) use as a reserve asset with which central banks can clear balance of payments imbalances and
(ii) use in private international capital markets and public bond issues by the Community and national authorities.

The establishment of the EMF with authority to execute market transactions in ECUs would enhance these uses of the ECU. Moreover, the EMF will be required to decide on a whole range of monetary questions (e.g.,

[3]For a discussion of the effects of the EMS on the Community, see Emerson (1981).

[4]Intra-EMS exchange rates were, on average, about as volatile as the dollar and pound sterling during 1974 to 1976. Moreover, during 1979 to 1980, the intra-EMS exchange rates were, on average, about one-third as volatile as the dollar and pound sterling.

exchange rates, external financing, and domestic monetary developments). While these proposals were not accepted by the Council, substantial progress has nevertheless been made in advancing the role of the ECU in private markets.

Developments in Budget Policy

The relative growth in government expenditure accelerated after the early 1970s, whereas the relative growth in tax receipts was less pronounced. For the Community, government expenditure as a percent of gross domestic product (GDP) rose from 32.1 percent in 1960 to 37.9 and 50.8 percent in 1970 and 1982, respectively; tax receipts as a percent of GDP were 32.7, 38.2, and 45.9 percent, respectively.

The budget was in surplus for the Community in both 1960 and 1970 (e.g., 0.6 and 0.3 percent of GDP) but reached a deficit equal to 5 percent of GDP in 1982. In addition, the deficit was 5.5 and 3.5 percent of GDP in 1975 and 1980, respectively. A group of countries (i.e., Belgium, Denmark, Greece, Ireland, and Italy) had deficits greater than 9 percent of GDP in 1982. Some of this shift to budget deficits during the 1970s is attributable to the general world-wide stop-go slowdown experienced since the first oil-price shock in 1973. It might also be suggested that some Member States have lost effective control of their budget policy.

The potential crowding out of private demand by increasing government deficits is of increasing concern. The disincentive effects of high real interest rates are a serious problem in Belgium. In Ireland and Italy, the interest expense in the budget represents a large share of the total public sector deficit; thus, the real stimulatory value of rising deficits is questionable. The empirical results of this paper, however, present surprising implications for budget deficits' effect on the household consumption-saving decision.

There are a number of problems with budget policy—some common to all Member States and others specific to a subset of the Community. These are

(i) the steady growth of government expenditure relative to GDP,
(ii) the size of budget deficits,
(iii) the growth of government indebtedness, and
(iv) the rising burden of debt service.

As mentioned above, government expenditure is, on average, 50.8 percent of GDP and the public deficit is 5 percent of GDP. The government has become a massive part of Member States' economies. Moreover, budgetary policy in a number of Member States has escaped effective control. It was for these reasons that the Commission conveyed its concern to the Council in "Budget Discipline and Economic Convergence" in July 1982. The Commission believes that the achievement of sounder budget policies must be an objective throughout the Community. Though there might not be disagreement in principle over needed budgetary reforms, in practice, there must be maximum political consensus for reforms to be implemented.

III. Ex-Ante Crowding Out: Theory

The efficacy of fiscal policy has been the subject of continous controversy over the last two decades. Expansionary fiscal actions may give rise to negative feedbacks that diminish the initial positive effect. Considerable research has been undertaken to investigate whether government spending financed by either debt or taxes has a permanent effect or whether it is merely crowded out. Fromm and Klein (1973) presented simulation results of 11 econometric models of the United States; their findings provide support for the crowding-out thesis. In most cases, the long-run impact multipliers in nominal terms were positive; but, in real terms, crowding out did occur usually with a substantial lag. The exception was the St. Louis model; crowding out occured in both nominal and real terms within one year. A recent examination of the St. Louis equation across six countries was performed by Batten and Hafer (1983). They concluded that fiscal policy was not crowded out in France and the United Kindom but was crowded out in Germany.[5] Moreover, monetary policy (and export growth) was significant in explaining nominal income growth in these three countries.[6]

Crowding-out effects can be classified as ex ante or ex post. They are ex post if the substitution of public for private spending is indirect and is induced by adjustments in economic variables caused by the initial fiscal impulse. For example, as the economy approaches full employment, a fiscal expansion results in rising prices and interest rates that crowd out private spending ex post. The crowding out is ex ante if the substitution of public for private spending is direct and autonomous. In this instance, fiscal expansion leaves prices and interest rates unaffected. This paper focuses on the ex ante variety of crowding out.

Bailey (1962, 1971, 1972) argued that if the household sector has perfect knowledge and perfect foresight, then both bond- and tax-financed government spending and retained-earnings- and debt-financed business investment are equivalent in the eyes of the household sector. Hence, if the

[5]For the other three countries (i.e., Canada, Japan, and the United States), fiscal policy was crowded out.

[6]Nguyen and Turnovsky (1983) have provided an alternative test of the effectiveness of monetary and fiscal policy. They simulate a dynamic theoretical macroeconomic model and examine the effects of fiscal and monetary policies. The dynamic macroeconomic model is in the tradition of Blinder and Solow (1973), Tobin and Buiter (1976), Pyle and Turnovsky (1976), and Turnovsky (1980). Nguyen and Turnovsky found that an increase in government spending leads to instability which ". . . takes the form of crowding out, whereby the initial expansion creates subsequent recessionary pressure." (1983, p. 69). In some instances, the instability was exhibited in an "explosive boom." The stability of these dynamic macroeconomic models has been of continuing interest. Smith (1982) has suggested that the instability in these models is a result of imposing "rigid" policy rules. Smith demonstrated that employing flexible policies (e.g., monetary authorities peg nominal interest rates and fiscal authorities peg real income) can ". . . stabilize an otherwise unstable economy." (1982, p. 177).

household sector has attained its desired level of saving and portfolio, then an increase in the government budget deficit (e.g., a tax cut) or a decrease in business retained earnings (e.g., higher dividend payments) are offset, in both cases, by an increase in household saving. Optimal consumption plans are unaffected. National saving is more stable than its individual components; that is, we observe perfect, direct substitutability between household, business, and government saving. There is no optimal mix between tax- and bond-financed government expenditure. Bailey recognized that perfect foreknowledge is an extreme situation; he considered the case where future foreknowledge is imperfect. Now, since the degree of substitutability between household and government saving is less than perfect, household consumption spending is affected by the fiscal policy mix. Here, the optimal policy mix is to tax-finance those government expenditures whose benefits and incidence are localized and known; those expenditures with diffused benefits and unknown incidence should be debt financed. Bailey (1962, p. 72; 1971, p. 155) also argued that if the household sector viewed its own and government's spending for consumption as equivalent, then consumption should be aggregated to the national level. That is, total consumption (including government consumption) would be a more stable aggregate than individual components.

David and Scadding (1974) argued, on the basis of empirical evidence for the United States, that private rather than national saving is the more stable aggregate.[7] This finding is not inconsistent with Bailey's general view of direct, ex ante substitutability but rather implies a different form which they called ultrarationality. Ultrarationality differs from perfect foreknowledge in that the household sector views both tax-financed government expenditure and consumption expenditure and debt-financed government expenditure and investment expenditure as perfect substitutes.[8] Consequently, ultrarationality implies that the saving and consumption aggregates should be household and business saving and consumption and tax-financed government expenditures, respectively. In support of their thesis, David and Scadding demonstrated that the gross private saving rate (GPSR) has been remarkably stable on a year-to-year basis as well as nearly constant in the long run. This stability was not affected by changes in government budget deficits nor by the notable sectoral shift from household to business saving over the sample period. The stability of the GPSR suggests that household and business saving are close (perfect) substitutes. Three implications of David and Scadding's analysis need to be mentioned.

> First, an increase in business saving (e.g., reduced dividend payments) is offset on a one-to-one basis by a decrease in household saving. Second, a tax-

[7]David and Scadding were building upon the observation of Denison (1958) that the private savings ratio possesses remarkable stability in the United States. Modigliani (1970, p. 219–21) referring to Harrod (1948, Ch. 2) also argued for the use of private saving.

[8]In fact, ultrarationality is contained within Bailey's category of imperfect foreknowledge.

financed increase in government expenditure is offset on a one-to-one basis by a reduction in household consumption expenditure. Third, an increase in debt-financed government spending crowds out dollar-for-dollar private investment expenditure. Ultrarational household behavior gives rise to ex ante crowding out. Fiscal policy is impotent in affecting aggregate demand in the short run and in the long run it, . . . begins to appear just as neutral as money in long-run growth. (1974, p. 247)

Miller (1982) developed a general model of household choice that allowed for differing degrees of substitutability between household decisions and business and/or government decisions. The household sector is asssumed to maximize

(1) $$U = U\{C, S(H); S(B), S(G), T\}$$

subject to the budget constraint

(2) $$Y \equiv C + S(H) + S(B) + T$$

where Y is net national product, C is household consumption expenditure, S(H) is household saving, S(B) is business saving, S(G) is government saving, and T is net taxes (i.e., tax receipts minus transfer payments).[9]

It is assumed that households do not control but rather react to adjustments in business and government decisions. Thus, the household utility maximization takes the variables determined by the business and government sectors as exogenous variables. Moreover, net taxes enter the utility function as a proxy for government consumption expenditures as suggested by ultrarationality.[10] The specification in equation (1) permits different degrees of substitutability between household saving and business and/or government saving, as well as between household consumption and tax-financed government expenditure. Perfect foreknowledge, ultrarationality, and no substitutability assumptions emerge as special cases of this more general specification.

From the first-order conditions of the utility maximization, the household consumption and savings functions can be derived (implicitly) as reduced-form equations in the exogenous variables. These equations are as follows:

(3) $$C = \alpha_1 + \alpha_2 S(B) + \alpha_3 S(G) + \alpha_4 T + \alpha_5 Y + \epsilon_c \quad \text{and}$$
$$S(H) = \beta_1 + \beta_2 S(B) + \beta_3 S(G) + \beta_4 T + \beta_5 Y + \epsilon_s$$

[9]The problems associated with constructing such a community utility function have been ignored.

[10]Miller (1982) had regressions with net taxes and government consumption expenditure used independently. Data restrictions did not allow us to consider government consumption expenditure directly.

where αs and βs are parameters to be estimated and ϵs are random errors. Equation (2) imposes the following cross-equation parameter restrictions:

$$(4) \qquad \beta_1 = -\alpha_1,\ \beta_2 = -(1+\alpha_2),\ \beta_3 = -\alpha_3,\quad \beta_4 = -(1+\alpha_4),\ \beta_5 = (1-\alpha_5).$$

Standard neo-Keynesian analysis assumes that the household sector makes its consumption-saving decision independent of business and/or government decisions. This no substitutability assumption implies that S(B), S(G), and T do not enter the utility function (or their marginal utilities are zero). Equation (1) becomes

$$(5) \qquad U = U\{C, S(H)\},$$

which is maximized subject to equation (2). This leads to the following standard consumption and saving functions:

$$(6) \qquad C = a_1 + a_2\{Y - S(B) - T\} + \epsilon_C \quad \text{and} \quad S(H) = -a_1 + (1-a_2)\{Y - S(B) - T\} + \epsilon_S.$$

Comparing equations (6) with the unconstrained equations (3) yields the following parameter restrictions for no substitutability:[11]

$$(7) \qquad \begin{array}{lll} \alpha_2 = -\alpha_5, & \alpha_3 = 0, & \alpha_4 = -\alpha_5, \\ \beta_2 = -\beta_5, & \beta_3 = 0, & \beta_4 = -\beta_5. \end{array}$$

Similar arguments can be presented for different perfect substitutability assumptions. Suppose the household sector exhibited perfect substitutability between S(H) and S(B) and between C and T, but no substitutability between S(H) and S(G) (i.e., the ultrarationality specification). The household sector substitutes on a one-to-one basis both S(H) and S(B) and C and T. Consequently, the household utility function is

$$(8) \qquad U = U\{C + T, S(H) + S(B)\}.$$

Utility maximization subject to the budget constraint leads to the following consumption and saving functions:[12]

$$(9) \qquad C + T = b_1 + b_2 Y + \epsilon_C \quad \text{and} \quad S(H) + S(B) = -b_1 + (1-b_2)Y + \epsilon_S.$$

[11]For a more thorough development of the model as well as the explicit derivation of these and other restrictions, see Miller (1982). The presentation in the text presents an intuitive justification for the restrictions implied by different types of direct substitutability.

[12]Note from equation (2) that if the household sector chooses {C + T} and {S(H) + S(B)}, then the constraint on this choice is Y.

Comparing equations (9) with equations (3) yields the following parameter restrictions for ultrarationality

$$\text{(10)} \qquad \begin{aligned} \alpha_2 &= 0, & \alpha_3 &= 0, & \alpha_4 &= -1, \\ \beta_2 &= -1, & \beta_3 &= 0, & \beta_4 &= 0. \end{aligned}$$

Finally, suppose the household sector exhibited perfect substitutability between S(H) and both S(B) and S(G) but no substitutability between C and T (i.e., one of the perfect foreknowledge possibilities). Now, the household utility function is

$$\text{(11)} \qquad U = U\{C, S(H) + S(B) + S(G)\}.$$

Utility maximization subject to the budget constraint yields the following consumption and saving functions:[13]

$$\text{(12)} \qquad \begin{aligned} C &= d_1 + d_2\{Y - G\} + \epsilon_C \quad \text{and} \\ S(H) + S(B) + S(G) &= -d_1 + (1-d_2)\{Y - G\} + \epsilon_S. \end{aligned}$$

Comparing equations (12) with equations (3) yields the following parameter restrictions:[14]

$$\text{(13)} \qquad \begin{aligned} \alpha_2 &= 0, & \alpha_3 &= -\alpha_4, & \alpha_4 &= -\alpha_5, \\ \beta_2 &= -1, & \beta_3 &= -(1+\beta_4), & \beta_4 &= -\beta_5. \end{aligned}$$

Table 1 provides a summary of the parameter restrictions implied by the various perfect substitutability assumptions.

IV. Ex-Ante Crowding Out: Empirical Evidence

The consumption and saving equations (3) were etimated for seven EEC countries—Belgium, France, Germany, Greece, Italy, the Netherlands, and the United Kingdom. The period of estimation was 1961 to 1979 except for Greece and Italy where the sample periods were 1961 to 1974 and 1961 to 1978, respectively. Data restrictions limited the sample to only seven EEC countries. The data employed were annual observations, measured in local currencies, and defined as follows:[15]

[13]Note that prior to maximizing one subtracts government expenditure (G) from both sides of equation (2).

[14]If, in this case, the household sector had also viewed C and T as perfect substitutes, then the restrictions on α_2 and β_2 are unchanged, the restrictions on α_4 and β_4 are as contained in (10), and the restrictions on α_3 and β_3 are $\alpha_3 = \alpha_5$ and $\beta_3 = -(1-\beta_5)$. Miller (1982) is unclear on this distinction.

[15]Data were obtained from *National Accounts of OECD Countries* 1961–1978 and 1962–1979. All variables are in millions of local currency units except Italy where variables are in billions.

Table 1:
Parameter Restrictions under Different Substitutability Assumptions

Substitutability between	S(H) and S(B)	S(H) and S(G)	C and T
No Substitutability	$\alpha_2 = -\alpha_5$ $\beta_2 = -\beta_5$	$\alpha_3 = 0$ $\beta_3 = 0$	$\alpha_4 = -\alpha_5$ $\beta_4 = -\beta_5$
Perfect Substitutability	$\alpha_2 = 0$ $\beta_2 = -1$	$\alpha_3 = -\alpha_4$ $\beta_3 = -(1+\beta_4)$	$\alpha_4 = -1$ $\beta_4 = 0$

Note: Tests of these hypotheses are reported in Tables 2, 3, 4, and 5. All tests are unaffected by whether or not there is perfect or no substitutability between other variables with the exception of perfect substitutability between S(H) and S(G). The test reported above is when there is no substitutability between C and T. If there is perfect substitutability between C and T, then the test for perfect substitutability between S(H) and S(G) becomes $\alpha_3 = \alpha_5$ and $\beta_3 = -(1-\beta_5)$. See (13) and footnote 14.

C ≡ private final consumption expenditure;
S(H) ≡ net household saving, computed as the sum of household saving and saving of nonprofit institutions serving households;
S(B) ≡ net saving of corporate and quasi-corporate enterprises;
S(G) ≡ net saving of general government;
Y ≡ net domestic product in purchaser's values, calculated as the difference between gross domestic product in purchaser's values and consumption of fixed capital; and
T ≡ net tax receipts, computed by subtracting from tax receipts the difference between government disbursements and government final consumption expenditure.[16]

All data were deflated by population and the implicit price deflator for consumption expenditure.

As was mentioned in the previous section, the reduced-form regression equations (3) provide a general framework for investigating the household consumption-saving decision. The estimated coefficients will be examined to see whether no substitutability or perfect substitutability best describe household behavior. Of particular interest are the coefficients α_2, α_3, and α_4 (or β_2, β_3, and β_4). A discussion and interpretation of these coefficients will facilitate an understanding of the empirical results.

First, α_2 measures the effect of a one currency unit increase in S(B) on C holding S(G), T, and Y constant.[17]

—$\alpha_2 = 0$ ($\beta_2 = -1$) means that a change in business saving leaves consumption unaffected and household saving adjusts to offset exactly the change in business saving. S(H) and S(B) are perfect substitutes.

—$\alpha_2 < 0$ ($\beta_2 > -1$) means that household and business saving are less

[16]The difference between government disbursements and government final consumption expenditure (G) is transfer payments. Thus, net taxes are tax receipts minus transfer payments.

[17]Rather than continuing to use the phrase currency unit, we shall henceforth substitute lire. It is understood that lire represents all the currencies in the sample.

than perfect substitutes. A one lire increase in S(B) leads to a fall in S(H) by less than one lire.

—$\alpha_2 > 0$ ($\beta_2 < -1$) means that a one lire increase in business saving results in an increase in consumption. Moreover, household saving falls by more than one lire.[18]

Second, α_3 measures the effect of a one lire change in debt-financed government expenditure (G) on household consumption holding S(B), T, and Y constant.[19]

—$\alpha_3 = 0$ ($\beta_3 = 0$) means that any change in government expenditure causes no change in household consumption or saving. This is the no substitutability hypothesis.

—$\alpha_3 > 0$ ($\beta_3 < 0$) means that an increase (decrease) in government expenditure leads to a decrease (increase) in household consumption. G and C are substitutes. Deficit spending crowds out household consumption. If $\alpha_3 = 1$, then the crowding out is complete.

—$\alpha_3 < 0$ ($\beta_3 > 0$) means that G and C are complements. That is, a one lire increase in government expenditure crowds in household consumption.

Third, α_4 measures the effect of a change in net taxes on household consumption holding S(B), S(G), and Y constant. That is, α_4 examines the effect of a tax-financed change in government expenditure.[20]

—$\alpha_4 = 0$ ($\beta_4 = -1$) means that a change in net taxes is offset lire-for-lire by a change in household saving; household consumption is unchanged.

—$\alpha_4 < 0$ ($\beta_4 > -1$) means that tax-financed spending crowds out household consumption. No substitutability occurs if α_4 is equal to minus the marginal propensity to consume (i.e, α_5). Perfect substitutability occurs when α_4 equals minus one.

—$\alpha_4 > 0$ ($\beta_4 < -1$) implies that tax-financed government expenditure causes household consumption to rise. Tax-financed G crowds in C. This result indicates a strong crowding-in effect. That is, if α_4 is positive, then α_3 should be negative. Tax-financed government expenditure should be more likely to reduce consumption than debt-financed government expenditure.

The regression results for equations (3) are reported in Table 2.[21]

[18]A positive α_2 could occur if the ultrarational household sector believed that the business sector can earn a higher return on saving than is available to the household sector directly.

[19]Given that $S(G) \equiv T - G$, then an increase (decrease) in S(G) holding T constant implies a decrease (increase) in G. Moreover, this change in G must be debt-financed.

[20]An increase (decrease) in T holding S(G) constant implies an equal increase (decrease) in G (i.e., a tax-financed change in G).

[21]We employed ordinary least squares or the Cochrane-Orcutt procedure for autocorrelation adjustment. If equation (2) were an identity in the data base, then the cross-equation parameter restrictions (i.e., see (4)) would be automatically imposed using either of these regression methods. Equation (2) did not hold exactly in the data base; it was, however, quite close. Thus, we calculated S(B) as a residual so that equation (2) held exactly. Moreover, we also ran regressions using measured S(B). The cross-equation constraints were not exact; we usually could not reject the hypothesis that they did hold. Finally, the coefficient estimates using measured and constructed S(B) did not differ substantially.

Table 2:
Consumption and Saving Function Estimates

Country	α_1 / β_1	α_2 / β_2	α_3 / β_3	α_4 / β_4	α_5 / β_5	ρ	$\bar{R}^2$	F	D-W
Belgium (C)	23.9100*	.1564	−1.0023*	.1712	.5267*	—	.9991	4939	2.43
	(7.0500)	(.7400)	(−5.5800)	(.4500)	(6.2800)				
Belgium (S)	−23.9100*	−1.1564*	1.0023*	−1.1712*	.4733*	—	.9893	419	2.43
	(−7.0500)	(−5.2300)	(5.5800)	(−3.0800)	(5.6400)				
France (C)	.4549*	−.3778*	−1.2320*	1.2084*	.4753*	—	.9994	7423	2.04
	(5.2300)	(−3.1400)	(−4.8700)	(3.5500)	(7.8200)				
France (S)	−.4549*	−.6222*	1.2320*	−2.2084*	.5247*	—	.9848	293	2.04
	(−5.2300)	(−5.1800)	(4.8700)	(−6.4900)	(8.64)				
Germany (C)	.3901**	.1522	−.5243*	.0147	.5892*	—	.9972	1589	1.44
	(2.1200)	(.5600)	(−3.0400)	(.0500)	(7.32)				
Germany (S)	−.3901**	−1.1522*	.5243*	−1.0147*	.4108*	—	.9496	86	1.44
	(−2.1200)	(−4.2700)	(3.0400)	(−3.5800)	(5.11)				
Greece (C)	4.1700*	.1324	−1.7489*	1.6258*	.3884*	—	.9991	3463	2.22
	(24.7000)	(.9000)	(−8.6100)	(6.2200)	(8.56)				
Greece (S)	−4.1700*	−1.1324*	1.7489*	−2.6258*	.6116*	—	.9950	649	2.22
	(−24.7000)	(−7.6900)	(−8.6100)	(−10.0400)	(13.48)				
Italy (C)	−.0030	−.5558**	.5052	−.9986**	.8266*	.465	.9967	1209	2.02
	(−.0800)	(−2.1700)	(1.4300)	(−2.0500)	(10.40)				
Italy (S)	.0030	−.4442	−.5052	−.0014	.1734*	.465	.9707	134	2.02
	(.0800)	(−1.7300)	(−1.4300)	(−.0030)	(2.18)				
Netherlands (C)	.7880	.0827	−1.2577*	.2925	.5483*	—	.9969	1456	1.64
	(1.6200)	(.1700)	(−2.3900)	(.2900)	(2.11)				
Netherlands (S)	−.7880	−1.0827*	1.2577*	−1.2925	.4517**	—	.9083	46	1.64
	(−1.6200)	(−2.2200)	(2.3900)	(−1.2600)	(1.74)				
United Kingdom (C)	.1323*	−.4889*	.0732	−.6076*	.7570*	.548	.9968	1318	1.42
	(3.8100)	(−7.1700)	(.7300)	(−4.6600)	(17.7300)				
United Kingdom (S)	−.1323*	−.5111*	−.0732	−.3924*	.2430*	.548	.9528	87	1.42
	(−3.8100)	(−7.4900)	(−.7300)	(−3.0100)	(5.6900)				

Note: Regression results were obtained using the Time Series Processor (TSP) 2.8B. The C and S in parentheses following each country refer to the consumption and saving regressions, respectively. Numbers under coefficient estimates in parentheses are t-statistics. The value for ρ is the autocorrelation parameter, if employed. Tests for $\alpha_5(\beta_5)$ are one-tailed; all other tests are two-tailed.

* means the coefficient is significantly different from zero at the 5 percent level.

Table 3:
Additional Parameter Tests for Table 2

Country	$(\alpha_2 + \alpha_5) = -(\beta_2 + \beta_5)$	$(\alpha_3 + \alpha_4) = (-\beta_3 + \beta_4 + 1)$	$(\alpha_4 + \alpha_5) = -(\beta_4 + \beta_5)$
Belgium	.6831*	−.8311*	.6979*
	(3.79)	(−3.54)	(2.35)
France	.0975	−.0235	1.6837*
	(1.13)	(−.17)	(6.02)
Germany	.7414*	−.5096*	.6038*
	(3.30)	(−3.39)	(2.97)
Greece	.5208*	−.1230	2.0142*
	(3.18)	(−.51)	(9.22)
Italy	.2708	−.4934*	−.1720
	(1.16)	(−2.33)	(−.41)
Netherlands	.6309	−.9653**	.8407
	(1.68)	(−1.83)	(1.10)
United Kingdom	.2680*	−.5344*	.1494
	(4.40)	(−6.48)	(1.58)

Note: See Table 2. All tests are two-tailed.

Additional parameter tests are in Table 3. In general, we find some support for perfect substitutability between household saving and both business and government saving. We do not find much support for perfect substitutability between tax-financed government expenditure and household consumption. In fact, the results provide strong support for complementarity between debt-financed (and sometimes, tax-financed) government expenditure and household consumption.

Perfect versus No Substitutability between S(H) and S(B)

($\alpha_2 = 0$, $\beta_2 = -1$ and $\alpha_2 + \alpha_5 = 0$, $\beta_2 + \beta_5 = 0$, respectively)

The results suggest that household and business saving are perfect substitutes in Belgium, Germany, and Greece. The hypothesis of perfect substitutability cannot be rejected at the 5 percent level. In these countries, a one lire increase in business saving is offset by a one lire decrease in household saving; household consumption is left unaffected. The results suggest that household and business saving are not substitutable in France and Italy. Here, the hypothesis of no substitutability cannot be rejected at the 5 or 10 percent levels, respectively. For these countries, an increase (decrease) in business saving causes a decrease (increase) in household consumption and saving in accordance with the marginal propensities to consume and save, respectively. For the United Kingdom, the coefficients fall between the values implied by perfect and no substitutability; this indicates some, but not perfect, substitutability between household and business saving. Feldstein and Fane (1973) had similar results for the United Kingdom using a 1947 to 1969 sample. Finally, for the Netherlands, we are unable to reject either perfect or no substitutability at the 5- or 10-percent levels.

Auerbach (1982) argued that households in the United States do not view business saving as perfectly substituable with household saving because of the "classical" corporate income tax (i.e., corporations and stockholders are taxed independently). David and Scadding (1974) addressed this issue and attempted to argue that ultrarationality was not inconsistent with a tax-avoidance explanation of the composition shift in private saving. Miller (1982) found evidence of less than perfect substitutability between household and business saving when total consumption expenditure was used in the regressions; but, when adjustments for the consumption of consumer durables were introduced, he could not reject the hypothesis of no substitutability. Auerbach noted that many European countries had ". . . partially or perfectly integrated tax systems (imputation systems)." (1982, p.87). More specifically, Belgium, France, and Germany have integrated systems; Greece, Italy, and the Netherlands have classical systems; and the United Kingdom had a classical system from 1965 to 1973 and an implicit imputation system for the other years in the sample.[22] If Auerbach's assertion is correct, then we should find perfect substitutability for those countries with imputation systems. We do find such a pattern. Both Belgium and Germany exhibit perfect substitutability and have imputation systems. Italy and the Netherlands exhibit no substitutability and have classical systems.[23] In addition, the United Kingdom had a mixed tax-system experience and exhibits partial substitutability between household and business saving. The exceptions to this categorization are France and Greece.

Perfect versus No Substitutability between S(H) and S(G):

($\alpha_3 + \alpha_4 = 0$, $\beta_3 + \beta_4 = -1$ and $\alpha_3 = 0$, $\beta_3 = 0$, respectively)

Perfect substitutability between household and government saving is supported in France and Greece and no substitutability in Italy and the United Kingdom, all at the 5 percent level. The results for the remaining countries fail to support either hypothesis. Note, however, that with the exception of Italy and the United Kingdom, α_3 was significantly negative in all cases. A negative α_3 indicates that debt-financed government expenditure and household consumption are complements. Thus, debt-financed government expenditure is highly expansionary. There are two effects; government expenditure raises aggregate demand directly and indirectly through the increase in consumption expenditure. It is possible that these results are due to a wealth effect. That is, rising government debt causes consumption to rise because wealth expands. We shall consider this possibility below.

Miller (1982) generally found for the United States that α_3 was not

[22]See Adams and Whalley (1977, Ch. 2) for details.

[23]The statement concerning the Netherlands is based on the results in Table 4 where a wealth variable has been added to the regression equation. See below for details.

significantly different from zero.[24] In the one case where α_3 was significant, it was positive. Thus, the finding for Belgium, France, Germany, Greece, and the Netherlands that debt-financed government expenditure and household consumption are complements is quite surprising. What might be the explanation? One, highly speculative answer relates to the "social-safety net" provided by these countries. If rising government expenditure is a signal to households that the government is, and will be, providing for more and more of their future needs, then rising government expenditure should depress household saving.[25]

The results reported in Table 2 do not distinguish between bond-financed and money-financed changes in government expenditure. Economists have typically differentiated bond-financed and money-financed increases in government expenditure in their effect on the money, and not the goods, market. Differential effects in the goods market would result if the household sector had different perceptions about government bonds and money as wealth.[26] Chiang and Miller (1983) found differential effects for the United States; Kochin (1974), on the other hand, did not. Consequently, we included in equations (3) as an additional variable the change in base money to approximate the money-financed portion of the government deficit.[27] Regression results in all cases had coefficients of the change in base money that were not significantly different from zero. Moreover, the other coefficient estimates were not affected. We have not reported these results. Thus, the mode of financing does not influence the effect of debt-financed government expenditure on consumption.

[24]Feldstein (1982a) also found for the United States that a debt-financed increase in government expenditure did not affect consumption. He was countering the results of Kochin (1974) and Tanner (1979a, 1979b). They found that government saving affected consumption *positively* and concluded that this was consistent with perfect tax discounting (i.e., the same as perfect substitutability between household and government saving). Although not directly comparable, our results imply that government saving affects consumption negatively (i.e., crowding in rather than crowding out).

[25]A small part of this issue has received considerable attention; do increases in social security benefits reduce household saving? Feldstein has offered evidence for the United States (1974, 1982b) and internationally (1977, 1980). Each of these studies concluded that increases in social security benefits reduced household saving. Others have countered Feldstein's work—Leimer and Lesnoy (1982) for the United States evidence and Barro and McDonald (1979) for the international evidence. In 1980, Belgium, France, Germany, Italy, and the Netherlands had social security contributions greater than 10 percent of GDP ranging from about 11 percent for Italy to about 17.5 percent for France and the Netherlands. Of these countries, four had significant increases in this percentage since 1960 ranging from 48 percent increase for Germany and France to a 134 percent increase for the Netherlands. Italy was the exception with a constant social security contribution as a percent of GDP. See OECD Studies in Taxation (1981). This evidence is consistent with the speculation explanation offered in the text.

[26]See Chiang and Miller (1983) for the theoretical arguments.

[27]Data were collected from *International Financial Statistics,* line 14.

Perfect or No Substitutability between C and T

($\alpha_4 = -1$, $\beta_4 = 0$ and $\alpha_4 + \alpha_5 = 0$, $\beta_4 + \beta_5 = 0$, respectively)

The results support no substitutability between tax-financed government expenditure and household consumption for Italy, the Netherlands, and the United Kingdom, all at the 5 percent level. In the case of Italy, we are unable to reject the perfect-substitutability hypothesis. The data in Italy do not allow us to differentiate perfect and no substitutability.

The most interesting, and surprising, result is that α_4 is positive for the same five countries that had α_3 negative; but α_4 is significantly positive only for France and Greece.[28] For Belgium, Germany, and the Netherlands, a tax-financed increase in government expenditure leaves household consumption unaffected and leads to an offsetting decrease in household saving. For France and Greece, a tax-financed increase in government expenditure leads to a rise in household consumption. Household saving is affected twice; it must fall because of the rise in taxes and because of the rise in household consumption. Thus, tax-financed government expenditure and household consumption are complements. Fiscal policy (i.e., a balanced-budget increase in spending) is very powerful in affecting aggregate demand but at the expense of significantly depressing household saving.

Net Wealth as a Factor in the Household Consumption-Saving Decision

The reduced-form equations estimated in Table 2 were deduced from a model that neglects the role of net wealth. Theory and empirical evidence, however, suggest that net wealth is a significant determinant of the household consumption-saving decision. Earlier, we found that debt-financed government expenditure increased household consumption in certain countries. We speculated that this result might be due to a wealth effect. Thus, in this section, we include a wealth measure, which contains government debt, to examine if it captures the observed complementarity between government expenditure and household consumption.

We define wealth as

$$W \equiv K + B + H \tag{14}$$

where W is wealth, K is the capital stock, B is government bonds, and H is government money. Thus, the rate of change in private wealth is given by

$$S(H) + S(B) \equiv \dot{W} \equiv \dot{K} + \dot{B} + \dot{H} \equiv I - S(G). \tag{15}$$

We have data on S(H) and S(B). If we had a benchmark figure for W, then we could construct a wealth series as the benchmark plus S(H) and S(B) each year (note that the saving data are net and not gross). We do not have a benchmark figure. Nevertheless, we arbitrarily choose a "reasonable"

[28]Miller (1982) found that α_4 was significantly negative in all regressions.

benchmark and construct a "pseudo-wealth" series. The constructed series will differ from the "true" series by a constant. Consequently, when we include this pseudo-wealth variable in equations (3), the constant term incorporates the measurement error of wealth; other coefficient estimates are unaffected. We construct the wealth series using nominal values; the resulting series is then deflated by population and the price level. Thus, the measure of real, per-capita wealth captures changes due to changes in nominal wealth as well as changes in population and the price level (i.e., induced-price wealth changes).[29]

After reestimating equations (3) with the wealth series incorporated, the coefficients of wealth in Belgium, France, Italy, and the United Kingdom are not significantly different from zero. In addition, the other coefficients, excluding the constant, are not affected significantly. Thus, we report only the results for Germany, Greece, and the Netherlands for which the coefficient of wealth is significantly different from zero (see Tables 4 and 5).

Several points stand out. First, in all cases, the coefficient of wealth is significantly positive in the consumption equation. The size of the coefficient is of the same order of magnitude for similar studies of U.S. data. Second, the changes in results for the Netherlands are that there is now evidence of no substitutability between S(H) and S(B) and that ($\alpha_4 + \alpha_5$) is now significantly negative although only at the 10 percent level. We are able to reject the perfect substitutability hypothesis between S(H) and S(B). Third, the changes for Greece are that α_2 is now significantly positive rather than not significantly different from zero and that ($\alpha_3 + \alpha_4$) is now significantly negative although only at the 10 percent level. The former result indicates that household saving increases (decreases) by more than the decrease (increase) in business saving (See footnote 18). Finally, the only change for Germany is that ($\alpha_3 + \alpha_4$) is now not significantly different from zero; this result is consistent with perfect substitutability between household and government saving.

In sum, the inclusion of the wealth variable does not alter many of the conclusions derived in the earlier specification. Only three countries have coefficients of wealth significantly different from zero and, in these countries, most of the coefficients are unaltered from the previous specification.

V. Conclusion

Macroeconomic policy coordination among the Member States in the EEC requires an understanding of the structure of each Member State's economy. If economic structures are similar across Member States, then one problem of policy coordination is removed. This paper has examined one small part of this question—the household consumption-saving decision.

[29]The measure of wealth does not capture interest rate induced wealth changes.

Table 4:
Consumption and Saving Function Estimates with a Wealth Variable

Country	α_1 β_1	α_2 β_2	α_3 β_3	α_4 β_4	α_5 β_5	α_6 β_6	ρ	$\overline{R}^2$	F	D-W
Germany (C)	.6031*	.3449	−.6494*	.4488	.3346*	.0755*	—	.9978	1627	1.59
	(3.19)	(1.36)	(−3.99)	(1.41)	(2.47)	(2.21)				
Germany (S)	−.6031*	−1.3449*	.6494*	−1.4488*	.6654*	−.0755*	—	.9605	89	1.59
	(−3.19)	(−5.29)	(3.99)	(−4.56)	(4.92)	(−2.21)				
Greece (C)	−1.03	.2949*	−2.5403*	1.7076*	.4576*	.0343*	−.553	.9992	2926	2.06
	(−.41)	(2.45)	(−6.63)	(8.21)	(9.36)	(2.08)				
Greece (S)	1.03	−1.2949*	2.5403*	−2.7076*	.5424*	−.0343*	−.553	.9959	580	2.06
	(.41)	(−10.78)	(6.63)	(−13.02)	(11.10)	(−2.08)				
Netherlands (C)	−4.28*	−.8580**	−1.6334*	.4267	.8096*	.0185*	—	.9982	2003	2.08
	(−2.73)	(−1.83)	(−3.92)	(.55)	(3.80)	(3.32)				
Netherlands (S)	4.28*	−.1420	1.6334*	−1.4267**	.1904	−.0185*	—	.9466	65	2.08
	(2.73)	(−.30)	(3.92)	(−1.82)	(.89)	(−3.32)				

Note: See Table 2. The coefficients of wealth are α_6 and β_6. Also, test for $\alpha_6(\beta_6)$ are one-tailed.

Table 5:
Additional Parameter Tests for Table 4

Country	$(\alpha_2 + \alpha_5) = -(\beta_2 + \beta_5)$	$(\alpha_3 + \alpha_4) = -(\beta_3 + \beta_4 + 1)$	$(\alpha_4 + \alpha_5) = -(\beta_4 + \beta_5)$
Germany	.6795*	−.2006	.7834*
	(3.3800)	(−1.0400)	(3.9700)
Greece	.7525*	−.8327**	2.1652*
	(7.3500)	(−2.3100)	(11.9400)
Netherlands	−.0484	−1.2068*	1.2362**
	(−.1400)	(−2.9500)	(2.0700)

Note: See Tables 2 and 3.

The empirical work needs to be viewed as preliminary and tentative. Nevertheless, some of the results provide a consistent pattern that is highly suggestive. We find structural differences across the countries in the sample with respect to the household consumption-saving decision. First, the countries can be divided into two groups as to whether personal or private saving is the appropriate level of aggregation. Belgium, Germany, and Greece exhibit a pattern consistent with perfect substitutability between household and business saving. The other countries exhibit no substitutability (partial substitutability for the United Kingdom). In addition, these results are generally in line with whether a country had a classical or an integrated tax system (i.e., Are stockholders and corporations taxed separately?). Second, we find strong evidence of complementarity between debt-financed government expenditure and household consumption in five countries (in France and Greece, we also find complementarity between tax-financed government expenditure and household consumption). We do not find that the method of financing the government deficit affects the household decision. Third, for France, Germany, and Greece, the evidence is consistent with perfect substitutability between household and government saving. This suggests that saving is appropriately aggregated to the national level (at least for Germany and Greece). Fourth, although it is highly speculative to classify countries based on our results, Italy and the United Kingdom appear to have significant structural differences from the other countries. Moreover, these two countries are closest to the standard neo-Keynesian specification of the household consumption-saving decision.

The most surprising result is that government expenditure has such a stimulative effect on household consumption in five of the seven countries. This stimulative effect, however, is a short-run phenomenon; it is at the expense of long-run growth. Expanding government deficits have two depressing effects. First, rising deficits absorb a larger share of private saving and, thus, crowd out investment (see equation 15). But, second, rising deficits also cause a decline in private saving (i.e., household saving falls, holding business saving constant). This further reduces investment. Consequently, in five of the seven countries, the empirical evidence is consistent with significant crowding out of investment by government budget deficits. These findings magnify the importance of the Commission's concern to adopt sounder budget policies within the Community. The crowding out of investment runs counter to the Community's growth objective. If Member States are more concerned about the short-run benefits of rising government deficits, then a significant barrier to long-run growth exists. Moreover, this short-run perspective becomes more seductive as the domestic economy experiences larger and larger unemployment.

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Discussion

Richard W. Kopcke*

After I accepted the invitation to discuss this paper on crowding out, I had second thoughts. After all no one willingly enters these seemingly endless discussions that teeter between unmeasurable concepts (credibility, expectations) and highly abstract theory, discussions that threaten to topple at any moment into the depths of metaphysics. After receiving the paper, I found I owed the authors an apology. They deserve our respect for writing a lucid paper, and I applaud their effort to combine a well-defined model with the data for seven nations to explore the EEC experience with crowding out. This is tangible, down-to-earth stuff.

Unfortunately, their work shows us why empirical work on crowding out is not more abundant. In proposing their model and sifting the evidence from the data, the authors have had to expose their analyses and techniques to specific criticisms. There can be no retreat into nebulous polemics or theory here. As we read this paper, or any empirical paper in economics, we often find that we would have done things differently, perhaps arriving at different conclusions. Perhaps then we cannot agree on a definitive tangible test for crowding out, but we surely cannot fault the authors for trying.

The paper distinguishes *ex ante* from *ex post* crowding out and considers only *ex ante* crowding out. I don't know how this limitation will be received by the European financial community but I know that when Wall Street inveighs against government deficits, it is *ex post* crowding out that the financiers fear. This limitation also undermines the paper's subsequent empirical work because *ex post* crowding out influences and may dominate any statistical evidence despite the authors' disclaimers that they are looking for *ex ante* crowding out only. (I will return to this issue presently.)

I am surprised that the national income accounting behind the paper's empirical work imposes the identities:

$$(1) \qquad Y \equiv C + I + G \qquad \text{and}$$

$$(2) \qquad Y \equiv C + S(H) + S(B) + T$$

where Y is net national product, C is household consumption, I is business investment, and G is government spending. Net exports and foreign capital flows are missing. This omission is especially curious for the seven EEC countries studied in the paper whose current account balances can be volatile.

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The paper's only empirical equations are the consumption and savings functions (3). The authors estimate both these equations for each country in the study, assuming S(B), S(G), T, and Y are exogenous. Because S(G) and T are exogenous, G must be exogenous also. Therefore, because Y and G are exogenous in (1) above, the function that determines C also determines I. Because Y, S(B) and T are exogenous in (2) above, the function that determines C also determines S(H). In other words, once consumption is known, both investment and savings are known.

The savings function is determined right down to its error by the consumption function (or vice versa). The same accounting identities that constrain the coefficients of the consumption and savings equations also constrain the "errors" in these two equations to be additive inverses. So the authors do not need to estimate two equations because there is only one behavioral function in this model.

The investment function, like the household saving function, is specified completely, right down to its error term, once the consumption function is estimated. In a sense, there is only one degree of freedom in the model. This "equivalence" between the investment and consumption functions poses a problem: the investment equation implied by the authors' consumption function does not appear to depend on the productivity of capital, the economy's production possibilities, or the cost of capital. Investment, of course, does depend on these influences; so the coefficients in the correctly specified "consumption" function must represent both the parameters of utility functions and production functions. If the authors' equation (3) is specified correctly, then its coefficients represent the elasticities of substitution embedded in the utility and production functions. Therefore the complex coefficients of this equation tell us little about the parameters of S(B), S(G) or T in the utility function alone.

This reinterpretation of the coefficients of the "consumption" equation is not fatal. Perhaps a more general concept of substitution can be justified by appealing to both taste and technology instead of taste alone. To see what these coefficients stand for, utility should be maximized subject to income being constrained by the production functions and necessary accounting identities. I say "production function*s*," because in a one-good model government capital, the government consumption good, business capital, and the household consumption good are all the same thing; and government capital must produce the same output as business capital. Perhaps this strong form of substitution should not be assumed from the beginning.

In any case, for two reasons I cannot agree that the coefficients in the so-called consumption function measure the effect of government or business decisions on consumption. First, even though the authors claim they are considering only *ex ante* crowding out, other macroeconomic variables may be influencing current consumption—by means of *ex post* crowding out or through business cycles, for example. If these other macroeconomic influences—including monetary policy—cannot be ignored, the interpretation of the coefficients in the consumption function is very complex because the explanatory variables appearing in the equation are correlated with omitted variables that should have been included as well. A more complete specification of the model would allow us to distinguish *ex ante* crowding out from the other elements—prices, interest rates, exchange rates, etc.—that influence current consumption, savings, government saving, and business saving.

Second, I must ask: why is Y exogenous? Given that Y is constant, consider two cases: (i) the change in S(G) is matched by an equal but opposite change in disposable income only; (ii) the change in S(G) is also matched by an equal but opposite change in investment spending. Suppose S(G) rises, then consumption would fall in case (i) or not change in case (ii). By allowing net exports to change or by allowing even larger changes in investment spending, I could even concoct a third case wherein consumption would rise. Which case applies will depend on *ex post* crowding out, monetary policy, the trade balance, the stage of the business cycle, etc. Because none of these "side conditions" are constant for any country over time, the estimates of the coefficients in the authors' "consumption" function depend on the shifting blends of "side conditions" that prevailed during the 1960s and 1970s for each country. Seen this way, the estimated "consumption" equation also suffers from simultaneous equations problems because the model has omitted relevant equations as well as relevant variables, equations that jointly determine household, business, government, and foreign saving.

I can understand why this paper avoids a full-blown simultaneous model, but this one-equation model exacts its price. Holding income constant (exogenous Y) not only creates estimation problems, it also guarantees that the paper must come to the conclusion that: "rising deficits absorb a larger share of private saving and, thus, crowd out investment . . . [and] rising deficits also cause a decline in private saving (i.e., household saving falls holding business saving constant). This further reduces investment." No other conclusion is possible because income, business savings, tax receipts, and government spending are exogenous.

The authors estimate their "consumption" equation for seven EEC countries to see if S(B) or S(G) can substitute for S(H) or if C can substitute for T. Six hypotheses are tested and each hypothesis imposes three constraints on the coefficients of the "consumption" function. The separate tabulation of the test statistics for these constraints suggests that the three constraints for each hypothesis were examined separately. I would advise tabulating a single all-inclusive test statistic for each hypothesis. The statistical properties of the tests are not controlled well if the constraints are studied piecemeal because the test statistics for each constraint are not mutually independent. The authors should also explain more clearly how they test their *three* competing hypotheses against one another: "perfect substitution" vs. "no substitution" vs. "partial substitution." Here too piecemeal testing compromises the statistical properties of the investigation.

Given the importance of the tests, I wish the authors would discuss their test criteria. For example, the authors conclude that for the Netherlands "the results support no substitutability between tax-financed government expenditure and household consumption." This hypothesis requires in part that the sum of two specific coefficients in the "consumption" function be zero ($\alpha_4 + \alpha_5$). The reported estimate of this sum for the Netherlands exceeds the estimates of this sum for all other countries except one, but the estimate of this sum for the Netherlands also has a large standard error. Apparently the authors did not control for Type II errors (falsely accepting the null hypothesis) in their tests. For example, if the true value of this sum were .6 for the Netherlands (about the same as Belgium and Germany), then the paper's t-test would falsely accept the hypothesis of no substitutability with a probability greater than 20 percent; but the probability of falsely rejecting the null hypothesis with their test would be only 5 percent if the true value of this sum were zero. For the Netherlands, the test was biased.

To be "large," must ($\alpha_4 + \alpha_5$) be as great as 0.6? α_5 is similar to the marginal propensity to consume out of net national product; it could be 0.6 for example. α_4 is a component of the marginal propensity to consume out of taxes; it could be -0.3 or -0.4 (depending on what is assumed about α_3). The sum of these coefficients is 0.3 or 0.2. Perhaps then Type I and Type II errors should be equal when testing $\alpha_4 + \alpha_5 = 0$ versus $\alpha_4 + \alpha_5 = .25$. If so, such an "unbiased" test would reject $\alpha_4 + \alpha_5 = 0$ for all countries. But this is a "piecemeal" test; the hypotheses for α_2, α_3, α_4 and α_5 should be examined together in an "unbiased" fashion.

Judging from the tabulated statistics, the power of the other tests may be low, suggesting that the tests, by construction, favor the null hypotheses. The authors should structure their tests so that the probability of Type II error does not greatly exceed the probability of Type I error for worthy alternative hypotheses.

Incidentally, the very high values for ($\alpha_4 + \alpha_5$) shown in Table 2 suggest the model may indeed suffer from specification errors. What sense is to be made of $\alpha_4 + \alpha_5 = 2.0$ for Greece? What sense is to be made of many of the values for the "consumption" equation coefficients reported in Table 2? What sense is to be made of the seemingly random pattern of "substitution effects" across and within countries?

The paper concludes by noting that its analysis and empirical work are a preliminary and tentative examination of household consumption-savings decisions for selected EEC countries. The authors claim their findings are "highly suggestive;" perhaps they should have said only "suggestive." I am not familiar enough with the history or economic structure of the countries studied to quibble with the authors' detailed findings, but my faith in their approach is shaken no further when they report that fiscal policy is highly stimulative in these countries.

The authors offer us this paper as a first step for coordinating the economic policies among the members of the EEC. This first step may be tricky, but the last step is a lulu. As Duesenberry contended in his conference paper, the coordination of policies means one thing to technicians who do not stand for election, who bear only benign ideologies, or who collaborate only with academic special interest groups; this coordination of policies means quite another thing to anyone else. The political pitfalls of "simply" coordinating monetary and fiscal policies in the United States are many and are apparently fatal. The prospects of a more complex concord within the EEC are far more remote. How much power over domestic policy are Thatcher, Kohl, Mitterand, and the next Prime Minister of Italy willing to surrender to one another? It is common knowledge that EEC economies cannot go their separate ways, but I am sure that many governments, voters, and interest groups see no need to aggravate this unfortunate condition by surrendering their few remaining political degrees of freedom without substantial tangible compensation. Perhaps the EEC has come to a point where the apparent marginal costs of further coordination exceed the marginal benefits. Indeed the recent popularity of money growth targets can be interpreted as an attempt to "manage" domestic economies without drawing explicit attention to implications for GNP growth, interest rates, trade balances, and exchange rates—to buy an extra political degree of freedom.

The authors have tried to answer difficult questions about crowding out in a very down-to-earth fashion. They could have lobbed their conclusions at us while taking cover in abstract concepts laden with undefined terms and untestable hypotheses. Instead they have come out in the open with their model. Had I undertaken their mission, I would like to believe I would have been so forthright. This approach takes courage. Because the profession has never embraced a universal model for anything, anyone taking this "high road" is vulnerable. For this the authors deserve our respect; for this they have elevated the level of the debate and taken our understanding a step forward.

Part III
Theoretical Issues

Monetary and Credit Targets in an Open Economy

Lucas Papademos and Franek Rozwadowski*

I. Introduction

Monetary theory has in general abstracted from an explicit examination of the role of credit in the monetary mechanism and the merits of credit aggregates as targets and guides of policy. The traditional focus of analysis has been the interaction of the money market with the "real" markets for goods and labor, with the credit market kept in the background as the "residual market" which automatically clears when all the other markets are in equilibrium. Theoretical studies of monetary policy have largely concentrated on policies which take the form of achieving target paths for interest rates or for the stock of money, narrowly defined by its main function as the medium of exchange. In these analyses, the nature and stability of the demand for money play a critical role in determining the effectiveness of policy while the nature and stability of the demand for and supply of credit do not appear as significant factors.

By contrast, credit market conditions and credit aggregates have played an important role in the practice of monetary policy — a role which is likely to become more prominent and widespread in the presence of ongoing fundamental changes in financial markets and institutions. During the 1970s, with the resurgence of monetarism and the shift in policy from targeting interest rates to controlling the stock of money, many countries chose, as their primary monetary target, domestic credit (Belgium, Italy, Sweden) or very broad monetary aggregates whose quantities correspond approximately to total domestic bank credit (France, Japan, Netherlands, United Kingdom).[1]

The usefulness of a broad credit aggregate as a target and guide for policy has also been advocated recently in the United States by a number of economists in the academic and business community as well as within the Federal Reserve. Although the Federal Reserve has been reporting targets for the rates of growth of various monetary aggregates to Congress since 1975, its primary objective until the summer of 1982 was the control of the

[1]See Black (1982a), Hodgman (1974), OECD (1979).

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narrow measure of the stock of money. But a succession of extensive financial innovations, which led to the creation of a plethora of very liquid assets, has seriously undermined the usefulness of money (M1) as a target and indicator of policy.[2] Simultaneously, a number of empirical studies in the United States established that broad credit and money aggregates can serve as efficient intermediate targets and guides on the basis of such criteria as the stability of their relationship to nominal income, their "causal" influence on output, and their contribution in providing advance information on output fluctuations.[3] Influential business economists also argued that broad credit aggregates provide effective measures of the thrust of monetary policy.[4] These views found increasing support within the Federal Reserve, which, in the presence of new instability in the financial markets, officially abandoned its M1 target in October 1982 and adopted in February 1983 a range for the rate of growth of "total domestic nonfinancial debt."[5]

The fact that many countries have been using credit aggregates as targets and that more may do so in the future does not, of course, imply that they are superior to other monetary targets. Indeed, the overall economic performance of the European countries employing credit targets is mixed [see Black (1982b)]. Moreover, the empirical evidence for the United States cited above in support of credit targets is based on data from periods when targets other than credit have been employed. The estimated statistical regularities may break down once the monetary authorities alter their targets and operating procedures as Goodhart and others have argued.[6] It is thus important to examine at a theoretical level the behavioral and institutional factors which determine the relative effectiveness of credit and monetary aggregates as targets and indicators. In a series of papers Modigliani and Papademos have studied the role of credit in the monetary mechanism and have shown how the relative effectiveness of monetary and credit aggregates in minimizing price and output fluctuations depends upon the source of economic instability, behavioral factors, and the financial and fiscal structure of the economy.[7] Their analyses, however, abstracted from the effects of international financial relations and thus from the question of whether credit targets are feasible and desirable in open economies, especially those highly integrated in international financial markets.

Macroeconomic analyses of open economies have paid little attention to the role of credit and to the potential usefulness of credit targets, having concentrated on the implications of alternative exchange rate regimes with

[2]For detailed descriptions of recent developments in the financial markets and discussions of their implications for monetary policy see Akhtar (1983), Cagan (1979), Davis (1981), Goodhart (1982), Hart (1981).

[3]See Cagan (1982), Davis (1979), B. M. Friedman (1980, 1983), Kopcke (1983). The robustness of this empirical evidence is questioned, however, by Berkman (1980), Fackler and Silver (1983), Islam (1981).

[4]See Kaufman (1980) and Wojnilower (1980).

[5]See Morris (1983) and Volcker (1983).

[6]See Goodhart, Letter to the Times of London, February 5th, 1980.

[7]See Modigliani and Papademos (1980, 1983) and Papademos and Modigliani (1983).

monetary policy taking the form of achieving target paths for the stock of money or exchange rates.[8] Two notable exceptions are the studies of Black (1982b) and Rozwadowski (1983). Black used an extended Modigliani-Papademos (1980) model to suggest the existence of a relationship between the choice of the monetary target and the type of exchange rate regime which is appropriate. He supported his hypothesis by evaluating the economic performance of 10 industrial countries, but he did not examine the issue formally on the basis of the model he developed. Rozwadowski (1983) studied the implications of narrow and broad monetary aggregates for the dynamic and stochastic stability of a small open economy under fixed and flexible exchange rates, but did not explore the effectiveness of credit targets or the implications of the imperfect substitutability between domestic and foreign instruments under flexible exchange rates.

This paper has two objectives. The first is to develop an open-economy model which focuses on the role of credit markets in the determination of macroeconomic equilibrium and which incorporates sufficient institutional detail to allow an examination of the relative effectiveness of various forms of monetary and credit control. The second objective is to examine the relative efficiency of a monetary and a credit target which have received a lot of attention in both the practice of policy and in recent discussions and empirical studies. These targets are the narrow measure of the stock of money (M1) and the total quantity of bank credit provided by the consolidated banking system (LB).

The paper is organized as follows. Section II develops the general theoretical framework. This model defines three monetary aggregates and two credit aggregates which may serve as policy targets. In section III we determine the general conditions for stochastic short-run equilibrium under the money and the total bank credit strategy. The analysis is carried out for a regime of freely floating exchange rates and under the assumption that expectations are formed "rationally." This section also presents the dynamic relations which describe how public anticipations about inflation, the terms of trade, and output depend upon the chosen path of the monetary or credit target as well as upon anticipated fluctuations of the world real interest rate. In section IV we analyze the implications of the money and credit targets for the dynamic and stochastic stability of the economy under the assumption that foreign and domestic loans are close substitutes. Although it has often been argued that a credit target is either infeasible or inefficient in such an environment, we find that in general total bank credit is a feasible target and we determine the conditions under which it is superior to the money target in the presence of four types of stochastic shocks. The concluding section summarizes our analysis and its policy implications.

[8]See, for example, Artis and Currie (1981), Henderson (1979, 1982), Melitz (1982), Turnovsky (1981), Weber (1981).

II. The Model of a Small Open Economy

An analysis of the effectiveness of credit aggregates as intermediate targets requires a model which incorporates financial intermediaries, makes explicit the role of credit in economic decisions and stresses the influence of credit markets on macroeconomic equilibrium. The framework developed here takes as its point of departure the model of Papademos and Modigliani (1983) which formalized the determinants of equilibrium in the credit markets in terms of the behavior of households (net lenders) and corporate firms (net borrowers).[9] That model is extended to allow for domestic and foreign financial instruments which, in general, are viewed as imperfect substitutes by both lenders and borrowers. Our model also incorporates a specification of aggregate price fluctuations in an economy in which domestic and foreign goods are imperfect substitutes, and it includes various types of stochastic disturbances. The model is presented in two parts. We first discuss the financial structure of the economy, describing the basic factors determining asset demands and supplies. We then examine the determinants of demand and supply of aggregate output, their relationship to credit markets, and the mechanism of price and wage adjustment.

A. The Financial Structure of a Small Open Economy

The financial structure of an economy is characterized in general by two elements: (1) the set of financial instruments available to households and firms for holding their wealth and financing the acquisition of tangible assets, and (2) the structure and characteristics of financial markets and intermediaries as defined by the degree of competition and the nature and extent of regulation.

The financial structure we examine is summarized in Table 1 which shows the set of financial instruments held by four domestic sectors [households (h), corporate firms (f), banks (b), and government including the central bank (c)] and a single foreign sector labelled "rest of the world" (w). Each row corresponds to a financial instrument and indicates the quantities of that instrument held as an asset (+) or as a liability (−) by each sector. Thus each row of Table 1 also corresponds to a market-clearing condition, indicating that the sum of sectoral demands equals the total supply. As usual, one of these conditions is redundant as a consequence of the sectoral budget constraints. Each column of Table 1 indicates the quantities of the various instruments held as assets or liabilities by that sector. The zero elements show that certain sectors are not involved with certain instruments.

[9] An alternative formulation is presented by Modigliani and Papademos (1980), where the equilibrium conditions in the credit markets are analyzed in terms of the behavior of "surplus" and "deficit" units.

Table 1

Financial Instruments and Markets	Sectors: Households	Firms	Banks	Government and Central Bank	Rest of the World
Currency and Bank Reserves (H)	H_h	H_f	H_b	$-H$	0
Foreign Currency and Reserves (H*)	0	0	0	EH_c^*	$-EH_w^*$
Demand Deposits (D)	D_h	D_f	$-D$	0	0
Time Deposits (T)	T_h	0	$-T$	0	0
Government Bonds (B)	0	0	B_b	$-(B_g-B_c)$	0
Bank Loans (L)	0	$-L_f$	L_b	0	0
Foreign Loans (L*)	EL_h^*	$-EL_f^*$	0	$-EL_c^*$	EL_w^*
Corporate Equity (V_e)	P_eS_e	$-P_eS_e$	0	0	0

Monetary and Credit Aggregates

Monetary Base	$M0 = H$
Money (narrow measure)	$M1 = (H - H_b) + D$
Money (broad measure)	$M2 = M1 + T$
Domestic Bank Credit	$LB = L_b + B_b + B_c + E(H_c^* - L_c^*)$
Total Domestic Credit	$LD = LB + EL_h^*$

Table 1 includes a total of eight financial instruments, six of which are created in the domestic economy and are denominated in domestic currency units. The domestic financial instruments are: currency and bank reserves (H), demand deposits (D), time and savings deposits (T), government bonds (B), bank loans (L), and corporate equity (V_e). There are two foreign-currency financial instruments held by domestic residents: foreign currency and reserves (H*), and foreign loans (L*). The term "foreign loan" is employed to denote all interest bearing foreign financial instruments (loans or bonds), issued by foreign governments and/or foreign private and central banks. The nominal quantities H* and L* are measured in terms of foreign currency and are therefore multiplied by the nominal exchange rate (E), the price of foreign currency in terms of domestic currency. All domestic assets, with the exception of corporate equity, have a fixed price per period in terms of the domestic currency. The value of corporate equity V_e is given by the stock of equity (number of shares) (S_e) multiplied by the market value of a share (P_e).

The nominal rates of return on all the financial instruments of Table 1, expressed in terms of domestic currency, are summarized by the vector

$$\underline{i} = [i_H, i_{H^*}, i_D, i_T, i_B, i_L, i_{L^*}, i_E]$$

Table 2 summarizes our assumptions on the expected values and interrelationships of all the elements of $\underline{i}$. The nominal rate of return on domestic base money, i_H, is zero, and the nominal rate of return on demand deposits, i_D, is fixed by a legal restriction or as a result of the banks' decision to charge implicitly for the transactions services they provide by offering demand deposits with a fixed or an infrequently changing low rate of return.

Table 2
Nominal Rates of Return on Assets in Terms of Domestic Currency

(1) Domestic Currency and Bank Reserves	$i_H = 0$
(2) Foreign Currency and Bank Reserves	$i_{H^*} = \hat{\epsilon}$
(3) Demand Deposits	$i_D = \bar{i}_D$
(4) Time Deposits	$i_T = (1-\kappa)i_L - \mu_T$
(5) Government Bonds	$i_B = i_L - \mu_B$
(6) Domestic Bank Loans	$i_L = i$
(7) Foreign Loans	$i_{L^*} = i^* + \hat{\epsilon}$
(8) Corporate Equity	$i_E = i_K + \lambda\zeta,\ \zeta = i_K - i_A$

Definitions of symbols
$\hat{\epsilon}$ = anticipated rate of depreciation of domestic currency
κ = required reserve ratio on time and savings deposits
μ_T = cost of intermediation per unit of bank deposits
μ_B = fixed spread between government bonds and private loans
i^* = interest rate on foreign loans measured in terms of foreign currency
λ = corporate firms' debt-equity ratio
ζ = risk premium
i_K = rate of return on the equity of "unlevered" firms
i_A = $\phi i + (1-\phi)(i^* + \hat{\epsilon})$, average interest rate on firms' debt
ϕ = share of domestic loans in firms' total debt

The rate of return on time deposits, i_T, is market determined by profit maximizing banks operating under competitive conditions. It can be expressed as a "mark-down" on the loan rate, i_L, as shown by (4) where κ is the required reserve ratio on time and savings deposits, and the spread μ_T reflects the costs of intermediation per unit of deposits due to the operating costs, reserve requirements on demand deposits, and the spread between the rates of return on bank loans and other bank assets.

In general, we may assume that all financial assets are gross substitutes. For analytical convenience, however, we assume that the rates of return on government bonds, bank loans, and corporate equity [i_B, i_L, i_E] differ by "constant" spreads, as shown by (5) and (8), which reflect differential transaction costs and risk characteristics. The rate of return on equity is expressed in terms of the rate of return on the equity of "unlevered firms" or rate of return on capital, i_K, and the risk premium ζ required by households for holding corporate equity. The risk premium is expressed relative to the average rate of return on firms' debt which is a weighted average of the domestic and foreign loan rates, weighted by the share of domestic bank loans in firms' total debt (ϕ). Households own corporate debt indirectly via their ownership of bank deposits but they may also hold firms' debt denominated in foreign currency.

The nominal rates of return on foreign assets expressed in terms of domestic currency reflect the anticipated rate of depreciation of the domestic currency. Assuming that the nominal rate on foreign currency and reserves, measured in terms of foreign currency, is zero, (2) states that i_{H^*} equals the anticipated rate of depreciation of the domestic currency $\hat{\epsilon}$,

$$\hat{\epsilon} = \hat{e}_{+1} - e$$

where e is the logarithm of the nominal exchange rate. The foreign loan rate is given by (7) as the sum of i^*, the interest rate on foreign loans, measured in terms of foreign currency, and $\hat{\epsilon}$. The assumption that the domestic economy is "small" implies that the world interest rate on foreign loans can be taken as given (in foreign currency units). Equations (1) – (8) (see Table 2) imply that the vector of nominal yields $\underline{i}$ can be expressed as a function of the two interest rates on domestic and foreign loans $[i, i^* + \hat{\epsilon}]$. Domestic and foreign loans are imperfect substitutes in part because of the exchange risk associated with the different currencies of denomination.

Households

Households hold domestic currency, demand and time deposits, foreign assets, and corporate equity. In this paper we assume that all real capital is held by corporate firms, and that households have claims on physical capital through their direct ownership of corporate equity and firms' foreign-currency debt and their indirect ownership of firms' domestic-currency debt via their holdings of domestic bank deposits. Since households do not own physical capital directly, they would borrow primarily for the purpose of acquiring corporate equity. But the extent of such household borrowing is very limited as the empirical evidence suggests and for reasons we have discussed elsewhere.[10] Accordingly, we will abstract from the households' demand for credit and will analyze the demand for bank loans (or supply of domestic private debt) in terms of the firms' decisions on how to finance their purchases of tangible assets.

The households' demand for every nominal asset is assumed to be proportional to the price level (P) and a real demand function denoted a[.] which depends upon the vector $\underline{i}$ of nominal rates of return on all assets, measured in terms of domestic currency, households' anticipated real disposable income ($\hat{Y}^D$), and initial real wealth (W_{-1}). Thus the demand for the representative asset A is expressed as:

(9) $$A_h^d = Pa_h[\underline{i}, \hat{Y}^D, W_{-1}]$$

where

(10) $$P = P_y^{\bar{\theta}} [EP_y^*]^{(1-\bar{\theta})}$$

The price level is measured by an index P defined as the geometric average of the price P_y of the domestically produced composite good Y and the price EP_y^* of the imported good in domestic currency units. P_y^*, the foreign-currency price of imports, is unaffected by domestic economic con-

[10]See Papademos and Modigliani (1983).

ditions and is taken as given. The domestically produced goods and the imported goods are imperfect substitutes. The weight in the price index represents the share of the domestic goods in total private expenditures by domestic residents at the long-run equilibrium. Real disposable income is defined in section II.B.

Firms

Corporate firms hold real capital and money (Ml) as assets which they finance by issuing equity and debt. Firms' debt is in the form of bank loans obtained from domestic banks or foreign currency loans from foreign banks and financial institutions and foreign currency bonds which are held by foreign and domestic residents.

The financing decisions of firms involve two fundamental choices: whether to finance new investment through debt or equity and whether to employ internal or external sources of financing new equity [retention of earnings vs. issuance of new shares]. In addition, firms must decide whether to borrow from domestic banks or in the international markets. The determinants of the capital structure of corporate firms have been discussed extensively in the financial literature, especially since the celebrated articles of Modigliani and Miller.[11] The issue has recently been reexamined within the context of a macroeconomic model by Papademos and Modigliani (1983). On the basis of that analysis, we postulate here that the total demand for bank loans (supply of debt) by corporate firms is proportional to the total value of the firms' assets:

$$L^d_{Tf} = \ell(\bar{\pi})[PK + Ml_f] \tag{11}$$

where the firms' capital is valued at its current replacement cost. The proportionality factor ℓ, the debt-asset ratio, is a function of the average anticipated inflation $\bar{\pi}$, but it is not sensitive to fluctuations in interest rates.[12] Its average value will reflect primarily parameters of the tax structure of the economy, which determine the contribution of leverage to the value of the firm, and parameters capturing the effects of bankruptcy and other costs that firms face as the debt-asset ratio increases. Given the tax structures of many western economies where nominal interest payments on debt are deductible from corporate taxes, the leverage ratio ℓ will tend to increase with the *average anticipated* inflation rate. Transitory fluctuations in the inflation rate are assumed to leave unaffected the anticipated long-run aver-

[11] Modigliani and Miller (1958), Miller and Modigliani (1961).

[12] It is possible to modify our present formulation of loan demand so as to allow for a negative interest rate effect on ℓ in order to capture the more conventional effects of interest costs on noncorporate borrowing which is not treated explicitly in the present analysis. Such an extension, however, does not alter the major conclusions of our analysis but it complicates the algebra.

age rate of inflation $\bar{\pi}$ and thus ℓ. The total (flow) demand for borrowing per period follows directly from (11):

$$\Delta L_{Tf} = \ell PI + \ell[\Delta P - \delta P]K_{-1} + \ell\,\Delta Ml_f \tag{12}$$

where I is gross investment and δ is the rate of depreciation of the capital stock. An increase in the level of interest rates reduces total borrowing indirectly by reducing investment, (I), and by reducing the demand for money by firms. An increase in income increases credit demand through its effects on firms' money balances. The demand for money by firms is determined according to a conventional specification: $\dot{M}l_f = Pm_f(\underset{-}{i}, Y)$. It is assumed that the demands for money balances by households and firms are characterized by the same interest and real income elasticities.

Given the total demand for credit, the firms' demand for domestic and foreign loans depends on the interest rate differential, in domestic currency units. Employing (7) we have that,

$$L_f^d = \phi(i - (i^* + \hat{\epsilon}))L_{Tf} \tag{13}$$

$$[EL_f^*]^d = [1 - \phi(i - (i^* + \hat{\epsilon}))]L_{Tf}$$

where $0 < \phi(.) < 1$, and $\phi'(.) < 0$.

Given the firms' planned investment and borrowing policy, the remaining fraction of investment must be financed through equity, either by retaining earnings (S_f) or by issuing new shares (S_e) or a combination of both. The firms' dividend policy will determine the nature of equity financing. We assume that retention of earnings together with borrowing provide sufficient funds for financing investment. Any surplus funds are distributed as dividends to the equity owners. The real value of retained earnings (S_f) and dividends (Π) must equal the real value of corporate profits net of interest payments on firms' debt:

$$S_f + \Pi = F_K K_{-1} - [iL_f + (i^* + \hat{\epsilon})EL_f^*]_{-1}/P \tag{14}$$

where F_K is the marginal product of the existing capital stock, *net* of the per unit cost of acquiring and installing new capital, and the last term represents the real value of the interest payments on the corporate debt outstanding at the beginning of the period. The real value of dividends distributed to households per period can be derived from the firms' budget constraint

$$PI + \Delta M1_f = PS_f + P_e\Delta S_e + \Delta L_{Tf}$$

after replacing ΔL_{Tf} and S_f by the expressions given by (12) and (14), letting $\Delta S_e = 0$, and solving for Π to get

$$\Pi = F_K K_{-1} - \ell r_{A,-1}[K_{-1} + (M1_f/P)_{-1}] \tag{15}$$

$$- [\delta K_{-1} + \pi(1+\pi)^{-1}(M1_f/P)_{-1}] - (1-\ell)[I - \delta K_{-1} + \Delta(M1_f/P)]$$

where $r_A = [\phi i + (1 - \phi)(i^* + \hat{\epsilon}) - \hat{\pi}]$ is the average real interest rate on the firms' total debt (domestic and foreign).

Banks

The banking sector is defined to include all financial intermediaries whose liabilities take the form of deposits which can be grouped into two broad categories: demand deposits (D) and time and savings deposits (T). As noted above, the interest paid on demand deposits is constant, $i_D = \bar{i}_D$, but the interest paid on time deposits is market determined. Banks operate under competitive conditions and with constant returns to scale. Their assets consist of reserves, H_b, held in the form of domestic currency or as deposits with the central bank, domestic currency bank loans, L_b, and domestic currency government bonds, B_b.

Banks are required to hold reserves against their liabilities or assets, and for simplicity it is assumed that they only hold the required amount, satisfying their potential needs for liquid assets by holding short-term government bonds. The nature of reserve requirements imposed on private banks depends upon the central bank's choice of a monetary or a credit target. If the target is total domestic bank credit, a case we examine below, banks will be required to maintain reserves equal to a fraction κ of all their domestic assets or, equivalently, of all their domestic liabilities, so that

$$H_b = \kappa\ (H_b + L_b + B_b) = \kappa\ (1-\kappa)^{-1}(L_b + B_b) = \kappa\ (D+T) \tag{16}$$

The unrestricted funds are used by banks to extend credit either by making loans (L_b^s) or by purchasing government bonds (B_b^d). Hence,

$$B_b^d + L_b^s = (1-\kappa)\kappa^{-1}H_b = (1-\kappa)(D+T). \tag{17}$$

Banks' operations imply the equality of the risk-adjusted yields on bonds and loans so that (5) holds.

Government and the Central Bank

The fiscal authorities finance any deficits by issuing government bonds. The total quantity of these bonds B_g is held only by domestic financial institutions. The monetary authorities' assets consist of domestic credit, equal to a quantity B_c of government bonds and foreign currency and reserves EH_c^*. The central bank's liabilities are domestic currency and reserves H and foreign loans from official sources or private banks EL_c^*. If we denote by F_c the net foreign assets held by the central bank, measured in domestic currency units, that is $F_c = E(H_c^* - L_c^*)$, the balance sheet constraint of the central bank is $B_c + F_c = H$. The sum of all elements in the government and central bank column of Table 1 equals government debt: $-H-(B_g-B_c)-F_c = -B_g$.

The consolidated (flow) budget constraint of the fiscal and monetary authorities in units of domestic currency, and expressed in real terms by deflating with the price index P, is

$$P_y(G-T^G)/P + (r_B b)_{-1} + \Delta f_c = \Delta h + \Delta b + \pi h_{-1} + (r_c f_c)_{-1} \tag{18}$$

where $P_y(G-T^G)/P$ is the real value of government expenditures minus taxes (net of transfers), $h = H/P$, $b = (B_g - B_c)/P$, $f_c = F_c/P$ are the real values of high powered money, privately held government bonds, and net foreign assets of the central bank; $r_B = i_B - \hat{\pi}$, $r_c = i_c - \hat{\pi}$ where $\pi = P_{+1}/P - 1$ and i_c is the average rate of return on the net foreign assets of the central bank expressed in terms of domestic currency,

$$i_c = \hat{\epsilon}(EH_c^*/F_c) - (i^* + \hat{\epsilon})(EL_c^*/F_c) = \hat{\epsilon} - i^*(EL_c^*/F_c). \tag{19}$$

The real government budget constraint states that the government's real current deficit (the first two terms) plus its net real purchases of foreign assets must be financed by an increase in the real quantities of money and/or bonds, the "inflation tax" on real high-powered money, and the real income from its net foreign assets.

The Rest of the World and the Balance of Payments

The foreign sector's financial instruments relevant to the domestic economy are its net supply of foreign currency and reserves, EH_w^*, which appears as a net liability, and its net supply of debt instruments to the central bank and private sector, EL_w^*. The real value of the economy's balance of payments constraint, expressed in terms of domestic currency and deflated by P, is

$$P_y(X - ZX^*)/P + (r_c f_c)_{-1} + (i^* + \hat{\epsilon} - \hat{\pi})_{-1} f_{-1} - \Delta f = \Delta f_c \tag{20}$$

where $Z = EP_y{}^*/P_y$, $f = E(L_h^* - L_f^*)/P$, $f_c = E(H_c^* - L_c^*)/P$, $r_c = i_c - \hat{\pi}$, and i_c is given by (19). The first three terms measure the balance of trade and the net income (interest plus capital gains) on the real value of net foreign assets of the central bank, f_c, and of the private sector, f. The sum of these three terms constitutes the real value of the balance of payments on current account while the change in the real value of the net foreign assets of the private sector Δf determines the real balance of payments on capital account.[13] A deficit on the combined current and capital account implies an excess demand for foreign currency which must be financed by a change in the real value of the net foreign assets of the central bank, the official settlements balance, Δf_c.

B. The Markets for Domestic Goods and Labor

Aggregate Supply

Firms produce the domestic final goods (Y) according to an aggregate production function of capital (K) and labor (N) with constant returns to scale. In order to derive explicit solutions, we consider an explicit function-

[13]International transfer payments other than interest and capital gains on the stock of net foreign assets are not treated explicitly.

al form, and for simplicity we adopt the Cobb-Douglas technology

(21) $$y = an + (1-a)k,\ 0 < a < 1.$$

where y, n, and k are the logarithms of Y, N, and K. The analysis concentrates on a period short enough that the capital stock may be taken as fixed and equal to its long-run equilibrium level, $\overline{k}$. Profit maximization implies that firms' demand for labor must satisfy

(22) $$w - p_y = k_0 - (1-a)n$$

where p_y and w denote the logarithms of the price of domestic output and the nominal wage rate respectively, and $k_0 = \log(a) + (1-a)\overline{k}$. The supply of labor is assumed to be independent of the real wage rate in the long run, $n^s = \overline{n}$. It follows that the real wage and output supplied in steady state are equal to $\overline{w} - \overline{p}_y = k_0 - (1-a)\overline{n}$ and $\overline{y} = a\overline{n} + (1-a)\overline{k}$. The supply of output in the short run can be expressed in terms of its long-run equilibrium level and the deviations of the product real wage from its equilibrium value,

(23) $$y = \overline{y} - (a/(1-a))[(w-p_y) - (\overline{w} - \overline{p}_y)]$$

The real wage received by labor, which is deflated by the overall price index, P, given by (10), is related to the real product wage by

(24) $$(w-p) = (w-p_y) - (1-\overline{\theta})z \text{ where } z = e + p_y^* - p_y.$$

z is the logarithm of the terms of trade, the price of foreign goods relative to the price of domestic goods; and p, e, and p_y^* are the logarithms of the corresponding upper case variables. Although in long-run equilibrium, the real wage defined by (24) is determined by the equilibrium product real wage and the equilibrium terms of trade, the real wage demanded by labor in a given period can be expected to depend upon the actual level of employment, relative to the long-run full-employment level, and the anticipated price level, P. Accordingly, we postulate the following specification describing the adjustment of the real wage in the short run

(25) $$(w - \hat{p}) - (\overline{w} - \overline{p}) = \psi(n - \overline{n}),\ \psi > 0.$$

were $\hat{p}$ is (the logarithm) of the price level anticipated by workers at the beginning of the period in which they provide a quantity of labor services equal to n. Short-run equilibrium requires that the nominal wage satisfies (22) and (25). It follows that the (domestic) price level will depend upon the anticipated price level, the deviations of output from equilibrium, and the deviations of the terms of trade from equilibrium:

(26) $$p = \alpha(y - \bar{y}) + \hat{p} + (1-\overline{\theta})(z - \bar{z}) + u^p$$

where $\alpha = (1 - a + \psi)/a$, and u^p represents an aggregate price disturbance which reflects the cumulative effect of random disturbances affecting the production technology, labor demand, and the real wage adjustment equation. This specification of the inflation-output tradeoff differs from the conventional closed-economy anticipations-adjusted Phillips specification by the last term whose relative significance depends on the share $(1-\bar{\theta})$ of imports in the steady-state level of private expenditures.

The Phillips-type relation (26) can be inverted and expressed as a Lucas-type specification of the determinants of short-run fluctuations of aggregate supply from its long-run equilibrium:

$$y^s = \bar{y} + \alpha_1(p - \hat{p}) + \alpha_2(z - \bar{z}) + u^s \tag{27}$$

where $\alpha_1 = \alpha^{-1}$, $\alpha_2 = -(1-\bar{\theta})\alpha_1$ and the supply shock $u^s = -u^p/\alpha$. This relationship can be directly determined by substituting the short-run market clearing real wage, satisfying (22) and (25), into the supply function (23).

Aggregate Demand

The market for domestic goods is in equilibrium when total domestic output (Y) equals the sum of domestic demands by households, firms and government plus the foreign demand for domestic goods:

$$Y = \theta(Z)P[C(\hat{Y}^D) + I(q, K_{-1})]/P_y + G + X(Z) \tag{28}$$

The first two terms are the real value of domestic private expenditures on domestic goods expressed as a fraction θ of the value of total domestic private expenditures deflated by the domestic price level P_y. The fraction θ is assumed to depend only on the terms of trade, Z.

Total real consumption is taken to depend on anticipated real disposable income. Real disposable income, Y^D, is the sum of real income out of current production, P_yY/P, minus real taxes net of domestic transfers, P_yT^G/P, plus real capital gains on the initial stock of capital and investment less depreciation, Y^K, plus the real (asset) income, Y^A, on the net claims of domestic private residents on the government and the rest of the world

$$Y^D = P_y(Y - T^G)/P_c + Y^K + Y^A \tag{29}$$

This definition of real disposable income corresponds to a measure of real saving which equals the change in real household net worth.

The demand for gross investment by corporate firms is expressed as an increasing function of Tobin's q, the ratio of the market value of the firms' assets to their reproduction cost, and of the initial stock of capital. We further assume that $I(q, K_{-1}) = I_K(q)K_{-1}$, $I'_K>0$, so that the rate of growth of capital is independent of the initial capital stock. Since firms hold money assets, q is defined by

$$q \equiv V/[PK + M1_f] = q_e(S_e/K) + \ell \tag{30}$$

where V is the market value of firms' assets. The second expression of (30) follows from the firms' balance sheet, equation (11), and the approximation $(1+m_K{}^{-1} \simeq 1$ where $m_K = M1_f/PK$. The value of q in a given period depends upon the real market value of corporate equity, q_e, which depends in turn upon the anticipated dividends and capital gains capitalized at the real rate "required" by households for holding corporate equity r_E. The value of q is thus determined according to

(31) $$q = [\hat{\Pi}_{+1} + (\hat{q}_{+1} - \ell)\hat{K}_{+1}]/K(1 + r_E) + \ell$$

where

(32) $$K_{+1} = I_K(q_{+1})K + (1 - \delta)K$$

and $\hat{\Pi}_{+1}$ and $\hat{q}_{+1}$ are the anticipated real dividends and the real value of the firm per unit of assets in the following period. The actual flow of real dividends is given by (15). In steady state, $K_{+1} = K$, $\hat{q}_{+1} = q_{+1} = q$, $\hat{\Pi}_{+1} = \Pi_{+1} = \Pi$, the equilibrium values of q, Π, and r_E are related by

(33) $$\bar{q} = \bar{\Pi}/\bar{r}_E\bar{K} + \ell \text{ and } \bar{q} = I_K^{-1}(\delta).$$

The last two terms of (28) denote the government expenditures on domestic goods, G, and real gross exports, X. Exports depend on the terms of trade which are determined endogenously in this model; they also depend on the real income of the rest of the world, which is exogenously determined and is not exhibited explicitly as an argument of X.

III. Equilibrium and Dynamics under a Money and a Credit Target

In this section we study how the choice of a money or a credit aggregate as a target by the central bank affects the economy's stochastic equilibrium in the short run and the dynamic response of aggregate output, prices, and the terms of trade to monetary policy. The model presented in the previous section allows the definition of three monetary aggregates and two credit aggregates which may serve as targets of monetary policy (see the lower part of Table 1). In this paper we examine the implications for the effectiveness of monetary policy of targeting the conventional narrow measure of the stock of money (M1) vs. targeting the total quantity of credit extended by domestic private banks and the central bank (LB). The behavior of the economy under these two targets is studied by employing a log-linear approximation of our model around the long-run equilibrium (steady-state) of the economy. The steady-state values of all real variables, which are denoted with a bar (–), are assumed constant and invariant to a change in the permanent rate of inflation. The steady-state inflation is assumed to be zero. In addition, it is necessary to specify (1) the nature of the exchange rate regime and the policies of the monetary authorities in response to external imbalance; (2) the policies of the fiscal authorities; and (3) the nature of expectations.

The analysis is carried out under the hypothesis that the exchange rate is allowed to fluctuate freely. The central bank adjusts the quantity of high powered money (H) so as to control the financial aggregate chosen as the intermediate target. This is achieved by open market purchases or sales of B_c while keeping the real value of the central bank's net foreign assets (f_c)

equal to the long-run desired level.[14] In order to isolate the implications of monetary policies from fiscal policy, we assume that the government keeps its budget balanced in real terms through appropriate changes in taxes, so that the real value of the government debt, $b_g = B_g/P$, remains constant.

Anticipations of all variables, except of transitory real capital gains, are formed "rationally"; that is, anticipations are model consistent and take into account the actions of the monetary and fiscal authorities. *Real* capital gains on all assets are expected to equal their long-run values. These assumptions on expectations, together with (the anticipated) balanced budget policy of the government, imply that the anticipated disposable income determining aggregate consumption is given by

$$\hat{Y}^D = P_y(Y-G)/P + (r_c f_c + r_f f)_{-1} - \delta K_{-1} \tag{34}$$

where $r_f = i^* + \hat{\epsilon} - \hat{\pi}$. All real income from transitory real capital gains is saved. The anticipated stream of future dividends is based on the (rationally) known steady-state values of the stock of capital and the firms' holdings of real money balances. It follows from (31) and (15) that

$$q = [\hat{\Pi}_K + (\bar{q} - \ell)]/(1 + r_E) + \ell$$

where $\hat{\Pi}_K = \bar{F}_K - (\ell r_A + \delta) - (\ell r_A + \hat{\pi})\bar{m}_K$ and $\bar{m}_K = (\overline{M1_f/PK})$. Employing (8), so as to express the real rate of return of equity r_E in terms of the average interest rate on the firms debt r_A and the risk premium ζ, and rewriting the resulting expression in deviations from equilibrium we obtain

$$(q-\bar{q})/\bar{q} = q_1(r-\bar{r}) + q_1^*(i^* + \hat{\epsilon} - \hat{\pi} - \bar{r}^*) + u_q \tag{35}$$

where

$$q_1 = -\bar{\phi}(1+\bar{\rho})^{-1};\ q_1^* = -(1-\bar{\phi})(1+\bar{\rho})^{-1} \tag{35a}$$

and

$$u_q = -[(\zeta-\bar{\zeta}) + (\hat{\pi}-\bar{\pi})\bar{m}_K\bar{q}](1+\bar{\rho})^{-1} + u_q' \tag{35b}$$

An increase in either the domestic real loan rate or the foreign real loan rate reduces the real market value of firms to an extent that depends on the proportion $\bar{\phi}$ of domestic loans in firms' total debt at equilibrium.[15] The parameter $\bar{\rho}$ is the equilibrium value of the real rate of return on the assets of "unlevered" firms, $\bar{\rho} = \bar{i}_K - \bar{\pi}$. The stock market disturbance, u_q, captures the cumulative effect on market valuation of random variations in the risk premium ζ, the loss in the real value of firms' money balances due to anticipated inflation,[16] and other stock market shocks, u_q'.

[14]See Claassen (1976) and Grubel (1971) for discussions of the optimal size of foreign reserves.

[15]Note that the constancy of the terms of trade in steady-state implies that $\bar{\epsilon} = \bar{\pi} - \bar{\pi}_y^*$, so that $\bar{r}_f^* = \bar{i}^* + \bar{\epsilon} - \bar{\pi} = \bar{i}^* - \bar{\pi}_y^* = \bar{r}^*$ where $\pi_y^* = p_y^* - p_{y,-1}^*$.

[16]The second term of (35b) implies that inflation has a nonneutral effect on market value and thus real investment. This effect is not treated explicitly and it is considered part of the random term on the assumption that it is relatively small since it depends on the ratio of firms' money balances to the replacement cost of their capital stock (m_K).

Aggregate real consumption, gross investment, exports, and the share of domestic goods in total private spending are approximated by linear functions of their arguments around the steady-state and they are subject to random disturbances which are proportional to the steady-state values of the variables they affect. Thus we have

$$(36)\quad C = \overline{C} + c'(\hat{Y}^D - \overline{Y}^D) + u_c\overline{C}, \qquad c' > 0$$

$$(37)\quad I = \delta\overline{K} + \nu(q - \overline{q})K_{-1} + u_i\delta\overline{K}, \qquad \nu > 0, \overline{q} = \delta/\nu$$

$$(38)\quad X = \overline{X} + x'(Z - \overline{Z}) + u_x\overline{X}, \qquad x' > 0$$

$$(39)\quad \theta = \overline{\theta} + \theta'(Z - \overline{Z}) + u_\theta\overline{\theta}, \qquad \theta' > 0$$

Substituting (35) into (37) and assuming $K_{-1} = \overline{K}$, we obtain net investment per unit of capital as a function of the domestic and foreign loan rates:

$$(40)\quad I_K - \delta = g(r - \overline{r}) + g^*(i^* + \hat{\epsilon} - \hat{\pi} - \overline{r}^*) + (u_i + u_q)\delta$$

where $g = \delta q_1$, $g^* = \delta q_1^*$, $g + g^* = -\delta(1 + \overline{\rho})^{-1}$.

Substituting (36)–(39) into (28), linearizing the resulting expression around the steady-state, replacing $\hat{Y}^D$ and $(q - \overline{q})/\overline{q}$ by (34) and (35), and employing the approximation $x - \overline{x} \equiv \log X - \log \overline{X} = X/\overline{X} - 1$, we arrive at the following specification for the economy's effective aggregate demand (IS)

$$(41)\quad y^d = \overline{y} + a_1[r - \overline{r}] + a_1^*[i^* + \hat{\epsilon} - \hat{\pi} - \overline{r}^*] + a_2[z - \overline{z}] + u^d$$

where

$$(41a)\quad a_1 = -m_x s_i \overline{\phi}(1+\overline{\rho})^{-1} < 0,\ a_1^* = a_1(1-\overline{\phi})/\overline{\phi} < 0,$$
$$m_x = (1-c'\overline{\theta}),^{-1}$$

$$(41b)\quad a_2 = m_x\eta_z = m_x[(s_c+s_i)(\overline{\theta}+\overline{\theta}'\overline{Z}/\overline{\theta}) + s_x(\overline{X}'\overline{Z}/\overline{X}) - (1-s_g)\,\overline{\theta}^2c'] > 0,$$

and

$$(41c)\quad u^d = m_x[s_c(u_c+u_\theta) + s_i(u_i+u_q+u_\theta) + s_x u_x],$$

$$(41d)\quad s_c = \overline{\theta PC/P_yY},\ s_i = \overline{\theta\delta PK/P_yY},\ s_x = \overline{X/Y},\ s_g = \overline{G/Y}.$$

Note that the variables y and z are now expressed in logarithms while the interest rates are expressed in percentages. The coefficient a_2 has been written as the product of the Keynesian impact multiplier (m_x) for an open economy and the elasticity of total aggregate demand with respect to the terms of trade (η_z). It is taken to be positive. The overall random component of effective aggregate demand (u^d) is given by a multiple of an average of the disturbances affecting consumption of domestic goods, investment, and exports, weighted by their respective shares in total output. The investment disturbance reflects two types of shocks: those associated with the real investment decisions of firms (u_i) and those originating in the stock market (u_q). Equilibrium in the market for domestically produced goods requires that effective aggregate demand equal the short-run supply of output, as given by (27).

We consider next the conditions for equilibrium in the financial markets. Since foreign loans (foreign assets) are, in general, imperfect substitutes for domestic loans, it is necessary to examine equilibrium in two financial markets simultaneously so as to determine the equilibrium values of the domestic loan rate and the foreign loan rate in terms of domestic currency [or, equivalently, the domestic loan rate and the exchange rate]. We choose to focus on the conditions for equilibrium in the money market (M1) and in the market for domestic bank credit (LB). The nature of equilibrium in the financial markets depends upon the central bank's choice of an intermediate target. When it controls M1, the supply of domestic bank loans is endogenously determined as a function of the money stock. Conversely, when the central bank attempts to fix the total quantity of bank credit, the supply of money is endogenously determined as a function of the target quantity of credit.

A. Equilibrium and Dynamics under a Money Target

When the central bank aims at achieving a target path for the stock of money M1, the private banks are required to maintain a fraction κ_1 of their demand deposits as reserves in the form of currency or deposits with the central bank. The central bank controls its liabilities (H) so as to achieve the desired monetary target. Employing a conventional log-linear specification for the demand for money, money market equilibrium requires that

$$(42) \quad m1 - p = n_1 i + n_1^*(i^* + \hat{\epsilon}) + k_1 y + v_1; \; n_1, n_1^* < 0, \; k_1 > 0,$$

where m1, p and y are the logarithms of the target quantity of money, the price level and real income, and v_1 represents the random component of the demand for real money balances. The coefficient n_1 is the total semi-elasticity of money demand with respect to the domestic rates of return on time deposits, government bonds, and corporate equity, which are expressed in terms of the domestic loan rate employing (4), (5) and (8).

The market for domestic bank credit is in equilibrium when the supply of domestic credit by private banks and the central bank, $L_b + B_b + B_c$, equals the demand for domestic credit by firms and the government, $L_f + B_g$. The *total* quantity of bank credit, denoted LB, provided by the consolidated banking system is $LB = L_b + B_b + B_c + F_c$. The balance sheet constraint of the central bank, $F_c + B_c = H = H_p + H_b$, and that of private banks, $H_b + B_b + L_b = D + T$, imply that total bank credit is identically equal to the broad measure of the money stock, $LB = M2 = H_p + D + T$. It follows that equilibrium in the market for domestic bank credit requires that

$$(43) \quad M1 + T = \phi(i - i^* - \hat{\epsilon})\ell\,[PK + M1_f] + P[\bar{b}_g + \bar{f}_c] + u_L(M1)\overline{LB},$$

where $b_g = B_g/P$ and $f_c = F_c/P$ are, respectively, the real values of the government debt and net foreign assets of the central bank, and $u_L(M1) = \ell u_\ell + \phi u_\phi$ represents random shifts in firms' borrowing behavior.

Log linearization of (43) around the long-run equilibrium of the economy yields

$$(44)\quad (1-s_T)\Delta m1 + s_T\Delta t = s_L[\phi'(\Delta i - \Delta i^* - \Delta\hat{\epsilon}) + s_K(I_K - \delta) + s_K\Delta p + (1-s_K)\Delta m1] + (1-s_L)\Delta p + u_L(M1)$$

where

$$(44a)\quad s_L = \overline{L_f}/\overline{LB} = \overline{\phi\ell}[\overline{PK} + \overline{M1}_f]/[\overline{M1} + \overline{T}],$$

$$(44b)\quad s_T = \overline{T}/[\overline{M1} + \overline{T}],$$

$$(44c)\quad s_K = \overline{\phi\ell}\,\overline{PK}/\overline{L}_f = \overline{PK}/[\overline{PK} + \overline{M1}_f],$$

and ϕ' is the elasticity of ϕ with respect to its argument, valued at equilibrium. The parameter s_L is the share of bank loans (or firms' debt) in total bank credit, s_T is the share of time deposits in the total supply of loanable funds by banks, and s_K is the share of capital in the total of firms' assets, valued at reproduction cost. All shares are valued at equilibrium. In deriving (44) we have used our earlier assumption that a policy objective is to maintain b_g and f_c constant. In (44) and in other expressions below we denote by Δx the deviation of a variable x from its steady-state value, i.e., $\Delta x \equiv x - \overline{x}$. As usual m1, t and p denote the logarithms of the corresponding upper case variables.

The demand for time deposits is given by

$$(45)\quad t = p + n_T i + n_T^*(i^* + \hat{\epsilon}) + k_T y + v_T;\ n_T > 0,\ n_T^* < 0,\ k_T > 0.$$

Substituting (45), in deviations from equilibrium, and (40) into (44) and rearranging terms, we obtain an implicit relation between the rates of return, income and inflation which must hold for equilibrium in the bank credit market, given the exogenously determined stock of money:

$$(46)\quad \Delta m1 - \Delta p = \nu_1\Delta i + \nu_1^*\Delta(i^* + \hat{\epsilon}) - s_1 s_T k_T\Delta y - s_1 s_L s_K(g + g^*)\Delta\hat{\pi} + v_L(M1)$$

where

$$(46a)\quad \nu_1 = s_1[s_L(s_K g + \phi') - s_T n_T] < 0,$$

$$(46b)\quad \nu_1^* = s_1[s_L(s_K g^* - \phi') - s_T n_T^*] > 0,$$

$$(46c)\quad s_1 = [1 - s_T - s_L(1 - s_K)]^{-1} = [\frac{M1}{M2}(1 - \phi\ell(\frac{M1}{M1}f))]^{-1} > 1,$$

$$(46d)\quad v_L(M1) = s_1[s_L s_K(u_i + u_q)\delta - s_T v_T + u_L(M1)].$$

The parameters ν_1 and ν_1^* in (46) depend upon the negative interest elasticities of investment and loan demand by firms (g, g*, ϕ') and the interest semi-elasticities of time deposits by households ($n_T > 0$, $n_T^* < 0$). Since s_1, s_L, s_K, s_T, are positive, ν_1 is unambiguously negative. Although the sign of ν_1^* is ambiguous in general, we may assume that $\nu_1^* > 0$ since we expect that the elasticity of firms' demand for domestic loans with respect to changes in the spread between domestic and foreign loans ($\phi' < 0$) and n_T^* are sufficiently large relative to g* and will dominate. Note that if firms hold a small fraction of the stock of money (M1), or if firms' demand for credit depends only on the reproduction cost of their capital stock rather than the total value of their assets, then the parameters of (46) simplify considerably, since in this case $s_K = 1$ and $s_1 = 1/(1-s_T)$.

Equations (27), (41), (42) and (46) form a complete system from which we can determine all variables of interest under a money target. Employing the definitional relationships

$$(47)\quad \hat{\epsilon} = \hat{e}_{+1} - e, \hat{\pi} = \hat{p}_{+1} - p, p = p_y + (1-\bar{\theta})z, z = e + p_y^* - p_y,$$

these equations can be expressed in terms of the four variables [y, p, z, r], the anticipated values of the price level and the terms of trade [$\hat{p}_{+1}$, $\hat{z}_{+1}$], the exogenously determined stock of money, the real rate on foreign loans adjusted for foreign inflation, $r^* = i^* - (p_{y,+1}^* - p_y^*)$, and four disturbance terms

$$(48)\quad \Delta y^d = a_1\Delta r + a_1^*\bar{\theta}[\Delta\hat{z}_{+1} - \Delta z] + a_2\Delta z + a_1^*\Delta r^* + u^d$$

$$(49)\quad \Delta y^s = \alpha_1[p - \hat{p}] + \alpha_2\Delta z + u^s$$

$$(50)\quad \Delta ml - \Delta p = n_1\Delta r + n_1^*\bar{\theta}[\Delta\hat{z}_{+1} - \Delta z] + k_1\Delta y + (n_1 + n_1^*)[\hat{p}_{+1} - p] + n_1^*\Delta r^* + v_1$$

$$(51)\quad \Delta ml - \Delta p = \nu_1\Delta r + \nu_1^*\bar{\theta}[\Delta\hat{z}_{+1} - \Delta z] - s_1 s_T k_T\Delta y - s_1 s_T(n_T + n_T^*)[\hat{p}_{+1} - p] + \nu_1^*\Delta r^* + v_L(M1)$$

Anticipations are formed "rationally", so that $\hat{x}_{t+i} = E[x_{t+i} \mid I_{t-1}]$, $(i=0,1)$, where I_{t-1} is the public's information set which includes knowledge of the economy's structure. It immediately follows from (49) that output is anticipated to deviate from equilibrium only if the public anticipates a deviation of the terms of trade from the long-run equilibrium:

$$(52)\quad \Delta\hat{y} = \alpha_2\Delta\hat{z}\ ,\ \alpha_2 = -(1-\bar{\theta})/\alpha.$$

The anticipated terms of trade and price level depend on the anticipated path of the money target and the anticipated current and future values of the world real rate, as specified by the following system of difference equations, which ensures the consistency of expectations with the model's economic structure:

$$(53)\quad \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \begin{bmatrix} \Delta\hat{z} - \Delta\hat{z}_{+1} \\ \Delta\hat{p} - \Delta\hat{p}_{+1} \end{bmatrix} = \begin{bmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{bmatrix} \begin{bmatrix} \Delta\hat{z} \\ \Delta\hat{p} \end{bmatrix} + \begin{bmatrix} \hat{f}_1 \\ \hat{f}_2 \end{bmatrix}$$

where

$$a_{11} = \bar{\theta}(a_1^* \nu_1 - a_1\nu_1^*), \qquad a_{12} = a_1 s_1 s_T(n_T + n_T^*),$$
$$a_{21} = \bar{\theta}(a_1^* n_1 - a_1 n_1^*), \qquad a_{22} = -a_1(n_1 + n_1^*),$$
$$b_{11} = \nu_1(a_2 - \alpha_2) + a_1\alpha_2 s_1 s_T k_T, \quad b_{12} = -a_1,$$
$$b_{21} = n_1(a_2 - \alpha_2) - a_1\alpha_2 k_1, \qquad b_{22} = -a_1,$$
$$\hat{f}_1 = a_1\Delta\hat{m}1 + a_{11}\Delta\hat{r}^*/\bar{\theta}, \qquad \hat{f}_2 = a_1\Delta\hat{m}1 + a_{21}\Delta\hat{r}^*/\bar{\theta}.$$

This system is obtained by determining the "rationally" anticipated relations between all variables in (48)–(51), eliminating the anticipated domestic real rate, and replacing $\Delta\hat{y}$ by (52). The set of equations (48)–(53) provides a complete characterization of the stochastic and dynamic properties of the economy under an M1 target.

B. Equilibrium and Dynamics under a Credit Target

We consider next the implications for the short-run equilibrium of the economy of a monetary policy which aims at controlling the total quantity of bank credit, LB, provided by the consolidated banking system. Since LB = M2, the supply of the narrow measure of the stock of money under the credit target is given by $M1^s = LB - T$; and equilibrium in the money market, expressed in deviations from the steady-state, requires that

$$(54)\quad \Delta\ell b = s_M\Delta m1 + (1-s_M)\Delta t, \quad s_M = \overline{M1}/\overline{M2} = (1-s_T).$$

where ℓb is (the logarithm of) the target quantity of bank credit. Employing (42) and (45), we express the condition for equilibrium in the money market as

$$(55)\quad \Delta\ell b - \Delta p = n_L\Delta i + n_L^*\Delta(i^* + \hat{\epsilon}) + k_L\Delta y + v_2$$

where

$$n_L = s_M n_1 + (1-s_M)n_T, \; n_L^* = s_M n_1^* + (1-s_M)n_T^*,$$
$$k_L = s_M k_1 + (1-s_M)k_T, \; v_2 = s_M v_1 + (1-s_M)v_T.$$

Under a total bank credit target, equilibrium in the market for bank credit requires that

$$(56)\quad LB = \phi(i - i^* - \hat{\epsilon})\ell[PK + M1_f] + P[\bar{b}_g + \bar{f}_c] + u_L(LB)\overline{LB}.$$

Substitution of (42) and (40) into (56) and log-linearization of the resulting expression around the steady-state yields

(57) $$\Delta \ell b - \Delta p = \nu_L \Delta i + \nu_L^* \Delta(i^* + \hat{\epsilon}) + s_L(1 - s_K)k_1 \Delta y - s_L s_K(g + g^*)\Delta\hat{\pi} + v_L(LB)$$

where

(57a) $\nu_L = s_L[s_K g + \phi' + (1 - s_K)n_1] < 0,$

(57b) $\nu_L^* = s_L[s_K g^* - \phi' + (1 - s_K)n_1^*] > 0,$

(57c) $v_L(LB) = s_L s_K(u_i + u_q)\delta + s_L(1 - s_K)v_1 + u_L(L).$

Equations (55) and (57) determine the conditions for equilibrium in the financial markets under the bank credit target. They can be expressed in terms of the four variables [y, p, z, r] and their anticipated values, employing (47):

(58) $$\Delta \ell b - \Delta p = n_L \Delta r + n_L^* \bar{\theta}[\Delta \hat{z}_{+1} - \Delta z] + k_L \Delta y + (n_L + n_L^*)[\hat{p}_{+1} - p] + n_L^* \Delta r^* + v_2$$

(59) $$\Delta \ell b - \Delta p = \nu_L \Delta r + \nu_L^* \bar{\theta}[\Delta \hat{z}_{+1} - \Delta z] + s_L(1 - s_K)k_1 \Delta y + s_L(1 - s_K)(n_1 + n_1^*)[\hat{p}_{+1} - p] + \nu_L^* \Delta r^* + v_L(LB)$$

The "rationally" anticipated price level and terms of trade are determined according to

(60) $$\begin{bmatrix} a'_{11} & a'_{12} \\ a'_{21} & a'_{22} \end{bmatrix} \begin{bmatrix} \Delta\hat{z} - \Delta\hat{z}_{+1} \\ \Delta\hat{p} - \Delta\hat{p}_{+1} \end{bmatrix} = \begin{bmatrix} b'_{11} & b'_{12} \\ b'_{21} & b'_{22} \end{bmatrix} \begin{bmatrix} \Delta\hat{z} \\ \Delta\hat{p} \end{bmatrix} + \begin{bmatrix} \hat{f}'_1 \\ \hat{f}'_2 \end{bmatrix}$$

where

$$\begin{aligned} a'_{11} &= \bar{\theta}(a_1^* \nu_L - a_1 \nu_L^*), & a'_{12} &= -a_1 s_L(1 - s_K)(n_1 + n_1^*), \\ a'_{21} &= \bar{\theta}(a_1^* n_L - a_1 n_L^*), & a'_{22} &= -a_1(n_L + n_L^*), \\ b'_{11} &= \nu_L(a_2 - \alpha_2) & b'_{12} &= -a_1, \\ &\quad - a_1\alpha_2 s_L(1 - s_K)k_1, & & \\ b'_{21} &= n_L(a_2 - \alpha_2) - a_1\alpha_2 k_L, & b'_{22} &= -a_1, \\ \hat{f}'_1 &= a_1 \Delta \hat{\ell b} + a_{11}\Delta\hat{r}^*/\bar{\theta}, & \hat{f}'_2 &= a_1 \Delta\hat{\ell b} + a_{21}\Delta\hat{r}^*/\bar{\theta}. \end{aligned}$$

Equations (58)–(59), together with (48)–(49) and (60), provide a complete description of the stochastic and dynamic properties of the four basic variables [y, p, r, z] under the credit target.

IV. The Stability of Prices and Output When Domestic and Foreign Loans Are Close Substitutes

In this section we compare the relative efficiency of the money and credit targets on the basis of two criteria: (1) their implications for the dynamic stability of aggregate output and the price level, and (2) their effectiveness in minimizing unanticipated output and price fluctuations induced by stochastic shocks. Due to space limitations, our analysis will focus on the case of close substitutability between domestic and foreign loans. This case is considered by many as the most relevant empirically in a world of high capital mobility; and it has been suggested that close substitutability between domestic and foreign debt undermines the feasibility of a credit-oriented policy in an open economy.[17] We shall show, by contrast, that credit policies are feasible even if borrowers view domestic and foreign loans as perfect substitutes so long as net lenders view domestic and foreign assets as imperfectly substitutable. The asymmetry between lenders' and borrowers' behavior may be traceable to their different attitudes towards risk or to differential access to capital markets and to hedging foreign exchange risk.

When domestic and foreign loans are highly substitutable, the proportion of borrowing in domestic currency $\phi(i - i^* - \hat{\epsilon})$ is very sensitive to the interest rate differential. So, formally, this case can be examined by studying the properties of our model as $\phi' \rightarrow -\infty$. As may be verified by inspecting (46) under the M1 target and (57) under the credit target, this implies that (in both cases) the credit market equilibrium condition reduces to the requirement

$$(61) \qquad i = i^* + \hat{\epsilon} \quad \text{or} \quad r = i^* + \hat{\epsilon} - \hat{\pi} = r^* + \bar{\theta}(\hat{z}_{+1} - z)$$

where $r^* = i^* - (\hat{p}^*_{y,+1} - p^*_y)$. The first of these equations shows that the domestic nominal loan rate (i) must equal the foreign nominal loan rate expressed in domestic currency units $(i^* + \hat{\epsilon})$. The second relationship between domestic and foreign real rates is obtained by using (47).

A. Anticipated Fluctuations under the Money and the Credit Targets

We first examine the implications of the two targets for the dynamic stability of the anticipated output and price level. When $\phi' \rightarrow -\infty$, the system (53) describing the anticipated path of the terms of trade, and thus output, and of the price level under the M1 target becomes recursive with the interesting property that the terms of trade (z) and thus output (y) are independent of nominal variables. The characteristic roots of (53) are:

$$(62) \qquad \lambda_z = \left[\frac{(a_1 + a_1^*)\bar{\theta}}{(a_1 + a_1^*)\bar{\theta} - a_2 + \alpha_2}\right]^{-1}, \quad \lambda_p(M1) = \left[\frac{-(n_1 + n_1^*)}{1 - (n_1 + n_1^*)}\right]^{-1}$$

Both roots are greater than one, since all parameters, except for $\bar{\theta}$ and a_2, are negative. This ensures that expectations of p and z are well behaved (bounded) functions of the expected future paths of the exogenous variables $\hat{m}1$ and $\hat{r}^*$. The "forward solution" of (53) is stable.

[17]Of course, perfect capital mobility does not imply perfect substitutability between domestic and foreign assets (as it is often assumed). In general, the empirical evidence supports the proposition that domestic and foreign assets are imperfect substitutes. See Obstfeld (1980) and Hansen and Hodrick (1980).

The system (60) describing the behavior of $\hat{z}$ and $\hat{p}$ under the credit target is also recursive when $\phi' \rightarrow -\infty$. The characteristic root, λ_z, of the first equation of (60) is exactly the same as under the money target, confirming that nominal factors do not affect the anticipated path of the terms of trade and output. But the other characteristic root, which relates to the dynamic behavior of $\hat{p}$, is different,

$$(63) \qquad \lambda_p(LB) = \left[\frac{-(n_L + n_L^*)}{1 - (n_L + n_L^*)}\right]^{-1} \gtrless 0,$$
$$n_L + n_L^* = s_M(n_1 + n_1^*) + (1-s_M)(n_T + n_T^*) \gtrless 0$$

Since the dynamic behavior of output is independent of the chosen financial target, we concentrate on a comparison of the behavior of the anticipated price level under the two targets. Equations (53) and (60) imply that, when $\phi' \rightarrow -\infty$, the anticipated price level in period t can be expressed in terms of the anticipated path of the target variable $\hat{a}$, over the interval (t, τ), and the anticipated price level at $\tau + 1$, according to

$$(64) \qquad \hat{p}_t = (1-\tilde{n})^{-1} \sum_{j=0}^{\tau-t} [(-\tilde{n}/(1-\tilde{n}))^j \hat{a}_{t+j} + (\bar{p} - \bar{a})] + (-\tilde{n}/(1-\tilde{n}))^{\tau+1} \hat{p}_{\tau+1}$$

where $\tilde{n}$ is a parameter characteristic of the financial target.

When $\hat{a} = \hat{m}1$, $\tilde{n} = n_1 + n_1^* \leq 0$ and $0 \leq -\tilde{n}/(1-\tilde{n}) < 1$. Letting $\tau \rightarrow \infty$, we obtain the familiar result that if the sequence of the anticipated stock of money $\{\hat{m}1\}_t^\infty$ is bounded, then the sum in (64) converges and the anticipated price level is finite provided that[18]

$$(65) \qquad \lim_{\tau \rightarrow \infty} (-\tilde{n}/(1-\tilde{n}))^{\tau+1} \hat{p}_{\tau+1} = 0.$$

The imposition of this terminal condition excludes the occurence of "bubbles," fluctuations in the anticipated price level which are not related to anticipated changes in the stock of money but which are induced by anticipations of price changes in the distant future. Equation (65) assures the uniqueness of $\hat{p}$.

When $\hat{a} = \hat{\ell b}$, $\tilde{n} = n_L + n_L^* = s_M(n_1 + n_1^*) + (1-s_M)(n_T + n_T^*) > (n_1 + n_1^*)$ since $(n_T + n_T^*) \geq 0$. Note that although $n_T > 0$ and $n_T^* < 0$, the households' budget constraint implies that the net effect is nonnegative. It follows that under a credit (M2) target $\tilde{n}$ may be negative or positive. As long as $\tilde{n} < 0$, the weights $(-\tilde{n}/(1-\tilde{n}))^j$ in (64) are positive and less than one, so that a bounded path of bank credit $\{\hat{\ell b}\}_t^\infty$ will result in a finite $\hat{p}$ provided that (65) holds. Since the weights in (64) under the credit or M2

[18]See Sargent and Wallace (1973) for the continuous time analog.

target are smaller and are decreasing at a faster rate than under the money target, the "announcement effects" on the current $\hat{p}$ of future changes in the credit target will be less pronounced than the effect of changes in the money target. Indeed, if the total interest elasticities of the demands for money ($n_1 + n_1^*$) and for time deposits ($n_T + n_T^*$) and the share of M1 in M2 are such that $\tilde{n} = 0$, then $\hat{p}_t = \ell\hat{b}_t + (\bar{p} - \ell\bar{b})$, which eliminates all announcement effects and the possibility of bubbles, since (65) is identically equal to zero. If $\tilde{n} > 1/2$, λ_p is less than one in absolute value, in which case the price level is unbounded for anticipated bounded paths of the credit aggregate. Thus, under "rational," forward-looking expectations the credit target is potentially unstable. This potential may be serious as we move to a world in which interest bearing money instruments are becoming prevalent.[19]

In comparing the relative effectiveness of the two targets in mitigating unanticipated price and output fluctuations, we will assume that the economy is dynamically stable under both targets in the sense that public anticipations are well-defined, bounded functions of the anticipated paths of the targets. Under the credit target, this amounts to imposing the restriction that $n_L + n_L^* < 1/2$.

B. Unanticipated Fluctuations under the Money and the Credit Targets

Turning to the characteristics of unanticipated fluctuations of price and output, we use (61) to eliminate r wherever it appears in (48) and (50) and rewrite the IS curve as

$$\text{(66)}\qquad \Delta y^d = (a_1 + a_1^*)(\Delta r^* + \bar{\theta}\Delta\hat{z}_{+1}) - a_z\Delta z + u^d,$$
$$a_z = (a_1 + a_1^*)\bar{\theta} - a_2 < 0.$$

The coefficient a_z represents the total effect on aggregate demand of the terms of trade, z, being the sum of the direct effect a_2 and the indirect effect via the expected real interest rate $\bar{\theta}(a_1 + a_1^*)$. Employing (66) we eliminate z from the money market equilibrium condition (50) and obtain the relationship between aggregate demand and the price level, necessary for simultaneous equilibrium in the money and goods markets under the M1 target. The "aggregate demand schedule," expressed in deviations from the anticipated levels of output and the price level, is given by:

$$\text{(67)}\qquad D(M1):\ (y - \hat{y}) = d_1(m1 - \hat{m}1) - \gamma_1(p - \hat{p}) + \epsilon_1^d$$

where

$$\text{(67a)}\qquad d_1 = a_z\beta_1 > 0,\ \beta_1 = (a_z k_1 + (n_1 + n_1^*)\bar{\theta})^{-1} < 0,$$
$$\gamma_1 = [1 - (n_1 + n_1^*)]d_1 > 0,$$

$$\text{(67b)}\qquad \epsilon_1^d = \beta_1[(n_1 + n_1^*)a_2(r^* - \hat{r}^*) - a_z v_1 + (n_1 + n_1^*)\bar{\theta}u^d].$$

[19]This result parallels closely the findings of Rozwadowski (1983) with reference to an M2 target.

The stochastic term ϵ_1^d includes the unanticipated deviations of the world real interest rate and it also depends on the random components of money demand (v_1) and of the "effective" demand for output (u^d).

Short-run equilibrium in the goods market implies another relationship between unanticipated fluctuations of output and the price level. Equality of "effective" demand (48) and aggregate supply (49) requires an (unanticipated) adjustment of the terms of trade in response to unanticipated movements of p and r* and the disturbances u^d and u^s. The resulting short-run equilibrium level of output is then given by:

(68) $$\text{YY:}\quad (y - \hat{y}) = (1/\alpha')(p - \hat{p}) + \epsilon_1$$

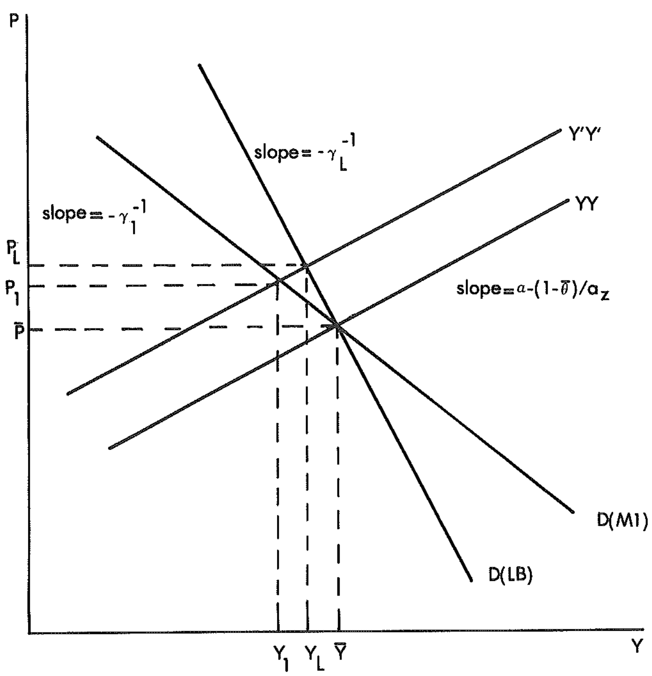
where

(68a) $$\alpha' = \frac{a_z + \alpha_2}{a_z\alpha_1} = \alpha - \frac{(1 - \bar{\theta})}{a_z} > 0,$$

(68b) $$\epsilon_1 = (a_z + \alpha_2)^{-1}[\alpha_2(a_1 + a_1^*)(r^* - \hat{r}^*) + \alpha_2 u^d + a_z u^s].$$

Figure 1 shows the aggregate demand schedule (67) under the money target, denoted D(M1), and the goods market equilibrium condition (68),

Figure 1



denoted YY. The slope of the YY schedule, α', depends upon the slope α of the short-run Phillips-type tradeoff, the elasticity of aggregate demand with respect to the terms of trade, and the share of imports in total private spending $\bar{\theta}$. The position of YY is determined by unanticipated fluctuations in the world real rate and real demand and supply shocks.

Simultaneous solution of (67) and (68) yields the following "reduced forms" describing the way random disturbances and unanticipated deviations of the stock of money induce unanticipated fluctuations of output and the price level when the central bank employs a money target:

$$(69)\qquad (y-\hat{y}) = (1+\alpha'\gamma_1)^{-1}[d_1(m1-\widehat{m1}) + \epsilon_1^d + \alpha'\gamma_1\epsilon_1],$$
$$(p-\hat{p}) = \alpha'(1+\alpha'\gamma_1)^{-1}[d_1(m1-\widehat{m1}) + \epsilon_1^d - \epsilon_1].$$

The derivations of the unanticipated components of y and p under the credit target run parallel, so we need only point out that since the IS and supply schedules (48) and (49) are common to both systems and since in both cases credit market equilibrium reduces to (61), all differences arise from the fact that the money market equilibrium condition is now (58) instead of (50).

The aggregate demand schedule under the credit target, expressed in deviations from the anticipated levels of all variables, is

$$(70)\qquad D(LB)\colon\ (y-\hat{y}) = d_L(\ell b - \widehat{\ell b}) - \gamma_L(p-\hat{p}) + \epsilon_L^d$$

where

$$(70a)\quad d_L = a_z\beta_L,\ \beta_L = (a_z k_L + (n_L + n_L^*)\bar{\theta})^{-1},\ \gamma_L = [1-(n_L+n_L^*)]d_L,$$
$$(70b)\qquad \epsilon_L^d = \beta_L[(n_L+n_L^*)a_2(r^*-\hat{r}^*) - a_z v_L + (n_L+n_L^*)\bar{\theta}u^d].$$

The sign of d_L need not be positive, in general, since β_L may be of either sign depending upon the sign of $(n_L + n_L^*)$. Stability of the equilibrium in the goods and the money markets requires that $\beta_L<0$ which we assume in what follows. This ensures that an unanticipated increase in bank credit will increase aggregate demand ($d_L>0$). The D(LB) schedule is also illustrated in Figure 1 with a slope which is smaller in absolute value than the slope of D(M1). This need not be always the case since the relative steepness of the two schedules depends upon a measure of the "degree of openness" of the economy as we discuss below. The YY schedule is not affected by the choice of the intermediate target.

The unanticipated fluctuations in output and the price level under a credit strategy are given by

$$(71)\qquad (y-\hat{y}) = (1+\alpha'\gamma_L)^{-1}[d_L(\ell b-\widehat{\ell b}) + \epsilon_L^d + \alpha'\gamma_L\epsilon_L]$$
$$(p-\hat{p}) = \alpha'(1+\alpha'\gamma_L)^{-1}[d_L(\ell b-\widehat{\ell b}) + \epsilon_L^d - \epsilon_L]$$

The coefficients d_L, γ_L and the shock ϵ_L^d are defined in (70), α' and $\epsilon_L \equiv \epsilon_1$, in (68). By comparing (69) and (71) we can find conditions under which a target promotes greater stochastic stability. In making these comparisons, we assume that the central bank fully announces and successfully enforces the path of the chosen target, so that the terms $(m1 - \hat{m}1)$ and $(\ell b - \hat{\ell b})$ in (69) and (71) do not contribute to aggregate fluctuations, and we concentrate on the price and output effects of the four disturbances (u^s, u^d, v_1, v_L) under the two targets.

When the supply shock is predominant, then the credit target will result in smaller output fluctuations than the money target if the economy is "sufficiently open" in the sense that

$$\bar{\theta}/a_z > \omega(k_1 - k_L) - k_1 \tag{72}$$

where $a_z = (a_1 + a_1^*)\bar{\theta} - a_2(\theta', \bar{\theta}) < 0$, $\omega = [1 - (n_1 + n_1^*)]/[(n_L + n_L^*) - (n_1 + n_1^*)]$. If the income elasticities of the demand for M1 and M2 are equal, (72) reduces to

$$a_2(\theta', \bar{\theta})/\bar{\theta} > 1/k_1 + (a_1 + a_1^*). \tag{72'}$$

The ratio of $a_2/\bar{\theta}$, the elasticity of aggregate demand with respect to the terms of trade divided by the share of domestic goods in total private spending, is a measure of the degree of openness of the economy. The role of this measure in determining the output effects of supply shocks under the two targets can be explained as follows. Although the main difference in the functioning of the economy under the two targets relates to the nature of equilibrium in the money markets, the extent to which an unanticipated change in the price level (supply shock) affects aggregate demand under M1 or LB is the outcome of an interaction between the financial and goods markets which depends on the responsiveness of aggregate demand to the adjustment in the terms of trade necessary to accommodate the shock. This is illustrated in Figure 1 which shows that the effects of a supply shock depends only on the slopes of the demand schedules under the two targets. Condition (72) ensures that $\gamma_1 > \gamma_L$ so that D(M1) is less steep than D(LB). The figure also makes clear that supply shocks will induce larger price fluctuations under the credit strategy than under the money strategy if (72) holds. It follows that the choice of a target imposes an unavoidable tradeoff between price and output variability. If one target is superior in minimizing output fluctuations, it is inferior in reducing price fluctuations.

The role of the degree of openness can be further clarified by noting that if condition (72′) holds for a closed economy ($a_2 = 0$, $\bar{\theta} = 1$, $a_1^* = 0$), it will also hold for an open economy ($a_2 > 0$, $1 > \bar{\theta} > 0$, $a_1^* < 0$). In this case openness strengthens the condition. On the other hand, if (72′) does not hold for a closed economy, it may hold for an economy which is sufficiently open. It is thus interesting to observe that (72′) is not likely to be valid in a closed economy for representative values of the parameters k_1 and a_1. Therefore, the degree of openness plays a critical role in determining the relative effectiveness of the credit target in the presence of supply shocks.

The degree of openness is also important in the case of a shock to aggregate effective demand, u^d. The credit target delivers an unambiguously more stable level of output than the M1 target, if the following inequalities are jointly satisfied

$$(n_L + n_L^*) < 1 - \bar{\theta} \tag{73}$$

$$[(n_L + n_L^*) - (n_1 + n_1^*)]\bar{\theta} + \alpha^{-1}[k_1(n_L + n_L^*) - k_L(n_1 + n_1^*)] - (1 - \bar{\theta})\alpha^{-1}(k_1 - k_L) > 0 \tag{74}$$

These additional conditions are not very restrictive. Equation (73) is obviously satisfied for the likely case of $(n_L + n_L^*) \leq 0$. More generally, in view of the dynamic stability condition imposed above, that $(n_L + n_L^*) < \frac{1}{2}$, (73) is always true if $\bar{\theta} < \frac{1}{2}$, that is if domestic goods are as important in private spending as imports. Condition (74) indicates that the extent of output fluctuations under the two targets depends, ceteris paribus, on the degree of price flexibility, measured by the slope α of the Phillips tradeoff. This is intuitively sensible since in an open economy the demand shock induces a shift in both the D and YY schedules of Figure 1. Notice, however, that (74) is always satisfied when the income elasticities k_1, k_L are equal. In this case the main restriction conditioning the relative outcome of u^d on Y under the two targets is (73). Neither target, however, dominates on the basis of a simple criterion with respect to its implications for price volatility when effective demand is the main source of instability.

We next turn to shocks that originate in asset markets, the velocity shock v_1 associated with money demand under an M1 target and the velocity shock $v_1(L)$ under a credit target which corresponds to the stochastic component of the total demand for all bank liabilities and may be labelled v_2. Three possible outcomes are of interest of which the first two are easily analyzed. First, if the random shock reflects a shift in demand between M1 and time deposits, that is $s_M v_1 = -(1 - s_M)v_T$ then, $v_2 = 0$ and the credit target is superior since it provides full insulation by allowing banks to accommodate the shift. Second, if the shock is a shift in demand from time deposits to a third asset (say foreign time deposits), then $v_1 = 0$ and M1 provides full insulation from the effects of the shock while credit does not. The third possibility is that $v_1 \neq 0$ and $v_2 = s_M v_1 \neq 0$: there are unanticipated shifts in the demand for M1 at the expense of a third asset (perhaps foreign money). In this case neither target provides full insulation but it can be shown that as long as (72) holds—so long as the economy is sufficiently open—the credit target dampens output fluctuations more effectively and is therefore the better alternative.

The above analysis has shown that the total bank credit or M2 target *can* insulate the economy better than the conventional money target from various stochastic shocks. It is equally evident, however, that it is not possible to reach a general verdict concerning the relative superiority of the two targets. Their effectiveness depends not only upon the origin of disturbances, but also on the degree of openness of the economy and the degree of price flexibility. Moreover, a single target need not provide the most effective means of minimizing price and output variability simultaneously. Finally, our analysis has abstracted from an examination of the implementation problems and uncertainty associated with the control of the two targets by the central bank.[20] This is an important topic for future research. It should be pointed out, however, that although a broad credit aggregate may not be as precisely controllable as the stock of money, the empirical evidence suggests that its control is possible and fairly accurate [Kopcke (1983)]; consequently, the relative effectiveness of the credit aggregate in stabilizing the price level and output remains a basic criterion for judging its usefulness as a target and guide of policy.

VI. Concluding Remarks

This paper has developed a macroeconomic model which stresses the role of credit markets in the monetary mechanism and incorporates sufficient institutional detail to allow an analysis of the relative effectiveness of alternative forms of monetary and credit control. The model formalizes the determinants of equilibrium in the credit markets in terms of the behavior of households (net lenders) and corporate firms (net borrowers) who consider domestic and foreign financial instruments as imperfect substitutes. The model defines three monetary aggregates and two credit aggregates which may serve as policy targets. We have employed this model to compare the relative efficiency of two widely used and discussed targets: the narrow measure of the stock of money and the total quantity of credit provided by the consolidated banking system. Our analysis has focused on the case when firms regard domestic and foreign instruments as perfect substitutes but households consider them as imperfect substitutes.

The efficiency of the two targets is evaluated on the basis of two criteria: (1) their implications for the dynamic stability of the economy, and (2) their effectiveness in minimizing unanticipated fluctuations of aggregate output and the price level in the presence of various shocks. The analysis is carried out under freely floating exchange rates and under the assumption that anticipations are formed "rationally." Although rational expectations and the absence of intertemporal price and wage rigidities imply that anticipated changes in the quantities of money and credit cannot affect real output, the central bank's decision to formulate a policy in terms of a money or a credit target affects the unanticipated fluctuations of output and the price level as well as the dynamic stability of the anticipated price level.

The results of this analysis are summarized in sections IV.A and IV.B and need not be repeated here. Three general observations, however, are worth reemphasizing. First, a measure of the degree of openness of the economy has emerged as an important factor which conditions the relative effectiveness of the two targets given the origin and relative significance of stochastic shocks and the relative magnitudes of certain key behavioral parameters. Second, in the presence of certain disturbances a single target

[20]Angeloni and Galli (1983) analyze how the effectiveness of monetary policy is affected by disequilibrium and quantitative ceilings.

can not deliver the best performance with respect to both output and price variability. Third, when borrowers regard domestic and foreign loans as perfect substitutes, the effectiveness of the credit target depends, ceteris paribus, upon the stability of the demand for bank liabilities (supply of domestic bank credit) but it is independent of the presumably fairly unstable demand for domestic credit. However, when domestic and foreign loans are also viewed as imperfect substitutes, a case examined in a forthcoming paper, the stability of the demand for domestic credit and the firms' financial structure and investment decisions become important factors in determining the efficiency of the credit target. In general, the answer to the question of whether credit or money serves as the best intermediate target must be an eclectic one. No single target can be expected to dominate for all stochastic environments and independent of the structure and degree of openness of an economy. In principle, as B. M. Friedman (1983) has also advocated, the best policy is a combination policy which monitors both money and credit targets simultaneously. Although such a policy may be difficult to implement, it provides the central bank with more information on the origin of disturbances and a more effective means of attaining the dual goal of price and output stability.

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Discussion

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The useful task that Papademos and Razwadoski (P-R) have set themselves is to evaluate the relative merits of narrow and broad monetary aggregates as intermediate targets for monetary policy in an open economy. Specifically they focus on the comparison between M1, defined as currency plus fixed interest demand deposits, and M2, which, in addition, includes time deposits that are assumed to yield a market determined rate of interest.

Although this distinction is specific to the United States (since in several countries rates on both types of deposits are regulated, while in others, such as Italy, both are free), the analysis is of general interest since it really involves the issue of whether it is desirable for large portions of the money stock to yield a variable rate of interest.

Credit enters the analysis through accounting indentities: since M2 comprises all banks' liabilities in the model, it is also equal to a perfectly legitimate, although rather unconventional, definition of total bank credit, in which the central bank's balance sheet is consolidated with that of private financial institutions.

It is worth noting that the authors are not concerned with the issue of why intermediate targets should be set at all. B. Friedman (1975) and more recently W. Buiter (1980) have convincingly argued that the mere existence of stochastic disturbances is not a sufficient justification for following a constant x policy (whether aggregates or interest rates). Except under particular conditions, a discretionary policy that involves looking at more than one factor always dominates constant x policies.

Other reasons must be invoked for having targets and especially (if the issue is not to be trivial) for keeping them unchanged for a prolonged period of time, such as several months or quarters. These reasons can range from the recognition of the linkage between credible targets and market expectations to the need for making sure that policies have the necessary political consensus (see A. Lamfalussy (1981)).

Neither are the authors concerned with the issue originally raised by W. Poole (1970) as to whether it is preferable to pursue a target in terms of interest rates or aggregates.

On both these grounds, this research can be classified as a second- or third-best analysis. Taking it for granted that in most countries targets are set and that they are often set in terms of aggregates for reasons which are extraneous to the analysis and in part probably not strictly economic, the authors ask what difference it makes whether an M1 or an M2 target is set and whether the choice between the two should be influenced by the finan-

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cial structures of individual countries.

It is perhaps of some interest that the answer to the second question is negative in the sense that the ranking of targets does not depend—within the P-R model—on such structural features as the composition of firms' financing, the weight of intermediaries in total assets, the size of markets etc.

This fact considerably simplifies the analysis since it can focus on a streamlined IS-LM-aggregate supply model of an open economy with perfect substitutability between domestic and foreign securities.

The basic difference, stressed by P-R, between the two aggregates is the greater interest elasticity of M1. On the basis of this difference they put forward two arguments relating to the stochastic stability of a final target (real output) and to the dynamic stability of the price level under the assumption of rational expectations. I will consider the three issues separately (interest elasticity, stochastic stability, dynamic stability).

1. Interest elasticities of M1 and M2

The authors contend that the total (semi) elasticity of the demand for M2 is smaller than that for M1, because the rate on time deposits (which accounts for the difference between the two aggregates) varies with the general level of interest rates, while that on demand deposits is fixed.

This may be true empirically in some countries, but can be questioned on theoretical grounds since M1 can be very interest *inelastic* (if it is held primarily for transaction purposes), while increases in the general level of interest rates may induce agents to shift from time deposits into alternative securities if, due to reserve requirements, such increases are accompanied by a widening of the interest differential.

Assuming that the P-R presumption is correct, there is still the question, which plays an important role in their discussion of dynamic stability, as to whether the interest semielasticity of M2 can be positive. It seems to me that this should be considered even more unlikely than the authors suggest: the implication is that when the rate on alternative assets is raised exogenously (say, because of foreign countries' policies) and banks start to lose deposits, they will react by raising the deposit rate by such large amounts as to end up, in the final equilibrium, with a larger stock of deposits than in the initial situation. Reserve requirements combined with banks' optimizing behavior should rule out this possibility.

2. Stochastic stability under M1 and M2 policies

Proceeding under the above stated presumption (that M2 is less interest elastic than M1), P-R provide a ranking of the two targets based on a comparison of the variance of real output in the face of shocks originating in the goods market (demand and supply) and in the financial system. They thus extend the Poole (1970) analysis to an open system with a supply side.

The basic result is that, in the face of supply shocks, an M2 target is superior if the following condition (72′ in the paper) is satisfied

$$(1) \qquad -(a_1 + a_1^*) + \frac{a_2}{\overline{\theta}} > \frac{1}{k_1}$$

where a_2 = terms of trade elasticity of aggregate demand
$\overline{\theta}$ = share of domestic goods in total private demand
k_1 = income elasticity of money demand
a_1 = domestic interest elasticity of aggregate demand
a_1^* = foreign interest elasticity of aggregate demand

In order to clarify the meaning and relevance of this condition, we can ask the following questions:
a) how does this condition differ from its closed economy analogue?
b) what is the role of the degree of openness of the economy?
c) how general is the result?

a) As to the first question, it can be shown that condition (1) closely parallels the condition which ensures the superiority of an M2 target in a closed economy.

Intuitively, the issue is whether is it desirable to have a steep LM (M2 target) in the face of supply shocks. The general presumption is that this is not the case. A supply shock can in fact be viewed as a shock to the (real) supply of money: its effects are thus the same as those of a financial shock in the traditional Poole fixed price framework. As shown by S. Fisher (1977), monetary accomodation is generally preferable.

The ranking may differ if changes in the price level enter the IS schedule, as they do in the P-R model, since they affect the expected rate of change of prices and thus the real rate of interest. This point can be clarified by considering the following standard model which is the closed economy analogue of the P-R model (P-R symbols are used):

$$(2) \qquad m - p = n_1 i + k_1 y + v_1 \qquad n_1 < 0 \quad k_1 > 0 \quad \text{LM}$$

$$(3) \qquad y = a_1\left[i - (\hat{p}_{+1} - p)\right] + u^d \qquad a_1 < 0 \quad \text{IS}$$

$$(4) \qquad y = \alpha_1\left[p - \hat{p}\right] + u^s \qquad \alpha_1 > 0 \quad \text{aggregate supply}$$

where $\hat{p}_{+1}$ is the expectation held today for tomorrow's price level, while $\hat{p}$ is the expectation held yesterday for today.

If we assume, following P – R, that expectations are rational, all variables perfectly flexible and disturbances serially uncorrelated, we can impose the condition that expected prices are always equal to their time invariant equilibrium level ($\bar{p}$).

From (2) and (3) we can then find an expression for the aggregate demand schedule:

(5) $$p = \frac{m}{1 - n_1} - y\left(\frac{n_1 + a_1 k_1}{(1-n_1)a_1}\right) + c$$

where $$c = -\frac{1}{1 - n_1}\left[v_1 - \frac{n_1}{a_1} u^d + n_1\bar{p}\right]$$

It is easily verified that (5) is steeper in the p,y space under an M2 target (n_1 algebraically larger) and therefore that supply shocks have smaller effects on output if

(6) $$-a_1 > \frac{1}{k_1}$$

which is the same as (1) except that the parameters corresponding to foreign variables (a_1^*, a_2) make it more likely to hold.

The general point is that, when prices are expected to return to their preshock level, the ranking of targets in both an open and a closed economy may be reversed and steep LMs may become preferable in the face of supply shocks.

As to aggregate demand and financial shocks, it is easily seen that, in a closed economy, supply considerations do not alter the traditional fixed price ranking.

b) The degree of openness of the economy is measured in (1) by $a_2/\bar{\theta}$, where, to recall, a_2 is the terms of trade elasticity of aggregate demand and $\bar{\theta}$ the share of domestic goods in private spending. a_2 enters because aggregate demand is a function of both the real rate and the terms of trade: a large a_2 thus has the same role as a large a_1 (interest elasticity of aggregate demand) in formula 6.

The parameter $\bar{\theta}$ enters instead through the effects of import prices on the general price level, which is correctly used to deflate both nominal money balances and the nominal rate of interest. Analytically, the P-R model is model 2–4 with the addition of a terms of trade (z) effect in both the IS ($+a_2z, a_2<0$) and in the aggregate supply schedules ($+\alpha_2z, \alpha_2<0$) and of the familiar open interest parity condition

(7) $$i = i^* + \hat{e}_{+1} - e$$

where i^* is the foreign nominal rate of interest and e and $\hat{e}_{+1}$ are the nominal exchange rate and its expected level one period ahead (a_1 and n_1 are also redefined as $a_1 + a_1^*$ and $n_1^* + n_1$ to account for the potentially different effects of foreign interest rates on the demands for goods and for money).

The crucial point is the definition of p: if p is defined as a weighted average of domestic and foreign prices (p_y and p_y^*),

$$(8) \quad p = \bar{\theta} p_y + (1 - \bar{\theta})(p_y^* + e)$$

under the usual assumption that z is expected to return to its constant equilibrium level (stability in the sense of rational expectations), the ranking of targets depends on (1). It can easily be shown on the other hand that if p were defined as the price of domestic goods (p_y), the formula would be

$$(9) \quad -(a_1 + a_1^*) + a_2 > \frac{1}{k_1}$$

in which $\bar{\theta}$ does not appear.

c) One of the paper's central suggestions is that in very open economies, an M2 (or total bank credit) target can insulate real output against various stochastic shocks better than the conventional money target.

In my view, this suggestion is subject to caveats that are somewhat more substantial than those already noted in the paper.

A first caveat concerns the crucial role of expectations. If exchange rate expectations were static, the interest elasticity of money demand ($n_1 + n_1^*$) would play no role; if present movements of the exchange rate were taken as a signal of further movements in the same direction the ranking of targets could be reversed.

A second consideration concerns banks' liability management. As explained in the Caranza-Fazio paper presented at this conference, a major reason why priority has not been given to money in Italy (where it yields a free rate of interest) is the possible instability of the interest differential. In the P-R model, a large disturbance in equation (4) (banks' mark-up) would make the LM schedule considerably less stable under an M2 target.

3. Dynamic stability

My understanding of the P-R discussion of dynamic stability is that they encounter the problem of the multiplicity of solutions of flexible price models with rational expectations (see Buiter 1981).

The standard solution to this problem is to assume that agents choose initial conditions for the price level (and other nonpredetermined variables) which bring the system on to the unique asymptotically bounded path. This method of solution is possible if this path is indeed unique, which requires, among other conditions, that the root of the price dynamics equation (say, in a Cagan type of money demand equation) should be unstable (more generally that the number of unstable roots be equal to the number of nonpredetermined variables). Since the authors do not exclude the possibility that the interest elasticity of the demand for M2 be positive and greater than .5, they find one stable root too many. This means that if the price equation is solved in the backward direction, any initial condition will be asymptotically stable (multiple solutions), while if solved in the forward direction the present price level will appear to be infinite (since the integral of the solution does not converge). They thus conjecture that the price level may be less stable under an M2 target.

My impression is that this is not a problem, so to speak, in the real world. Rather it is a problem of models (not just the P-R model) which assume rational expectations and fully flexible prices. It should be sufficient to put some inertia in the dynamics of prices and/or expectations to have finite initial conditions and (in the case $(n_1 + n_1^* > .5)$ asymptotic boundedness of the price level.

Finally, I feel that I should say that the paper contains considerably more than my remarks would make it appear: the model that is used for the final analysis, although relatively standard, is carefully derived from an analysis of the financial structure as well as of the behavior of households, firms, and financial institutions. This analysis is interesting and provides a useful framework within which we can work and enhance our understanding of the monetary mechanism in different countries and institutional settings.

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Alternatives to Intervention: Domestic Instruments and External Objectives

James M. Boughton*

I. Introduction

Every monetary policy has both domestic and international effects. In a world without fixed exchange rates, actions that are intended to stabilize the domestice price level will alter the exchange rate as well, which will not only affect other countries but will also feed back and modify the domestic response. During the past decade of generalized floating, there have been several episodes in which major industrial countries have implemented programs of monetary restraint, only to find their exchange rates appreciating by a greater magnitude than would have been warranted by the effect of the policy change on underlying economic conditions. These real appreciations have weakened the countries' international competitiveness and have thereby aggravated the deterioration in domestic output and employment associated with the monetary programs. Prominent among these episodes have been the experience of the Federal Republic of Germany during the mid-1970s and those of the United Kingdom and the United States during the past few years.

This tendency for monetary restraint to produce excessive and unsustainable appreciation of exchange rates is probably an inevitable byproduct of the relatively rapid response of financial markets to a policy shift.[1] But this does not imply that the magnitude of the responses that have characterized the past decade need be accepted as the norm. The monetary authorities in the large industrial countries have a number of policy instruments available for the implementation of their policies, some combinations of which may enable them to improve their control over exchange rates in order to limit the extent of overshooting and hasten the adjustment process. In some circumstances, sterilized intervention in the foreign exchange market may serve this function. Other methods that have been attempted at

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[1]This aspect of exchange market dynamics has been emphasized by Dornbusch in a number of papers. For a recent example, see Rudiger Dornbusch, "Exchange Rate Economics: Where Do We Stand?" in Jagdeep S. Bhandari and Bluford H. Putnam, *Economic Interdependence and Flexible Exchange Rates,* Cambridge: The MIT Press, 1983.

various times by one or more major central banks include the imposition of capital controls, reserve requirements on bank deposits of nonresidents, and controls on interest rates. This paper examines some of the alternatives to sterilized exchange market intervention that have been or could be implemented in four major industrial countries with diverse financial systems: The United States, the United Kingdom, France, and the Federal Republic of Germany.

Although the importance of the exchange rate as a policy objective differs substantively among these four countries, it plays a significant role in each. This role is most explicit in France and Germany, both of which have specific obligations as members of the European Monetary System. The U.S. dollar and the pound sterling float independently, but the authorities of both countries occasionally intervene or alter monetary policy in order to influence the exchange rate: frequently in the United Kingdom, and comparatively rarely in the United States. One may therefore treat control over exchange rate movements as at least an indirect policy objective in each case, even though the weights assigned to it obviously differ quite markedly. A more problematic dissimilarity is that the financial systems of these four countries are quite different from one another, so that the means of influencing the exchange rate differ among them. It is not possible to develop a single model explaining the relationship between policy instruments and the exchange rate that would apply uniformly to all of these countries. A secondary objective of this paper, therefore, is to describe the aspects of these financial systems that are relevant in this context in order to clarify the choices that may meaningfully be made in each country.

The theme of what follows is that the monetary authorities can influence the exchange rate independently of the general policy stance to the extent that they can alter the structure of yields available on financial assets or otherwise shift relative asset demands. The general policy stance may be described by its effect on the inflation rate, nominal aggregate demand, monetary growth, or the level of real returns on financial assets. The exchange rate, however, depends additionally on relative returns. Sterilized exchange market intervention is an attempt to alter relative returns between domestic and foreign assets by shifting their relative supplies.[2] The limitations of sterilized intervention, however, have been frequently averred [3] and have led many observers to conclude that domestic and international monetary policy cannot be differentiated. The major conclusion of the present study is that—under specified assumptions—there are alternatives to intervention that give the authorities at least the potential ability to

[2]For a review of the role of intervention policy in portfolio balance models, see Hans Genberg, "Effects of Central Bank Intervention in the Foreign Exchange Market," IMF *Staff Papers,* 28 (September 1981), pp. 451–476.

[3]For example, the working group on exchange market intervention that was established at the 1982 summit conference at Versailles concluded that sterilized intervention generally has had short-term but not lasting effects. See Phillipe Jurgenson (Chairman), "Report of the Working Group on Exchange Market Intervention," March 1983.

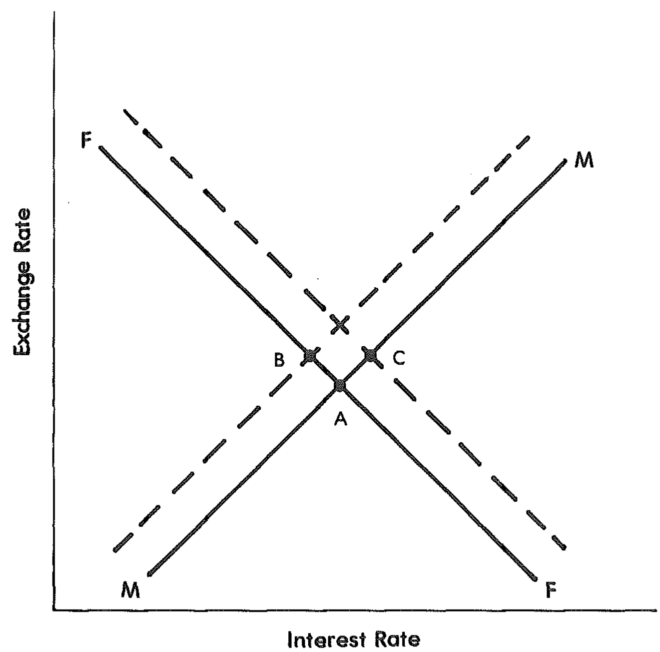
exert an independent influence on the exchange rate.

II. Monetary Policy and Sterilized Intervention

Monetary policy affects the exchange rate via a number of channels, including principally its effects on competitiveness, expectations, asset valuation, and current account balances. The competitiveness effect—in which the exchange rate adjusts to offset inflation differentials between countries—is the point of departure for any study of the monetary effects on the exchange rate, because it defines monetary neutrality. All of the relevant questions about monetary policy can be framed in terms of deviations from that position. In the modern therory of exchange rate determination, the remaining effects are envisaged as operating through the portfolio choices made by private market participants. For example, monetary expansion directly decreases the real yield on domestic securities. If foreign interest rates are unchanged or change by less than domestic rates, and if exchange rate expectations are regressive, then a depreciation of the home currency will be required in order to equalize the expected returns on domestic and foreign securities. In addition to (or instead of) this process, there may be

Figure 1

Domestic and International Financial Policies



wealth effects related to induced changes in current account balances.[4]

The exact specification of the transmission process from monetary policies to exchange rates is less important than the direction of the net effects and the stability of the process. Portfolio balance models can be predicated on any of several processes and then reduced to a common form. This reduced form can concentrate on two markets: domestic money balances and foreign exchange.[5] The latter represents the aggregate demand for and supply of assets denominated in foreign currencies. The specification of the reduced-form functions varies from one country to another, depending on how monetary policy is implemented; this point is examined in detail below. But a fairly general illustration may be derived by assuming the stock of money to be exogenously controlled by the monetary authorities. In that case, equilibrium in the two markets can be described by the two curves shown in Figure 1.

The MM curve in the diagram represents equilibrium in the market for domestic money balances, holding the stock of money constant. The demand for money is assumed to depend negatively on domestic interest rates and positively on the exchange rate (defined as the domestic price of foreign currencies).[6] If the underlying structural model operates through a regressive expectations effect, then a depreciation (i.e., an increase) of the exchange rate generates the expectation of an offsetting appreciation, reducing the relative return on holding foreign exchange and increasing the demand for money. If the underlying model operates principally through normal wealth effects, then depreciation raises domestic wealth via the current account and thus again increases the demand for money. Either way, the MM curve may be assumed to be positively sloped.

The eqilibrium curve for the foreign exchange market (the FF curve in Figure 1) is drawn as having a negative slope, although the opposite case is not as unlikely as for the MM curve. The excess demand for foreign exchange is assumed to depend negatively on both domestic interest rates and the exchange rate: a reduction in the relative return on holding foreign

[4]These include valuation effects (depreciation raises the home-currency value of foreign-currency assets if domestic residents hold positive net balances) as well as discrete-time flow effects (depreciation raises the home-currency value of the current account balance if the Marshall-Lerner condition holds over the relevant time period).

[5]The semi-reduced-form model developed in this paper is derived from the structural model in James M. Boughton, "Conditions for an Active Exchange Rate Policy With a Predetermined Monetary Target," IMF *Staff Papers,* 30 (September 1983). That model includes demand functions of domestic residents and of the rest of the world for several financial assets: money, other bank liabilities, government securities, bank loans, and foreign exchange. Relative interest rates are determined primarily by the profit-maximizing decisions of commercial banks, thus reducing the model to two markets with two relative prices: domestic interest rates and the exchange rate. The semi-reduced form of the model is described algebraically in the Appendix to this paper.

[6]Since the analysis in this paper is in terms of deviations from monetary neutrality, changes in interest rates and exchange rates are in real terms throughout.

exchange reduces the demand for it and increases the supply.[7] In addition, the supply of foreign exchange is affected by exchange market intervention. An increase in official foreign exchange reserves simultaneously increases the net assets denominated in the home currency that are held by the rest of the world. This fact reflects the balance of payments constraint: given the current account balance, any change in official capital must be mirrored in the private capital accounts. The increased net stock of assets held by the rest of the world will then normally result partly in increased holdings of home-currency assets and partly in decreased liabilities; i.e., in a reduced supply of foreign exchange to the home country.

In this simple model, an expansionary domestic open market operation shifts the MM curve to the left by increasing the supply of money, while sterilized intervention shifts the FF curve to the right by reducing the supply of foreign exchange. Monetary expansion thus results in a decline in interest rates and a depreciation of the home currency (a shift from A to B in Figure 1); expansion of external reserves results in an increase in interest rates, along with depreciation of the currency (from A to C). It is quite possible in practice that sterilized intervention will not work; i.e., that the foreign exchange market will not operate in the postulated manner, perhaps because of close substitutability between domestic and foreign assets or because the stock of outstanding private-sector assets is so large.[8] The point is simply that if sterilized intervention does work, it may be differentiated from domestic monetary policy through this difference in the implications for domestic interest rates corresponding to a given effect on the exchange rate. This difference is the source of the additional dimension for monetary policy afforded by the implementation of sterilized intervention.

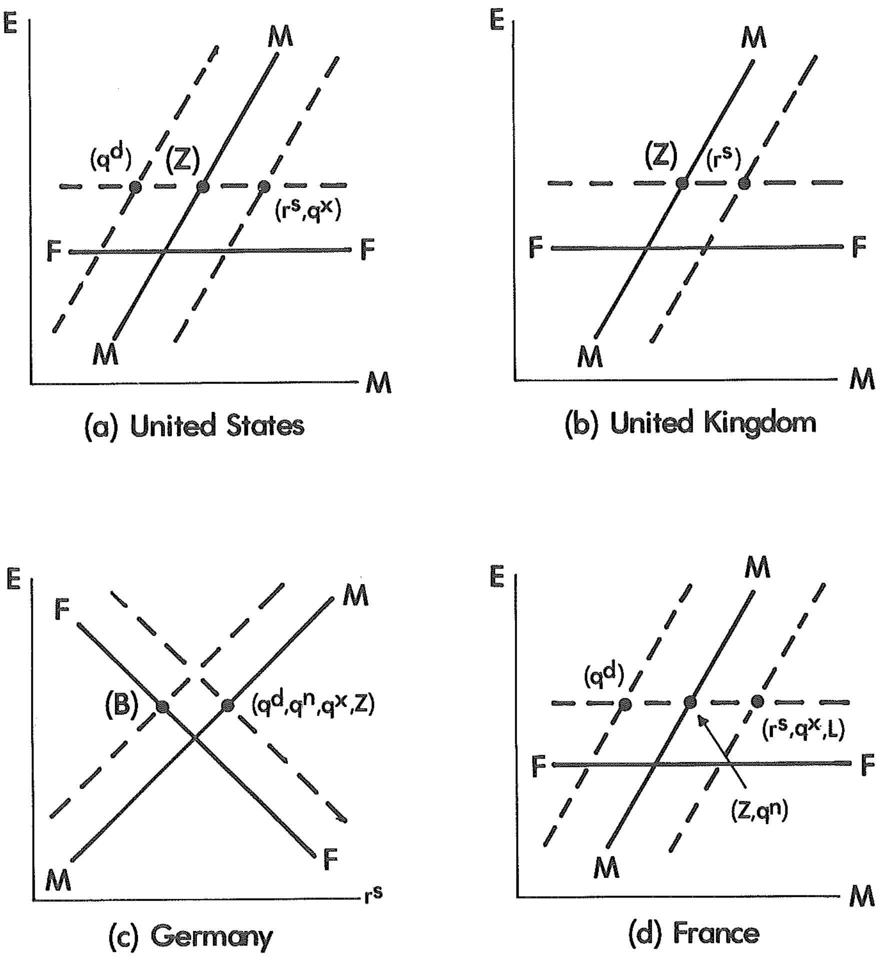
It is not obvious in this model whether monetary growth or sterilized intervention has the smaller effect on the level of domestic interest rates, relative to the effect on the exchange rate. The balance depends on the relative slopes of the two market curves. However, even if sterilized intervention has effects on interest rates that are just as large as those of monetary expansion, it has the great advantage of pushing the exchange rate and the interest rate in the same direction. If the authorities aim to influence the exchange rate with minimal disruption to their underlying policy course,

[7]The effect of the exchange rate is unambiguously negative if a regressive expectations effect dominates. On the other hand, the wealth-redistribution effect works in the opposite direction and so could impart a positive slope to the FF curve. As long as the slope remained less than that of the MM curve, the system would be stable but would have some perverse properties. These possibilities are examined in Boughton, "Conditions," and will be ignored for the remainder of this discussion.

[8]The necessary conditions for sterilized intervention or any of the alternatives examined below to have normal and stable effects in this model are that domestic securities and foreign exchange must not be perfect substitutes, and the demand for money must have a negative total elasticity with respect to domestic interest rates. The related sufficiency conditions are somewhat stricter than those that apply to most earlier models, as summarized in Genberg, "Effects of Intervention."

Figure 2

Policy Instruments in Four Countries[1]



[1]Open market operations are represented by changes in B or r^s; sterilized intervention by Z; reserve requirements by q^d, q^n, or q^x; and credit ceilings by L. In each case, the new equilibrium is indicated by the mnemonic for the instrument; the initial equilibrium is the intersection of the solid lines.

the effectiveness of such a policy will be weakened much more when depreciation is associated with monetary expansion and declining interest rates than when it is associated with rising interest rates that result from a shift in relative asset demands.[9] In this limited sense, sterilized intervention is clearly the more "efficient" means of altering the exchange rate.

Efficiency may be defined in a number of ways. What is meant here is the following: an instrument is a relatively efficient means of influencing a target if it has relatively small or benign side effects. Specifically, sterilized intervention is relatively efficient if it can be used to generate a given change in the exchange rate with a relatively small change in the level of domestic interest rates or if interest rates change in the same direction as the exchange rate. This concept certainly is not the only important aspect of the problem of determining whether an instrument is useful, but it is central to the development of meaningful policy alternatives. If the authorities had no concern with the interest rate consequences of their policies, they could readily achieve whatever exchange rate they chose.

III. Alternatives to Intervention

The difficulty with the model as expressed in Figure 1 is that it does not fully represent the policy options actually available to national authorities: the stock of money is not an instrument of policy, but an intermediate target. In practice, the authorities generally have recourse to several instruments for influencing monetary growth, and there is no prior reason to treat them as exact substitutes. Extending the model to incorporate those instruments opens the possibility of multiple dimensions, rather than the two suggested so far.

The most generally applied instrument of monetary policy is open market operations, which play a significant role in each of the four countries surveyed in this section. Strictly construed, the instrument is the central bank's portfolio of securities. As a practical matter, however, central banks vary that portfolio more or less automatically in order to stabilize a proximate target. That proximate target could be the monetary base, a subset of assets included in the base such as nonborrowed bank reserves, or a short-term interest rate. The choice among these depends on actual practices and is unlikely to be invariant over time or between countries.

In the United States, for example, open market operations are directed partly at short-term interest rates and partly at the growth of bank reserves. Over the medium term, monetary growth constrains and directs

[9]This relationship may be exacerbated by the effect of policy actions on expectations. When depreciation is accompanied by a decrease in real interest rates resulting from monetary expansion, the likelihood of a shift in the expected long-run exchange rate—invalidating the assumption of a stable regressive or static expectations process—is relatively large.

these short-term operational objectives. There is thus no single variable that can be designated unambiguously as the instrument, i.e., as the principal indicator for determining the scale of open market operations in the short run.[10] It is clear, however, that the path of short-term interest rates (specifically, the federal funds rate) has played an important role in this regard over much of the past decade. The key role of the federal funds rate was most explicit prior to the October 1979 reform of the Federal Reserve's operating procedures, but it has also been apparent more recently, especially since the derailing of monetary growth in the latter part of 1982. As an approximation, therefore, the level of domestic interest rates may reasonably be treated as the open market instrumental variable in the United States;[11] practices in other countries are described briefly below.

Another policy instrument that has been used with some frequency in these countries is the discount rate. It is by no means clear, however, that the discount rate is in any substantive way independent of open market policy. Two potential channels for an independent effect may be specified. First, the announcement of a discount rate change can affect expectations about the intent of monetary policy and so can hasten the response of financial markets to a policy change. This channel does not fundamentally alter the eventual outcome, but it can affect the speed of adjustment. Whatever the dynamic effect, it results largely from the announcement of the change, rather than from the change itself. Second, a change in the discount rate alters the commercial banks' borrowing costs and expected opportunity cost of holding excess cash reserves. These costs affect the levels of desired borrowing and excess reserves and thereby the amount of open market operations that is required in order to achieve a given level of interest rates or a given rate of monetary growth. That effect is of technical importance to the central bank, but it is of slight consequence to the rest of the economy.[12]

The discount rate has little independent influence because it does not

[10]The ambiguity inherent in the current control procedures is discussed by Peter Sternlight in Paul Meek (ed.), *Central Bank Views on Monetary Targeting*, Federal Reserve Bank of New York, April 1983. Mr. Sternlight, who directs open market operations at the Federal Reserve Bank of New York, notes (p. 43) that "it is probably fair to say that the present method is a bit of a hybrid that includes some interest rate concern along with the basic reserve-oriented approach." A number of outside observers have argued more strongly that the current procedures incorporate an interest-rate constraint as a dominant element. See, for example, the discussion by W. Lee Hoskins of David E. Lindsay, "Nonborrowed Reserve Targeting and Monetary Control," in Laurence H. Meyer (ed.), *Improving Money Stock Control: Problems, Solutions, and Consequences*, Boston: Kluwer-Nijhoff Publishing, 1983.

[11]The properties of the U.S. system under the alternative assumption—that growth of nonborrowed reserves is the relevant instrument—are similar to those of the German system as described below.

[12]If commercial banks have a demand for excess reserves that is proportional to required reserves, and if that demand is a function of the discount rate, then it may be shown that an increase in the discount rate will reduce deposit rates relative to yields on securities by an amount equal to the product of the required reserve ratio and the *ex post* change in the excess reserve ratio. This second-order effect is ignored in this discussion.

affect the demand for money. Regardless of the nature of the model, variables that enter only through the money supply function matter only to the extent that they shift that function and thus serve to implement general monetary policy. Under either an interest rate regime or an effective monetary targeting regime, the money supply process is redundant. The demand for money depends on the yields on assets that the nonbank public holds; the structure of these yields does not depend on the discount rate.

Reserve requirements provide a clearer example of an independent policy instrument. An increase in the required cash reserve ratio for a given type of deposit reduces the profit-maximizing interest rate for that deposit, relative to other interest rates, because it reduces the portion of the funds that the bank can invest in earning assets. Reserve requirements thus drive a wedge between yields on securities and yields on deposits, shifting the demands for money and other financial assets. Therefore, although reserve requirements obviously do not enter the public's structural demand functions, they do enter the reduced form functions via their influence on the yield structure. Requirements on deposits that are defined as money reduce the demand for money; requirements on excluded deposits increase it. Similar effects may be expected from controls on interest rates payable on deposits. Assuming that the controls are effective, they again drive a wedge between deposit rates and security yields.

Panel (a) of Figure 2 illustrates the effects of four policy instruments in the *United States*:[13] expansionary open market operations (represented by a decrease in the yield on government securities, r^s), an increase in reserve requirements on "included" deposits (q^d)—those that are defined as money—and on those that are excluded from the definition of money (q^x),[14] and intervention in the foreign exchange market (represented by an increase in the net stock of international reserves, Z). The effects of the last three instruments on the level of interest rates (r^s) are assumed to be sterilized through open market operations. The endogenous target variables are the stock of money (M) and the exchange rate (E), the latter being defined as the domestic price of foreign currency.

As in Figure 1, the MM curve represents equilibrium in the market for money balances; here, however, the money stock replaces the interest rate

[13]For a number of reasons, changes in required reserve ratios have been largely abandoned as a policy instrument in the United States, but the potential for their use remains in place. The Monetary Control Act of 1980, which established uniform requirements for all depository institutions, retained the option for the Board of Governors of the Federal Reserve System to vary requirements within prescribed ranges for purposes of monetary control. In addition, the Act gave the Board the authority to require interest-bearing supplementary reserves on a temporary basis, subject to certain conditions. However, since the implementation of the Act (from September 1980 to mid-1983) there have been no reserve requirement changes.

[14]The definitions of q^d and q^x employed here are theoretical constructs that do not correspond exactly to the categories in use in the United States. In practice, depending on the preferred definition of money, q^d and q^x might both be affected, though not necessarily uniformly, by changes in a given required ratio.

on the horizontal axis. With all policy instruments unchanged, depreciation (increase) of the exchange rate raises the demand for money (as explained above), so the MM curve has a positive slope. Partial equilibrium in the foreign exchange market depends only on interest rates, the exchange rate, and intervention policy; it does not depend directly on the stock of money.[15] The FF curve in this case is therefore a horizontal line.

Not surprisingly, sterilized intervention is a more efficient instrument than a pure open market operation for depreciating the exchange rate with minimal effects on the stock of money. As Figure 2 indicates, both policies lead to an increase in the money stock and a depreciation of the exchange rate, but the ratio of the two is unambiguously smaller for sterilized intervention because its direct effects are concentrated in the foreign exchange market. Of the two alternative policies, one is also relatively efficient, but the other is not. A sterilized increase in the reserve requirement against included (monetary) bank deposits either produces an increase in the money stock that is smaller than those produced by the other two policies, or it causes the money stock to decline. The advantage of this type of reserve requirement change is similar to the advantage of sterilized intervention: by combining the increase with expansionary open market operations so as to hold the level of domestic interest rates unchanged, the authorities affect only the structure of interest rates and hence the relative demands for money and other financial assets. In this case the demand for money declines, the demand for foreign exchange increases, and the exchange rate depreciates with little net effect on the money stock.

This advantage does not extend to the remaining instrument, the level of reserve requirements on excluded (nonmonetary) bank deposits. An increase in this requirement reduces the yield on excluded deposits and thus increases, rather than decreases, the demand for money. As the demand for foreign exchange also increases (asset holders shift out of excluded deposits into all other forms of financial assets), the exchange rate again depreciates. But in this case it cannot be determined that the increase in the money stock associated with this depreciation will be any smaller than under a pure expansionary open market operation, because the expansionary operations required to offset the rise in interest rates resulting from the increase in money demand are so large.[16] This type of policy, along with discount rate changes, may be eliminated as a candidate for consideration as an alternative to intervention, at least for the U.S. system.

A number of other instruments have been implemented at various times in the United States in order to influence the exchange rate or the

[15]This relationship may be seen by inspection of equations (3) and (4) in the Appendix. Note, however, that the independence of the FF curve from M does not imply that E is independent from M, since the MM curve is positively sloped.

[16]For simplicity of exposition, r^s and q^x are represented in Figure 2 as having identical effects. All that is intended is that the two instruments have effects that are qualitatively similar.

balance of payments. These include capital controls such as the Voluntary Foreign Credit Restraint (VFCR) program (1965–74) and the interest equalization tax (1964–74), reserve requirements on nonresident bank liabilities in the form of Eurodollar borrowings (since 1969), and—on occasions such as the implementation of the dollar support program of November 1978—changes in the discount rate. The redundancy of this last type of policy was discussed above. The other policies can be shown in principle to have been comparable to the "efficient" policies just described, although their empirical effectiveness was not clearly established.[17] The VFCR program and the nonresident reserve requirements would have affected only the foreign exchange market and hence would have been similar to sterilized intervention, while the tax on foreign interest earnings would have shifted both curves and had exchange rate effects broadly similar to those of reserve requirements (q^d).

In addition to these explicitly external policies, controls on interest rates payable on bank deposits have been a feature of the U.S. financial system since 1933. As noted above, these controls also have effects that are quite similar to those of reserve requirements. Choices among these theoretically similar instruments would therefore depend on their palatibility and an estimate of their likely effectiveness in more general terms.

The available policy options at present are rather more limited in the *United Kingdom.* As in the United States, the principal instrument for conducting domestic monetary policy is open market operations. Under the reforms implemented in August 1981, no regular reserve requirements are in effect except that certain commercial banks agree to maintain minimum portions of their assets in specified liquid forms, including call loans to the discount houses.[18] This requirement is not intended to serve as a fulcrum for monetary policy, but it does function similarly to any other liquid asset requirement. In addition, the authorities may impose the "special deposits scheme," under which the banks would be required to hold interest-bearing deposits with the Bank of England as a percentage of their eligible liabilities. Because these deposits would bear interest, the special deposits scheme would be practically equivalent to a liquid assets, rather than a cash reserve, requirement. In any event, it is not in regular usage and has not been imposed since July 1980.

Furthermore, there is not presently any strict equivalent to the discount window in the United Kingdom. The Bank of England lends infre-

[17]For an empirical analysis and review, see John Hewson and Eisuke Sakakibara, "The Impact of U.S. Controls on Capital Outflows on the U.S. Balance of Payments: An Exploratory Study," IMF *Staff Papers*, 22 (March 1975), pp. 37–60.

[18]In addition, banks are required to hold noninterest-bearing deposits at the Bank of England equal to ½ per cent of their eligible liabilities in the preceding six-month period. This requirement is imposed only to provide operational funding for the Bank of England; because it is independent of current changes in deposits, it would be of very limited value as a policy instrument.

quently to the discount houses, at rates that are established only at the time of the loan. The effects of these loans are closer to open market operations than to discount window loans because no fixed interest rate and no regularly oustanding stock of liabilities are associated with them. Finally, international capital controls were eliminated in 1979. Thus only two policy instruments are in effect in this system: open market operations and exchange market intervention.

The main fulcrum for open market operations in the United Kingdom is the banks' voluntarily held noninterest-bearing clearing balances at the Bank of England.[19] The banks provide daily estimates of their target balances to the Bank, which then conducts its security operations so as to influence the cost of acquiring those balances. But there are two crucial differences between this system and one based on required cash reserves. First, because the banks are able to choose the desired value of their clearing balances, they are able in principle to equalize the implicit marginal returns on these balances with the returns available on earning assets. Altering the cost of holding cash balances also alters the equilibrium returns on earning assets by the same amount. Second, the Bank of England does not possess a policy instrument in the form of a variable reserve requirement.

The relationship between the two U.K. instruments is shown in panel (b) of Figure 2. Because the Bank of England explicitly employs an interest rate strategy for conducting open market operations, the form of the model is similar to that described for the United States. Either instrument can be used to depreciate the exchange rate, but the depreciation can be achieved with less effect on monetary growth through sterilized intervention.

The *Federal Republic of Germany* presents a contrasting picture, as the range of instruments is more varied and is employed rather differently. The Deutsche Bundesbank has eschewed an interest rate strategy in favor of a close targeting of the central bank money stock. This aggregate is equivalent to the monetary base, adjusted for changes in reserve requirements and net of excess reserves. The stock of money responds endogenously to shifts in demand among the various types of deposits, since reserve requirements are not uniform. More importantly, the level of domestic interest rates responds endogenously to shifts in the demand for money or for foreign exchange, as shown in panel (c) of Figure 2. This system therefore is more closely akin to the hypothetical model described in Figure 1 than to those of the other countries considered in this section.

Because the central bank money stock is calculated on the basis of fixed reserve requirements, the equilibrium curve for the money market (the MM curve) for Germany is not affected systematically by sterilized

[19] The current operating procedures are described in "Methods of Monetary Control," Bank of England *Quarterly Bulletin*, 20 (December 1980) and are analyzed in a paper by A. L. Coleby in Meek, "Central Bank Views." The latter volume also contains useful discussions of monetary control procedures for each of the other countries surveyed here.

changes in reserve requirements. Consequently, also in contrast to the other countries being surveyed, each policy instrument shifts only one of the two market equilibrium curves. An increase in the central bank money stock depreciates the exchange rate and reduces interest rates, while the other policy instruments shift the FF curve and hence raise domestic interest rates while depreciating the exchange rate. All of these other instruments are therefore relatively efficient in the sense in which that term is being used here.

In addition to exchange market intervention, the sterilized instruments actually available in Germany include reserve requirements on monetary bank deposits (q^d), on excluded bank liabilities held by residents (q^x) and on bank liabilities held by nonresidents (q^n). From 1957 to 1978, requirements on nonresident deposits were usually higher than those on resident deposits, reducing the profit-maximizing interest rate available to nonresidents and thereby serving as a form of capital control.[20] Changes in these requirements therefore had effects similar to those of exchange market intervention.[21] In the German system, again because the central bank money stock is adjusted for changes in reserve requirements, the other two types of reserve requirements also have effects similar to those of exchange market intervention. In this context, therefore, it would seem to make little difference whether policies are implemented through changes in one category of deposit or in all together, although there could be significant practical differences that are beyond the scope of this exercise.

Monetary policy in *France* is characterized by a greater use of controls than in the other three countries. Specifically, the "encadrement de credit" is a ceiling that may be treated analytically as preventing banks from expanding loans to a profit-maximizing level. As a corollary, the nonbank public is unable to satisfy its notional loan demand, so the constrained value of bank loans replaces the interest rate on loans as an argument in the demand functions for other financial assets. Changes in this constraint serve as the principal instrument for controlling monetary growth in France.

In other respects, the French financial system can be represented by a model that is similar to that of the United States, with elements that are related to the German and U.K. systems as well. Open market operations are aimed at controlling domestic interest rates, and there is a system of reserve requirements, with different requirements applying to nonresident

[20]At present, no capital controls are in place in Germany. Furthermore, there are no interest rate ceilings, either for residents or nonresidents. Rediscount quotas are an important feature of monetary control, but it may be shown that—like changes in the discount rate—these quotas do not generally have effects that are independent of their overall monetary effects.

[21]The effect of reserve requirements on nonresident deposits as an instrument for influencing the exchange rate depends on the assumption that home-currency deposits in Eurobanks are not a perfect substitute for deposits in the home country.

than to resident deposits.[22] As is shown in panel (d) of Figure 2, changes in reserve requirements on nonresident deposits—as in the German model—are practically equivalent to sterilized intervention. Because residents, by definition, cannot hold such deposits, they are unaffected by changes in the yields; hence this particular reserve requirement is not an argument in the reduced-form money demand function, and changes in it do not cause the MM curve to shift. Both sterilized intervention and increases in nonresident reserve requirements result in a smaller increase in the stock of money in relation to the associated depreciation of the exchange rate than does a pure open market operation. Other reserve requirements have characteristics similar to those described above for the United States: requirements on monetary bank deposits are relatively efficient, while requirements on nonmonetary deposits in general are not. Changes in the banks' credit ceilings have properties that are similar to those of open market operations and therefore are also relatively inefficient in this sense.

IV. Conclusions

Two basic assumptions underlie the analysis developed in this paper. First, exchange rates are assumed to be influenced by portfolio choices; specifically, by the effects of relative rates of return on the demands for domestic money balances and for foreign exchange. This assumption in turn implies that financial assets are imperfect substitutes in demand functions. Under fairly broad conditions, if the demand functions are stable, this general assumption implies that the relationship between domestic monetary conditions and exchange rates can be altered in predictable ways by shifts in these functions. Second, it is assumed that the interest rates that matter in these demand functions include the rates on bank deposits and that these rates can be influenced by instruments that alter the marginal profit-maximizing conditions facing the commercial banks. In addition, other policy instruments—including sterilized exchange market intervention and quantitative credit ceilings—directly constrain the public's demand functions and thereby influence the exchange rate.

These assumptions imply that sterilized intervention is potentially a relatively efficient instrument for influencing the exchange rate with minimal domestic disruption. It is recognized, however, that intervention might not be sufficient by itself and might even be abjured by the authorities. Sterilized changes in some, but not all, of the other instruments examined here have the potential to serve as supplements or alternatives to intervention for the purpose of influencing the exchange rate. Reserve requirements and interest rate controls may be singled out as the clearest examples, with regulations on nonresident deposits being perhaps the closest and most natural alternative to intervention. Other instruments, most notably

[22]In 1972–73 and in 1980–81, requirements on nonresident deposits were raised above those of residents. Otherwise, they have generally been set to zero.

changes in discount rates, do not alter the banks' profit-maximizing conditions and hence do not have effects that may be differentiated from their overall effects on domestic monetary conditions.

The common feature of all of the policies examined here is that they alter the structure of interest rates by imposing taxes or controls on selected assets. The essential requirements for their success are that the controls be effective and that they not shift the excess demand functions for money and foreign exchange in the same direction. Where both curves do shift in the same direction, the effects are qualitatively the same as those of a general monetary policy. The effectiveness problem may be formidable for reserve requirements, since large changes may result primarily in shifts in intermediation patterns rather than in relative prices. In addition, one must recognize the limitations inherent in any policy designed to tinker marginally with the financial system. It is nonetheless important to recognize the potential impact that these instruments have on exchange rates, if only to ensure that policies not have unintended effects. The relevant empirical question suggested by this analysis is whether judiciously selected changes in reserve requirements, especially on nonresident deposits, or in the other potentially effective instruments can generate quantitatively important and predictable exchange rate movements without seriously disrupting financial flows.

Appendix

A Model of Exchange Rates and Domestic Financial Conditions

$$W = W^d + K(\underset{+}{E}) \tag{1}$$

$$M/W = M(\underset{+}{r^d}, \underset{-}{r^x}, \underset{-}{r^s}, \underset{-}{r^\ell}, \underset{-}{r^f}) \tag{2}$$

$$E \bullet F/W = F(\underset{-}{r^d}, \underset{-}{r^x}, \underset{-}{r^s}, \underset{-}{r^\ell}, \underset{+}{r^f}) \tag{3}$$

$$E \bullet F = \Phi(\underset{+}{r^n}, \underset{+}{r^s}, \underset{+}{r^\ell}, \underset{-}{r^f}, \underset{-}{Z - K}) \tag{4}$$

Equation (1) states that the financial wealth of the domestic private nonbank sector (W) is equal to domestic wealth (W^d) plus the cumulative external balance on current account and direct investment (K). The first component—which, for a given physical wealth, is essentially equivalent to the stock of government debt outstanding—is assumed to be exogenous. The second is affected by changes in the domestic price of foreign currency (E), the effect being positive if there is a positive valuation effect or if the Marshall-Lerner condition holds.

Equation (2) is the demand function for money (M), and equation (3) is the demand function for assets denominated in foreign currencies (F). Each function is homogeneous in wealth, with the portion of wealth allocated to each asset being a function of relative interest rates. There are several interest rates, as explained below. Each demand depends positively on the own yield and negatively on substitute yields.

Equation (4) is the supply of foreign exchange from the rest of the world. This supply depends negatively on the own yield and positively on substitute yields, as well as negatively on the net supply of rest-of-world claims on the home country. This last item is equal to the negative of K plus the home country's net official claims on the rest of the world. That is, the current account balance, the private capital balance, and the official capital balance sum to zero. The effect is negative if a rise in wealth is allocated partly to additional assets and partly to reduced borrowing.[23]

$$r^f = \underset{+\ \ -}{f(r^s, E)} \tag{5}$$

This equation states that the uncovered yield on foreign assets (r^f) is a function of the yield on domestic securities (r^s) and the exchange rate. The first argument reflects the interaction of international arbitrage and the reaction function of foreign monetary authorities: a rise in r^s leads to increases in rates elsewhere, with the magnitude of the effect depending on the importance of the home country in world financial markets and the policy objectives of the authorities in other countries. The second argument represents the effect of a change in the level of the exchange rate on its anticipated rate of change. The derivative is negative if exchange rate expectations are regressive.

The remainder of the model is country-specific. It is assumed that banks maximize profits subject to a set of regulations; this assumption generates equations relating the interest rates on bank loans (r^ℓ) and deposits (r^d, r^x, and r^n) to security yields. These relationships permit the reduction of the portfolio balance model to two markets (money and foreign exchange), eliminating the markets for bank loans, government securities, and for the different types of bank deposits.[24]

(1) <u>United States</u>

$$r^\ell = r^s \tag{6}$$

$$r^x = (1 - q^x)r^s \tag{7}$$

$$r^d = \underset{+\ \ -}{\delta(r^s, q^d)} \tag{8}$$

$$r^n = r^x \tag{9}$$

All of these equations omit the constant differences between rates that arise from differences in risk or maturity structure, which are assumed not to depend systematically on the variables included in the model. Equation (6) states that loan rates must otherwise equal security yields, while equation (7) describes the wedge that reserve requirements (q^x) on bank liabilities that are excluded from the money stock drive between security yields and the profit-maximizing rates paid on those liabilities (r^x). Equation (8) is similar to (7) for deposits that are included in the money stock, except that it is specified more generally in order to allow for rigidities arising from ceilings on certain types of deposits and from the administered nature of these rates. Nonresident deposits should earn the same yield as resident deposits, since the same reserve requirements are applied; hence, equation (9).[25]

This model may be solved for the excess demand functions for money and foreign exchange, corresponding to the MM and FF curves shown in panel (a) of Figure 2.

[23]This hypothesis is a generalization of the homogeneity postulate governing the specification of equations (2) and (3). Equation (4) is not homogeneous because the sign of Z-K is indeterminate.

[24]This reduction of the model is derived in Boughton, "Conditions."

[25]In practice, r^n will differ from r^x because of differences in the composition of deposits for the two groups.

(10) $$\text{MM: } E = \mu(\underset{+}{M}, \underset{+}{r^s}, \underset{+}{q^d}, \underset{-}{q^x})$$

(11) $$\text{FF: } E = \phi(\underset{-}{r^s}, \underset{+}{q^d}, \underset{+}{q^x}, \underset{+}{Z})$$

The signs of the partial derivatives of equations (10) and (11) follow directly from those of the structural equations as long as normal gross substitution effects dominate. If the total elasticity of money demand to interest rates is positive, then $\partial\mu/\partial r^s$ will be negative; if wealth effects dominate substitution effects in the foreign exchange markets, then all of the partials in equation (11) will change sign and the system in general will be unstable.

(2) United Kingdom

(6′) $$r^{\ell} = r^s$$

(7′) $$r^x = r^d$$

(8′) $$r^d = q^s r^s + (1 - q^s) r^{\ell}$$

(9′) $$r^n = r^s$$

As noted in the text, banks in the United Kingdom are able approximately to equate marginal returns on all assets and liabilities, because reserve requirements may be satisfied by holding interest-bearing assets. Therefore, except for risk premiums, all interest rates will tend to be equal. There are no effective policy levers of the type described for the other countries, and the market equilibrium curves reduce to the following:

(10′) $$E = \mu(\underset{+}{M}, \underset{+}{r^s})$$

(11′) $$E = \phi(\underset{-}{r^s}, \underset{+}{Z})$$

(3) Federal Republic of Germany

The equations for r^d, r^x, and r^{ℓ} are the same as those for the United States (equations [6–8]). However, because separate reserve requirements (q^n) are imposed on nonresident deposits, the yield on those deposits will differ from domestic yields.

(9″) $$r^n = (1-q^n) r^s$$

In addition, the model must be extended to incorporate the central bank money stock (B).

(12) $$B = q_0^d D + q_0^x X^p + C$$

The control variable (B) is equal to reserves required against domestic deposits, calculated at constant reserve requirements, plus currency in circulation (C). Currency demand as a portion of total money demand may be assumed to depend on the yield on deposits.

(13) $$C/M = c(\underset{-}{r^d})$$

Together with the definition of M ($M = D + C$), equations (12) and (13) produce the following money supply equation.

(14) $$M = mB - mq_0^x X^p$$

where $m = 1/[q_0^d + (1 - q_0^d)C] = m(\underset{+}{r^d})$

To close the system requires a demand function for excluded deposits (X^p), which should have the same form as the money demand function.

(15) $$X^p/W = X(\underset{-}{r^d}, \underset{+}{r^x}, \underset{-}{r^s}, \underset{-}{r^l}, \underset{-}{r^f})$$

In the excess demand function for money, reserve requirements now play a less important role. For example, a decrease in the requirement on monetary deposits (q^d) increases the demand for money by increasing the own yield, but it also increases the supply, both by increasing the multiplier (m) and by reducing the demand for excluded deposits. The net effect on excess demand is indeterminate. Similarly, a decrease in the requirement on nonmonetary bank liabilities (q^x) decreases the demand for money by increasing a substitute yield, but it also decreases the supply via equation (14) by increasing the demand for X^p. Both q^d and q^x have therefore been omitted from equation (10″).

(10″) $$E = \mu(\underset{+}{B}, r^s)$$

(11″) $$E = \phi(\underset{-}{r^s}, \underset{+}{q^d}, \underset{+}{q^x}, \underset{+}{q^n}, \underset{+}{Z})$$

(4) France

The imposition of credit ceilings in France means that the interest rate on loans must be replaced by the constrained value of loans as an argument in the portfolio allocation equations. The other domestic interest rates are determined as in Germany (equation [6–8] and [9″]). The solution is as follows.

(10‴) $$E = \mu(\underset{+}{M}, \underset{+}{r^s}, \underset{+}{q^d}, \underset{-}{q^x}, \underset{-}{L})$$

(11‴) $$E = \phi(\underset{-}{r^s}, \underset{+}{q^d}, \underset{+}{q^x}, \underset{+}{q^n}, \underset{+}{Z}, \underset{+}{L})$$

Discussion

Robert W. Eisenmenger*

Dr. Boughton has prepared an ambitious and highly thought-provoking paper on the potential of sterilized intervention and some alternatives to intervention as tools for influencing the exchange rate—independent of traditional monetary and fiscal policies. Adapting a typical small-open-economy portfolio-balance model of exchange rate determination to four institutionally distinct *large* open economies, Dr. Boughton is able, given his assumptions, to show that sterilized intervention and some (heretofore ignored) alternative policies are relatively more "efficient" than monetary policy if the goal is to influence the exchange rate. Accordingly, he suggests that recent large and prolonged real appreciations of certain industrialized countries' currencies need not be accepted in the presence of these policy alternatives.

The paper is comprised basically of two parts. The first part describes a small-open-economy portfolio-balance model similar to earlier ones by William Branson, Michael Dooley and Peter Isard. Such a model is typically used to contrast the exchange rate and domestic interest rate effects of sterilized intervention policy with those of traditional monetary policy (i.e., open-market operations), where the effectiveness of policy is usually defined as its ability to influence the exchange rate without regard to the ultimate effects on other policy targets.[1] In contrast, Dr. Boughton elects to subdue the issue of the relative effectiveness of sterilized intervention and instead analyzes the relative efficiency of such intervention—where an efficient policy is one that minimizes side effects on other policy targets. He claims that sterilized intervention is more efficient than pure open market operations as an exchange rate policy because "it has the great advantage of pushing the exchange rate and the interest rate in the same direction" (p. 8).

In part I of my remarks, I comment on some technical attributes of Dr. Boughton's model. I conclude that given different, and equally plausible assumptions, his model would produce somewhat different conclusions. In part II, I relate his paper to the broader issues being discussed at this conference.

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[1]See Hans Genberg, "Effects of Central Bank Intervention in the Foreign Exchange Market," IMF *Staff Papers,* vol. 28 (3), September 1981.

I. Technical Issues

In developing his portfolio-balance model, Dr. Boughton assumes that exchange rate expectations are regressive. Such an assumption is clearly at odds with much current theorizing which instead assumes that expectations are formed rationally. Moreover some recently completed, widely referenced empirical studies suggest that regressive exchange rate expectations are unrealistic. Both in-sample[2] and out-of-sample[3] tests of structural and autoregressive models of exchange rate determination suggest that a "random walk" model of exchange rates performs as well as any of the other models, indicating that static expectations are "a reasonable rule of thumb."[4] Although Dr. Boughton recognizes that his portfolio-balance model is also consistent with an alternative framework emphasizing static expectations and wealth effects, he relies on the regressive expectations approach in his analysis of alternatives to intervention. This choice, however, is not trivial; under a more realistic framework emphasizing static expectations and wealth effects, the results are weaker.

In the second part of his analysis Dr. Boughton modifies his small open economy portfolio-balance model for the institutional idiosyncrasies of monetary policy in each of the United States, the United Kingdom, Germany, and France. Thus he attempts to narrow a bothersome gap in this literature in which the typical small-open-economy model has persistently been estimated for *large* open economies. Dr. Boughton exercises care in establishing how the financial distinctions across the four countries either create or eliminate certain potential instruments for exchange rate policy as alternatives to sterilized intervention and pure open market operations. A major conclusion of his analysis is that—in the case of the United States, United Kingdom, or France—sterilized intervention is unambiguously a more efficient exchange rate policy than a pure open market operation because—for a given exchange rate rise—the accompanying money stock increase is smaller for sterilized intervention than for the open market operation.

Yet, the strength of this conclusion relies heavily upon the assumption of regressive exchange rate expectations. To illustrate, suppose exchange rate expectations are static, as suggested by empirical evidence, and wealth effects are not ignored. In Figures 2(a), 2(b), and 2(d), the FF curve would now be positively sloped; that is, foreign exchange market equilibrium is no longer independent of the money stock. A rise in the money stock increases domestic wealth. As wealth rises, demand increases for net for-

[2]See Michael Mussa, "Empirical Regularities in the Behavior of Exchange Rates and Theories of the Foreign Exchange Market," in *Policies for Employment, Prices, and Exchange Rates*, Carnegie-Rochester Conference Series on Public Policy, vol. 11, 1979.

[3]See Richard Meese and Kenneth Rogoff, "Empirical Exchange Rate Models of the Seventies," *Journal of International Economics*, vol. 14, 1983.

[4]William H. Branson, "Economic Structure and Policy for External Balance," IMF *Staff Papers*, vol. 30 (1), March 1983.

eign assets. To restore foreign exchange market equilibrium, the exchange rate must rise to increase the domestic value of foreign assets held. Thus, by including wealth effects, sterilized intervention is now actually more effective—although no less efficient. For the same size sterilized intervention as before, the exchange rate rises even further because of added stimulus from incorporating the effect of increased wealth.

Furthermore, consider a pure expansionary open market operation. Under regressive expectations, a pure open market operation generating an exchange rate rise equivalent to that from a sterilized intervention induces a money stock increase larger than that accompanying the sterilized intervention, suggesting that intervention is equally effective but relatively more efficient. However, the same pure expansionary open market operation under static expectations and including wealth effects would cause the exchange rate to rise even further. The reason is that under static expectations the consequent increases in wealth from the money stock expansions cause increases in the demand for net foreign assets, generating a larger exchange rate change for a given decline in the domestic interest rate. Thus, under static expectations pure open market operations can be shown to be much more effective than sterilized intervention, though still less efficient. Furthermore, if the relative "usefulness" of the two policies is evaluated on grounds of effectiveness and efficiency jointly, it becomes ambiguous whether sterilized intervention is more or less useful than a pure open market operation as an exchange rate policy in this model.

Dr. Boughton, as indicated earlier, chooses to subdue the importance of effectiveness. However, if a policy is essentially ineffective, efficiency is of little consequence. To illustrate, suppose domestic and foreign financial assets are virtually perfect substitutes. If the exchange rate rose, the domestic interest rate need fall by only a negligible amount in order to restore foreign exchange market equilibrium. In this case, sterilized intervention is ineffective in altering relative yields on assets and in altering the exchange rate (i.e., FF is nearly vertical). Several recent studies[5] including the recently completed Versailles Working Group Study on Exchange Rate Intervention have suggested that domestic and foreign assets are almost perfect substitutes. In the absence of clear evidence in support of the portfolio

[5]For example:

John P. Martin and Paul R. Masson, "Exchange Rates and Portfolio Balance," NBER Working Paper No. 377, August 1979;

Peter Hooper and John Morton, "Fluctuations in the Dollar: A Model of Nominal and Real Exchange Rate Determination," Board of Governors International Finance Discussion Paper No. 168, October 1980;

Peter Isard, "Factors Determining Exchange Rates: The Roles of Relative Prices, Balances of Payments, Interest Rates and Risk," Board of Governors International Finance Discussion Paper No. 171, December 1980;

Jeffrey Frankel, "Monetary and Portfolio-Balance Models of Exchange Rate Determination," in J.S. Bhandari and B.H. Putnam, eds., *Economic Interdependence and Flexible Exchange Rates*, Cambridge: MIT Press, 1983.

balance model or the effectiveness of sterilized intervention, the relative *efficiency* of sterilized intervention becomes a moot issue.

II. Sterilization and Public Policy

Under certain assumptions, of course, Dr. Boughton's analysis is correct and sterilized intervention might be an efficient method for reducing the exchange rate impact of a given policy of monetary restraint. If that were the case, *should* currency appreciations—such as those generated by monetary restraint in the United States and England during the last few years—have been partially offset by sterilization? In his paper Dr. Boughton argues that the U.S. dollar and pound have appreciated unnecessarily and that this has aggravated "the deterioration in domestic output and employment." He suggests that sterilized intervention would have alleviated the problem.

I have two responses to Dr. Boughton. First, I believe the administrations in both the United States and England believed that a large dosage of tight monetary policy was necessary to curtail inflationary expectations. Certainly the 1983 Economic Report of the President to the Congress of the United States suggests this is the case. I doubt that much of the restraint was unintentional.

Second, I would ally myself with Jeffrey Frankel[6] who argues that monetary restraint should constrain both the export trading sections of an economy as well as the purely domestic sectors. He argues that appreciation of the home country's currency spreads the impact of restraint across more sectors, thereby making monetary policy more effective and equitable. Moreover, in a flexible exchange rate regime, monetary restraint in one country depreciates the foreign exchange values of other countries' currencies, thereby partially neutralizing the spread of restraint worldwide. Thus exchange rate flexibility, unfettered by sterilized intervention, permits each country to have its own growth policy.

I should also like to comment on the "political" consequences of monetary restraint. In his paper, Professor Duesenberry suggests that in the post World War II period monetary policy has had its primary effect in housing and that this industry has regularly opposed tight money. I would agree that this was true in the past. Now that we have a flexible exchange regime, however, many sectors of the economy besides housing and consumer durables are clearly restrained by monetary policy. High technology exports (e.g., aircraft, computers, specialized machinery), agricultural exports, and import vulnerable industries (autos, steel, textiles) are all affected. Thus the burden of restraint is spread across many industries and the combined political power of all these industries could easily curtail the indepen-

[6]Jeffrey A. Frankel, "The Desirability of a Dollar Appreciation, Given a Contractionary U.S. Monetary Policy," Dept. of Economics, University of California, Berkeley, California, Feb. 28, 1983.

dence of any central bank. In fact if the reaction function analysis outlined by Professor Woolley in this conference were applied in this situation, we might conclude that "politics" will completely frustrate monetary policy in the future.

I would argue, however, that with articulate and strong leadership the direction of "political" causation can run the other way. Top government leadership can help businessmen understand and favor more effective policies. For example, in the United States Paul Volcker, the Chairman of the Federal Reserve Board, Martin Feldstein, Chairman of the Council of Economic Advisers, Alan Greenspan, personal adviser to President Reagan, and Rudolph Penner, the new head of the Congressional Budget office, have been passionate and effective advocates of a new policy mix of less monetary/more fiscal restraint. The Volcker/Feldstein/Greenspan/Penner logic is that such a mix would reduce interest rates worldwide and would encourage greater industrial investment in the United States. I believe these four senior officials are being very effective in helping the Congressional and business leadership in the United States understand the continuing danger of inflation *and* the disadvantages of the present policy mix. Obviously a changed mix would bring slightly lower interest rates (helping the housing industry), stimulate exports (helping high technology industries, specialized service industries and agriculture) and moderate the competitive burden on import vulnerable industries (steel, autos, textiles). The new policy mix would also encourage investment in those industries in which the United States has a comparative advantage—research intensive manufacturing, agriculture, and specialized export services—and stop the erosion of the competitive position of these industries. Thus the overall efficiency of the world economy would be improved.

In my view, these economic truths can be explained and understood by businessmen in the United States. Therefore, a political coalition of all the benefiting industries should be able to influence economic policy in the United States in a very constructive way. They could lobby Congress for the improved policy mix. Thus leadership can create a political climate which can give scope for creative new policies. Central banks and governments do not have to be captives of their political environments.

Comparative Performance of Multiple Reaction Function Equations Estimated by Canonical Methods

Robert W. Resek*

This paper considers reaction function or control theory models and the appropriate estimation methods. Initially, we discuss a variety of issues that affect our theory and estimates. These include questions of uncertainty, appropriate assumptions, the mix of theory and empirical work, goals of analysis and criticism of past models, as well as responses to these questions. While we believe that regression analysis is one appropriate empirical method for these problems, in the second part of this paper we briefly introduce the canonical correlation approach to estimation. Finally, in the third section, we have specific estimates for reaction functions using canonical correlation methods for four European countries.

Reaction Function Estimation—General Discussion

In this section, we consider benefits from the use of reaction functions along with some criticism of the technique. Reaction functions actually are an implication of control theory methods. Through evaluation of specific assumptions and critiques of these methods, we can better understand them along with possible alternative techniques for their implementation.

In a prior paper [Resek, 1981] we laid out a mathematical view of reaction functions. Basically the process relies on specific assumptions about the world. First, we have a *structure* of the economy. This structure is combined with a *utility function* held by the policy authority. Combining the information from these sources, the authority adjusts policy tools to maximize his expected utility. Let us consider ways in which that process may be confused or may lead to unreliable estimates.

Varying Parameters and Assumptions about Uncertainty

First, consider the policymaker's utility. Structural econometric models are based largely on linear models—or models at least linear in parameters. These have been found to approximate reality reasonably well. Similarly, it is generally assumed that policymaker's utility is quadratic. This assump-

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tion is one that ultimately must stand the test of time. There may be variables that cross a threshold and lead to a change in utility; but even this may be well approximated by a quadratic function. Quadratic utility does lead to reasonable behavior in general and seems appropriate for many applications.

Utility functions also suffer from division of authority within countries. Our models assume that a single authority determines policy in a unified rational way. However, countries may have separate monetary and fiscal authorities. Furthermore, the policy problem may be sufficiently complex so separate groups of individuals operate on different policy instruments. This difficulty may be handled by carefully examining the timing and the sequence of decisions. The divided authority then is modeled as a sequential policy.

Moreover, the policymaker's utility changes with change in governments. Although sequential governments may have the same utility, the utility structure must be modeled to allow for these structural changes. This question is central to the role of political influences on economic policymaking and estimation must fully consider these policy changes by appropriate parameterization.

Second, consider the economic structure. Several problems arise here. The structure itself is likely to be stochastic. Most structural econometric models have imbedded stochastic elements but in contrast, many simple control models assume the structure is known. Clearly, any reasonable model must bring in stochastic elements, and control theory shows that these elements combined with quadratic utility serve to dampen or reduce optimal policy changes from period to period. The reaction models estimated must allow for these changes.

Additionally, the policymaker may believe a structure is true when it is in fact wrong; and the policymaker's view of true structure may change as governments change. In considering this issue, note that the government acts based on its perceived structure, but the ultimate effect of the actions is based on the true structure. This distinction between true and perceived structure may be handled by two elements. First, the difference impacts the utility function. That is, structural belief in the effectiveness of monetary policy is similar to adding utility to the use of that policy and disutility to other policies. Second, such diversion of true and perceived policy increases errors of structural equations. Since these two elements are already present in the model, no additional adjustments may be necessary.

All of these questions are related to the utility function and changes in utility. Hence models that avoid strong assumptions about known utility structure or nonvarying parameters may have an advantage in application over other models.

Theory versus Empiricism: The Art of Econometrics

The *art* of econometrics selects the theory that is known and parameterizes true unknown areas. It carefully uses the known or reliable structure and avoids unsustainable assumptions.

The dangers of this art come from two sides. First, overspecification of theory introduces those theoretic errors into estimation—since properties of estimation require that the underlying theory be correct. Or overprecise theories may make unsustainable assumptions which then enter into final estimates.

On the other side, too little theory leads to over-parameterization which in turn asks a great deal of the data—and the data are often from limited time series. The data may not be rich enough to estimate the full structure. Hence the final structure must specify as much as possible of what is known so that the data can sustain the overall estimation process. Clearly, we must adequately parameterize the economic structure without asking too much of the data.

The problem of data versus theory is particularly prevalent in reaction theory estimation. Consideration of every political change leads to a shift at every period and provides no data for any real estimation.

Forecasts versus Structural Estimation

Consider standard econometric model building and estimation. In this process we specify stochastic equations of the underlying economic structure. This method requires assumptions of known structural form and generally also a linear structure. The structure is assumed to be unchanging over time—or at least the changes in structure are themselves parameterized in constructing the model. To the degree the structure changes rapidly or structural changes are not embedded in the model, the model will make erroneous estimates and forecasts.

Based on the assumed structure and empirical evidence, estimates are made of the structural parameters. At least two specific goals are possible in this process. First, we may wish to learn the details of the economy. That is, we seek values of specific parameters or the direct and indirect implications of exogenous or endogenous changes. Second, we may wish to forecast the future through direct use of the model. Econometricians understand the differences of these two goals and models need to be evaluated differently based on the goals. Similarly, reaction models designed to estimate the structure should not be judged on their forecasting ability.

In general, questions of changing structure make the forecast process quite difficult, and most serious forecasting groups make broad use of judgment in adjusting forecasts in ways not fully evolving from the original model. Indeed many forecasters who prefer not to rely on econometric simulation for forecasts use structural estimates indirectly.

While the intermixing of econometrics, mathematics, and good judgment are broadly accepted in structural forecasting, we need to insure the same acceptance of the use of judgment with econometrics in reaction functions or control theory estimates.

The Lucas Critique

The so-called Lucas "critique" of Econometric Policy Evaluation also affects our view of policy models [Lucas, 1981]. Good use of reaction functions alters behavior and so alters observed future values. Forecasts themselves are not likely to be correct for they will not include forecasts of altered policy decisions. Therefore, reaction functions are most useful to estimate structural relations of the control model and to be combined with judgment in better understanding the future. At the present time they do not seem to be good techniques for forecasting policy behavior. It is also noteworthy that many alternative tools exist for policy use and it seems impossible to forecast which tool a future government will employ.

Lucas correctly notes that to evaluate policy we must have a *structure* that does not change with the exogenous variable, x. He suggests, of course, that as time passes and tax laws are altered, the means by which investors react in investment functions will vary. And as they learn what transitory income they will have in the future, the knowledge will affect their consumption. So Lucas really has two complaints: the structure of policy itself varies, and consumers' or investors' expectations change as they become aware of these policies, thus altering eventual actions.

However at the end of his work, Lucas clearly agrees that if you go beyond fixed parameters, you can employ changing temporal parameters. Moreover, "agents' responses become predictable . . . when they can become confident that agents and observers share a common view . . ." (p. 125). That is, the past may be studied but the future is hard to predict given different views that agents and observers hold.

We may ask questions such as these: On what historical insights can we base policy decisions? In the light of written records as to goals and methods of policy, does the empirical evidence support the stated policies? And how did this behavior change when the policy was changed? On the other hand, forecasts of the future do not seem to fit well in this analysis.

Furthermore, we look for consistencies across several policy periods with the idea of determining what similarities remain as policy and expectations change but also what differences have occurred in those times. Clearly, the Lucas critique of policy is critical for understanding analysis, but we interpret his work as supporting the present type of analysis.

The major method of reaction functions in this conference, [e.g., Hodgman, 1983]—keeps the issues enumerated above clearly in mind. It considers policy changes, and makes complete tests of alternative parameterization. This paper handles these questions with canonical correlation.

Instruments versus Targets

One simple item discussed in some papers on optimal control theory is the actual number of targets and instruments that exist in a given optimal control or reaction theory problem. The view taken in some control theory articles is the following. We know that policy targets are not achieved exactly each period. Unemployment remains, inflation is not reduced to a manageable level, and so forth. Some theoretical device must be found to insure that in the model targets are *not* met. For that reason it is often assumed that the policymaker seeks many targets. Moreover, he has a smaller number of instruments than targets to deal with. This relation between targets and instruments leads to optimal control that does not satisfy the targets exactly in each period. We emphasize that the assumption is made not because the users of the theory believe it, but because the need to get results that parallel reality requires it. If the number of targets equals the number of instruments or if there are fewer targets, then optimal control can always lead to targets being exactly satisfied every period. Hence, in the context of these models, the assumption that targets exceed instruments is the only way to reach seemingly realistic results.

One of the devices these theorists use is to include the instruments themselves as targets. For example, we may say that no instrument used as a target should be moved more than a small amount and therefore its goal is the past level. Since every instrument is a target, the total number of targets must exceed the total number of instruments.

In this paper we do not make this target-instrument assumption. Rather, uncertainty dominates our analysis or at least affects it considerably. That is, there is great uncertainty as to model structure, as to effect of instruments, and perhaps even as to what the targets are. This uncertainty was discussed above. No policymaker will ever achieve all his targets simply because he does not know the effects of his actions. This is a quite different perception of the world from that where he knows what will happen but does not have sufficient number of instruments to achieve the target.

We carry this view another step. Because of his uncertainty he may try to achieve only a small number of targets, for example, only inflation and unemployment. All other targets are subsumed into two components which really are these two elements. Yet in this situation he can control exchange rates, money supply, a certain number of interest rates, fiscal policy, different types of tax expenditures policies, and so forth. Therefore, he has a very substantial number of policy instruments which he may bring to bear on the problem while he is seeking to achieve only two or three policy targets. In this view of the world the number of instruments *vastly* exceeds the number of targets and therefore the standard control theory approach would yield an indeterminate solution. The theory simply does not tell us how the different instruments will be manipulated.

To this point we have discussed a number of problems of implementation of reaction models. We turn now to canonical correlation estimates as one solution to this question.

Reaction Functions — Theory and Estimation

Simple Reaction Model

Specifically we consider the specification of reaction functions in a system where there exist m endogenous variables, y; k exogenous variables, x; and p instruments, z.

Our simple reaction model arises from a known reduced form

(1) $$y = T_1x + R_1z + u_1$$

and a quadratic loss function

(2) $$L = (y - y_0)'P(y - y_0).$$

This discussion above led us to question the correct specification or constancy of P. Estimation must be implemented solely within single governments that have unchanging utility. Alternatively the model is to be estimated in a dynamic fashion with the structure altered for changes in P at changes in government. For this reason this effect requires a very rich database—or perhaps is difficult or impossible.

Instead consider optimizing the *effect* of the instrument R_1z. That is, the impact of the z_i on equation (1) is the first element of R_1z. Now the optimal values for R_1z arise from differentiating expected loss with respect to R_1z. Setting the result equal to zero, adding an error and multiplying by P^{-1} yields.

(3) $$R_1z^* = y_0 - T_1x + u_1$$

Consider equation (3) where there are more instruments than targets. For example let $p = 2$ and $m = 1$. Also let $k = 1$. Then we have

(4) $$r_{11}z_1{}^* + r_{12}z_2{}^* = y_{01} - tx + u_1$$

In this equation u_1 represents the error between optimal policy and the true policy level chosen by the policymaker and observed. This single equation (or m equations in general) must determine p instruments and p is greater than m. Clearly, the structural model is underspecified.

Our belief is that the policymaker chooses one of the z_i by some prior decision rule. This rule may be arbitrary, may be based on completely separate issues such as a decision to do something different from the past, may arise from a reaction model employing uncertainty, or may be based on policymaker judgment or bias. We represent this decision as

(5) $$r_{21}z^* + r_{22}z^* = u_2 \qquad \text{or}$$

(6) $$R_2z^* = u_2$$

where, in general, R_2 is (p-m) by p. This is a linear combination chosen with an error u_2. We believe the variance of u_2 to be very large representing the arbitrary nature of the choice and the large range of either value that can lead to acceptable policy.

Combining (3) and (6) we have an augmented equation

$$(7) \qquad Rz^* = y_{00} - Tx + u$$

The p equations now include the m true policy equations and the p-m supplementary equations representing the arbitrary choice to make the system determinate. For a determinate system, R is nonsingular. Hence

$$(8) \qquad z^* = R^{-1}(y_{00} - Tx) + v$$

where $v = R^{-1}u$

This equation is amenable to econometric reaction function estimation. However, consider the nature of the error vector v. We assume

$$Eu = 0$$

$$Euu' = S$$

where elements of S relating to policy equations (the first m) are "small" u. The remaining (p-m) elements are from arbitrary equations and are large.

For consideration of estimation we need the mean and variance of v. Clearly

$$E\,v = 0$$

$$Evv' = S_v = R^{-1}SR'^{-1}$$

To see the effects, consider an example.

Let $R_{11} = R_{12} = R_{22} = 1;\ R_{21} = 0$

$S_{u11} = a$ (small) $\qquad S_{u12} = 0$

$S_{u22} = b$ (big)

Then it is easily shown that

$$S_{v11} = a + b \qquad S_{v22} = b$$

That is, *both* equations will have large variance even if the structural equation has a small variance.

Estimation of the system (8) will bring forth very large equation errors. Hence we anticipate that reaction function estimation may have some difficulty.

Canonical Correlation

Instead, return to (7). Rather than solving for z^* as in (8), we multiply by a nonsingular matrix Q.

$$(9) \qquad QRz^* = Qy_{00} - QTx + Qu$$

One estimation method is reduced form as in (8). Instead we may use canonical correlation to estimate (9). It operates by choosing a linear combination of the rows of (7) that maximizes the correlation between the two sides of the equation. Then a second component is chosen that is orthogonal to the first and maximizes correlation remaining. This canonical correlation chooses a specific A which implies a Q that makes u as small as possible in the transformed model. In turn this corresponds well to the theoretical structure we have outlined. In our example, canonical correlation would estimate the true structural equation. The second component would find the arbitrary equation (6).

Reaction function estimation must deal with questions raised to this point in the paper. Varying parameters, uncertainty, and limited data all create difficulties discussed in the first part of this paper. Canonical correlation provides the promise of interesting estimates that avoid some of these problems.

Canonical Correlation Estimates

Presentation of Results

The discussion of results of canonical correlation brings to focus the essential differences between canonical correlation analysis and regression analysis. We are accustomed to making a series of specific tests in this regression context. First we test individual coefficients of explanatory variables to see if they are different from zero. This test has no counterpart in canonical correlation. Since our estimate is of the maximum correlation, it may not affect the actual structural equation but instead a linear combination of two or more such equations. Clearly a test on an individual coefficient is heavily dependent on the implied linear transformation and is not sensible statistically.

Instead, we rely on tests as to whether the equation is significant or not significant and examination of the relationships to see if they are sensible. Moreover, in any given canonical analysis, the number of significant equations relative to the number of variables is extremely interesting. If all variables generate significant equations, then the variables are truly operating independently of one another. However, if there are fewer equations than variables, then the interrelation among both dependent and independent variable sets is of interest.

The reported coefficients in canonical correlation differ from those in regression. In regression analysis, coefficients have a direct interpretation as the unit change in y relative to the unit change in z. In canonical correlations, the variables are normalized. First, all variables—both y and z—are adjusted to a constant variance equal to one. Second, since we have a linear combination of y variables as well as z, there remains a scaling factor. In this analysis, the coefficients are scaled so that the linear combinations of y and z each have a variance of one. Thus a coefficient .5 means the variable accounts for half the variance of the result. Since the y and z are correlated, the coefficients will not sum to one or any other particular value.

Empirical Analysis

To this point we have discussed the rationale behind the use of canonical analysis. Specific models developed should explain the relation between multiple instruments and multiple policy targets. We consider first alternative approaches to instruments and then discuss the targets and the issues that are raised concerning choice of targets. Consider the policy targets. The principal goals are unemployment and inflation. Other similar variables are the utilization rate, growth of GNP or growth of industrial production. A final goal is a reasonable balance of payment stability. This last goal can be represented by the balance of payments itself or by an underlying target such as the interest rate on Eurodollars. These target variables will be employed with each alternate set of instruments that we consider. We have avoided the inclination to fine tune our results by altering those target variables. Instead, we allow all to enter the equations and present the results that occur.

Next turn to possible sets of instrument variables. First, consider a broad view of policy. In this perception, total government policy includes fiscal policy, monetary policy, and exchange rate policy. Therefore, our instruments should include one from each of these areas. For example the federal deficit, an interest rate, and an exchange rate or exchange control variable would encompass one set of three that may broadly describe overall government policy. For each country we shall attempt to develop such a set of variables.

Secondly, one may turn to monetary policy. There is not just one monetary instrument but instead a whole family of possible interest rates or variables of monetary policy or credit restriction. This set of variables will be employed to measure differential monetary effects. Obviously, the method of implementation will vary substantially from country to country.

One problem in this estimation process is that time lags for these policies may differ in a major way. Hence future analysis may benefit from consideration of alternative lag structures. Moreover, some country specific institutions may affect our results.

A third question in setting instruments concerns the timing of policy. Since the monetary authority perceives the policy need and then acts, the exact lag structure from target to instrument may vary. An interesting benefit of canonical correlation is that the same variable may be entered with different lags allowing for possible determinates of the level of policy, timing of policy, and even differential causes for different timing. The purpose of the analyses is to determine which month in the quarter is most important in policy and to determine whether it is the level of the variable or its change that is important. The former is represented by all months having the same sign while the latter brings a sign reversal over the three months. This too will be a subject of scrutiny. Note that since we are not fine tuning any results we may have some potential questions of direction of causation arise in all our efforts. Now we turn to the results for each of the countries. Initially we look at Germany.

Analytic Results—Germany

We present results in Table 1 for several canonical analyses of Germany. An example of interpretation is at the bottom of the table. These results are of interest and generally make good sense. For explanatory or independent variables in all our analyses we use a general group of policy target type variables.

First, we look at three broad types of policy—monetary, fiscal, and foreign exchange. In German CCI, we find the first correlation has an R^2 of .77. The critical y variable is the interest rate, RLQ, which has a .95 coefficient. Its greatest relation is, as expected, with the inflation rate, DCPI, and unemployment rate, UNR. The second correlation has an R^2 of .63 and y represents fiscal policy, the government deficit. Its highest relation is negative with new orders, showing y and z components must be orthogonal to the first canonical correlation, causing the possible reordering of priorities. Finally, the third canonical correlation has an R^2 of only .32 but it is significantly different from zero. This represents the forward exchange premium; it has a high relation with new orders, unemployment, and also with the balance of payments. Interestingly, the current account balance plays a very minor role through the entire German analysis.

It is particularly noteworthy that canonical analysis clearly divides the roles of monetary, fiscal, and exchange policy all of which are significant. There is little multiple instrument selection in this analysis. The last canonical correlation is not close to zero even though the explanatory portions must be orthogonal to the prior variable sets. Moreover, this analysis shows policy targeted for specific results. Monetary policy is targeted at inflation and unemployment; fiscal policy at industrial activity; and exchange policy at the balance of payments.

Next turn to German CCII, the analysis of monetary variables in Germany. In this, we employ five indicators of monetary policy to determine the effects of fine tuning with different monetary tools. This mixture of variables includes the money supply plus four different interest rates. Initially note the values of R^2 and the significance of the correlations. The first three R^2 are .96, .87, and.63 but they are followed by .11 and .05. This indicates that the monetary variables display three orthogonal components—but not more than three.

The first component clearly represents money supply—with a coefficient of 1.00. This has the highest relation to new orders. It is interesting that the inflation rate is not important for this component. The second component represents the loan rate. For it the largest explanatory variable

Table 1
Germany Canonical Correlation

	CCI			CCII			CCIII		CCIV
	1	2	3	1	2	3	1	2	1
Set 1									
FWD	.04	.20	.98						
DEFICIT	.15	1.02	−.11						
RLQ	.95	−.40	−.01						
M				1.00	−.16	−.14			
RDISC				.36	−.17	−1.57			
RCALL				−.27	−.64	2.47			
PABY				.20	.64	1.22			
RLQ				.06	1.15	−2.26			
RL1							.25.	3.20	
RL2							−1.11	.70	
RL3							1.85	−3.69	
RD1									.13
RD2									.13
RD3									.77
Set 2									
RED	.49	−.23	.30	.29	.38	−.56	.47	.28	.45
DCPI	.72	−.02	.53	.06	.98	.67	.61	.43	.66
DGNP	.17	.30	.37	−.16	.18	−.03	.12	−.40	.02
BOP	−.02	.06	−.70	.07	−.02	−.21	−.07	.26	−.07
UNR	−.49	−.39	.60	.40	−.31	.58	−.53	.21	−.47
NUORD	−.21	−.58	−1.05	.58	−.50	−.45	.04	−.69	.07
CTACC	.13	−.16	−.22	−.16	.20	.01	.09	.41	.11
R^2	.77	.63	.32	.96	.87	.63	.79	.36	.71
Probability Value									
Correlation									
1		.000			.000		.000		.000
2		.000			.000		.017		.495
3		.003			.000		.624		.690
4					.414				
5					.441				

Observations: 1967-1 through 1980-1 (n = 53).

Variable Names

FWD	Forward Exchange Rate/Current Exchange Rate. Dm/$
DEFICIT	Government Deficit (−) or Surplus
RLQ	Three-Month Loan Rate
M	Money Supply
RDISC	Discount Rate
RCALL	Call Money Rate
PABY	Public Authority Bond Yield
RL1/2/3	Three-Month Loan Rate for Specific Month in Quarter
RD1/2/3	Day-to-Day Money Market Rate for Specific Month in Quarter
RED	Eurodollar Rate
DCPI	One-Year Rate of Change—CPI
DGNP	One-Year Rate of Change—GNP
BOP	Balance of Payments
UNR	Unemployment Rate
NUORD	Indes of New Manufacturing Orders
CTACC	Current Account

EXAMPLE: Interpretation—CCI, Correlation 1.

$$.04\ \text{FWD} + .15\ \text{DEFICIT} + .95\ \text{RLQ} = R^2\,[.49\ \text{RED} + .72\ \text{DCPI} + \ldots + .13\ \text{CTACC}] + u$$

The multiple correlation between the two variable sets is .77.

EXAMPLE: Probability value for CCIII.

1. H_0 All three correlations are zero.
2. H_0 The last two correlations are zero.
3. H_0 The last correlation is zero.

The first hypothesis is rejected at 0% level. The second hypothesis is rejected at 1.7% level. The third hypothesis is accepted as it would take a 62.4% level for rejection.

is the inflation rate. Yet the role of unemployment is negative probably due to the prior canonical correlation. This relation parallels the results of the first component in CCI where RLQ is related to inflation.

By the time we come to the third component, the interpretation is more difficult due to enforced orthogonality. I feel it most clearly measures the spread between the call rate and the loan rate and is related to unemployment, Eurodollar rate, and inflation. The results for these monetary variables are similar to those above in German CCI in that there are three components, but the similarity ends there. Those results had dependent variables that followed the pattern of the data with a single variable dominating each component. In contrast, the components here are clear combinations of several variables. Second, we note there were five monetary variables and potentially five components but only three were significant. Thus canonical correlation clearly reduced the dimensionality of this question.

Third, consider German CCIII, which analyzes the German loan rate. This considers the three values for three months of the quarter. The critical factor here is that only the first canonical correlation is significant at the 1 percent level—the R^2 of the second variable is .36. We see the coefficients representing the three months in the quarter for the loan rates alternate in sign and become smaller absolutely as time passes. If we ignore the first month in the quarter, with a very small coefficient, the pattern is the same as .7 times the most recent value plus 1.1 times the monthly change in the loan rate. Clearly both the loan rate and change in loan rate play a critical role in this first component. The second component, although of marginal significance, represents the two-month change in the rate.

It is interesting to contrast the loan rate of German III with the day-to-day rate of German CCIV. Here the y coefficients in succession do not alternate for the three months but have the same sign. They are complementary but the most recent month is most important. The month-to-month difference is represented by the second component but this is not significant at all. As expected, the primary explanatory variables are the inflation rate and unemployment rate.

Analytic Results—Italy

The types of analysis run for Italy closely parallel those employed for Germany. As we consider these results, we contrast them with those found above.

Italy CCI considers the relation of fiscal, monetary, and foreign exchange policy. The first correlation is .73 and represents the monetary base. This is similar to the result for Germany. Moreover, the inflation rate has the largest effect here. The second component has an R^2 of only .38. It represents a combination of all three policy variables. The new elements affecting y are government deficit and the forward premium on the lira. These factors are related negatively to poor global balance of payments and

Table 2
Italy Canonical Correlation

	CCI 1	CCI 2	CCII 1	CCII 2	CCII 3	CCIII 1
Set 1						
DEFICIT	.12	1.20				
PRXR	−.08	−1.07				
MB3	1.16	1.74				
RD			.15	2.76	−.16	
RGB			.89	−2.98	1.83	
BMPOL			.04	.08	.75	
RTB			.13	−.04	.27	
MB3			−.07	.31	−2.07	
MB1						1.14
MB2						.62
MB3						−.77
Set 2						
DCPI	.92	−.20	.91	.20	−.02	.91
DGNP	.06	−.69	−.05	.83	−.33	.07
RED	.07	.04	.15	−.01	.23	.08
UNQ	.36	.09	.24	−.08	−.62	.38
UTR	.17	.81	.18	−.06	−.14	.16
CAB	.24	−.04	.16	−.63	−.54	.29
GB	−.01	−.77	.06	.17	.04	.00
R^2	.73	.38	.83	.68	.33	.73
Probability Value						
Correlation						
1	.000		.000			.000
2	.002		.000			.230
3	.262		.026			.472
4			.581			
5			.860			

Observations: 1966-1 through 1980-3 (n = 59).
Variable Names

DEFICIT	Government Deficit (−)
PRXR	Forward Premium on Lire
RD	Discount Rate
RGB	Government Bond Yield
BMPOL	Controlled Changes in Monetary Base
RTB	Treasury Bill Rate
MB1/2/3	Monetary Base—Specific Month in Quarter
DCPI	One-Year Change—CPI
DGDP	One-Year Change—GDP-Deflated
RED	Rate on Eurodollar
UNQ	Unemployment Rate
UTR	Industrial Capacity Utilization Rate
CAB	Current Account Balance
GB	Global Balance of Payments

high utilization rate. In contrast with Germany CCI, the third component here is not significant.

In Italy CCII we relate several monetary variables to the policy targets. The first correlation, with an R^2 of .83, represents the rate on government bonds. This variable has a very high relation to the inflation rate. The next variable signifies the differences between the discount rate, RD, and the rate on government bonds. The high discount rate is associated with growth of real GNP and with a negative balance on the current account. This relation has an R^2 of .68.

The third correlation is of marginal significance and has an R^2 of .33. The crucial variable is the monetary base and the most interesting element is the failure of this variable to be significant in the earlier correlations. The highest relation shows an increase of the monetary base with high unemployment.

Since we entered five monetary variables, five correlations are possible but the last two are of no statistical significance.

Finally, consider Italy CCIII. This examines the importance of the timing of the total monetary base. Only the first component is significant and the three coefficients sum to about 1.00. Yet the result is like a negative first difference in that the most recent month is minus and the earlier months positive. It indicates that inflation is associated with a higher level of money supply but also that the level of money supply tends to be decreasing. No other variable plays a really major role here.

Analytic Results—United Kingdom

For the United Kingdom, our data base is directed at monetary variables so we have a smaller set of canonical results. First, we related foreign exchange and monetary policy to targets. This relation omitted a fiscal policy variable and the omission should be corrected in the future. With only two policy tools, there are a maximum of two correlations. The first represents mainly the interbank rate and shows it is highly related to the Eurodollar rate. The interesting element of this relation is the small role of inflation and of unemployment. The second correlation represents the foreign exchange variable, the forward premium in the dollar relative to the pound. This variable has the highest relation to inflation, but the correlation is small with an R^2 of .20. It is significant at the 5 percent level but not at 1 percent.

In the United Kingdom CCII we relate a set of monetary variables to the targets. We computed estimates employing three interest rates and three measures of the monetary base. However, colinearity among monetary variables led to results emphasizing differences of monetary measurement. In the estimate presented we include three interest rates and the monetary base. The first correlation chooses the monetary base as the significant monetary variable. Its greatest relation is with unemployment. The second monetary variable selects the interbank rate, or more precisely combines the interbank rate, RIB, and the Bank of England minimum lending rate, RB. The former is positive and the latter is negative and smaller absolutely. The implication is that the critical factor is the degree that RIB exceeds RB. This difference is related to the Eurodollar rate and negatively to unemployment. Recall again that the explanatory factors are

Table 3
United Kingdom Canonical Correlation

	CCI		CCII		
	1	2	1	2	3
Set 1					
FPR	−.59	.98			
RIB	1.13	.05			
RB			−.36	−2.81	8.29
RIB			.18	3.44	−4.99
RCM			.20	.31	−2.15
MB			1.00	−.46	−1.26
Set 2					
DCPI	.05	1.06	.04	.32	.69
UNQ	.10	−.38	.72	−.77	−.89
PSBRQ	.11	.34	.18	−.14	.82
REDQ	.87	−.46	.27	.99	−.40
DGDP	−.04	.17	.02	−.00	−.04
R^2	.89	.20	.93	.52	.27
Probability Value					
Correlation					
1	.000			.000	
2	.011			.000	
3				.005	
4				.862	

Observations: 1965-1 through 1980-4 (n = 64).
Variable Names
FPR Forward Premium Dollar
RIB Interbank Rate (3 months)
RB Minimum Lending Rate
RCM Call Money Rate
MB Monetary Base
DCPI One-Year Change—CPI
UNQ Number Unemployed
PSBRQ Public Sector Borrowing Requirement
REDQ Eurodollar Rate
DGDP One-Year Change Gross Domestic Product Deflated

required to be orthogonal to the prior correlation set.

Finally, a third component is significant although the R^2 is only .27. It emphasizes the bank rate and its relation to the public sector borrowing requirement, PSBRQ, and inflation.

Analytic Results—France

For France, we consider France CCI, which analyzes the role of the three types of policy. The first component is dominated by monetary policy in the form of interbank lending rate, IBR. Its greatest relation is to the Eurodollar rate. Additionally, it is affected by inflation rate. The second component represents the forward premium on the franc. This is related with an R^2 of .57 and is most affected by inflation. The third component represents fiscal policy—the deficit—but is not statistically significant. The

Table 4
France Canonical Correlation

	CCI 1	CCI 2	CCII 1	CCII 2
Set 1				
FPR	.58	.91		
DEFICIT	−.03	−.21		
IBR	−1.12	.12		
MB			.97	.44
IBR			.03	1.12
M1BRQ			.03	−2.17
Set 2				
LABCONF	.04	.11	.01	.02
DIPI	.03	.31	.07	−.18
UN	.05	−.48	.90	.88
BOP	−.05	−.37	.02	.15
DCPI	−.37	1.38	.11	−1.02
RED	−.79	−.77	.09	−.42
R^2	.78	.57	.98	.71
Probability Value				
Correlation				
1	.000		.000	
2	.000		.000	
3	.374		.546	

Observations: 1966–1 through 1979–4 (n = 64).

Variable Names

FPR	Forward Exchange Rate/Spot Rate (FR/$)
DEFICIT	Government Deficit (−)
MB	Money Supply — M3
IBR	Overnight Interbank Rate
M1BRQ	One-Month Rate
LABCONF	Labor Conflicts — Days Lost
DIPI	One-Year Change — Industrial Production Index
UN	Unemployed (Number)
BOP	Balance of Payments
DCPI	One-Year Change — CPI
RED	Eurodollar Rate

most important result then is the failure of fiscal policy in the form of the deficit to play any role.

In France CCII, we consider three monetary variables, the money supply and two interest rates. Despite the key relation found above of the interbank rate with the Eurodollar rate, these variables do not seem to belong in any part of this analysis. The most important monetary variable is the money supply. And it is highly related to the unemployment rate. The second component takes the monthly interbank rate directly and as an increment over the quarterly rate. It is highly related to inflation. These two components exhaust the significant relations found for France.

Cross Country Comparisons

It is interesting to compare the various types of results across the four countries. Contrasting the policy types leads to very different results for the different countries. In Germany, these policies are quite separated by the canonical correlations, but in contrast, the United Kingdom had only two policies and both provided significant correlations, although the second value was low. In both Italy and France, fiscal policy and exchange rate policy were intermixed and provided a single correlate of moderate magnitude. In each country, monetary policy dominated the first correlate.

The second major type of analysis related several monetary variables. In the United Kingdom, France, and Germany, money supply was of greater importance than interest rates, but in Italy the loan rate dominated the results. In France, United Kingdom, and Italy the difference between interest rates and not the rates themselves dominated the second correlate. In contrast, Germany showed more importance for single variables and therefore clearly differentiated policy variables than in the other countries.

These results may be affected by errors in timing, or may be estimating structural equations rather than policy. Nevertheless, these estimates of country relations and contrasts between countries provide an interesting and useful application of canonical correlation methods.

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Discussion

Ignazio Visco*

This is a difficult paper to discuss. The difficulty does not concern so much the development of the technical part of the paper; rather, it concerns a proper understanding of the author's objectives and of his interpretation of the actual results. In my comments I will try to follow the structure of Professor Resek's paper, discussing first a number of technical points and then his estimates of correlations between sets of "policy instruments" and sets of "policy targets" for a number of European countries.

Reaction Functions

In the first section of his paper Professor Resek makes a number of penetrating and interesting comments on the traditional approach to the estimation of policy rules, the "reaction" functions of policymakers. One can only agree with his discussion of the many problems connected with the view of reaction functions "as an implication of control theory." Among these problems, that of parameter variability (not only of structural models, to which the well-known criticism by Professor Lucas is related) appears to be the most important. Indeed, it is certainly true that "policymaker's utility changes with change in governments." Even if it might be possible to find something like an "encompassing" policy rule with variable coefficients related to changes in the preferences of policymakers, there are certainly great problems in estimating such a rule from the available observations.

Professor Resek also emphasizes that the assumption that targets exceed instruments is made in optimal control theory "not because it is believed by the users of the theory, but because it is required to get reasonable results," that is, to avoid exactly achieving targets every period. Instead, the author appears to suggest that in reality there are many instruments at the disposal of the policymaker and only a few targets he is really interested in achieving. The policymaker ends up using all these instruments, without, however, being able to reach all his targets, mainly because the world in which he operates is greatly affected by uncertainty. This is an interesting proposition. It is not, however, totally new, and one could recall the works of Brainard (1967), Henderson and Turnovsky (1972) and Johansen (1973) as the pioneering attempts at a proper understanding of this issue. My impression is, however, that in reality not many *independent* instruments are under the *direct control* of the policymaker and that there are also limits

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to the ranges within which they can be used (which is incidentally an important reason for their introduction in the loss functions and the consequent joint treatment as instruments and targets at the same time).

Instead of relying on optimal control theory, and in order to avoid the assumption of an unchanging utility, Professor Resek chooses to start directly from a known reduced form:

$$y = T_1 x + R_1 z + u_1 \tag{1}$$

where y is an $m \times 1$ vector of endogenous variables (the objectives of the policymaker), z is a $p \times 1$ vector of instruments, x is a $k \times 1$ vector of noncontrollable exogenous variables (for instance, time, weather, world demand, raw material prices for nonproducing countries, etc.). T_1 and R_1 are proper conformable matrices of coefficients and u_1 is a vector of residuals. If the policymaker wants to achieve a given set of target values, y_0, one might consider the problem of finding a proper set of instruments, z^*, so that

$$R_1 z^* = y_0 - T_1 x + u_1 \tag{2}$$

where, this time, "u_1 represents the error between optimal policy and the true policy level chosen by the policymaker and observed." Clearly, only when $p = m$ could (2) be solved directly for z^* and the "reaction function" be directly estimated, within a framework close to that of Tinbergen of one instrument for each target. Professor Resek considers instead, at this stage, the situation $p > m$, so that (2) is overdetermined. He suggests, however, that policymakers choose $p - m$ instruments by means of *ad hoc* rules of the form

$$R_2 z^* = u_2 \tag{3}$$

where R_2 is a $(p - m) \times p$ matrix. But this is in my opinion a very strange way of making policy and it is by no means clear how (3) could be a consequence of uncertainty or similar factors. Anyway, it is clear that the combination of (2) and (3) is capable of producing a determinate system such as

$$Rz^* = y_{00} - Tx + u \tag{4}$$

where, obviously, $R = (R_1', R_2')'$, $y_{00} = (y_0', 0')'$, $T = (T_1', 0')'$, and $u = (u_1', u_2')'$.

(4) could be solved for z^*, premultiplying both sides by R^{-1}, and one could estimate the derived reaction function by standard regression techniques. Professor Resek, however, shows that since the variance of u_2 is likely to be extremely large (and this seems to be quite obvious given the oddness of (3)!), the variance of the errors of the reaction functions will also be very large so that it will be quite difficult to obtain a good fit from estimates of such functions. But such is nature! Therefore, instead of solving (4) for z^*, the proposal is to apply canonical correlation to estimate an "innocuous"

linear transformation of (4), that is:

$$QRz^* = Q(y_{00} - Tx) + Qu \tag{5}$$

where Q is a nonsingular matrix. It is obvious that (5) gives exactly the same solution as (4). Considering a sample of n observations, so that Z^*, Y_{00} and U would be matrices of dimensions $n \times p$, $n \times m$ and $n \times p$, respectively, and assuming for simplicity that there were no other exogenous variables, x, (5) could be rewritten as

$$Z^*R'Q' = Y_{00}Q' + UQ' \tag{6}$$

or

$$Z^* = Y_{00}P + V \tag{7}$$

where $P = R'^{-1}$ and $V = UR'^{-1}$, so that the ordinary least squares estimate of P would be

$$\hat{P} = (Y'_{00}Y_{00})^{-1}Y'_{00}Z^*. \tag{8}$$

Professor Resek's proposal amounts, instead, to computing the canonical variables of (5), (or (6)). The method consists in standardizing the original variables z^* and y_{00}, obtaining, say, $\bar{z}^*$ and $\bar{y}_{00}$ and finding the estimates of the column vectors a_i and b_i in the two canonical variables.

$$t_i = a_i'\bar{z}^* \quad , \quad s_i = b_i'\bar{y}_{00} \tag{9}$$

which maximize the correlation between t_i and s_i. A property of this technique is that one can compute pairs of canonical variables up to the order $j = \min(p,m)$ and that they will always be orthogonal with previous canonical variables (see Dhrymes (1971) for further details). To each pair will correspond a canonical correlation coefficient, r_i, which will also be, as shown by Vinod (1968) (but see also Chetty (1969), Dhrymes and Mitchell (1969) and Vinod (1969)), the estimate of the regression coefficient in

$$t_i = \rho_i s_i + e_i. \tag{10}$$

But, then, an immediate relation between this technique and the previous ordinary least squares regression estimates can be made, provided that *all* pairs of canonical variables are computed. Consider, for simplicity, the case of $p = m$ (but the analysis could be easily extended, even if for $p > m$ one should work with generalized inverses). Following Vinod (1968), one can then rewrite (10) as

$$t = \rho s + e \quad , \quad t = A\bar{z}^*, \quad s = B\bar{y}_{00} \tag{11}$$

where $t = (t_1,\ldots, t_p)'$, $\rho = \mathrm{diag}(\rho_1,\ldots, \rho_p)$, $s = (s_1,\ldots, s_p)'$, $e = (e_1,\ldots, e_p)'$, and A and B are matrices with i-th rows equal to a_i' and b_i', respectively, for $i = 1,\ldots, p$. But then

$$\bar{z}^* = A^{-1}\rho B\bar{y}_{00} + A^{-1}e \tag{12}$$

or

$$\overline{Z}^* = \overline{Y}_{00}\,\overline{P} + \overline{V} \tag{13}$$

where $\overline{P} = B'\rho A'^{-1}$ and $\overline{V} = EA'^{-1}$. But it is immediately clear that (13) is a linear system of equations involving exactly the same variables as (7), except that they are now *standardized*. Furthermore, if one used the canonical correlation estimates r_i and, say, $\hat{a}_i$, b_i to estimate $\overline{P}$, obtaining $\hat{\overline{P}}$, as Chetty (1969) and Dhrymes and Mitchell (1969) have shown, it will also hold that

$$\hat{\overline{P}} = (\overline{Y}'_{00}\,\overline{Y}_{00})^{-1}\,\overline{Y}'_{00}\,\overline{Z}^* \tag{14}$$

which is identical to (8) except for the standardization. But, then, the problem associated with estimates such as (8), namely that there will be large equation errors so that "we anticipate that reaction function estimates may have some difficulty," does not seem to me to be resolved by means of a different estimation technique such as canonical correlation, as suggested by the strong relationship between (14) and (8). Indeed, this problem is really a fact of life, associated with the original specification of the *ad hoc* policy rules (3), and, for that matter, with possibly large errors in the set of equations (2).

It is true, however, that not all pairs of canonical variables need to be calculated. Indeed, Professor Resek relies on a test of significance of the estimated canonical correlation coefficients, discarding those components associated with correlations not significantly different from zero. In this case the strict relationship between ordinary least squares and canonical correlation estimates does not hold anymore, since (13) can no longer be derived from the pairs of canonical variables. I suspect, however, that this does not alleviate significantly the problem due to the large errors in the original specification of the policy rules. Furthermore, in the case considered by Professor Resek in the technical part of his paper, with more instruments than targets, one should expect a priori that for $p - m$ pairs of canonical variables the correlation coefficients should be equal to zero, due to the specification of (3). I think that a proper interpretation of Professor Resek's formalization is not that there are more instruments than targets, which could be justified on the grounds of structural uncertainty of a kind different from that considered in that formalization, but rather that the instruments are not independent among themselves. However, one can consider different instruments which are linear combinations of the original ones, and whose number is equal to that of the targets, given the framework considered by Professor Resek (system (2), with $p > m$), which is very similar to that first examined by Tinbergen (1952).

Indeed, before passing to consider the empirical results, it might be useful to recall that Professor Resek's structural model does not contain "uncertain" structural coefficients. Furthermore, these coefficients are constant and independent of changes in policy, so that Lucas' (1976) critique necessarily holds also in the present case and a claim that his work is "supporting the present type of analysis" cannot be accepted. Even if one agrees with Professor Resek's observation that "Varying parameters, uncertainty, and limited data all create difficulties," it is difficult to support the further observation that "canonical correlation provides the promise of interesting estimates that avoid some of these problems."

The Canonical Correlation Estimates

As one can see from the set of equations (5), one would expect to find, in applying canonical correlation analysis, on the left hand side the values of policy instruments and on the right hand side the values of policy targets *and* of *important* exogenous variables. To start with, instead, the latter disappear in the empirical analysis and, what I think is even more important, rather than considering the correlations between linear combinations of instruments and targets, Professor Resek considers the correlations between linear combinations of a number of instruments and of the *actual* values of a number of endogenous variables, presumably the objects of policymaking.

Furthermore, contrary to the proposition put forward in the theoretical development, the actual calculations are always conducted, for the four major Western European countries, with a number of instrumental variables that is always smaller than the number of variables assumed to be the target of policy. It is also to be noticed that the canonical correlation is always conducted among contemporaneous variables, without allowing for *dynamic* effects which, however, should be quite naturally included through the presence of predetermined variables among the x variables in a system such as (5) (system (9) in Professor Resek's paper). I think that, even if Professor Resek's objective is only that of *describing* the policy decisions actually taken, and not that of examining possible optimal policies, one should be extremely careful in considering his empirical estimates as estimates of the actual policy process. I would prefer to interpret these results as exploratory data analysis by means of which a number of significant relationships can be identified. I am not clear, however, whether the pairs of canonical variables estimated by Professor Resek are really a description of actual policy rules or somewhat incomplete estimates of structural equations or even of pseudo-reduced forms relating endogenous variables to other endogenous variables.

Consider, indeed, the actual figures of Table 1. One can see that there is a strict positive relationship in Germany between the loan rate and the rate of inflation (a similar result also occurs for Italy, see Table 2). What does this mean? It might simply describe the correlation which one could expect out of any variant of a Fisher effect. It is very difficult instead to interpret it as a direct estimate of a policymaker's decision rule. One might think, only to exemplify, that it is some measure of money supply which is directly controlled to counteract increases in inflation, thus producing an increase in nominal interest rates and therefore a *contemporaneous* correlation between the rate of inflation and the interest rate. But then the policy instrument would be money and not the interest rate. This would have the obvious consequence that a measure of money supply and not an interest rate should be considered as "the" monetary instrument in what Professor Resek calls the "broad view of policy" (that is set CCI of Table 1). Furthermore one should then look for a negative correlation between such an instrument (or its rate of growth) and actual (possibly lagged) values of the rate of inflation. Also, one should not have *both* money and interest rates in the set of monetary instruments CCII. Indeed if money is the instrument, one should consider interest rates as endogenous variables freely moving to equilibrate the financial markets. As a further point, I think that if the monetary instrument is the money base, it might be very difficult to interpret in a sensible way the single coefficient estimates in a set of instruments which includes the government deficit (as in CCI of Table 2 for Italy). Finally, I don't think that there is much hope of discriminating among the *months* in which a given policy instrument is most important, within a quarter, on the basis of its correlation with a set of values of endogenous variables observed in the same quarter. One would probably benefit, instead, from allowing the lagged values of the instruments to be present among the set of the right hand side variables of (5), and trying to specify the target values (rather than considering the actual ones) with respect to which the correlation of a set of instruments should be calculated.

To close these critical comments, I wish to point out that I find Professor Resek's attempt to use a different technique from standard regression analysis to investigate such a difficult field as the setting of policy a courageous one. Even if I don't share his faith in the power of canonical correlation analysis, I think that a contribution will be made to the investigation of the mixture of policy instruments when improvements in the treatment of the dynamics of policy rules and in the specification of target values are obtained.

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