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NEW MORTGAGE DESIGNS FOR STABLE HOUSING IN AN INFLATIONARY ENVIRONMENT

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PROCEEDINGS OF A CONFERENCE HELD IN JANUARY 1975

Sponsored by the Federal Reserve Bank of Boston,
U.S. Department of Housing and Urban Development,
and Federal Home Loan Bank Board

NEW MORTGAGE DESIGNS for an INFLATIONARY ENVIRONMENT

Proceedings of a Conference
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FOREWORD

The Federal Reserve Bank of Boston is pleased to publish these papers on *New Mortgage Designs for Stable Housing in an Inflationary Environment* presented at a conference at MIT in January 1975. Continuing developments in both the monetary and housing fronts bear out the importance of finding ways to alleviate the impact of inflation on housing and we hope that the publication of the conference papers will both stimulate and suggest promising avenues for this search. The conference was the culmination of a study carried out at the Sloan School of Management at MIT with the support of the U.S. Department of Housing and Urban Development and the Federal Home Loan Bank Board.

Since all the papers are part of one study, they reflect many of the same basic themes. Further, although only those responsible for each part of the study appear as authors, each paper reflects the contribution of the entire group. As sponsors of the study and of the conference, we hope that this integrated approach will provide useful insights and stimulate further research and action.

Frank E. Morris
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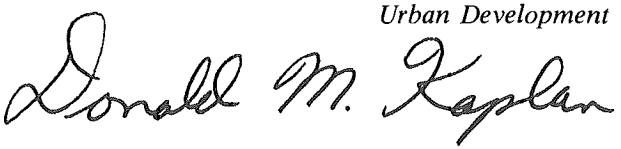

Donald M. Kaplan
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Solving the Long-Range Problems of Housing and Mortgage Finance

Frank E. Morris*

The very title of this session is encouraging. We have passed through a decade of intense public concern over housing finance. Yet this concern has tended to be focused on short-term palliatives which have had very limited success. The mortgage market in its fundamentals has not changed in the past decade, despite the obvious need for change. The mortgage market was just about as sensitive to swings in short-term money rates in 1974 as it was eight years earlier in 1966.

After a decade of failure, it is time to turn away from makeshift responses to the problem of housing finance and begin to seek fundamental answers. These answers, it seems to me, lie in the restructuring of the mortgage instrument. I would like to emphasize that the views I express are solely my own and not necessarily those of the Federal Reserve System.

The year 1966, it seems to me, was the turning point for the mortgage market. We learned in that year that the thrift institutions, as they were then structured, were not well adapted to an economy characterized by inflation and sharp swings in short-term money rates. This fact raised two major public concerns. First, there was anxiety over the viability of the thrift institutions themselves. Second, there was concern because the vulnerability of our thrift institutions to swings in short-term money rates aggravated the impact of monetary policy on the housing industry.

Housing will always be the most sensitive sector in the economy to shifts in monetary policy, no matter how well we organize and perfect the mortgage market. This will be so because the level of the mortgage rate is much more critical in limiting the ability of the consumer to carry such debt than is the interest rate on any other type of borrowing. But the problems of housing finance in the United States are compounded by the fact that the principal sources of mortgage money in our system, the thrift

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institutions, find that their own money flows tend to dry up or turn negative when short-term money rates rise. As a consequence, we have been subjected to much larger swings in housing construction than would have been the case if the thrift institutions were in a position to adapt to changes in short-term money rates.

In attempting to deal with this problem during the past decade, the Congress has fostered a group of governmental financial intermediaries empowered to raise money in the open market and to channel the funds into the housing market. This approach has met with only limited success for reasons which are familiar to you all.

More recently the Congress has been contemplating credit allocation as a possible solution. Short of comprehensive administrative control over all sources of finance, which would carry with it heavy costs to society in the form of a less dynamic and less efficient economy, this approach is also likely to fail to meet the problems of housing finance.

While the Federal Government has been trying to innovate in the mortgage market, even if not too successfully, there has been a remarkable lack of innovation on the part of the thrift institutions over the past decade. While it is true that the liability side of their balance sheets has been substantially changed by a major increase in longer-dated liabilities, the composition of their assets has not changed much in the past decade. As a result, the thrift institutions were not in a very much better position to meet the pressures of 1974 than they were to meet the pressures of 1966.

In my judgment, the answer to the problems of the thrift institutions is not to convert them into commercial banks. What we need are specialized housing finance institutions which are capable of functioning in an inflationary economy. To produce this capability, it will be necessary to move away from sole reliance on the long-term, fixed-rate mortgage, a financial instrument which was a product of the Great Depression, when stable prices and low interest rates were properly imbedded in expectations.

At a recent conference on financial innovation at New York University, the question arose: why have we not seen, until very recent months, any significant thrust by private institutions to produce a mortgage instrument better suited to our times? Why have private markets failed to innovate in this case?

The answer, it seems to me, lies in the shelter provided by Regulation Q. In the absence of this shelter, the thrift institutions would have been compelled to innovate. Regulation Q is a crutch which has been just barely strong enough to prevent the necessary adaptation from taking place.

However, it seems to me that the shelter of Regulation Q is rapidly eroding for two principal reasons. First, the market is responding by designing new open-market financial instruments to meet the needs of the small saver. In 1973-1974, we saw two such new instruments introduced: the floating-rate note and the money-market mutual fund. The success of

these new instruments, particularly the money-market mutual fund, assures that, in the next period of tight money, the competition of open market instruments is likely to be more severe than ever before.

The second reason why the shelter of Regulation Q is eroding is the rising strength of consumerism. There is a growing awareness that the small saver has been the principal victim of Regulation Q. The rate on home mortgages has been subsidized by artificially depressing the return available to the small saver. This is a very regressive arrangement, since the poorest 40 percent of our population owns 25 percent of all savings deposits, but accounts for only 10 percent of mortgage debt. In the past the interests of the consumer as saver have never received much attention in the Congress. I think this is changing. The survival of the NOW account in Massachusetts and New Hampshire is a symptom of this change. It survived the formidable combined opposition of the commercial banks and the savings and loan associations because the NOW account was considered by the Congress as an innovation favorable to the consumer.

No single form of mortgage instrument can meet all of the housing finance needs of the American people. We need an array of mortgage instruments which, in combination, can move us toward three objectives: first, a more stable flow of funds into the thrift institutions; second, a fairer shake on interest rates for the small saver; and third, the solution of the housing "financing gap" caused by higher interest rates.

The level-payment mortgage is not well adapted to the expected life-income stream of our young adult population. It has always required that a much higher percentage of the total income of young adults be spent on housing during the early years of the mortgage. This was not so critical when interest rates were low, but when mortgage rates rise sharply the problem becomes acute. A move from 5 percent to 9-1/2 percent in the mortgage rate increases the monthly payment on a $30,000, 30-year mortgage by 57 percent. This creates the "financing gap" I referred to earlier, which is pricing much of our young adult population out of the housing market.

Unless our private institutions respond to this "financing gap" problem by devising a workable graduated-payment mortgage, the Federal Government will have to meet the problem with a mortgage interest rate subsidy. Such a subsidy should gradually phase out over the first five or six years of the mortgage as the income of the homeowner rises.

The mortgage market of the future should offer an array of mortgage instruments to the consumer so that he or she can choose the one which best meets his or her needs. The conventional, fixed-rate, level-payment mortgage should not be eliminated, but it should be offered at a significantly higher rate than the variable-rate mortgage. If the homeowner wishes to be protected against future changes in interest rates, he should expect to pay an interest rate premium for the privilege. He should not expect, at no cost, to push this risk onto the shoulders of the savings depositor, who typically has a lower income than the homeowner.

In addition to the variable-rate mortgage, a graduated-payment mortgage of some sort should be available to the young adult whose income can reasonably be expected to rise substantially in the future. With this array of mortgage instruments, housing finance could be put on a sound basis.

Whenever one talks about restructuring the mortgage portfolios of our thrift institutions, two responses are inevitable. The first is that the idea is impractical because it would take seven or eight years to accomplish significant change. The second is that it is impractical because the consumer will not buy these strange new mortgage instruments. The first argument undoubtedly accounts for much of the lethargic response of the thrift institutions to the idea of the new mortgage instruments. It will, indeed, take a long time before these new instruments can make a significant difference. When money is tight, the attention of the management of thrift institutions must be focused on short-term survival. When the turn in short-term money rates comes, and funds start flowing in again, the whole matter loses its sense of urgency. There is never a really good time to work on the long-term viability of the thrift institutions and the long-term stability of the mortgage market.

With respect to the second argument, that these new mortgage forms cannot be sold to the American consumer, I am not persuaded. It is true that to the person who can afford the high initial payments (which many of our young adults cannot), the fixed-rate, level-payment mortgage is a good deal. The lender (and ultimately the savings depositor) bears all the risks of changing interest rates. But is the present mortgage form really a good deal for the American public if it prevents the mortgage market from functioning properly?

The recent Congressional action on variable-rate mortgages stems from the concern which has led state legislatures in the past to impose usury ceilings on mortgage rates — a concern to protect the public from greedy and unscrupulous lenders. The effect of the usury laws, however, has been to impair the proper functioning of markets and to divert money away from the mortgage market whenever the market rate rises above the ceiling. The consumer gains no protection from markets that do not function.

There is a pressing need to restructure the mortgage market so that it can function effectively in the environment in which we find ourselves today. If our private mortgage-lending institutions fail to adapt to their environment, either due to their own inertia or due to legislative constraints on their ability to adapt, the Federal Government's role in the mortgage market must expand. These are the alternatives as I see them.

Inflation and the Housing Market: Problems and Potential Solutions

Donald Lessard and Franco Modigliani*

I. INTRODUCTION

Recent years have witnessed increasing rates of inflation accompanied by high and volatile interest rates. Although these factors have affected the entire economy, their most drastic effect has been on housing as shown by wide swings in construction activity and in the turnover of the existing stock of housing as well as by a growing feeling that adequate housing is out of the reach of an increasingly large number of households. The conclusions of the M.I.T. study are that (1) these effects can be largely traced to shortcomings of the standard mortgage and the institutional arrangements that surround it which, in an inflationary environment, have had a serious destabilizing impact on both the demand for and supply of housing and that (2) this instrument, in many ways obsolete, should be supplemented by alternative mortgage designs.

Given the persuasive case that the standard mortgage instrument is a major culprit, the study examines a variety of possible modifications of the traditional mortgage in order to assess the effectiveness of alternative designs in reducing or eliminating the demand and supply effects resulting from inflation and its variability. The alternatives examined include designs which have been advocated within the United States or actually implemented either here or abroad as well as a set of novel designs aimed directly at the two major types of inflationary effects.

Outline of the Study

The study was broken down into five subtasks, each of which appears as a paper in this volume.

The paper by Cohn and Fischer provides a detailed description and microeconomic analysis of the major alternative mortgage instruments from the perspectives of both borrowers and lenders. The types of mortgages considered include variable interest rate mortgages, which resolve

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the lender mismatch problem but in their standard form do not eliminate the inflation-related distortions in the time pattern of payments; graduated-payment mortgages with a fixed graduation geared to expected inflation, which do adjust the time stream of nominal payments for anticipated inflation but have no flexibility to cope with subsequent changes, and do nothing to resolve the supply problem; price-level-adjusted mortgages, where the outstanding principal is adjusted in line with changes in the price level, which address both problems; and a class of novel mortgage designs which are roughly as effective as the price-level-adjusted mortgage but which are deemed to be more easily implementable within the current institutional setting.

Kearl, Rosen, and Swan review existing empirical evidence regarding the potential impact on the demand for housing of changes in the mortgage instrument. They find general confirmation that basic elements of the mortgage do matter, though are led to conclude they find that existing studies are inadequate to provide quantitative information about the likely impact of the various proposed changes.

Experience in six countries with alternative types of mortgages is reviewed by Lessard with the collaboration of Anderson, Cohen, Cukierman, and Kouri. The countries studied include the United Kingdom and Canada, which employ variable-rate mortgages with level money payments; Brazil and Israel, which have adopted price-level-adjusted mortgages; Sweden, which has combined variable rates with a time stream of patterns tailored to remove inflationary distortions; and Finland, which has a hybrid scheme lying somewhere between that of price-level indexation and variable nominal interest rates.

Jaffee and Kearl present an examination, through simulation, of the macroeconomic impacts of various mortgage innovations. Relying on the MPS econometric model they estimate how construction activity, the profitability of thrift institutions and other related variables would have fared over the last ten years if the traditional mortgage had been replaced by a number of alternative mortgage designs.

Various tax, legal and regulatory barriers to innovation in the mortgage instrument are examined in the final paper by Holland.

The remainder of this paper provides an overview and synthesis of the results of the five studies.

II. THE CAUSES OF RECENT INSTABILITY IN THE HOUSING SECTOR

The recurrent crises which have plagued the housing industry in the last decade can be largely traced to the interaction of a rising and variable rate of inflation with two major institutional features which have characterized the financing of housing in the United States in the postwar period. These are (1) almost exclusive reliance on the traditional fully amortized, level-payment mortgage as the vehicle for financing the acquisition

of single-family houses; and (2) overwhelming dependence for mortgage funds on thrift institutions which secure the bulk of their funds through relatively short-term deposits. This framework could and did work reasonably well in the period of relative price stability that prevailed until 1965, but has been a source of serious problems in the environment of rising and variable rates of inflation which have prevailed in the last decade through their effect on both the *demand* by potential buyers and the *supply* of mortgage funds.[1]

A. *The Effect of Inflation on Demand: Shortcomings of the Traditional Mortgages*

Our conclusions that inflation has an unfavorable effect on the *demand* for houses financed by mortgages and that fluctuations in the rate of inflation tend to lead to corresponding fluctuations in construction activity rests on the following considerations which are spelled out in the rest of this section.

1. Inflation and the anticipation of its continuation tends to raise interest rates, including mortgage rates, by an "inflation premium" needed to compensate the lender for the anticipated erosion in the purchasing power of his claim. The rise in interest in turn raises the annual payment needed to acquire a house of given value.
2. This higher interest rate and resulting annual payment do not *per se* change the real cost of carrying a house in that they are offset by the gain to the debtor resulting from the gradual decline in the purchasing power of his debt and of his annual payment.
3. Nonetheless the rise in interest rates resulting from inflation has an important effect on the time profile of the stream of annual payments, expressed *in terms of constant purchasing power.* Whereas in a world of constant prices these payments are constant over the life of the mortgage, the inflation-induced increase in interest rates results in an increase in the level of real payments in the early years of the contract with a commensurate reduction in the later years.
4. In a world in which the household's ability to meet the annual payment is constrained by its current income (there being no significant opportunities for second mortgages and the like) the increase in the annual payment in the early years of the contract is bound to have an unfavorable effect on the demand for housing by forcing many households to postpone or forego home-ownership or scale down their demand.

These propositions are illustrated by Table 1 and Figures 1 and 2. Column 2 of the table shows the effect of alternative rates of inflation on the annual payment for a $20,000 30-year mortgage. Assuming a 3 percent

[1]Most studies of inflation and housing have focused on the supply effects. Only Poole [1972] and Tucker [1975] have addressed the demand effects in any detail.

Table 1

EFFECT OF INFLATION ON THE STREAM OF PAYMENTS FOR DIFFERENT RATES OF INFLATION

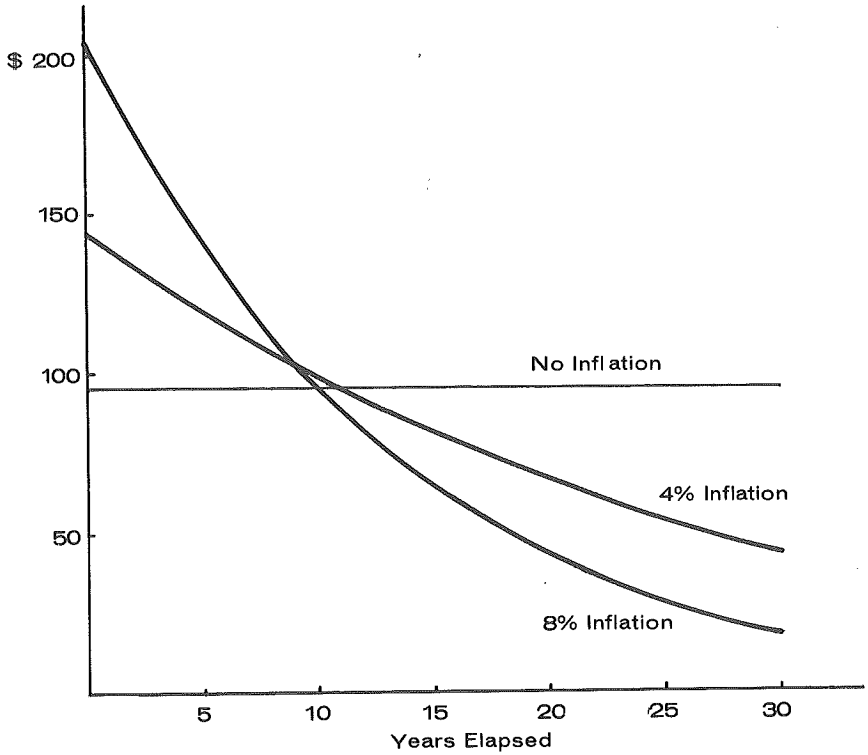
$20,000 — 30-Year Mortgage
$10,000 Initial Annual Income Increasing at Inflation Rate

	(1) Year	(2) Annual Payment	(3) Real Payment	(4) Payment/ Income (%)
Case A:		0% Inflation	3% Interest Rate	
	1	1,020.39	1,020.39	10.00
	5	1,020.39	1,020.39	9.24
	10	1,020.39	1,020.39	8.37
	15	1,020.39	1,020.39	7.58
	20	1,020.39	1,020.39	6.87
	25	1,020.39	1,020.39	6.22
	30	1,020.39	1,020.39	5.63
Case B:		2% Inflation	5% Interest Rate	
	1	1,301.02	1,275.52	12.50
	5	1,301.02	1,178.38	10.67
	10	1,301.02	1,067.30	8.79
	15	1,301.02	966.68	7.22
	20	1,301.02	875.56	5.94
	25	1,301.02	793.02	4.88
	30	1,301.02	718.26	4.01
Case C:		4% Inflation	7% Interest Rate	
	1	1,611.73	1,549.74	15.21
	5	1,611.73	1,324.72	12.04
	10	1,611.73	1,088.83	8.99
	15	1,611.73	894.94	6.73
	20	1,611.73	735.57	5.03
	25	1,611.73	604.59	3.76
	30	1,611.73	496.93	2.81
Case D:		8% Inflation	11% Interest Rate	
	1	2,300.49	2,130.01	20.91
	5	2,300.49	1,565.68	14.28
	10	2,300.49	1,065.59	8.87
	15	2,300.49	725.21	5.50
	20	2,300.49	493.57	3.42
	25	2,300.49	335.91	2.12
	30	2,300.49	228.62	1.32

Assumes 2% real growth in income

Figure 1

REAL VALUE OF MONTHLY PAYMENTS



Source: Donald Tucker, "The Variable-Rate Graduated-Payment Mortgage" Real Estate Review, Spring 1975.

interest rate in the absence of inflation, the annual payment is $1,020. As the inflation rate rises to 2, 4, and 8 percent, raising the mortgage rate by corresponding amounts, the annual payment is seen to increase by 30, 60, and 130 percent respectively.

The reason for the higher annual payment is that the payments are spread over a long period of time and, in the presence of steady inflation, these payments are made in dollars which are worth less and less in terms of purchasing power. This proposition is illustrated in column (3) of the Table, which expresses the annual payment in dollars of "constant purchasing power." This column is obtained by dividing the figures of column (2) by the price level relative to that prevailing in the year the contract was initiated, which is implied by the assumed rate of inflation for each of the years indicated in column (1).

In Case A, where no inflation is assumed, the figures of column (3) are of course identical to those of column (2) with stable prices, a standard mortgage calls for a stream of payments which is constant both in current dollars and in terms of purchasing power.

In Case B, with a 2 percent rate of inflation, the payments of column (3) decline at a rate of 2 percent per annum; thus while they start higher than in Case A, they end appreciably lower, with the terminal rate of payment only about half as high as the initial rate. This effect of inflation in "tilting" the real stream of repayments becomes more and more pronounced as we move to 4 and 8 percent rates of inflation in Cases C and D. In this last case, the payments start twice as high, but end up one-fifth as large.

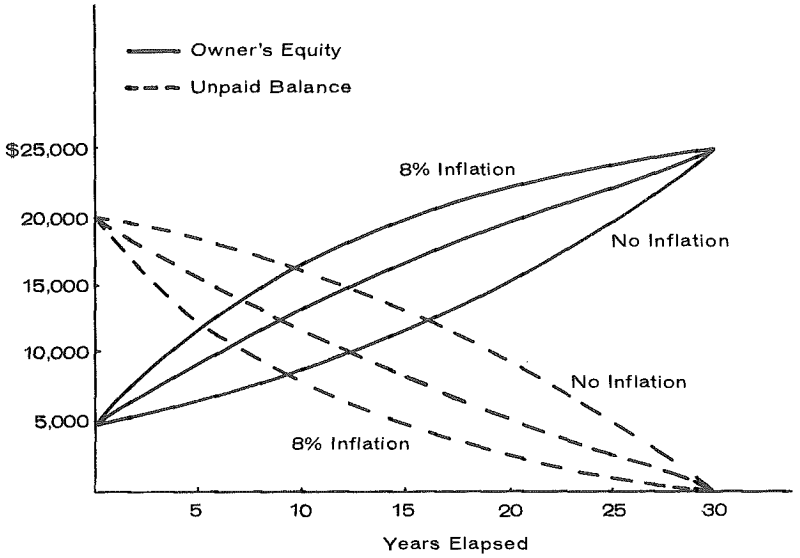
This tilting effect of a rising rate of inflation on the stream of annual payments expressed in constant purchasing power is brought out vividly in Figure 1 which shows a graph of the real payment required in *each* year of the contract (the information reported in column (3) is only for selected years), for zero inflation, 4 percent inflation, and 8 percent inflation.

The Level of Inflation and the "Real" Cost of Housing. While the payment streams corresponding to different rates of inflation differ radically in shape, they do have one feature in common: the present value of each of the payment streams measured in dollars of constant purchasing power is the same — $20,000 — when discounted at the rate of 3 percent which we have assumed represents the interest rate which would prevail in a world of no inflation (and hence is appropriate to dollars of constant purchasing power).

It is precisely in this sense that the higher rate of interest and the higher initial level of money payments resulting from inflation merely compensate the lender but do not *per se* increase the *real* overall cost of acquiring a house. The same conclusion may be arrived at in a different way. The cost of owning and using a house for a determined period consists of the outlays to acquire the house less the value of the house when sold. As long as the value of the house maintains a reasonably close correspondence to the general price level (or better yet exceeds it), the inflation premium paid to finance the house will be recaptured through an

Figure 2

REAL VALUE OF OWNER'S EQUITY AND UNPAID BALANCE



Source: Donald Tucker, "The Variable-Rate Graduated-Payment Mortgage" Real Estate Review, Spring 1975.

eventual capital gain. In fact, taking into account the assymetric tax treatment of interest charges (fully deductible) and capital gains on a primary residence (totally exempt if reinvested in another residence and taxed at the capital gain rate otherwise), inflation should actually *lower* the real cost of home ownership.

The Level of Inflation and the Ability of Households to Purchase Housing. Even though inflation does not increase the sum of discounted payments, it will have an effect on the value of housing which a household is able to acquire, for this depends not only on the sum of payments but also on their time profile. The typical household must meet payments from current income and lenders generally limit the size of a mortgage in order to maintain a desired payment-to-income ratio in the early years of the contract. Thus, the amount of housing which a household can acquire will be limited by its current income and the fraction thereof it can devote to housing.

It can be seen from Table 1 that a household with an annual income of say $10,000 and a mortgage of $20,000 could, in the absence of inflation, service the debt throughout the life of the mortgage with 10 percent of its income; with a 2 percent inflation, the initial payment would require over 13 percent of his income; with 4 percent inflation nearly 16 percent; and the figure would rise to nearly 23 percent if inflation reached 8 percent. Furthermore, as is apparent from Table 1 and Figure 1, with inflation the traditional mortgage will require higher real payments through most of the first half of the contract than would be required in a world of no inflation for which the mortgage instrument was designed. Looked at from a different angle, the traditional mortgage requires of the borrower quite different time shapes of repayments of his "real" debt, depending on the rate of inflation. This point is illustrated in Figure 2, which compares the behavior over time of the unpaid balance, measured in terms of purchasing power, for alternative rates of inflation. As one would expect from Figure 1, a higher inflation results in a more rapid decline in the outstanding debt. Correspondingly, the owner's equity also builds up more rapidly, if the value of the house remains constant in real terms.

Our conclusions about the unfavorable effects of the tilting induced by inflation are reinforced by the consideration that a major group of potential home buyers are young households who can look forward to an increase in income even in the absence of inflation, both because of the general effect of productivity growth, which tends to raise all incomes, and because typically, even in the absence of productivity growth, income tends to rise with age, at least for a while. For such households, the optimal time profile of real payments might be one rising over time; inflation instead will tilt the ratio of mortgage payments to income even further than indicated by Figure 1.[2]

[2]For this reason, young families with expectations of rapid increases in income might prefer a mortgage with rising real payments while other families, facing retirement and a drop in income, might prefer the opposite.

A faster repayment schedule and the resulting higher ratio of payment to income in the early years of the contract need not of course be a problem for those households who had intended to save at a rate sufficiently high to satisfy the schedule; but would be a problem for other households and their number would grow rapidly with rising inflation and the resulting speedup of repayments.

Even for these households, the problem could be handled in a world of perfect markets, no money illusion, and infinite ingenuity in devising financial instruments suited to changing circumstances. In this ideal world, the borrowers would be able to raise otherwise the funds needed for the high early payments, for example, through second mortgages or unsecured personal loans. But, obviously, our world does not meet these ideal specifications. Indeed, there is little evidence of any significant tendency on the part of lenders to make full use even of the flexibility in the existing mortgage contract to counteract the higher initial payments resulting from inflation by lengthening maturity or by raising the loan-to-value ratio. In any event, these devices would not go very far in counteracting the effect of inflation on the early payments.[3]

On the basis of this analysis, we conclude that, under traditional mortgage financing, inflation is likely to affect adversely the demand for houses by inducing potential buyers — especially first owners — to scale down their demand in terms of quantity and/or quality or to forego acquisition, at least until they have accumulated enough assets for a larger downpayment. It also follows that marked fluctuations in the actual and anticipated rate of inflation such as have occurred in the last decade, tend to change the demand for housing and thus contribute to the observed swings in residential construction activity. The Kearl, Rosen, and Swan paper endeavored to find empirical evidence on the quantitative magnitude of this impact, through a search of the empirical literature of factors controlling the demand for housing. Unfortunately, the existing contributions did not provide this evidence as none of the authors of previous empirical studies has explicitly treated these effects.

Uncertainty About the Level of Inflation and the Demand for Housing. In addition to the effects just discussed, which depend on the level of inflation, the demand for housing may also be affected by *uncertainty* about the future of inflation. Consider, for instance, the case illustrated in Case D of Table 1, when the rate of inflation anticipated over the 30 years of the contract is 8 percent, and on this basis the mortgage rate is set at 11 percent. If the actual path of inflation turned out to be appreciably different from 8 percent, the path of actual payments expressed in terms of purchasing power would also be different from that of column (3). In particular, if the deviations were prevailing in one direction, the

[3]Lengthening maturity from prevailing practices could accommodate, at best, only a very moderate rate of inflation and changing the loan-to-value ratio increases the lender's risk in the early years of the contract.

present value of the stream of real payments could deviate significantly from the intended $20,000. Thus, in the presence of significant uncertainty about the future rate of inflation, the mortgage instrument, as a fixed long-term contract, becomes a risky one for the borrower as well as the lender. If inflation turns out to be higher than expected, the borrower reaps a windfall gain (and the lender suffers a windfall loss); and if lower, the opposite occurs.

In our recent history, inflation typically has turned out to be higher than expected and, in addition, interest rates have frequently been kept artificially low by government policy, all of which has worked out to the advantage of the borrower. Thus there has been a tendency to assume that inflation is detrimental to the lender, but is good for the borrower and has a favorable impact on housing demand. Actually, once inflation has developed for a while, and interest rates are left free to incorporate expectations of hefty rates of inflation, anyone borrowing on a long-term basis to invest in a house bears a substantial risk of inflation turning out lower than anticipated.

This risk is mitigated to some extent by the prevailing early repayment provisions on mortgages, mandated by law in many states. Often borrowers are allowed to repay ahead of schedule with minimal penalties. This is viewed as a social necessity to allow people to buy and sell houses freely; but it also results in a "one-way option" in which the borrower can always get out of the original contract if interest rates fall, thereby reducing his risk of a lower than expected rate of inflation — but the lender cannot get out if they rise. Of course, a rational financial intermediary that recognizes this assymetry should exact a premium for this option during periods of high and uncertain inflation and interest rates with the result that borrowers would have to pay for the reduction of risk inherent in the prepayment clause in the form of an even higher interest rate.

One might conclude that insofar as households are prevailingly averse to risk, prepayment options are correctly priced, and interest rates freely reflect expected inflation. A high and uncertain rate of inflation could tend to reduce the demand for housing through its effect on the expected cost and risk to the borrower. It must be acknowledged however that, since these circumstances also increase the risk of investment in long-term fixed-rate financial assets, they may encourage wealth holders to invest in physical assets such as houses, especially since much evidence suggests that equities are not a particularly good hedge against inflation. The empirical relevance of this phenomenon is supported by the experience of countries with high rates of inflation.

These considerations make it hard to reach firm conclusions about the overall impact of uncertainty about the future of inflation on the demand for houses, especially since this depends in part on the nature of financial instruments available to investors. One conclusion that seems warranted, however, is that, if alternative instruments could be devised to finance housing which reduce the price-level risk inherent in the standard

mortgage, this would also have some favorable impact at least on the demand for owner-occupied housing. However, the shortcomings of the traditional mortgage arising from the uncertainty of inflation are likely to be of secondary importance compared with those arising from the tilting of the stream of payments discussed earlier.[4]

Inadequacies of Current Remedies. Several countries which at one time or another experience double-digit inflation have come to realize that at these high rates the traditional mortgage instrument requires such an exorbitant initial rate of repayment of principal that it becomes practically useless as a financing device. They have accordingly been led to try out basic reforms in this instrument involving some form of "price-level adjustment" along lines detailed in the reviews of Finland, Israel and Brazil and discussed further in IV.D below. Many other countries, including the United States and the United Kingdom have tried to relieve the problem by holding down interest rates through ceilings or by providing interest rate or housing subsidies. Only a few countries, notably Sweden, have tried to combine subsidies with financial innovation and government guarantees.

Typically, the approaches implemented or proposed in the United States have aimed at making mortgages available to qualified borrowers at below equilibrium interest rates. It should be apparent from our analysis that such schemes constitute an inefficient approach: they would be unnecessary if the right cure were provided.

If our analysis is correct, the problem does not arise from the fact that, with a higher inflation, the borrowers can no longer afford to pay the interest rate on the principal and amortize the debt at a reasonable and prudent rate. Indeed, we have shown that higher interest rates arising from inflation *do not change the overall real cost of the house;* hence, inflation *per se* should not be a ground for subsidies, especially to potential home purchasers who on the average do not come from the poorest classes of society. The problem arises instead from the fact that, with high inflation, use of the standard mortgage requires borrowers to repay the debt at an unreasonably fast pace.

The true solution to this demand effect must therefore lie in devising instruments such that the path of repayment of the loan (measured in terms of purchasing power) will be independent of the rate of inflation — say the same as it would be under a traditional mortgage in the absence of inflation thus eliminating the tilt effect of the standard mortgage.

B. *Effect of Inflation on Housing Through the Supply of Mortgage Funds*

Supply effects can be dealt with briefly as they are already fairly generally understood and agreed upon. They arise not from the rate of inflation as such, but rather from its variations, and from its interaction

[4]To the extent that the risks transferred to the lender via the "one-way" prepayment options result in higher mortgage interest rates, they will exacerbate the "tilt" effects.

with interest rate ceilings. Both are intimately related to the rather unique and not altogether satisfactory structure through which the bulk of funds to finance mortgages have been raised in the United States in recent decades.

As is well known, by far the largest share of private mortgage funds, especially those financing owner-occupied housing, has come from the thrift institutions — savings and loan associations and mutual savings banks — and to some extent from commercial banks and life insurance companies.[5] These institutions in turn have obtained the funds almost entirely from deposits. Through much of the postwar periods these deposits were almost entirely short term and highly liquid — indeed, for all practical purposes they could be and were regarded as demand liabilities. This practice was on the whole looked upon with favor, as one of the basic functions of these institutions was viewed as that of providing the public with a highly liquid investment. Only recently has this type of liability been supplemented to a growing extent by deposits with longer maturities.

Consequences of Maturity Mismatching. As a result of these practices, thrift institutions acquired an extremely unbalanced or mismatched financial structure, consisting of very long-term assets and very short-term liabilities. This unbalanced portfolio did not reflect a conscious endeavor to speculate on the term structure, which would have involved shifting asset and liability maturities at various points in time. This becomes clear when one recognizes that mortgages are not very attractive instruments for speculating on the term structure since in many states the borrower can easily avail himself of the option to repay at no significant penalty in the event that interest rates fall. Rather, at least in the case of S&Ls, mortgages were one of the few investments that regulation allowed them to make. That thrift institutions were thus forced into an unbalanced asset-liability structure must be regarded as unfortunate since it would hardly seem socially desirable for these institutions to incur the risks of failure associated with extensive term-structure intermediation.

This portfolio imbalance did not create any difficulty during the period of relative price stability which lasted until the mid-60s as interest rates changed slowly, the term structure was prevailingly a rising one, and in addition, deposit rates were not under serious competitive pressure thanks to the low ceilings imposed on commercial bank time deposits. Accordingly, the thrift institutions and the S&Ls in particular were able to attract a large flow of funds and provide ample financing for residential mortgages. They were in fact so successful that home mortgages became less attractive for other intermediaries, such as life insurance companies, causing the market to rely on thrift institutions to a growing extent. Thus, the thrift institutions' share of all privately held home mortgages increased from the early 50s to the early 70s from roughly one- to two-thirds; and

[5]Government funds, in particular purchases of mortgages by the FNMA, have played an increasingly important role in mortgage financing in recent years.

because of this growth, their share of the annual flows was even more impressive, frequently reaching 80 percent and over.

But the weaknesses inherent in such a structure become apparent in the era of rising and variable inflation that began in the mid-60s. Rising interest rates during periods of monetary stringency made it difficult to attract depositors at rates of the earlier period. And the problem became more acute at each successive monetary crunch — 1966, 1969-70, 1974 — when short-term rates rose even more than long-term ones. Supervisory authorities became concerned that if institutions competed to retain deposits, they would have had to offer rates which would have resulted in severe losses and ultimate collapse — especially in view of the reduced market value of their portfolios which were very illiquid anyway. To prevent this outcome the regulatory authorities imposed ceilings on all depository intermediaries.

Since the level of ceilings was constrained by what the thrift institutions could afford to pay, it was frequently well below short-term market rates. Because no other assets of similar characteristics yielded more, the thrift institutions were spared a mass withdrawal. Nonetheless, their liabilities lost attractiveness for savers and their net inflows slowed down dramatically and even became negative for brief periods (the so-called "disintermediation"). Furthermore, this unfavorable response of depositors tended to become more pronounced at successive "crunches" as they became sensitive to rate differentials and as financial innovations provided them with better alternatives, such as the short-term money-market funds. These periods of famine were typically followed by periods of heavy inflows as each crunch was followed by a period of very low short-term rates as monetary policy eased off. The wide swings in deposit inflows resulted in similar swings in the supply of mortgage funds which played a major role in the wide fluctuations in construction activity and housing markets.

Solutions to the Supply Problem. The lessons to be learned from this experience are fairly obvious and broadly agreed upon: if there is a substantial risk of inflation, the institutions financing housing must not be allowed to continue the present practice of lending through traditional mortgages — a very long-term instrument — while relying on very short-term liabilities as a source of funds.

Hence, if the thrift institutions are to continue to provide the public with a highly liquid, conventional, deposit-type asset and to use the bulk of the funds so obtained to finance housing, they must have a financing instrument which will allow them to earn a return commensurate with changing short-term market rates. If they continue to invest part of their portfolio in instruments of long maturity with fixed interest rates, they should hedge them by liabilities of commensurate maturity, as well as matching characteristics in terms of prepayment options and the like. If instruments of an entirely new type were made available to them (such as the price-level-adjusted mortgages discussed below), they should again finance investments in this asset with liabilities of similar characteristics. It

should be added that the basic principle that prudent financial structure requires matching the characteristics of assets and liabilities has long been a tenet of financial theory and practice and is recognized by the institutions which finance housing in other countries. Thus (1) where conventional mortgages are used, they are typically financed by mortgage bonds, (e.g., Sweden, as well as many other countries); (2) where mortgages are financed by short-term deposits, their interest rate is subject to change (e.g., United Kingdom); (3) where the mortgage is financed by liabilities of intermediate term, the balance still due at the end of that term is refinanced at the then prevailing rate (e.g., Canada).

In the next section, drawing on the more detailed and rigorous analysis of the Cohn-Fischer paper, we review a number of alternative mortgage designs, assessing how well each design could fit into the portfolio of thrift institutions in terms of matching requirements, how well it would suit borrowers' interests, and how effective it would be in eliminating or reducing the demand effect of inflation-induced changes in interest rates, and hence in reducing instability in construction activity resulting from such changes.

III. ALTERNATIVE MORTGAGE DESIGNS AND THEIR EFFECTIVENESS IN ELIMINATING DEMAND AND SUPPLY EFFECTS OF INFLATION

A. *The Basic Elements of the Mortgage Contract*

A mortgage is simply a loan contract which specifies a rule for (1) determining the interest rate applying in any year to the debit balance then outstanding, called hereafter the debiting rate, and (2) calculating the periodic payments through which the debtor is to pay the interest and amortize the principal over the life of the contract. The traditional mortgage can thus be viewed as a special case of a much broader class, and a large number of alternative designs can be constructed by varying the various parameters characterizing the instrument. In the course of the Cohn-Fischer study, as well as in the Jaffee-Kearl simulations, many designs have been given at least passing consideration. In what follows, we concentrate on a few of these, chosen on the basis of two criteria: (1) the extent to which they have already received attention and are being applied here or abroad, or are at least being actively promoted, and (2) the extent to which they appear to provide a viable solution to the problems discussed in Section II.

B. *The Variable-Rate Mortgage*

The alternative to the traditional mortgage that has received by far the greatest attention and already has been adopted in some parts of the country, is the variable-rate mortgage (VRM). It is being promoted primarily by lending intermediary interests as a solution to their problem and thus also to the supply component of the housing problem

The essential characteristic of the VRM is that the debiting rate charged on the borrower's outstanding balance is not fixed at the outset but is allowed to float up or down, being tied to some agreed "reference rate." This specification is consistent with a variety of designs in terms of (1) choice of specific reference rates such as a short, intermediate or long-term market rate, or the deposit rate of the intermediary originating the loan, (2) frequency with which the debiting rate is changed, (3) limitations, if any, on the maximum permissible change at revision points or over the life of the contract, and (4) methods for computing the periodic payments.

Within this class, two major alternative designs have received consideration. In one design, which has been adopted in the United Kingdom and elsewhere, the periodic payment is fixed at the beginning of the contract as in the traditional mortgage. Because a discrepancy between the debiting rate and the rate used to compute the payment at the outset leads to a corresponding discrepancy between the amount *available* for the amortization of principal and the amount *scheduled* for that purpose, the payments do not necessarily terminate at the original scheduled maturity, but only when the principal has been fully amortized. Thus, the instrument is of variable maturity. In the alternative design, the maturity is fixed and the periodic payments change with the debiting rate, that rate being used to recompute a new level payment over the remaining life of the contract which applies until a new change occurs in the debiting rate.

The adoption of the VRM could be expected to alleviate, if not solve, the intermediaries' mismatching problem and, hopefully, the supply aspect of swings in housing markets, especially if the reference rate were of the same maturity as the funds used to finance the mortgage. For intermediaries financed by short-term deposit liabilities, whose market value is always par, the appropriate rate would be a short-term rate or the deposit rate itself provided it was not distorted by ceilings. This would keep the value of the mortgages close to par. In terms of its effect on the borrower, however, the VRM appears to offer little relief to the housing problems and in fact is likely to make matters worse. This is because the rate used to compute payments with a VRM is a nominal rate which responds to the rate of inflation and hence does not eliminate the tilt effect. Actually the relatively wider variations in short-term interest rates are likely to exacerbate swings in demand due to changes in initial periodic payments, although the generally lower level of these rates, relative to long-term rates, may stimulate demand over the long term (Cf. the simulation results of Jaffee and Kearl).

A more common criticism of the VRM advanced by consumer advocates has been that making the interest rate variable increases the borrower's risk. This conclusion is open to question. It is true that if the reference rate should turn out to rise above the initial mortgage rate, the debtor would end up paying more, but presumably this would tend to happen if inflation were also higher than the expectation built into the long-term rate, in which case the debtor's money income would also tend

to be higher in the long run. On the other hand, the reference rate could also decline, reducing payments, and this would tend to happen in the event that the rate of inflation turns out lower than anticipated and hence less growth in money income is realized than was expected. In other words, some of the risk of the VRM is offset by the long-term positive association between the borrower's money liability and his money income.

However, with the fixed maturity version some of this risk remains. Although variations in the periodic payment are broadly associated with those in the rate of inflation and money income, in the short run the association is not close, in part because of the jerky nature of payment changes, and as a result the ratio of payment to income could be subject to substantial variability. This can be seen by inspecting columns (1) and (2) in the last row of the VRM block. If the rate of inflation rises from 3 to 5 percent, the scheduled payment under VRM rises from $1,453 to $1,798 or by 24 percent, whereas the effect on the average homeowner's nominal income would be more like 2 percent. The reason for this much higher percentage change is that the higher inflation, by raising the nominal rate used in computing the constant payment for the rest of the contract, implies a further tilting of the real repayment schedule. For similar reasons, an absolute decline in inflation produces a much larger percentage decline in the scheduled payment. (Cf. col. (3) and (4)).

The potentially large fluctuations in payments over time with VRMs could be relieved by a variety of modifications. One modification is the fixed-payment variable-maturity version of VRM. But this version can afford only limited relief when the maturity is long, as is the case in the early years of the contract, and most of the periodic payment consists of interest. Even small upward revisions in the debiting rate produce large changes in the scheduled maturity, and the point is soon reached where a fixed payment proves insufficient even to amortize the debt.[6] Thus the variable-maturity VRM is capable of "smoothing" minor fluctuations in the interest rate, but not major shifts such as those observed in recent years.

Various other modifications have been proposed for the variable payment VRM such as using as reference a longer-term interest rate which presumably is less volatile than a short-term rate; limiting the frequency with which the debiting rate can be changed; allowing the maturity to vary and limiting its maximum permissible change at revision dates or over the entire life of the contract. But while such modifications would certainly improve the borrower's lot, they might by the same token reduce the benefits of VRM to the lender, and hence also its effectiveness in solving the supply problem. Indeed, any of these proposals increase the probability that the market value of the mortgages will vary relative to their par value and thus deviate from the value of intermediaries' liabilities.

[6]For example, an increase in the debiting rate to 8.8 percent from an initial level of 8 percent would result in the entire payment going toward interest.

All of these proposals relate directly or indirectly to a basic dilemma in VRM design. From the perspective of the lender who obtains a significant proportion of funds with short-term liabilities, a short-term debiting rate is desirable while from the borrower's perspective a longer-term rate is desirable because of its lower volatility. This dilemma, and the extent to which the various proposed modifications of the basic VRM instrument resolve it, can be best understood by considering a novel variant of the VRM which emerged during the course of our study.

C. *The Dual-Rate VRM and Other Approaches to the VRM Dilemma*

The dual-rate VRM endeavors to resolve the above dilemma by using two distinct interest rates; one, which we call hereafter the debiting rate, is used to compute the interest on the outstanding balance; the other, which we term the payment factor, is used to compute the periodic payment. For the debiting rate, one would use as reference a short-term rate or the deposit rate; the latter would seem preferable because it is directly related to the cost of funds to the intermediary, and because this mechanism is likely to be more readily understood, verified, and accepted by borrowers. The periodic payment, on the other hand, is recomputed at fixed intervals by applying to the principal still outstanding with the standard annuity formula using some longer-term rate, say an intermediate rate or the rate on the longest-term deposit offered by the intermediary.[7] Using longer rates for computing the periodic payment would have the effect of reducing the magnitude and, possibly, the frequency of changes in the payment.

If the debiting rate differs from the payment factor, the actual amortization of the debt may differ from that implied by the payment factor. Thus when a new periodic payment is computed, it could differ from the previous payment because of the aforementioned discrepancy in principal and because of a change in the reference rate for the payment factor. Nonetheless the variations could be expected to be appreciably smaller than for a standard VRM which used the same debiting rate for three reasons. First, the discrepancy in principal should not be large since the average debiting rates — short-term rates — should not differ markedly from the longer-term rate which is, after all, a forecast of the average short-term rates. Second, the discrepancy, if any, is spread over the remaining life of the contract and thus will not have a major impact on the payment. Finally, the payment rate, a longer-term rate, should be smoother than the debiting rate.

Thus a dual-rate VRM, with appropriately chosen reference rates and frequency of adjustment, can both enable the lending intermediary to earn a rate adequate to keep its deposit rate competitive with other short-term market instruments and still result in a smooth path of periodic payments in money terms. Its primary drawback, however, is its complexity.

[7]Section III.F and the Cohn-Fischer paper illustrate mechanics of this design.

Another approach to the dilemma is simply to use a longer-term rate for debiting as well as computing the payment. Insofar as its liabilities are of shorter term, this approach, as noted earlier, again exposes the intermediary to the danger of its revenue not keeping up with the rate it must pay on its liabilities or equivalently to the risk that the market value of its assets will fall short of that of its liabilities. Ideally, this risk would be avoided if the liabilities were themselves term deposits with maturities matching that of the debiting rate. This approach is actually used in Canada, where mortgage rates are adjusted at five-year intervals and funding is obtained through five-year term certificates. As a result, Canadian institutions are perfectly hedged, that is, changes in the market value of assets are perfeclty matched by changes in the value of liabilities. Because of this, they have been able to avoid most of the supply (but not the demand) problems which have plagued U.S. housing markets.

If the debiting rate were a three-year rate fixed for three years, the risk to an intermediary financed by short-term liabilities might not be appreciably larger than if the debiting rate were a short-term one (a three-year instrument is unlikely to fall significantly below par), while the smoothing from the point of view of the borrower would be appreciable. It may be argued that bearing this limited risk is an appropriate function of the intermediary in order to reduce the borrower's risk.

The Federal Home Loan Bank Board has recently proposed a modification of this approach in which the debiting rate would be a three- to five-year rate, but instead of being fixed for this term, it would be adjusted every six months in accordance with movements in this same rate. There would also be a limitation to the maximum change in the debiting rate to one-half of 1 percent every six months and 2.5 percent over the life of the contract. This instrument is a hybrid that is neither short nor intermediate term. By adjusting the rate at more frequent intervals than the term of the rate, it would appear to create situations where market values would fluctuate around par and might provide borrowers with arbitrage opportunities. However, the more frequent adjustments would insure that mortgage yields would be sensitive to general shifts in the level of interest rates, thus reducing the chance of the mortgage portfolio going to a significant discount.

To summarize, the VRM would be helpful to lenders and with ingenuity might not impose too great a burden on borrowers as compared with the standard mortgage. The dual-rate VRM appears to go furthest in mitigating the disadvantages to the borrower for a given gain to the lender by using a short-term debiting rate such as the deposit rate, while eliminating much of the inconvenience and risk placed on the borrower through large, sudden changes in the periodic payment.

However, the VRM in any form still fails to resolve and at least to some extent would worsen what we have called the demand effects of inflation, namely the capricious changes in initial level of payments due to inflation-swollen interest rates.

A quite different foreseeable shortcoming that might result from widespread adoption of the fixed maturity VRM is of a macroeconomic character. A change in the debiting rate would result in an increase of the periodic payments for millions of homeowners. If the reference rate is a market rate, a great deal of public pressure might be brought to bear for the central bank to hold down that rate when stabilization considerations would, on the contrary, call for higher rates (reflecting, e.g., inflationary expectations). This sort of pressure, which even now interferes with appropriate policy, would certainly be greatly magnified under the VRM. And if the VRM were the deposit rate, the same pressures would be directed toward holding that rate down in the face of rising market rates. This pressure, if successful, would, much like the imposition of ceilings, cause the intermediaries' deposits to lose attractiveness, and thus recreate the very supply effect that VRM was designed to solve. The recent experience of the United Kingdom provides an enlightening illustration of this scenario.

D. *The Graduated-Payment Mortgage (GP)*

Since a major impact of inflation on the homebuyer is the tilting of the time-stream of payments — one obvious solution to this problem is a mortgage which involves relatively lower money payments in early years. Clearly, unless such a mortgage is subsidized or of longer maturity, it must involve relatively higher money payments in later years in order to fully amortize the loan and provide the required return to the lender. Graduated-payment mortgages, with contractually rising payment streams, have been advocated in the United States and have been implemented in some other countries including the United Kingdom, where they are known as "low-start" mortgages, and Germany. The Federal Home Loan Bank Board moved part way in this direction when it authorized S&Ls to write mortgages with payments covering only interest for the first five years and amortizing the principal over the remaining term of the mortgages.

In a world with a steady rate of inflation, a graduated-payment mortgage with payments which increase over time at a rate equal to the rate of inflation would eliminate the tilt effect in terms of constant purchasing power dollars and restore the basic feature of the traditional mortgage in a noninflationary environment — level payments over the life of the mortgages. By and large, this would imply the same ratio of mortgage payments to household incomes and the same equity buildup (measured in real terms or simply as a ratio of the value of the property to the loan outstanding) as the traditional mortgage instrument, since wages and house values should, on average, also increase at the rate of inflation relative to their levels in the noninflationary environment.

One feature of the graduated-payment mortgage which might generate resistance on the part of both borrowers and lenders is that the outstanding principal in the early years of the contract would actually increase. For example, if the rate of inflation was 6 percent and the current

nominal interest rate 9 percent, reflecting an interest rate of 3 percent in dollars of constant purchasing power, a $20,000, 30-year graduated-payment mortgage with payments geared to rise at the rate of inflation would call for a payment of $1,020 in the first year.[8] The interest charge on the other hand would be $1,800. The "shortfall" of $780 would be added to the loan balance. The principal would continue to increase for several years, although the rising payments would eventually exceed interest charges and would fully amortize the principal by the end of the contract period.

While this situation raises some interesting tax questions, which are discussed by Holland, it should not be a cause for alarm on the part of either borrower or lender. The value of the house, and hence of the borrower's equity and the lender's collateral, can be expected to rise along with the loan buildup. In fact, if the rate of increase in the property value was exactly 6 percent greater than under noninflationary conditions, the borrower's equity position every time, measured by the ratio of outstanding debt to the value of property, would be identical to that in the zero inflation environment.

Any resistance, then, would be the result of a failure to take into account the changing value of the dollar due to inflation. This is not to say that this "money illusion" will not be present or hard to overcome; hopefully it should be possible to overcome it through information and education.

Unfortunately, the GP mortgage suffers from several serious shortcomings. First, with uncertainty about future rates of inflation, a contract calling for payments rising at the *expected* rate of inflation would be risky for both the borrower and lender. If inflation turned out to be less than anticipated, the borrower would face payments rising relative to income and a slimmer equity position. This, of course, would also increase lender risk. For this reason, the graduated payment mortgage with a rising schedule of payments set forth at the outset is generally viewed as appropriate only for young families with expectations of wage growth substantially in excess of the rate of inflation. While it is true that the risk is less for such families, this view confuses two issues — the need for a nonlevel payment in money terms simply to remove the distortions in the payment pattern of the traditional mortgage resulting from inflation and the need for a nonlevel payment in real terms, either rising or falling, to match a household's position in the life cycle.

Finally, a graduated-payment mortgage with a fixed interest rate over its entire life, being a long-term instrument, would do nothing to solve the supply problem stemming from thrift instituions' reliance on short-term deposits as a source of funds. In fact, it would exacerbate the problem since it would lengthen the duration of the mortgage, i.e., a larger balance

[8]This payment is equivalent to the payment required to amortize the loan with level payments at 3 percent, the difference between the debiting rate and the rate of graduation.

would be outstanding at each payment date than would be the case with a standard mortgage.

We must conclude that neither the VRM nor the GP is an attractive solution to the distortions in mortgage financing brought about by inflation and the accompanying high and uncertain interest rates. Each is a partial solution that benefits either the lender or the borrower, but at the expense of the other party. One mortgage design which, in the abstract at least, has the potential of satisfying these requirements is the price-level-adjusted mortgage (often referred to as a price-level-indexed or index-linked mortgage).

E. *The Price Level-Adjusted Mortgage (PLAM)*

The basic mechanics of the PLAM involve a contractual interest rate which abstracts from inflationary anticipations, and a periodic revaluation of the outstanding principal in accordance with the change in the price-level index to which it is tied. In effect, the debiting rate on the PLAM is a *real* rate of interest, differing from the current money rate by the exclusion of the inflation premium, which reflects the anticipated change in the price level over the period of the contract. Payments are recomputed whenever the principal is revised, using the contract rate as the payment factor. As a result, the PLAM payment stream changes exactly in line with the reference price level.

This is illustrated in Case C of Table 2, which also shows the mechanics of the calculations. The contract rate is taken as 3 percent, the rate assumed to hold in the absence of inflation premia, and this results in an initial payment of $1,020, as compared with $1,453 at the 6 percent rate for the standard mortgage at the market rate shown in Case A of the exhibit. This payment is subtracted from the sum of the beginning principal plus interest plus the revaluation of principal (the rate of inflation times the beginning principal). Thus, at the end of the period the borrower owed the amount shown in row 5, an amount greater than the beginning principal much as with a GPM.

When account is taken both of the 3 percent interest charged on the oustanding principal and of the 3 percent writeup of the debt to reflect inflation, the total return to the lender and cost to the borrower is 6 percent, the same as the nominal rate.[9] The low contract rate, however, makes it possible to hold the initial payment down. Moving to the second year, the revalued principal is used to compute the next year's payment at the 3 percent rate. Because the principal has been increased precisely by the rate of inflation the new payment based on it also increased at that

[9]More precisely the return is (1 + payment rate) x (1 + rate of change in reference price index) -1.

Table 2

EXAMPLES OF COMPUTATION OF ANNUAL MORTGAGE PAYMENTS UNDER STANDARD MORTGAGE AND THREE ALTERNATIVE TYPES

Year	1	2	3	4
Real Interest Rate	3%	3%	3%	3%
Rate of Inflation	3%	5%	5%	4%
Nominal interest rate[1]	6%	8%	8%	7%
Years to Maturity	30	29	28	27
A — STANDARD MORTGAGE				
1. Beginning Principal	20,000.00	19,747.00	19,478.82	19,194.55
2. Plus Interest (6%)	1,200.00	1,184.82	1,168.73	1,151.67
3. Less Annual Payment[2]	1,453.00	1,453.00	1,453.00	1,453.00
4. Ending Principal	19,747.00	19,478.82	19,194.55	18,893.22
5. Memo: Annual Payment in Constant Purchasing Power as of Beginning of Each Year[3]	1,453.00	1,410.68	1,342.89	1,279.53
B — VARIABLE-RATE MORTGAGE (VRM)				
1. Beginning Principal	20,000.00	19,747.00	19,557.06	19,351.93
2. Plus Interest (nominal rate)	1,200.00	1,579.76	1,564.57	1,354.64
3. Less Annual Payment[2]	1,453.00	1,769.70	1,769.70	1,614.45
4. Ending Principal	19,747.00	19,557.06	19,351.93	19,092.12
5. Memo: Annual Payment in Constant Purchasing Power as of Beginning of Year	1,453.00	1,718.16	1,636.34	1,421.70
C — PRICE-LEVEL-ADJUSTED MORTGAGE (PLAM)				
1. Beginning Principal	20,000.00	20,179.61	20,742.33	21,296.29
2. Plus Interest (3%)	600.00	605.39	622.27	638.89
3. Plus Revaluation of Principal for Inflation	600.00	1,008.98	1,037.12	851.85
4. Less Payment[2]	1,020.39	1,051.65	1,105.43	1,162.02
5. Ending Principal	20,179.61	20,742.33	21,296.29	21,625.01
6. Memo: Annual Payment in Constant Purchasing Power as of Beginning of Each Year[3]	1,020.39	1,021.02	1,021.65	1,023.29
D — CONSTANT-PAYMENT-FACTOR VARIABLE-RATE MORTGAGE				
1. Beginning Principal	20,000.00	20,179.61	20,742.33	21,296.29
2. Plus Interest (nominal rate)	1,200.00	1,614.38	1,659.39	1,490.74
3. Less Annual Payment[2]	1,020.39	1,051.65	1,105.43	1,162.02
4. Ending Principal	20,179.61	20,742.33	21,296.29	21,625.01
5. Memo: Annual Payment in Constant Purchasing Power as of Beginning of Each Year[3]	1,020.39	1,021.02	1,021.65	1,023.29

[1]For simplicity, we simply add the rate of inflation, q, and the real rate of interest, r, to obtain the nominal rate of interest, i. The precise rate is the product of the two — $i = (1 + r)(1 + q)-1$.

[2]The payment due at the end of each year is calculated at the beginning of the year by applying the appropriate payment factor, either a constant *or* the nominal rate of interest, to the principal outstanding at the beginning of the year. This is done in order to provide the borrower with adequate notice of a change in payments. In practice, such a "notification" lag would more likely be on the order of three months.

[3]Payments are expressed in terms of constant purchasing power at the time they are scheduled (and the borrower is notified). This is consistent with the need for a "notification lag," although the one-year interval is undoubtedly excessive. In the cases of the PLAM and the constant-payment-factor VRM, whose objective is to produce a stream of payments which is stable in terms of constant purchasing power, it might be more desirable to compute payments so that they would be stable in terms of purchasing power at the time of payment. This could be done by first restating the principal for inflation over the year, computing the payment which would amortize the resulting balance over the remaining life of the mortgage, adding the interest on the restated principal, and then subtracting the payment. In our example, this would result in a year one payment of $1,051.00 which is precisely $1,020.39 in terms of year-end purchasing power, $1,103.55 in the second, with the identical year-end constant purchasing power. The same result could be obtained simply by "inflating" the payment based on the original principal by the cumulative price-level change since the date of the contract. But this would mean that the exact payment could not be determined until the end of the period when the realized rate of inflation is known. Fortunately, our example exaggerates the severity of the problem since it is based on one-year intervals. Shorter periods, such as three months, would result in much smaller discrepancies. The choice between a longer notification lag or a more stable real payment depends upon whether households' incomes are more stable in money or in real terms over the short run. Although we clearly believe that the answer is in real terms over the long run, it very likely is the opposite in the short run.

rate. This of course means that the payment expressed in constant purchasing power, shown in row 6, remains at the initial level.[10] This result holds for all remaining years of the contract.

Advantages of PLAMs for Borrowers. PLAM has a number of advantages for borrowers. First and foremost, it completely eliminates the tilting effect of inflation on the stream of payments in purchasing power terms which results from the traditional mortgage (or the VRM); under PLAM the stream of payments is constant over the life of the contract and is, in fact, equal to the payment required by a traditional mortgage in the absence of inflation. In terms of the example of Table 1, the initial payment would be $1,020, whether the expected inflation be 0, 2, 4 or 8 percent. Second, a constant stream of payments in real terms, in contrast to one decreasing at a rate capriciously determined by the happen-chance of the rate of inflation, could be expected to suit the bulk of potential homeowners, particularly the younger households, whose real income is largely independent of the rate of inflation.[11]

A third important property of PLAM is that, by contractually establishing the total payment in terms of purchasing power, it eliminates the risk to borrowers associated with unanticipated variations in the price level. As pointed out earlier, though in the past these unanticipated variations have tended to benefit borrowers, this need not be the case in the future as interest rates have adjusted to reflect expectations more adequately. As shown by Cohn and Fischer, this property is again especially important in reducing uncertainty for those households who can expect their real income to be largely independent of the rate of inflation.

To summarize then, PLAM (in contrast to VRM or GP) does appear to offer a more complete solution to the range of problems which we have labeled the demand effects of inflation. It does so through a contract which, in effect, produces the same real consequences for the borrower (and the lender) as would the traditional mortgage in the absence of inflation — and does so no matter what the rate of inflation either anticipated or realized.

Feasibility of PLAMs. Some form of PLAM has actually been adopted in several countries, most notably Brazil, but also Israel, Finland, Colombia, and Chile. Experience with PLAMs appears to have been extremely successful in a few cases, though they have been abandoned in

[10]The payments in the example are constant in purchasing power as of the time when they are scheduled, *i.e.*, at the beginning of the year. As noted in footnote 1 of Table 2, payment could be scheduled so as to be constant in terms of purchasing power at the time of payment. However, this would not provide the borrower with any prior notice regarding the exact money amount of his payment. The problem is exaggerated in our example since there is a one-year interval between the scheduling date and the date when the payment is due.

[11]Actually, as noted earlier, for many households, real income may be expected to have a rising trend over time, and to this extent, even under PLAM the ratio of periodic payments to income would tend to decline over time. In principle, this variation too could be reduced by combining the PLAM with the GP mechanism.

others (but the reviews of country experience included in this volume suggest that this occurred for reasons largely unrelated to the basic mortgage instrument itself.)

Unfortunately, as a practical short-run solution to the U.S. problems, the novelty of the PLAM is a drawback. Borrowers and lenders are used to contracting in money terms with nominal rather than "real" rates and to payments fixed in nominal terms. Rates of inflation have not been so high and persistent in the United States as to make people fully aware of the pitfalls of money illusion. Thus fixing the payments in real terms with the actual payment depending on inflation may be regarded by many as increasing rather than decreasing risk. This hurdle could be surmounted as it has been in other countries, but it might require an education effort. To the extent that consumers are acquainted with wage escalators and other such price-level-indexed contracts, this task will be made somewhat easier.

There is, however, one further, and in the short run, more serious difficulty. Reaping the full benefits from PLAM would require substantial changes in the type of liabilities issued by financial intermediaries — as well as possibly some changes in existing laws. Specifically, if thrift institutions are to be encouraged to offer PLAMs, they should be enabled to hedge this asset by a price-level-adjusted deposit — or PLAD — that is, a deposit whose principal would be revalued periodically on the basis of the reference price index, and which accordingly would pay a real rate.

In our view, the addition of PLADs to the menu of presently existing assets would be highly desirable in the presence of substantial and uncertain inflation, as it would make it possible for savers to hedge against the risk of price level changes. Such an opportunity is not presently available, especially where *small* savers are concerned.

One further advantage of empowering thrift institutions to offer PLADs is that it would go a long way toward also solving the supply problem — assuming of course that supervisory authority would refrain from placing ceilings on PLAD rates. Indeed, there are sound reasons for supposing that PLADs could effectively compete with other instruments even in periods of high interest rates. The U.S. experience suggests that much of the variation in interest rates, especially longer-term ones, can be traced to variations in actual and anticipated inflation. Thus keeping PLADs competitive with other assets would not require appreciable changes in the rate offered depositors, even in the face of large changes in market rates.[12]

Unfortunately, the straightforward solution involving PLAMs hedged by PLADs, despite its great attractiveness in principle, is likely to face serious obstacles and resistance, at least in the near future. First, as already

[12]Cohn and Fischer point out that thrift institutions could even finance PLAMs with short-term PLADS or with ordinary deposits with a risk substantially smaller than they presently incur in financing the traditional mortgage with short-term deposits.

indicated, this solution would require substantial changes in the thinking of both borrowers and lenders, as well as substantial changes in regulations affecting thrift institutions. Second, authoritative financial circles have frequently expressed strong opposition to the introduction of price-level-adjusted deposits for fear that this would disrupt the market for other instruments and/or force widespread adoption of price-level-adjusted securities. They further argue — though wrongly in our view — that any reform that would reduce the pains of inflation should be opposed, as it would sap the will to fight inflation. Finally, the adoption of PLAMs and PLADs might well require some changes or reinterpretation of the tax laws. Thus, for a PLAM borrower, the revaluation of principal would have to be treated, for income tax purposes, as a deductible expense on a par with interest if he is not to be at a disadvantage vis-à-vis a borrower relying on the standard mortgage; and if this treatment were accorded to him, then the revaluation of principal of a PLAD would have to be treated as ordinary income to avoid a special advantage to this asset and minimize disruption of capital markets, as well as avoid a net loss of revenue to the Treasury. These issues and related ones are reviewed in the Holland paper.

For all of these reasons, we believe that a more promising solution to the problem may be found in the adoption of a somewhat different instrument which we label the "constant-payment-factor VRM." This instrument, described in the next section, combines most of the advantages of the PLAM-PLAD approach, while requiring a minimum of institutional changes.

F. *The Constant-Payment-Factor Variable-Rate Mortgage*

This instrument may be thought of as a variant of the dual-rate VRM outlined in Section IV.C, or also as a hybrid of the variable-rate and the graduated-payment mortgage.[13] Just like the dual-rate mortgage, the constant-payment-factor VRM makes use of two separate rates: a debiting factor which is charged on the outstanding balance and a payment factor which is used to recompute the periodic payment at regular intervals by applying to the balance still outstanding the standard annuity formula. As in all VRMs, the debiting rate varies in accordance with an appropriate reference rate reflecting market conditions. There is some room about the choice of this reference rate, but ideally it should be chosen with reference to the frequency with which the rate is adjusted and to the term of the instrument with which the mortgage is financed. The basic difference with

[13]Donald Tucker [1975] advocates a graduated-payment VRM with either a fixed schedule of graduation or a schedule which varies with changes in the reference interest rate. Cohn and Fischer show that the latter version, which calls for recomputing the entire stream of payments whenever the reference rate changes, is identical to the constant-payment-factor VRM.

respect to the dual-rate VRM, and also the essential ingredient of the instrument, is in the choice of the payment factors. This factor would be chosen to *approximate the "real" rate and would be kept fixed for the duration of the contract.* To the extent that the real rate is reasonably stable, or equivalently that the debiting rate less the rate of inflation does not deviate widely or systematically from the payment factor, as past evidence suggests, the payments on a constant-payment-factor VRM will approximate those of a PLAM. The initial payment, being based on the real rate, will be the same as under PLAM — a "low-start" payment which regardless of the actual rate of inflation is equal to what it would be in the absence of inflation. The behavior of the periodic payment in subsequent years will depend upon the difference between the payment factor and the debiting rate. If there is inflation, the debiting rate will exceed the payment factor. Therefore, principal will not be amortized at the rate implied by the annuity formula and under highly inflationary conditions it would actually rise. Thus, when the payment is recomputed, it will rise, even though the payment factor remains unchanged. *In fact, if the debiting rate exceeds the real rate by a differential roughly equal to the rate of inflation, then the periodic payment will also rise roughly at the rate of inflation.*

This conclusion is illustrated by a specific example in Part D of Table 2. In the first year the payment is $1,020.39, the annual amount required to amortize the $20,000 balance over 30 years with a 3 percent interest rate. (Note that it is the same as the initial PLAM payment, also computed at the 3 percent rate.) This $1,020.39, however, falls short of the actual interest charge of $1,200 at the 6 percent debiting rate. Hence, the "shortfall" or $179.61 is added to the principal (the amortization is negative). In the second year, a new payment of $1,051.65 is computed by applying the 3 percent annuity factor for 29 years to the $20,179.61. Note that the payment is 3.06 percent greater than the payment in year 1, approximately the rate of inflation.[14] [15]

Differences from the PLAM. The debiting rate could not be expected to equal the rate used as payment factor plus the rate of inflation in every

[14]It would have been exactly the same if we had used the precise nominal rate rather than the simple sum of the real rate and the rate of inflation.

[15]In order to be consistent with the PLAM illustration, the payments are computed so as to be constant in terms of purchasing power at the time they are scheduled (the beginning of the year in our example). In the case of the PLAM this was necessary if the borrower required one-period advance notice of the exact money payment. With the constant-payment-factor VRM, however, payments could be set to be roughly constant in purchasing power terms at the time of payment since the interest rates, which implicitly forecast inflation, are known at the start of the period. Payments would vary only in that debiting rates did not properly forecast inflation. The minor increases over time in the payment stated in terms of purchasing power result from the fact that the compounding of interest and inflation is ignored in the example and thus payments rise to adjust for the minor discrepancy.

year, though one would expect this relation to hold approximately, and on the average, as long as the payment rate had been chosen judiciously. If, in fact, the debiting rate for a given year differs from the constant payment factor plus the inflation that actually materialized in that year, the annual payment in successive years will differ from that under PLAM — and hence will not quite be constant in terms of purchasing power — but the differences will tend to be small.[16] Furthermore, such differences would not produce serious consequences since the effective cost to the borrower would be unaffected. The interest rate paid on the balance is the same, namely the debiting rate. The choice of the payment rate affects only the path of periodic payment and hence the path of repayment of principal. If the rate chosen is too low, the repayments are more gradual than expected, being initially lower and eventually high — and conversely, if too high. The evidence for the United States cited earlier, indicating a reasonably stable real interest rate over the postwar period, suggests that it should not be difficult to select a payment factor such that the resulting stream of payments will be approximately level in real terms.

The conclusion that moderate "errors" in the choice of the payment factor would not produce serious consequences for either the lender or the borrower, when combined with the evidence that the real rate is quite stable, has one implication of considerable practical importance: an institution that chose to offer a constant-payment-factor VRM could afford to post a payment rate that changed at very infrequent intervals if at all. The convenience of such an arrangement should be obvious.

If the lender were anxious to avoid the risk of too slow a rate of repayment and/or the borrower were anxious to avoid the risk of his payment stream rising in time, one could readily reduce the risk to any desired extent by choosing for the payment rate an upward-biased estimate of the real rate. This would of course imply a higher initial payment, and, on the average a correspondingly declining real payment stream.[17] Further, this option would be greatly preferable to the traditional mortgage in which both the initial payment and the anticipated rate of decline are determined by the happen-chance of inflationary expectations.

Flexibility of the Constant-Payment-Factor VRM. One further feature of the constant-payment-factor VRM should be noted. By intentionally setting the payment rate different from the estimated real rate,

[16]To a very good approximation, a 1 percent deviation of the debiting rate from the sum of the payment rate plus the rate of inflation will result in the annual payment rising by 1 percent relative to the PLAM payment.

[17]Tucker [1975] advocates this approach as a means to gain acceptance of this type of mortgage.

one can approximate any desired rate of graduation in real terms. Setting the payment rate at x percent above or below the real rate would result in a real payment stream with a declining or rising trend of x percent per year.[18]

Further flexibility is to be obtained through appropriate choice of the debiting rate. If intermediaries issued term deposits of substantial length, say three to five years, then they could afford to offer a borrower anxious to minimize changes in the debiting rate, a contract in which the debiting rate would itself be fixed for that length of time. If that length were say five years, then over that period the contract would behave precisely like a GP mortgage in nominal terms, with the annual payment rising over the term of the debiting rate at a predetermined rate equal to the difference between the fixed payment rate and the fixed debiting rate. Of course while this arrangement would eliminate uncertainty about money payment, it would correspondingly enhance uncertainty about real payments; yet for reasonably short periods of time, the uncertainty of inflation may be fairly limited and households may be more able to estimate their money income over such a span. In such circumstances the use of a medium-term fixed debiting rate may serve to reduce risk.

It is apparent that with such arrangements, thrift institutions could themselves offer an array of short-term and longer-term deposits, matching their asset maturity structure, and could always afford to pay rates competitive with the market, as these would be the rates they would in turn earn on their assets. The scheme is thus fully consistent with the intermediaries performing the function for which they were designed, while eliminating the supply effects of inflation.[19]

To summarize, the constant-payment-factor VRM relies on two basic ingredients: a payment factor related to the "real" rate and hence independent of the rate of inflation, and a variable-debiting rate tied to an appropriate market rate, with maturity related to the frequency of rate revisions. By combining these ingredients in different ways one can readily put together a wide variety of specific contracts capable of suiting the needs and preferences of both borrowers and lenders, providing thereby a solution to many of the present problems of housing and of the thrift institutions. The instrument achieves this result because it combines the desirable features of a VRM from the point of view of the lending

[18]As noted earlier the same result could be achieved with a PLAM.

[19]A variant of this instrument considered in the Cohn-Fischer paper involves a periodic payment which is fixed at the outset in terms of purchasing power and thus a variable maturity. Because large sustained discrepancies between the rate of inflation and the inflation premium reflected in the debiting rate are unlikely, this variable-maturity instrument does not suffer from the difficulty which was outlined in connection with variable-maturity VRM in Section III.B.

intermediaries with the main positive aspects of the PLAM from the point of view of the borrowers.[20]

These considerations lead us to conclude that while the PLAM is in some ways the most straightforward, rational solution of the problem in an abstract sense, the constant-payment-factor VRM provides an alternative which is not significantly inferior in any sense and is superior in many respects, particularly in terms of its ease of implementation in the light of existing institutions and attitudes.

IV. TRANSITION PROBLEMS

The adoption of either the PLAM or the constant-payment-factor VRM (or any other VRM for that matter) would allow lenders to better match asset and liability maturities, thus reducing the periodic profit squeezes and related problems that have contributed to interruptions in mortgage supply. However, supply difficulties will be resolved fully only if deposit rates paid by institutions are competitive, i.e., sufficiently high to attract the deposits needed to satisfy mortgage demand at the deposit rate plus an equilibrium spread without resorting to outright rationing or to indirect rationing devices such as very high downpayments and excessively strict lending standards. If rate ceilings continue, or if rates are repressed in any other fashion, fluctuations in supply will continue although thrift institutions might no longer bear much of the brunt.

A major obstacle to competitive deposit rates is that most thrift institutions still have large proportions of their assets tied up in low-yielding fixed-interest rate mortgages. Therefore, an immediate shift to fully competitive — and presumably on the average higher — deposit rates, would worsen their profit position and would threaten the solvency of many of them. It is for this reason that we have seen a number of proposals, such as tax exemptions for interest paid on thrift institution deposits, which would increase their ability to compete for funds without threatening their profitability or their solvency.

[20]There are some differences between the constant-payment-factor VRM and the PLAM which should be recognized, and which depend in part on the specific form of the constant-payment contract. If the borrower opts for a short-term debiting rate, he ends up by paying over the life of his contract a real rate equal to the average rate which actually materializes over that life. That rate is of course uncertain and need not coincide with the payment factor. By contrast, under a PLAM the real rate *is* the payment factor and is thus fixed and known in advance. Furthermore, under PLAM the periodic payments, are by construction, constant in terms of purchasing power (as measured by the reference price index) whereas with the alternative instrument they would exhibit at least some fluctuations because of fluctuations in the realized real rate. Accordingly, the PLAM might be a somewhat preferable instrument for the majority of borrowers in that it would enable them to hedge against future movements of the real rate. The alternative contract would be superior only for those who had reason to expect a positive association between their real income and the real rate. While this disadvantage relative to PLAM should be acknowledged, we do not believe that it is a major one.

Such proposals — as well as attempts to protect thrifts by maintaining deposit rate ceilings even if alternative mortgages are adopted — create distortions in current financial transactions in order to avoid the consequences of past errors. Further, they would very likely be planting the seeds for future supply crises if conditions changed. A superior approach would be to deal directly and separately with the problems arising from past practices and allow current transactions to take place on a sound basis. It seems clear to us, at least, that the entire burden of this adjustment should not be imposed on the thrift institutions. While part of the current problem no doubt can be blamed on their shortsightedness, it is quite clear that it resulted primarily from behavior patterns forced on them by government regulation as well as major changes in the economic environment over which they had no control.

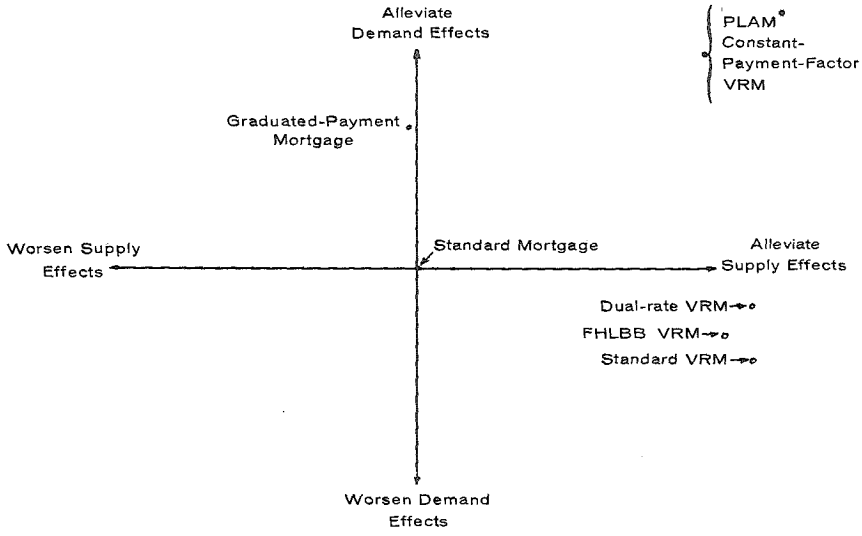
It would seem that to achieve a rapid phasing-out of rate ceilings would require not only the adoption of new types of mortgages along the lines presented in section IV but also some form of one-time government transfers to compensate institutions for the losses they would incur in the short run and thus maintain their solvency. While such a subsidy program might appear to be expensive, its cost would probably be modest when measured against that of wild gyrations in construction and the fact that an increasing proportion of Americans cannot acquire adequate housing.[21]

Clearly, there are many issues which will have to be dealt with in the transition to new mortgage lending patterns. The new instruments would have to be described in terms intelligible to consumers so that they can make appropriate choices. In particular, since they would presumably face a variety of choices, they would have to give careful attention to the benefits and costs of alternative features including prepayment provisions, the level of initial payments and the potential variability of payments. In a similar vein, lenders would have to rethink credit standards, downpayments, and desirable real payment patterns for different types of households. Since thrift institutions would face a situation in which cash inflows might fall short of accounting income, especially during early years of the transition, changes would be required in liquidity planning and might require further recourse to advances or secondary market operations. Along similar lines, regulatory authorities would undoubtedly have to rethink reserve and liquidity requirements for thrift institutions in response to different asset characteristics. Details of mortgage design, including the choice of appropriate reference rates for VRMs or price indices for PLAMs, adjustment intervals, and so on would have to be worked out.

[21]Such a subsidy would have a more favorable impact on the distribution of income than tax exemptions on thrift deposits. It would benefit all depositors proportionately rather than providing the greatest benefits to those in the highest income brackets.

Figure 3

CLASSIFICATION OF MORTGAGE DESIGNS BY EXTENT TO WHICH THEY ELIMINATE



* If price-level adjusted deposits are issued.

Inasmuch as these transition issues were not part of the study, we do not pretend to present a concrete set of recommendations. However, it is clear that they must be dealt with in relation to any potential changes in patterns of mortgage lending.

V. CONCLUSIONS AND RECOMMENDATIONS

The analyses summarized in this introduction and detailed in the following five papers support the conclusion that the standard mortgage has been a major contributor to the problems which have plagued housing during the recent inflationary period. Further, they provide the basis for the hopeful conclusion that innovations in mortgage financing could substantially alleviate these problems, eliminating the need for further resort to housing subsidies or to greater direct government intervention.[22]

Alternative mortgage designs were analyzed along two dimensions: 1) the extent to which they resolve the demand problem by eliminating inflation-related distortions in the time pattern of real payments and 2) the extent to which they resolve the supply problem by allowing closer asset-liability matching. The position of the various instruments along these dimensions is shown in Figure 3. Of all the mortgage innnovations studied, only the price-level-adjusted mortgages and the class of variable-rate mortgages with smoothed real payment streams (of which the constant-payment-factor VRM appears to be best) rate well on both dimensions.

Based on these analyses, we offer four recommendations which should be considered as a package. These are:

1. Price-level-adjusted mortgages and/or variable-rate mortgages with constant-payment factors should be offered to the public. Federal and state regulations, as well as institutional practices, should be changed where necessary to allow for these instruments.
2. Thrift institutions should maintain a much closer balance between asset and liability maturities by both shortening effective asset maturities through PLAMs or VRMs (hopefully with constant-payment factors), and lengthening liability maturities through more extensive use of term deposits and mortgage bonds.
3. Regulation Q ceilings should be abandoned as quickly as possible in order to restore the allocative mechanism of financial markets and reduce fluctuations in the supply of funds through traditional mortgage lenders.

[22]We refer here to general mortgage subsidies which are likely to benefit largely those groups that are able to borrow most as opposed to subsidies or other mechanisms targeted at income groups which could not afford adequate housing even with appropriate innovations in mortgage financing. We wish to stress that subsidies should not be wasted in correcting problems which can be dealt with more efficiently and at lower cost through financial innovation.

4. Some form of once and for all subsidy (or other form of public intervention) should be granted to thrift institutions which will erase past mistakes and will not penalize housing and depositors of these institutions for past errors of financial policy.

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Alternative Mortgage Designs

Richard A. Cohn and Stanley Fischer*

I. INTRODUCTION[1]

This paper examines a number of potential innovations in the design of the residential mortgage instrument from the respective standpoints of both parties to the contract, household borrowers and institutional lenders.

The mortgage instrument is a debt contract that can be fully described by a surprisingly small number of parameters that determine the interest rate, the time shape of the payment stream, and the maturity. In view of the wide variety of feasible designs, it is perhaps strange that essentially only one of these designs flourishes in the United States today, namely, the level-payment, fully amortized mortgage, which we shall refer to in this paper as the "standard mortgage" contract.

The reasons for the failure of the standard mortgage to serve the needs of both borrowers and lenders have been discussed by Professors Modigliani and Lessard in their introductory paper[2] and therefore need not be pursued at length here. Suffice it to say that the standard mortgage does not perform well in an inflationary environment, nor was it designed to do so.

The plan of the paper is as follows. Section II presents and discusses the criteria that were employed in evaluating the various mortgage instruments that were studied. Section III provides an analysis of five nonstandard mortgage designs, employing the standard mortgage as a basis for comparison. Section IV seeks to respond to potential consumerist objections to the mortgage design innovations discussed in Section III. Some concluding remarks follow. Formulas for determining nominal and real payments and outstanding debt for each of the various instrument designs appear in the Appendix.

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[1]This paper is both a summary and an extension of the authors' analysis presented at the January Conference. The discussants' comments which follow are addressed to the original paper.

[2]"Inflation and The Housing Market: Problems and Potential Solutions," this volume.

II. CRITERIA FOR EVALUATING MORTGAGE INSTRUMENT DESIGN

In this section we discuss the mortgage instrument with four sets of considerations in mind. First, we briefly consider the impact of new designs on housing construction. Second, we assess the contract designs from the standpoint of household borrowers. Third, we analyze the potential effects of new instruments on thrift institutions, which are currently the predominant lenders in the single-family residential mortgage market. Fourth, we briefly discuss the appeal of a number of new mortgage designs for institutional investors, such as life insurance companies and corporate pension funds, that are no longer active or have never been active in the single-family residential mortgage market. In the remainder of this section, we present and explore a number of criteria for analyzing and evaluating proposed new designs that arise from consideration of these four considerations.

A. *Housing Construction*

The standard mortgage instrument has contributed to the cyclical instability of housing construction in the United States largely through its effects on the supply of mortgage funds. But the standard instrument has also made the demand for housing sensitive to the expected rate of inflation because changes in the expected rate of inflation are reflected in nominal interest rates and consequently in mortgage payments.

Deposit rate ceilings, which do not allow thrift institutions to pay competitive rates when they are binding, cause disintermediation at times of cyclically high short-term interest rates.[3] Consequently, mortgage credit is rationed at times of high short-term rates[4] and fluctuations in the supply of mortgages are typically more responsible for cyclical instability in construction than are changes in the demand for mortgages. The ceilings must be removed and lending institutions must be allowed to match the effective maturities of their assets and liabilities for them to be able to compete for deposits at all times and thereby avoid rationing credit.

The demand for mortgages is also, however, a function of nominal interest rates. A rise in nominal interest rates, even if only a reflection of a change in the anticipated rate of inflation, causes an increase in the real value of the initial payments. For reasons made clear by Modigliani and Lessard, the current mortgage instrument accordingly makes construction activity sensitive to changes in the expected rate of inflation. From the

[3]The intermediaries do not oppose these ceilings because they are locked into long-term assets — standard mortgage instruments — yielding lower returns because the bulk of the loans were made in periods of lower interest rates.

[4]Dwight M. Jaffee, "An Econometric Study of the Mortgage Market," in Gramlich and Jaffee (eds.), *Savings Deposits, Mortgages and Housing,* (Lexington, Mass.: Lexington Books, 1972).

viewpoint of stabilizing the demand for housing, a real annual payment per unit of housing that is independent of the expected rate of inflation is desirable.[5]

B. *Borrowers*

We distinguish four desirable characteristics of the mortgage instrument from the viewpoint of the household. First, it is desirable that the annual payment in real terms per unit of housing be independent of inflation. When interest rates rise in response to inflation, housing demand is adversely affected because some people cannot afford the housing they could acquire if there were no inflation. As Modigliani and Lessard emphasize, the increasing difficulties of financing the purchase of a house with the standard mortgage instrument as interest rates rise result from capital market imperfections which make it impossible for the household to borrow in such a way as to choose its most desired path of real payments over time.

Our second desirable characteristic is that the borrower be able to choose a particular payment-to-income ratio that can vary as desired over the life of the mortgage. This second characteristic is accordingly closely related to the first. For example, a young household might want this ratio to decline over the life of the mortgage because of anticipations of increasing childbearing and educational expenses. Other borrowers might desire a stable ratio of payment to income.

A third characteristic desirable for the borrower would be a low level of uncertainty about the real cost of the mortgage. The real cost in terms of a rate of interest can be thought of as the nominal rate of interest for the period in question less the actual rate of change in the price level for the period. This difference represents the rate of return measured in terms of constant purchasing power that the borrower has been obligated to pay the lender for the use of his funds.

Perhaps a more intuitively appealing notion of this risk involves the ratio of nominal mortgage interest, less any decrease in the value of the mortgage as a result of inflation, to borrower income. The ratio represents the proportion of the borrower's income that is owed for the use of borrowed funds. Furthermore, because both the numerator, which can be thought of as the net nominal interest obligation, and the denominator of this ratio are measured in current dollars, there is no need to distinguish between nominal and real concepts.

These two notions are closely related, however. Money incomes reflect inflation over reasonably long periods. Consequently, low uncertainty about the "real" rate of interest corresponds in large measure to low uncertainty about the ratio of the net nominal interest obligation to household money income.

[5]This is not the place to discuss the desirability of totally stabilizing construction activity; it is clear, though, that current fluctuations in construction are excessive.

A fourth characteristic which we regard as desirable in a mortgage is concerned with the ability of householders to budget their mortgage payments over the near-term future. A desirable mortgage would be one in which there was little short-run deviation from trend in the ratio of payment to income. The trend in the ratio could, of course, be either up or down.

On the basis of these four considerations for evaluating mortgages from the standpoint of the borrowing household, we argue that the principal criterion by which to judge alternative designs is the stability of the payment-to-income ratio. Our analysis emphasizes both long-run and short-run variability in this ratio. Long-run variability can be thought of in terms of trends in the ratio that differ from the trend desired by the borrower. Given the prevailing short-run stability of household incomes, short-run variability in the ratio can be thought of as payment-to-payment variability in the payment-to-income ratio.

C. *Thrift Institutions*

In [3] we present a model of a perfectly competitive financial intermediary which assumes that it would suffer real costs in the event of insolvency. Such a model is obviously simplistic, but it does contain two valuable features. First, we can discuss lender behavior in the context of a firm that seeks to maximize its market value without having to refer to an institutional utility or preference function to explain its behavior. And second, we capture neatly the asset-liability maturity hedging behavior that is characteristic of financial intermediaries. Indeed, the results of this model indicate that a value-maximizing intermediary in the context of this model will act as though it were seeking to minimize the variance of the real rate of return on equity. It will attempt to hedge interest rate risk perfectly by matching the maturity characteristics of its assets and liabilities.[6]

What is important to stress in evaluating alternative mortgage designs, however, is that they cannot be judged independently of the nature of the deposit liabilities which lenders employ to finance their residential mortgage asset portfolios. For an institutional lender to remain viable under changing market conditions, there must be a close relation between the interest it earns on its assets and the interest it pays on its deposits. Otherwise it is looking for trouble.

Thrift institutions have been encouraged to issue short-term deposits. They realize that it is risky to finance a portfolio consisting largely of standard mortgages with such deposits. While they would like to hedge,[7] they have been prevented by regulation from doing so.

[6]While perfect hedging by lending institutions may not be possible in the mortgage market, the significant result of the model is its emphasis on the importance of hedging for financial institutions.

[7]Efforts by thrift institutions to implement variable-rate mortgages are one indication of this desire.

It is virtually impossible to analyze proposed innovations in mortgage design from the standpoint of depository lending institutions without separately examining two different scenarios. In the first, we investigate the present liability structure. In the second, we allow for changes in the liability structure, in particular, the issuance of price-level-adjusted deposits. It must be emphasized here, however, that any viable improvement in mortgage design, and indeed the continued existence of the standard contract requires that deposit interest rate ceilings be eliminated. Otherwise imbalances will continue to result to the detriment of the lenders.

1) *Continuation of Present Liability Structure.* At the present time thrift institutions, both savings and loan associations and mutual savings banks, can be usefully characterized in terms of their liability portfolios as issuers of dollar-denominated deposit liabilities that are short term or intermediate term. Indeed, they serve the dual social function of both financing housing and providing households with liquid assets.

If the predominance of this liability structure is to continue, then a desirable characteristic of a mortgage design from the standpoint of an institutional lender would be the ability to provide a short-term rate of return. Such an instrument would be equivalent to a rollover series of short-term instruments in terms of interest yield. Because such an instrument yields a current interest rate at any point in time, it will tend to sell at par, independent of the current or anticipated rate of inflation. Such a design would avoid the well-known "lock-in" effect that leads institutional investors to want to avoid realizing losses by selling assets at significant discounts from par value. Such a design would allow thrift institutions to bid successfully for funds independent of the rate of interest or inflation, thereby contributing to the stability of housing.

A further desirable characteristic of a mortgage instrument from the lender viewpoint would be a low level of default risk and one that is independent of inflation. One risk of inflation is that it will not be so high as had been anticipated. Consequently, the actual burden of payments called for in a dollar-denominated contract could be higher than the borrower and lender had expected at the time the mortgage was negotiated.

2) *Allowing for Innovation in Liability Structure.* One of the mortgage designs analyzed below in Section III is a price-level-adjusted mortgage, a design which specifies a constant real rate of interest. Such an instrument would be a desirable asset holding for an institutional lender interested in issuing price-level-adjusted deposits, for it would hedge his risk on the liability side. In a period of historically high and variable rates of inflation, many savers might be interested in holding such deposits. These new liabilities could therefore provide an additional source of stability for the housing market.

Another potential innovation is the issuance of long-term fixed-rate nominal deposits. Standard mortgages, for example, would be better financed in the maturity matching sense by such deposits than they are

under the current system. There have been some recent innovations in this direction in the sale of six- or seven-year nominal deposits by the savings institutions.

D. *Attraction of Other Intermediaries to Residential Finance*

Price-level-adjusted mortgages could well prove to be a desirable holding for institutional lenders other than thrift institutions. They could be attractive assets for any intermediary that wishes to issue price-level-adjusted liabilities or has already issued such liabilities. Life insurance companies might want to issue price-level-adjusted insurance policies so as to provide constant-purchasing-power death claims for their clients. Price-level-adjusted mortgages could support the issuance of such policies.

Another potential major supplier of funds for price-level-adjusted mortgages is corporate pension funds. Many corporations have promised pensions to employees that represent something of an inflation hedge by being tied to nominal wage and salary levels. At the present time there is no obvious inflation-hedged asset available to ease the asset-liability portfolio management problems of pension funds. Price-level-adjusted mortgages could well meet their needs in this regard.

E. *Summary of Criteria*

Our analytical approach has been conceived with the stability of housing construction and with household borrowers, thrift institutions, and other intermediaries in mind. These four sets of considerations have led us to evaluate alternative mortgage designs in terms of the following desired criteria:

1) Independence of the annual payment per dollar of housing from the rate of inflation.
2) Ability of borrower to choose a ratio of payment to income over the life of the mortgage that is independent of the anticipated rate of inflation.
3) Low uncertainty with respect to the real rate of interest or with respect to the ratio of interest to income.
4) Low short-term variability in the ratio of payment to income.
5) Ability of lenders to hedge on the liability side.
6) Low default risk independent of inflation.[8]

Specific designs are analyzed with respect to these criteria in Section III.

[8]Item 6 has not been discussed above but is of obvious relevance.

III. ANALYSIS OF ALTERNATIVE DESIGNS

A. *Introduction*

Our study considered a wide variety of mortgage designs. We discuss six representative designs in this section. These six designs can be regarded as falling into three major classifications. First, under the heading of mortgages with fixed nominal interest rates, we examine both standard and graduated-payment mortgages. Second, we analyze two types of variable-rate mortgages (VRMs), what we term the "standard" VRM and a dual interest rate variety. Third, we examine two designs that attempt to smooth the real stream of mortgage payments over the life of the mortgage, both a price-level-adjusted mortgage (PLAM) and a design which we refer to as the constant-payment-factor variable-rate mortgage.

Interest rates are used to compute both mortgage payments and mortgage interest. It is not necessary that payments and interest be computed by employing a single rate. One rate may be used to calculate the mortgage payment and yet another rate employed to calculate the borrower's interest obligation. For convenience in describing the six mortgage designs, we shall refer to the interest rate used to compute the payment as the "payment factor" and to the rate used for computing interest as the "debiting factor" or "debiting rate."

We shall analyze each design in turn. Each will be described and then evaluated from the standpoint of both borrowing households and institutional lenders.

The analysis is illustrated and supported by reference to historical simulations of the various designs. Tables 1-6 present for each of the six designs a simulation of a 20-year $30,000 mortgage negotiated at the beginning of 1951. Table 7 attempts to capture recent experience by presenting, for each of the six designs, a simulation of the first four years of a 20-year $30,000 mortgage taken out at the beginning of 1971. These latter simulations show the impact of generally higher rates of inflation and larger changes in interest rates on the various designs in the early years when these factors have the greatest effect.

Table 8 summarizes this section. It presents a schematization of each of the six designs and a summary evaluation. As mentioned previously, formulas describing the contracts can be found in the Appendix.

B. *Fixed Nominal Interest Rate Mortgages*

1) *The Standard Mortgage.* This design should be viewed as the benchmark for our analysis. This type of mortgage uses the same interest rate as both payment factor and debiting factor. This rate is a long-term, nominal interest rate, and it does not change over the life of the mortgage. This design consequently is characterized by payments that are constant in nominal terms.[9]

[9]The analysis of this paper ignores the effect of the tax deductibility of interest on actual payments. This effect is discussed by Professor Holland in his contribution to this volume.

Table 1

STANDARD MORTGAGE

(Payment and Debiting Factor — 3.50%)

Year	Principal at Start of Period	Payment at End of Period	Payment Breakdown		Payment in 1951 Dollars (beginning of year)
			Interest	Principal	
1951	$30,000.00	$2,110.86	$1,050.00	$1,060.86	$1,956.13
1952	28,939.14	2,110.86	1,012.87	1,097.99	1,914.34
1953	27,841.15	2,110.86	974.45	1,136.43	1,900.19
1954	26,704.72	2,110.86	934.69	1,176.17	1,890.70
1955	25,528.55	2,110.86	893.51	1,217.35	1,897.66
1956	24,311.20	2,110.86	850.88	1,259.98	1,870.01
1957	23,051.22	2,110.86	806.79	1,304.07	1,805.63
1958	21,747.15	2,110.86	761.15	1,349.71	1,757.50
1959	20,397.44	2,110.86	713.92	1,396.94	1,743.57
1960	19,000.50	2,110.86	665.02	1,445.84	1,715.92
1961	17,554.66	2,110.86	614.41	1,496.45	1,698.82
1962	16,058.21	2,110.86	562.04	1,548.82	1,680.03
1963	14,509.39	2,110.86	507.84	1,603.02	1,659.77
1964	12,906.37	2,110.86	451.72	1,659.14	1,638.45
1965	11,247.23	2,110.86	393.66	1,717.20	1,610.80
1966	9,530.03	2,110.86	333.55	1,777.31	1,564.84
1967	7,752.72	2,110.86	271.35	1,839.51	1,522.14
1968	5,913.21	2,110.86	206.95	1,903.91	1,460.72
1969	4,009.32	2,110.86	140.33	1,970.53	1,386.62
1970	2,038.79	2,110.86	72.07	2,038.79	1,308.73

Table 2

GRADUATED-PAYMENT MORTGAGE

(Payment and Debiting Factor — 3.50%)
(Payment Rise at 5% a Year)

Year	Principal at Start of Period	Payment at End of Period	Payment Breakdown		Payment in 1951 Dollars (beginning of year)
			Interest	Principal	
1951	$30,000.00	$1,349.50	$1,050.00	$ 299.50	$1,250.58
1952	29,700.50	1,416.98	1,039.52	377.46	1,285.06
1953	29,323.04	1,487.82	1,026.31	461.51	1,339.34
1954	28,861.53	1,562.21	1,010.15	552.06	1,399.27
1955	28,309.47	1,640.33	990.83	649.50	1,474.66
1956	27,659.97	1,722.34	968.10	754.24	1,525.82
1957	26,905.73	1,808.46	941.70	866.76	1,546.96
1958	26,038.97	1,898.88	911.36	987.52	1,581.01
1959	25,051.45	1,993.82	876.80	1,117.02	1,646.90
1960	23,934.43	2,093.52	837.71	1,255.81	1,701.82
1961	22,678.62	2,198.19	793.75	1,404.44	1,769.10
1962	21,274.18	2,308.10	744.60	1,563.50	1,837.02
1963	19,710.68	2,423.51	689.87	1,733.64	1,905.61
1964	17,977.04	2,544.68	629.20	1,915.48	1,975.18
1965	16,061.56	2,671.92	562.15	2,109.77	2,038.94
1966	13,951.79	2,805.51	488.31	2,317.20	2,081.13
1967	11,634.59	2,945.79	407.21	2,538.58	2,124.21
1968	9,096.01	3,093.08	318.36	2,774.72	2,140.41
1969	6,321.29	3,247.73	221.25	3,026.48	2,133.43
1970	3,294.81	3,410.11	115.30	3,294.81	2,114.27

Table 3

STANDARD VARIABLE-RATE MORTGAGE

(Payment and Debiting Factor — 3-5 Year Government Bond Rate Plus 2.32%[1])

Year	Principal at Start of Period	Payment at End of Period	Payment Breakdown		Payment in 1951 Dollars (beginning of year)	Debiting Factor
			Interest	Principal		
1951	$30,000.00	$2,158.86	$1,145.99	$1,012.87	$2,000.61	3.82%
1952	28,987.13	2,173.43	1,231.96	941.47	1,971.08	4.25
1953	28,045.66	2,260.67	1,248.03	1,012.64	2,035.06	4.45
1954	27,033.02	2,300.31	1,319.21	981.10	2,060.39	4.88
1955	26,051.92	2,383.32	1,078.55	1,304.77	2,142.60	4.14
1956	24,747.15	2,247.63	1,190.33	1,057.30	1,991.18	4.81
1957	23,689.85	2,364.26	1,269.77	1,094.49	2,022.39	5.36
1958	22,595.36	2,457.82	1,339.92	1,117.91	2,046.38	5.93
1959	21,477.45	2,551.94	1,123.27	1,428.67	2,107.90	5.23
1960	20,048.78	2,442.90	1,335.25	1,107.65	1,985.83	6.66
1961	18,941.13	2,654.56	1,197.08	1,457.48	2,136.39	6.32
1962	17,483.65	2,606.41	1,036.79	1,569.62	2,074.44	5.93
1963	15,914.03	2,555.64	937.34	1,618.30	2,009.24	5.89
1964	14,295.73	2,550.86	863.46	1,687.40	1,979.98	6.04
1965	12,608.33	2,567.29	804.40	1,762.89	1,959.10	6.38
1966	10,845.44	2,601.35	709.31	1,892.04	1,929.68	6.54
1967	8,953.40	2,615.89	669.71	1,946.18	1,886.32	7.48
1968	7,007.22	2,693.56	517.83	2,175.73	1,863.94	7.39
1969	4,831.49	2,686.71	381.69	2,305.02	1,764.90	7.90
1970	2,526.47	2,753.34	226.87	2,526.47	1,707.07	8.98

[1]Payment factor is lagged one year.

Table 4

DUAL-RATE VARIABLE-RATE MORTGAGE

(Payment Factor — 3-5 Year Government Bond Rate Plus 2.32%[1]
Debiting Factor — One-Year Government Bill Rate Plus 2.00%)

Year	Principal at Start of Period	Payment at End of Period	Payment Breakdown		Payment in 1951 Dollars (beginning of year)	Debiting Factor
			Interest	Principal		
1951	$30,000.00	$2,158.86	$1,110.00	$1,048.86	$2,000.61	3.70%
1952	28,951.14	2,170.73	1,100.14	1,070.59	1,968.70	3.80
1953	27,880.55	2,247.34	1,143.10	1,104.24	2,022.93	4.10
1954	26,776.31	2,278.45	776.51	1,501.94	2,040.82	2.90
1955	25,274.37	2,312.18	985.70	1,326.48	2,078.67	3.90
1956	23,947.89	2,175.02	1,149.50	1,025.52	1,926.76	4.80
1957	22,922.37	2,287.63	1,260.73	1,026.90	1,956.75	5.50
1958	21,895.47	2,381.68	897.71	1,483.97	1,983.01	4.10
1959	20,411.50	2,425.27	1,245.10	1,180.17	2,003.11	6.10
1960	19,231.33	2,343.28	1,057.72	1,285.56	1,904.84	5.50
1961	17,945.77	2,515.06	879.34	1,635.72	2,023.88	4.90
1962	16,310.05	2,431.44	815.50	1,615.94	1,935.08	5.00
1963	14,694.11	2,359.73	778.79	1,580.94	1,855.54	5.30
1964	13,113.17	2,339.85	760.56	1,579.29	1,816.02	5.80
1965	11,533.88	2,348.51	703.57	1,644.94	1,791.98	6.10
1966	9,888.94	2,371.92	712.00	1,659.92	1,759.57	7.20
1967	8,229.02	2,404.25	559.57	1,844.68	1,733.59	6.80
1968	6,384.34	2,454.12	485.21	1,968.91	1,698.20	7.60
1969	4,415.43	2,455.35	401.80	2,053.55	1,612.36	9.10
1970	1,960.08	2,134.56	174.48	1,960.08	1,323.41	8.90

[1]Payment factor is lagged one year.

Table 5

PRICE-LEVEL-ADJUSTED MORTGAGE

(Payment Factor — 3.00%)

Year	Principal at Start of Period	Payment at End of Period	Payment Breakdown		Principal Adjustment	Payment in 1951 Dollars (beginning of year)
			Interest	Principal		
1951	$30,000.00	$2,175.98	$971.19	$1,204.79	$ 2,372.95	$2,016.48
1952	31,168.16	2,223.37	955.41	1,267.96	678.71	2,016.48
1953	30,578.91	2,240.11	924.27	1,315.84	230.22	2,016.48
1954	29,493.29	2,251.20	889.18	1,362.02	146.05	2,016.48
1955	28,277.32	2,242.93	845.20	1,397.73	-103.72	2,016.48
1956	26,775.87	2,276.20	815.19	1,461.01	397.10	2,016.48
1957	25,711.96	2,357.27	798.83	1,558.44	915.81	2,016.48
1958	25,069.33	2,421.79	772.67	1,649.12	686.05	2,016.48
1959	24,106.26	2,441.35	729.03	1,712.32	194.90	2,016.48
1960	22,588.84	2,480.47	688.52	1,791.95	362.02	2,016.48
1961	21,158.91	2,505.68	641.22	1,864.46	215.03	2,016.48
1962	19,509.48	2,533.71	591.83	1,941.88	218.03	2,016.48
1963	17,785.63	2,564.36	540.02	2,024.34	215.19	2,016.48
1964	15,976.48	2,598.03	485.59	2,112.44	210.01	2,016.48
1965	14,074.05	2,642.60	429.46	2,213.14	241.41	2,016.48
1966	12,102.32	2,718.21	373.46	2,344.75	346.29	2,016.48
1967	10,103.86	2,796.45	311.84	2,484.61	290.79	2,016.48
1968	7,910.04	2,914.02	247.28	2,666.74	332.68	2,016.48
1969	5,575.98	3,070.70	176.27	2,894.43	299.79	2,016.48
1970	2,981.34	3,252.38	271.04	2,981.34	0.00	2,016.48

Table 6

CONSTANT-PAYMENT-FACTOR VARIABLE-RATE MORTGAGE

(Payment Factor — 3.00%
Debiting Factor — One-Year Government Bill Rate Plus 2.00%)

Year	Principal at Start of Period	Payment at End of Period	Payment Breakdown		Payment in 1951 Dollars (beginning of year)	Debiting Factor
			Interest	Principal		
1951	$30,000.00	$2,175.98	$1,038.00	$1,137.00	$2,016.48	3.46%
1952	28,863.00	2,058.98	1,085.25	973.73	1,867.39	3.76
1953	27,889.27	2,043.02	1,115.57	927.45	1,839.07	4.00
1954	26,961.82	2,058.08	935.58	1,122.50	1,843.49	3.47
1955	25,839.32	2,049.56	834.61	1,214.95	1,842.55	3.23
1956	24,624.37	2,093.23	1,115.48	977.75	1,854.39	4.53
1957	23,646.62	2,167.89	1,241.45	926.44	1,854.48	5.25
1958	22,720.18	2,194.92	1,095.11	1,099.81	1,827.49	4.82
1959	21,620.37	2,189.64	1,135.07	1,054.57	1,808.57	5.25
1960	20,565.80	2,258.27	1,433.44	824.83	1,835.84	6.97
1961	19,740.97	2,337.85	915.98	1,421.87	1,881.42	4.64
1962	18,319.10	2,379.15	930.61	1,448.54	1,893.47	5.08
1963	16,870.56	2,432.43	838.47	1,593.96	1,912.74	4.97
1964	15,276.60	2,484.15	867.71	1,616.44	1,928.09	5.68
1965	13,660.16	2,564.99	811.41	1,753.58	1,957.27	5.94
1966	11,906.58	2,674.22	788.22	1,886.00	1,983.84	6.62
1967	10,020.58	2,773.45	681.40	2,092.05	1,999.89	6.80
1968	7,928.53	2,920.71	589.88	2,330.83	2,021.11	7.44
1969	5,907.42	3,253.32	473.77	2,779.55	2,136.41	8.02
1970	3,127.87	3,427.21	299.34	3,127.87	2,124.87	9.57

Table 7

SIMULATIONS OF ALTERNATIVE MORTGAGE DESIGNS OVER THE RECENT PAST

Year	Principal at Start of Period	Payment at End of Period	Payment Breakdown: Interest	Payment Breakdown: Principal	Payment in 1971 Dollars (beginning of year)
I. Standard Mortgage (Payment and Debiting Factor — 8.00%)					
1971	$30,000.00	$3,055.57	$2,400.00	$ 655.57	$2,955.65
1972	29,344.43	3,055.57	2,347.55	708.02	2,855.43
1973	28,636.41	3,055.57	2,290.91	764.66	2,617.40
1974	27,871.75	3,055.57	2,229.74	825.83	2,337.51
1975	27,045.92	—	—	—	—
II. Graduated-Payment Mortgage (Payment and Debiting Factor — 8.00% Payments Rise at 8% a Year)					
1971	30,000.00	1,620.00	2,400.00	-780.00	1,567.35
1972	30,780.00	1,749.60	2,462.40	-712.80	1,635.00
1973	31,492.80	1,889.57	2,519.42	-629.85	1,618.61
1974	32,122.65	2,040.73	2,569.81	-529.08	1,561.16
1975	32,651.73	—	—	—	—

Year	Principal at Start of Period	Payment at End of Period	Payment Breakdown: Interest	Payment Breakdown: Principal	Payment in 1971 Dollars (beginning of year)	Debiting Factor	Payment Factor[1]
III. Standard Variable-Rate Mortgage (Payment and Debiting Factor — 3-5 Year Government Bond Rate Plus 2.32%[1])							
1971	30,000.00	3,449.45	2,427.00	1,022.45	3,337.32	8.09%	9.69%
1972	28,977.55	3,036.85	2,367.47	669.38	2,837.91	8.17	8.09
1973	28,308.17	3,057.28	2,332.59	724.69	2,618.66	8.24	8.17
1974	27,583.48	3,0720.80	2,794.21	278.59	2,350.67	10.13	8.24
1975	27,304.89	—	—	—	—	—	10.13
IV. Dual-Rate Variable-Rate Mortgage (Payment Factor — 3-5 Year Government Bond Rate Plus 2.32%[1] Debiting Factor — One-Year Government Bill Rate Plus 2.00%)							
1971	30,000.00	3,449.45	2,001.00	1,448.45	3,337.32	6.67%	9.69%
1972	28,551.55	2,992.20	1,932.94	1,059.26	2,796.19	6.77	8.09
1973	27,492.29	2,969.17	2,477.06	492.11	2,543.18	9.01	8.17
1974	27,000.18	3,007.82	2,621.72	386.10	2,300.96	9.71	8.24
1975	26,614.08	—	—	—	—	—	10.13
V. Price-Level-Adjusted Mortgage (Payment Factor — 3.00%)							
1971	30,000.00	2,084.23	930.24	1,153.99	1,007.93	2,016.48	6.46%[2]
1972	29,853.94	2,157.84	927.23	1,230.61	1,054.24	2,016.48	6.64
1973	29,677.57	2,354.24	971.35	1,382.89	2,701.25	2,016.48	12.38
1974	30,995.93	2,635.94	1,041.18	1,594.76	3,708.91	2,016.48	15.32
1975	33,110.08	—	—	—	—	—	—
VI. Constant-Payment-Factor Variable-Rate Mortgage (Payment Factor — 3.00% Debiting Factor — One-Year Government Bill Rate Plus 2.00%)							
1971	30,000.00	2,084.23	1,989.00	95.23		2,016.48	6.63%
1972	29,904.77	2,161.48	1,821.20	340.28		2,019.90	6.09
1973	29,564.49	2,345.23	2,196.64	148.59		2,008.92	7.43
1974	29,415.90	2,501.67	2,650.37	-148.70		1,913.78	9.01
1975	29,564.60	—	—	—		—	—

[1]Payment factor is lagged one year as described in the text. In 1971, for example, the payment factor was 9.69 percent — a spread of 2.32 percent above the average rate on 3-5 year government securities in 1970. In 1972, it was 8.09 percent, etc. Since the payment factors are lagged, the simulations have very high beginning payments, reflecting 1970s high rates, but they do not reflect the 1974 increase of rates until 1975. In the latter instance, the payment factor rises from 8.24 percent to 10.13 percent, leading to increases in the 1975 nominal payment over the 1974 level, of 14.5 percent and 14.0 percent, respectively.

[2](Interest and principal adjustment) / beginning principal

Table 8

ANALYSIS OF MAJOR MORTGAGE TYPES

	Characteristics of Contract Payment Stream									
	Debiting Rate			Ex Ante Time Shape	Payment Factor				Evaluation	
Name	Denomination	Term	Base		Denomination	Term	Base	Maturity	Borrower	Lender
Standard	Nominal	Long	Initial	Level nominal	Nominal	Long	Initial	Fixed	Poor	Poor
Graduated-payment	Nominal	Long	Initial	Graduated nominal	Nominal	Long	Initial	Fixed	Fair	Poor
Standard variable-rate	Nominal	Long	Current	Level nominal	Nominal	Long	Current	Fixed	Poor	Fair
Dual-rate VR	Nominal	Short	Current	Level nominal	Nominal	Long	Current	Fixed	Poor	Excellent
Price-level adjusted	Real	Long	Initial	Level real	Real	Long	Initial	Fixed	Good	Depends on liability structure[1]
Constant-payment-factor VR	Nominal	Short	Current	Level real	Real	Long	Initial	Fixed	Good	Excellent

[1]Excellent if financed by price-level-adjusted deposits. Fair otherwise.

Table 1, which simulates a standard mortgage over the 1951-70 period, shows that while the nominal payment is constant, the inflation-adjusted, or real, payments are obviously sensitive to changes in the price level. Viewing the column that presents payments in terms of their value in dollars as of the beginning of 1951, the time at which the contract was negotiated, the final payment is but two-thirds of the value of the initial payment. The effect of inflation is even more forcefully brought home by the recent experience presented in Table 7.I.

A constant nominal payment accompanied by anticipation of inflation necessarily implies an *ex ante* stream of declining real payments. Consequently, the initial payment must be high so as to make up for this "tilt" effect and maintain at issuance a given real present value for the mortgage.

Because the initial payment is high, the initial ratio of payment to income is high for the borrower in a period of anticipated inflation. Such a design is likely to produce cash flow difficulties for the borrower. Owing to these inflation-induced effects, we regard the standard mortgage design as poor from the standpoint of the borrower. Our empirical analysis did show, however, that short-run variability in the ratio of payment to income was relatively low. This perceived stability results from the stability of nominal income in the short run.

The standard design also rates poorly from the borrower viewpoint with respect to the risk dimension. Inasmuch as inflation can just as easily be less than anticipated as more than anticipated, the real cost can turn out to be more than anticipated.

This design also rates poorly from the standpoint of institutional lenders because of their unhedged deposit position. As experience has shown time and again, borrowing short and lending long can lead to severe difficulty for the lender. A portfolio of standard mortgages should be financed by long-term fixed nominal rate deposits if it is to remain viable in the long run.

2) *The Graduated-Payment Mortgage.* This design is an attempt to cope with the "tilt" problem inherent in the standard mortgage. While it too has a fixed nominal interest rate serving both as payment factor and as debiting rate, it is so geared as to have a payment that uses, in nominal terms, a fixed rate over the life of the mortgage.

The higher the rate of graduation, the lower the initial payment. If the rate of graduation turns out to be the average rate of inflation over the life of the mortgage, then the inflation-adjusted payments will fluctuate but will not have an upward or a downward trend. If the graduation rate turns out to be less than the average rate of inflation, then the real payments will exhibit a declining trend over time. If the rate of graduation turns out to be more, then the converse result holds with respect to the payment stream.

Largely because this design results in a lower initial payment, and consequently initial payment-to-income ratio, we regard it as fair from the

borrower standpoint. While it does overcome the cash flow problems induced by the standard design, to some extent it fares even more poorly along the risk dimension. Owing to its stream of nominally fixed rising payments, its real burden is even more sensitive to changes in interest rates than is the case with the standard mortgage.

We found the short-run variability of the payment-to-income ratio to resemble that of the standard design, which is to say relatively modest. But the borrower has little control over the long-term path of this ratio with this design.

Historical simulations of graduated-payment mortgages appear in Tables 2 and 7.II. Table 2 shows a 3.5 percent mortgage with a 5 percent rate of graduation and Table 7.II depicts an 8 percent mortgage with an 8 percent graduation rate. The real dollar payment depicted in the final column of Table 2 rises steadily from 1951 to 1967, a period during which the average rate of inflation was considerably less than 5 percent, and then levels off. The real payment in Table 7.II rises from 1971 to 1972 and then declines as rates of inflation moved above the 8 percent level in 1973 and 1974.[10]

From the standpoint of lenders, the graduated-payment design appears even worse than the standard mortgage. Its design implies, because of its rising payment stream, an even longer duration of real maturity than a standard mortgage with the same term to maturity and payment-debiting factor. Hence its value in the secondary market will be even more sensitive to fluctuations in interest rates than the value of the standard mortgage. Consequently, lenders will be even less hedged. Furthermore, the rising stream of payments implies greater default risk because of the slower accumulation of equity and the heavier payment burden for the borrower in the later years of the mortgage. With respect to lenders, we regard the graduated-payment design as poor.

C. *Variable Interest Rate Mortgages (VRMs)*

During the course of our study, we examined a wide variety of mortgage designs with fluctuating payment and/or debiting factors. Such designs are usually referred to as variable-rate mortgages or VRMs. Here we examine two such designs which we consider representative.

1) *Standard Variable-Rate Mortgage.* The design which we term the "standard" VRM uses the same rate for both the payment and debiting factors. But this rate is tied to some long-term reference interest rate, such as a market rate or a deposit rate, that can fluctuate. As the payment-debiting factor fluctuates, the nominal payment moves in the same direction.

[10]Throughout this study we measured rates of inflation as percentage changes in the Consumer Price Index from yearend to yearend. The yearend value of the index was approximated by the mean of the published levels for December and January.

The VRM design raises a number of implementation problems. What reference rate should be employed? Should there be an adjustment lag so as to allow an advance notification to the borrower of a change in the nominal payment? If so, how much? How often should nominal payments be allowed to change? How much of an advance notice of a change should be given to the borrower? What limits, if any, should be placed on the extent to which a nominal payment can change at any one time? What limits, if any, should be placed on the borrower's ability to refinance or otherwise repay his outstanding debt?

The historical simulations of a standard VRM depicted in Table 3 and Table 7.III represent one possible contract design. In this simulation the payment factor is the previous year's average three- to five-year government bond rate plus a spread of 2.32 percent.[11] The debiting rate is the current year's value for the same factor. The lag in the payment factor is designed to capture the adjustment lag needed so as to allow sufficient advance notice to the borrower.

The simulations serve to show that the standard VRM does not eliminate the "tilt" effect induced by inflation. For example, as shown by Table 7.III, the real payment falls by 30 percent between 1971 and 1974. The difficulty is essentially that a nominal interest rate rather than the price level is used at each point in time to calculate the payment. The standard VRM is similar to the standard mortgage in this respect.

Payments for the standard VRM are highly sensitive to changes in the nominal payment factor. Small changes in the rate of interest can lead to large changes in the payment in the early years of the mortgage.

Because of these two aspects, we regard the standard VRM as poor from the standpoint of borrowers. The ratio of payment-to-income is unstable in both the long and short runs. Payments are not independent of inflationary anticipations. We also found the payment-to-payment variability to be virtually an order of magnitude higher than was the case for the fixed-rate designs. Borrowers would also view this design as risky in terms of the net nominal interest obligation.

This design rates better from the lender viewpoint. Because the debiting rate responds to general interest rate movements, the lender is in a fairly well-hedged position. The hedging is less than perfect, however, because the debiting rate is a long-term rate while deposits bear, in principle, short-term rates of interest. But in practice the lack of a fully hedged position is not likely to be a source of serious difficulty because an intermediate rather than a long-term rate is usually proposed as the reference rate and, furthermore, thrift institutions today have a large part of their deposit liabilities in the form of term deposits.

[11]This spread results from the derivation of Table 3 from a simulation of a 25-year mortgage with an initial interest rate of 3.5 percent that is presented in the original paper by the authors.

2) *The Dual-Rate Variable-Rate Mortgage.* This VRM design represents an attempt to correct for the remaining lack of hedging that characterizes the standard VRM from the institutional lender viewpoint because both the payment and debiting factors are three- to five-year rates. In the dual-rate VRM, the payment factor has a long-term rate as its reference rate while the debiting factor has a short-term reference rate. Because short-term interest rates are more volatile than long-term rates, the use of a long-term payment factor results in a smoother payment stream than would a short-term payment factor. But because the debiting rate is a short-term one, the lender earns a short-term rate of interest on his investment, and institutional lenders could finance a portfolio of such mortgages with short-term deposits and still be hedged.

The historical simulations of the dual-rate VRM presented in Tables 4 and 7.IV employ the same payment factor (and adjustment lag) that was used to simulate a standard VRM. The debiting factor is the current year's average one-year government bill rate plus a spread of 2 percent.

The dual-rate VRM, when viewed from the standpoint of borrowing households, fares essentially the same as the standard VRM, for it suffers from the same drawbacks. While we view this design favorably with respect to institutional lenders, it rates poorly from the borrower viewpoint. This design is also more complicated than that of the standard VRM.

D. *Smoothed Real Payment Designs*

All of the designs examined above are characterized by an *ex ante* declining stream of real payments under conditions of anticipated inflation. Here we explicitly examine two designs that attempt to overcome this inflation-induced problem. It must be emphasized, however, that a wide variety of designs are capable of overcoming the tilt effect. We regard the two designs examined below as not only representative but also as containing a number of desirable characteristics.

1) *The Price-Level-Adjusted Mortgage (PLAM).* The PLAM is essentially equivalent to a standard mortgage in a world of no inflation or deflation. It has payments that are constant in real terms. The lender earns, and the borrower pays, a fixed real rate of interest.

The mechanics can be illustrated by referring to the historical simulation in Table 5 and Table 7.V. In this design the payment factor is constant and represents the real rate of interest. In this simulation we assume no adjustment lag.[12] If there were an adjustment lag, the payments would not be strictly constant in real terms, and the degree of instability would increase with the length of the lag.

In the simulations 3 percent is employed as the payment factor. This payment factor is used to calculate an initial payment in dollars as of the

[12]Consequently, our simulations of the PLAM differ from the illustrations presented by Lessard and Modigliani.

time the contract is negotiated. Consequently, even the first payment reflects inflation in the first year. "Interest" is also in real terms in the sense that it represents 3 percent of the principal at the start of the period escalated by the actual rate of inflation in that period. The column labeled "Principal Adjustment" represents the amount that the initial principal must be escalated so as to remain constant in real terms over the period.

The PLAM has some straightforward advantages for the borrower. The payment is, by design, independent of the anticipated rate of inflation. If borrower incomes are stable in real terms, then the long-run variability in the ratio of payment-to-income will also be low. Our empirical results indicate that the short-run variability in this ratio is quite low, approximately the same as that which characterized the fixed-rate nominal mortgages. Because the borrowers' interest obligation is fixed in real terms, the PLAM represents less risk. On the whole the PLAM appears quite good from the viewpoint of borrowers. Borrowers may regret their choice, of course, if real rates fall.

The appeal of PLAMs for lenders depends on their liability structures. If supported by price-level-adjusted deposits (PLADS), the lenders will be well hedged. While the PLAM earns a long-term real rate of interest and PLADS would pay a short-term real rate of interest, the short-term real rate is not likely to fluctuate widely, and little difficulty is consequently likely to result.

Because short-term nominal interest rates capture inflation reasonably well, PLAMs could also be financed by ordinary deposits although there would, of course, be more risk for the lender. It should be emphasized, though, that the PLAM should at least be considered under the current liability structure.

While the PLAM does contain more default risk than the standard mortgage, owing to its rising stream of payments, it also has the advantage of perhaps attracting new lenders to residential finance. This point was discussed in Section II.

2) *The Constant-Payment-Factor Variable-Rate Mortgage.* This design seeks to smooth the stream of real payments while employing a short-term nominal debiting factor.[13] Consequently, a portfolio of such mortgages could easily be financed by ordinary short-term deposits.

The historical simulations show how this design would work. They appear in Tables 6 and 7.VI. At each point in time the payment is calculated as though the instrument were a PLAM. The method is that described above; once again no adjustment lag is employed. But the debiting

[13]The constant-payment-factor VRM is essentially the same as the graduated-payment VRM proposed by Donald F. Tucker, "The Variable-Rate Graduated-Payment Mortgage," *Real Estate Review,* Spring 1975, pp. 71-80. The constant-payment-factor VRM, which seeks by design to smooth the stream of real payments, can be viewed as a mortgage with graduated nominal payments and a variable short-term debiting factor, the rate of graduation at any point in time being approximately the difference between the debiting factor and the constant-payment factor.

factor is the one-year government bill rate[14] plus a spread of 2 percent. The payment in the last year, as is also the case for the dual-rate VRM, is whatever payment is required to extinguish the loan.[15]

Table 6 shows that this design had a real payment that showed no clear trend over the 1951-1970 period. It can consequently be viewed as having achieved the purpose of smoothing the stream of real payments.

Because this design has a fairly stable real payment over the long run, it has some appeal for the borrower, but this appeal is somewhat diminished by short-run variability in the stream of real payments. From the lender standpoint, because it has a short-term debiting factor, it would appear to be an excellent design.

IV. RESPONSES TO POTENTIAL CONSUMER OBJECTIONS

Political acceptability is an issue that dominates most of the other problems involved in implementing nonstandard mortgage designs. The public's reaction to the variable-rate mortgages that have been issued in the United States has been, on the whole, negative. Consumer organizations have raised what amount to the following six objections to the variable-rate instrument, and they may serve to indicate the reaction that may be engendered by other innovations:

1) Mortgage-lending institutions can manipulate the reference interest rate and thereby cause the borrower's monthly payment to rise.
2) The instrument is so complicated that individuals cannot understand it adequately and will not realize what they are getting into.
3) The role of a financial intermediary should be to bear risk, not to pass it on.
4) Introduction of such instruments would endanger the continuation of government subsidies to housing, and the elimination of such subsidies would cause the cost of housing to increase.
5) Variable-rate mortgages are so preferred by lenders that their widespread adoption will cause the standard mortgage to vanish.
6) The introduction of the variable-rate mortgage will lead to a reduction in the portion of residential mortgage credit going to the poorer classes generally and to racial minorities in particular.

[14]In the case of the dual-rate VRM, the debiting represented the average of this series for the year. Here we employ an *ex ante* rate, specifically the mean of the January and preceeding December rates.

[15]The payments for this design would be identical to that of the PLAM if at every point in time the debiting factor equaled the product of one plus the payment factor and one plus the rate of inflation during the period.

It is probably safe to say that no one, except perhaps most recently who has financed the purchase of a house with a variable-rate mortgage has turned out to be pleased with his or her choice of financing. Nominal interest rates have trended upward for the past two decades; and, judging from the performance of the bond market, this rise has been largely unanticipated. This experience has undoubtedly had a negative effect on the public's willingness to consider the variable-rate mortgage and recent experience with inflation probably entails similar implications for the price-level-adjusted mortgage.

It must be emphasized, however, that it is certainly not obvious that as of today interest rates are expected to rise or that the rate of inflation is expected to increase. Abstracting from refinancing clauses in the mortgage contract, it might be much riskier for a borrower to take on a standard mortgage during a period of historically high nominal interest rates, such as the present, than would be the case with a PLAM or a variable-rate instrument.

Objection (1) could be met by requiring that the reference rate be the lender's deposit interest rate. A unilateral increase in the deposit rate above the competitive level would cause a large increase in deposits, thus squeezing lender profits. This objection could also be met by a number of external reference rates.

Objection (2) implies that full and fair disclosure is essential to the successful introduction of new designs. There is a significant burden of education that properly falls on the mortgage-lending institutions, both individually and in association, that must be forthcoming. Furthermore, it is probably reasonable that the borrower be required to sign a disclosure statement appropriate to the particular design in addition to the mortgage contract itself.

With respect to objection (3), there is ample evidence that savings and loan associations are not an efficient vehicle for coping with interest rate risk. If PLAMs and variable-rate mortgages are introduced into the mortgage market and deposit rate ceilings are eliminated, the resulting potential reduction in interest rate related risk may lead to an increase in the default risk that lenders are willing to undertake. Some borrowers who are marginal risks under the current system might then be able to obtain financing.

Objection (4) probably has some merit. One should keep in mind, however, that some of these indirect subsidies, such as the tax deductability of mortgage interest payments and local property taxes, may tend to benefit the higher income classes relative to the poorer classes.

Objection (5) is questionable. Presupposing the introduction of new mortgage designs together with an elimination of deposit rate ceilings, it is likely that some lenders will choose to specialize in issuing standard mortgages, financing them with long-term, fixed-rate deposits. Consumers will then be able to choose a mortgage design on the basis of their own expectations of future inflation and interest rates and their own credit requirements. Some consumers will desire the standard mortgage when it is

priced in equilibrium along with other designs. Its scheme of declining real payments under inflation will probably appeal to some households in later stages of the life cycle.

Objection (6) is based on the hypothesis that the money incomes of poor people do not respond to inflation. But this hypothesis is open to most serious question. Furthermore, the validity of this objection is presumably lessened if the standard mortgage survives the introduction of new designs.

If innovations increase the supply of mortgage credit, poor people may benefit as a result. While new designs were not developed with poor people in mind, they are unlikely to hurt them. Some lenders in fact might be more willing to lend on a fixed real rate basis with declining real payments than on a fixed nominal rate basis.

V. CONCLUDING REMARKS

Recent events argue strongly against a continued reliance on the conventional mortgage instrument as the sole vehicle for financing the housing needs of the United States. The price-level-adjusted mortgage and some variable-rate mortgage designs seem to provide significant advantages to both borrowers and lenders. Borrowers would be able to service a significantly larger mortgage debt with a given initial monthly payment than is the case with the conventional mortgage loan.

The introduction of nonstandard mortgages into the U.S. financial market requires that deposit rate ceilings be removed. Obviously, major changes in laws and regulations at both federal and state levels would be required in order to implement new designs.

In closing, we wish to emphasize that none of the perceived design improvements we analyze is meant to drive the standard mortgage out of existence. Nor is it our judgment that they would be likely to do so. We simply wish to see the household's housing financing choice enlarged.

APPENDIX

Description of Alternative Contracts

I. Notation

Q_t = Nominal payment required at end of t – th tim period

q_t = Real payment at end of period t

M_t = Nominal debt outstanding at end of period t

m_t = Real debt outstanding at end of period t

R_t = Nominal long-term interest rate appropriate to period t

r_t = Real long-term interest rate at period t

$\bar{R}(t)$ = Nominal short-term interest rate at period t

g_Q = Fixed rate of graduation

P_t = Price level at end of period t with P_0 set equal to one

T = Original amortization period or term to maturity

II. Terms of the contracts (discrete time)

A. Standard mortgage

1. Nominal payment

$$Q_t = R_1 M_0 [1 - (1 + R_1)^{-T}]^{-1}$$

2. Real Payment

$$q_t = Q_t / P_t$$

3. Nominal debt outstanding

$$M_t = M_0[1 - (1 + R_1)^{t-T}]/[1 - (1 + R_1)^{-T}]$$

4. Real debt outstanding

$$m_t = M_t / P_t$$

B. Graduated payment mortgage

1. Nominal payment

$$Q_t = \{[(1 + R_1)/(1 + g_Q)] - 1\} M_0(1 + g_Q)^{t-1}/$$
$$\{1 - [(1 + R_1)/(1 + g_Q)]^T\}$$

2. Real payment

$$q_t = Q_t/P_t$$

3. Nominal debt outstanding

$$M_t = Q_1 \sum_{i=t+1}^{T} [(1 + g_Q)^i(1 + R_1)^{t-i}]$$

4. Real debt outstanding

$$m_t = M_t/P_t$$

C. Standard variable-rate mortgage

1. Nominal payment

$$Q_t = \begin{cases} R_t M_{t-1}/[1 - (1 + R_t)^{t-T-1}], & t < T \\ M_{t-1}(1 + R_t), & t = T \end{cases}$$

2. Real payment

$$q_t = Q_t/P_t$$

3. Nominal debt outstanding

$$M_t = M_0 \prod_{i=1}^{t} (1 + R_i) - Q_t - \sum_{i=1}^{t-1} Q_i[\prod_{j=i+1}^{t} (1 + R_j)]$$

4. Real debt outstanding

$$m_t = M_t/P_t$$

D. Dual-rate variable-rate mortgage

1. Nominal payment

$$Q_t = \begin{cases} R_t M_{t-1}/[1-(1+R_t)^{t-T-1}], & t<T \\ M_{t-1}[1+\bar{R}(t)], & t=T \end{cases}$$

2. Real payment

$$q_t = Q_t/P_t$$

3. Nominal debt outstanding

$$M_t = M_0 \prod_{i=1}^{t}[1+\bar{R}(i)] - Q_t - \sum_{i=1}^{t-1} Q_i \prod_{j=i+1}^{t}[1+\bar{R}(j)]$$

4. Real debt outstanding

$$m_t = M_t/P_t$$

E. Price-level-adjusted mortgage

1. Nominal payment

$$Q_t = P_t q_t$$

2. Real Payment

$$q_t = r_1 M_0 [1-(1+r_1)^{-T}]^{-1}$$

3. Nominal debt outstanding

$$M_t = P_t m_t$$

4. Real debt outstanding

$$m_t = M_0 [1-(1+r_1)^{t-T}]/[1-(1+r_1)^{-T}]$$

F. Constant-payment-factor variable-rate mortgage

1. Nominal payment

$$Q_t = \begin{cases} r_1 M_{t-1}[1 - (1 + r_1)^{-T}]^{-1} P_t / P_{t-1}, & t < T \\ M_{t-1}[1 + R(t)], & t = T \end{cases}$$

2. Real Payment

$$q_t = Q_t / P_t$$

3. Nominal debt outstanding

$$M_t = M_0 \prod_{i=1}^{t} [1 + \bar{R}(i)] - Q_t - \sum_{i=1}^{t-1} Q_i \prod_{j=i+1}^{t} [1 + \bar{R}(j)]$$

4. Real debt outstanding

$$m_t = M_t / P_t$$

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Discussion

Henry B. Schechter*

Richard Cohn and Stanley Fischer have provided a useful classification and comparative analysis of the major types of nonstandard mortgages. The models of debt service payment streams which they developed to analyze effects upon the financial positions of borrowers and lenders will be valuable for further research, with substitute variables to reflect different empirical conditions.

My comments will deal primarily with implications of the major types of nonstandard mortgages for household borrowers. I will also touch upon the responsiveness of households to changes in interest rates, both as mortgage borrowers and as investors. This will lead to some concluding considerations of the potential effects of proposed mortgage innovations upon the capability of the thrift institutions to provide a more stable supply of mortgage funds.

Implications for Household Borrower

A borrower who would receive a price-level-adjusted mortgage, or PLAM, would have to make periodic payments that were adjusted by a predetermined inflation factor, or that reflected a readjustment of principal each period by a price change factor, such as the percentage change in a price index during the period. There are variations in the design, but essentially the periodic payments are adjusted to reflect inflation rates or price-level changes. In an inflationary economy, the borrower's repayments of principal and interest, in nominal dollar terms, would increase to protect the lender against a decline in real value of scheduled repayments. The borrower would bear the full risk of inflation.

The PLAM provides, in effect, for an indexing of required repayments, without any guarantee to the individual borrower that his income would be similarly indexed. (I am *not* advocating price and wage indexing for the entire economy.) During periods when wages lag behind

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price increases, as in 1973-74, the PLAM would exaccerbate the adverse impact upon those mortgagors whose incomes lagged behind prices. I agree with an observation by Cohn and Fischer that recent large increases in the rate of inflation would have a negative effect on willingness to consider the price-level-adjusted mortgage.

The authors found, on the basis of data for 1964-73, using per capita disposable income as the income measure, that the PLAM would provide a more stable stream of payments as a share of income than the other nonstandard mortgage types, as well as a more stable equity-debt ratio. They believe that "if a single characteristic of the payments pattern has to be singled out as affecting the desirability of the alternative mortgage types from the viewpoint of the borrower, it is the payment as a share of income." Maintenance of a stable debt service-to-income relationship — in real income and payment terms — is also looked upon favorably in other parts of the paper.

Stability of their mortgage debt service payments-to-income relationship, while occupying the same house, may not strike mortgage borrowers as desirable. Based on experience of their own and preceding generations, households look forward to upgrading their housing and other living standards as incomes increase.

In historical perspective, it seems reasonable to expect increases in real income in the future. Assuming that there will be increases in productivity and real income, nominal income should increase at a rate in excess of the inflation rate over the life of the loan. An adjustment of payments designed to correct for inflation should, therefore, result in a declining payments-to-income relationship.

A declining payments-to-income relationship provides a better cushion against risk of default than a stable relationship, and is beneficial for both the borrower and lender. In fact, credit underwriting of the borrower might tend to be more rigorous in the context of a stable payments-to-income outlook, which could make it more difficult for certain income or age groups to qualify for PLAMs than for standard mortgage loans.

Risk of default and lender loss of part of the adjusted outstanding balance would also increase where the principal is adjusted each period, while a constant real interest rate is applicable. In an inflationary economy, the outstanding principal amount could rise above the initial principal for five to ten years, as shown in a PLAM payments schedule developed by the authors. Under these conditions lender selectivity among prospective household borrowers would tend to increase.

A set of broader issues relates to a change in the attributes of home ownership that the mortgage borrower would be asked to accept along with a PLAM. Home ownership has been distinguished from rental housing, primarily because homeowners have had some protection against increases in their nominal housing costs reflecting changes in housing capital values. The homeowner has been the sole beneficiary of the capital gain arising from an increase in the housing value. For many, if not most

homeowners, the residential property is their only means of sharing in inflation-generated capital gains which are enjoyed by owners of other types of equities.

The homeowner's equity position has been based on payment of a specified price at time of purchase, and a loan to be repaid in dollars unadjusted for changes in price or value. While it may be argued that purchasing the fee ownership to the house is separate from agreeing to repay a loan obtained to finance that purchase, the first transaction is generally dependent upon the second, and they are executed simultaneously. As a practical matter, therefore, it would be difficult to draw a convincing distinction between a price-level-adjusted mortgage payment plan and a sharing by the lender of any increase in property value. The lender would, in effect, become a partner of the equity owner in a prevailing benefit of ownership.

The standard variable-rate mortgage, under which the interest rate is adjusted in accordance with the movement of some reference rate, shares with price-level-adjusted mortgages a major drawback from the perspective of households. There would be a required rise in mortgage debt service payments when the economy is subject to significant inflationary pressures. Assuming that the use of VRMs becomes widespread, large numbers of home-owning mortgagors would be subject to increased claims upon their income when other prices are rising. Demands for higher wages and salaries to offset the effects of inflation would be intensified as a result of the required increases in mortgage payments.

Modifications of the VRM design can produce graduated-payment schedules which are similar to those of the price-level-adjusted mortgage. As in the latter case, individual household mortgagors would still be subject to risks of incomes lagging behind increased payment requirements. In a 20-year graduated, smoothed, variable-rate mortgage simulation for 1954-1973, presented by the authors, the payment for the 20th year is 90 percent greater than in the 15th year. Empirical data for the same five-year period show an increase of 40 percent in the median total money income of families and 49 percent in per capita disposable income. Although the simulation represents an extreme or "worst" case for a smoothed, graduated VRM, it indicates the type of difficulty that household borrowers would face.

Extension of maturity to lessen the burden of increased payments has its practical limits of acceptability by lenders, provides only marginal relief of the payments-increase burden, and increases the cumulative interest payments total for the borrower.

To provide some protection against large, upward adjustments of the required payments, most VRM proposals include a limit on upward adjustments within a given time period. The authors suggest that the limit on upward adjustments be reasonably high: 6 percent semi-annually. Otherwise, fixed-maturity instruments might have rapidly rising payments toward maturity. The possibility of a 12 percent annual increase in payments would probably make such mortgages unacceptable to most household borrowers.

As Cohn and Fischer observe, the trend of nominal interest rates over the past two decades "has undoubtedly had a negative effect on the public's willingness to consider the VRM alternative."

Households As Borrowers and Investors

The authors also observe that the standard mortgage contract worked reasonably well into the 60s, but that its contribution to stability of mortgage financing eroded substantially since the mid-1960s. I question whether it is the standard mortgage form or the movement and level of interest rates at cyclical peaks which has been the key factor in mortgage financing instability. Marked instability was experienced during the tight money periods of 1956-57 and 1959, as well as during 1966 and later periods. In addition to the interest rate elasticity effects upon housing and mortgage demands, the cyclical behavior of mortgage interest rates has probably influenced household acceptance of standard mortgages.

Both of these influences were operative in 1974, judging from the experience record of government mortgage assistance programs. To compensate for the significant decrease in the flow of savings funds for mortgage financing, about $10 billion was committed to mortgage lenders under government mortgage assistance programs. These commitments were made over the last 11 months of the year, for mortgages bearing interest rates of 7 3/4 to 8 3/4 percent. A sizable amount of funds, thus, was made available to finance home purchases with mortgages at interest rates that were between 1 and 2 percentage points lower than on mortgages that could be obtained with funds emanating from private sources. Yet, households did not rush to purchase homes with 7 3/4 to 8 3/4 percent mortgages. By the end of the year only about 20 percent of the dollar amount of commitments had been delivered. There was still a 12-month sales inventory of unsold new homes after a year in which housing unit production was well below the volume required for household growth and replacement of losses from the existing housing stock.

A large proportion of households were, no doubt, precluded from purchasing homes because the combination of high home prices and mortgage interest rates placed available homes beyond their means. On the other hand, households with sufficient income to upgrade their housing had reason to defer purchases. Many of them are comfortably housed, if not as well as might be desired, and have mortgages at significantly lower than prevailing interest rates. In addition, past experience and a growing sensitivity to fluctuations in interest rates, created a negative attitude toward home purchases under 1974 conditions.

The increasing sensitivity of households toward changes in interest rates is reflected in the role of households as investors during high interest rate periods. Thus, in the high interest year of 1966, households, personal trusts and nonprofit organizations made net investments of $17.3 billion in market credit instruments compared with $4.5 billion in the preceding year. In 1969, another tight money year, the comparable net investment

figure was $35 billion; in the second half of 1973, it was at a seasonally adjusted annual rate of $41.5 billion, and in the third quarter of 1974 the comparable rate was $66 billion. The figures represent primarily household investments.

Potential Effects of Proposed Mortgage Innovations

The pattern of household responsiveness to cyclical high interest rates — both as borrowers and as investors — bears upon the question of the potential of the proposed mortgage innovations to bring greater stability to mortgage financing.

The proposed nonstandard mortgages are designed to increase portfolio interest income, so that the thrift institutions could pay higher interest rates on savings, thereby continue to attract a relatively stable inflow of savings from households, and be in a position to maintain a relatively stable volume of mortgage lending. A prerequisite for this intended sequence of operations would be the elimination of "Reg Q" ceilings on savings interest rates.

The thrift institutions would then be able to compete more aggressively in the market for savings. This would, incidentally, serve to accelerate the competitive escalation of interest rates. It is doubtful, however, in the light of recent experience, whether the thrift institutions would be able to compete for funds with borrowers of funds for nonhousing purposes more successfully than in the past. To illustrate, from June 1973 to the end of 1974, the yields on AAA recently offered utility bonds rose by about 2 percentage points to about 9.65 percent. A comparable adjustment, such as from 8 to 10 percent in the mortgage interest rate on a $30,000, 30-year mortgage, would increase the mortgagor's monthly payment by $41 per month. Most of the proposed VRM or adjusted payment mortgage plans would limit upward adjustments of the monthly payment to a much smaller amount in order to provide consumer protection that would make the proposals acceptable. The change in yields on a mortgage portfolio, thus, is likely to lag behind rising security market yields during a tight money period, so that thrift institutions could not afford to compete effectively with other bidders for funds.

Assuming that the thrift institutions *were* able to increase portfolio yields sufficiently to raise their interest rates on savings to, let us say, 8 or 8 1/2 percent levels, they would probably have to make new mortgage loans at 9 1/2 or 10 percent. The record of mortgage credit and housing construction cycles over the past two decades suggests that mortgage interest rates of above 9 percent would induce sharp cyclical declines of housing.

With a PLAM they could offer a lower interest rate and relatively low initial payments, with contractual adjustments of payments or principal in accordance with some price change or inflation factor. In a period of rising prices, however, it is questionable whether many informed households would accept such loans.

VRMs or PLAMs would not affect the strong competitive demands for more credit from corporations, consumers, and government during tight money periods. Such credit demands reflect the underlying demands for the nonhousing goods and services at prices which can absorb higher interest rates and exact a higher priority than housing in the marketplace for available credit resources.

When inflationary pressures increase, the resultant competitive escalation of interest rates is reinforced by restrictive general monetary policies. Although such monetary policies are regarded as nonselective in a pragmatic sense, they do produce selective allocation of credit. There have been five demonstrations in the past 20 years of the effects of reliance upon restrictive general monetary policy and high interest rates to cool off an overheating economy. Housing repeatedly has borne a disproportionate share of the burden of reduction in economic activity through credit restriction, reflecting the greater sensitivity of household mortgage borrowers than other borrowers to rising interest rates.

As long as general tight money policy is the only tool used to cool off the economy in an overheating period, capital funds flow to the issuer of credit instruments yielding the highest return for acceptable, comparable risks. Such flows of funds, moreover, are not dependent upon financial institution intermediaries. In the high interest rate years, households have directly invested large amounts of funds in U.S. Treasury bills, notes and bonds; in Federal agency bonds; in corporate bonds, and in flotation rate notes issued by nonfinancial corporations. In recent months, short-term investment mutual funds have attracted household savings. Other innovative mechanisms will, no doubt, be devised to channel funds away from mortgage-lending institutions to higher-yield outlets in the future.

To assure more adequate housing credit, restraints have to be imposed upon some of the nonhousing demands, requiring deliberate policy decisions with respect to national social priorities. The restraints can be brought about through selective credit regulation in capital and consumer finance. They could help to allocate credit resources to support a more adequate and stable volume of housing production. Such restraints could reduce pressures for interest rate increases and disintermediation. Thrift institutions would then be in a better position to remain viable while making standard mortgage loans that would not require a radical change in related risks and benefits for household borrowers.

Discussion

Kenneth J. Thygerson*

Let me begin by saying that I appreciate the opportunity to review and comment on what in my opinion is some very important research. It is particularly important with respect to the business I represent — the savings and loan business. It is well acknowledged that thrift institutions are contemplating some significant changes in the years ahead largely because the environment in which they operate has in the last decade become far more adverse. Moreover, I think it is generally recognized that a large and growing proportion of the savings and loan business has come to view new forms of mortgage instruments as one possible partial remedy to the asset-liability structural imbalance they face, while at the same time presenting a new opportunity to tailor a mortgage contract which will better serve the needs of the borrowing public. Thus, the task of this MIT study group is particularly relevant and timely.

I would like first to make some very generalized comments. The paper entitled: "An Analysis of Alternative Non-Standard Mortgages" is an important addition to a literature which has grown rapidly during the last several years and which concerns itself with developing and analyzing alternatives to the fully amortized, fixed rate standard mortgage contract. In some respects, this is one of the first papers to provide a broad analytical framework by which each of the various mortgage contracts that have been proposed and some that have not yet been proposed can be evaluated and compared against a consistent set of criteria. A major value of the paper is, therefore, the generalized analytical framework within which each of the various instruments is compared and contrasted. Thus, the paper helps to eliminate many of the biases that tend to be reflected in proposals made by the various vested interest groups who have turned out to be the major contributors to research in this emotionally charged and sensitive area. As such, it brings us a long way toward being able to develop an instrument that will have as its major feature "marketability" or in other words acceptance by large numbers of borrowers and lenders.

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Another major and important feature of the paper is the development of a number of models which are used to establish criteria for the acceptability of the mortgage instruments in question. To do this, the authors develop two primary models; the first describing the role of mortgages in the household portfolio and the second describing the behavior and maximization function of the financial intermediary. From these models the authors derive a set of criteria which they use later to evaluate a group of alternative, non-standard mortgage contracts. This approach is sound and I think it significant to note that this paper is one of the few that has taken a broad approach to this problem.

There is, of course, a problem with this approach. The authors subject themselves to potential criticism from those who do not agree with them as to the appropriateness of the models developed, their specifications, and the inherent assumptions of each. It is here that I will begin the process of commentary and discussion.

The Household Model

I would like to begin by reviewing the analysis of the role of non-standard mortgages in relation to household borrower optimization. Although the analysis of the role of mortgages in the household portfolio is not rigorously developed — a heuristic approach is employed — the authors conclude that (1) the relationship between mortgage payments and household income, and (2) the ratio of household equity to mortgage debt represent two primary concerns of the household as they evaluate their borrowing decision. Thus, the authors conclude that each alternative mortgage contract under study must be evaluated in terms of the effects that each has on these two primary behavioral requisites. Certainly, most studies of the demand for mortgage credit and for housing would seem to indicate that these two requisites are important factors affecting the behavior of both households and lenders. Thus, I would accept that these are appropriate factors to be included in the analysis, and I find that I have no serious reservation with this particular formulation of the criteria function from the standpoint of the borrower.

Having arrived at these conclusions, the authors proceed to evaluate each of the various non-standard mortgages with regard to the effects that they have on these two requisite variables of household optimization behavior. They do this by providing a simple analysis of the effects of implementing each of these instruments during the period from 1946 to 1970. This is followed in Section IV by the development of the generalized cases for each of these instruments.

At this point, several limitations become apparent. One relates to their testing of the generalized cases. One would assume, for example, that in their testing of a generalized formulation that the authors would be consistent with the basic assumption they make at the outset, namely, the premise that price expectations are highly uncertain. Yet, when they provide the empirical results of testing the instrument formulations, they

resort to using 1954-73 data as the appropriate test distributions for measuring the key variances for nominal payments for each instrument. If price expectations are as uncertain as they suggest, then it is clear that the distributions of the relevant variables are unknown and any testing of these generalized models against distributions relevant during the 1954-73 period may not be particularly relevant to the evaluation of these instruments in an uncertain future.

An alternative approach would be to compute the variances for hypothesized distributions which are significantly different from that of the 1954-73 period. One can conceive of having hypothesized distributions which represent substantially different states of the world — an unstable deflationary environment, an unstable inflationary environment, and a stable inflationary environment, for example. Having arbitrarily tested these models for the period 1954-73, the authors leave themselves open to the criticism that "while one instrument may have performed relatively well during 1954-73, there is no assurance it will in another environment."

Equally important is the fact that the reader is hard pressed to measure the importance of the variances they compute, since as readers we are forced to compare the variance of one instrument with the variance of another. This is fine for evaluating relative differences, but it does not indicate whether any of the variances are meaningful in an absolute sense. In other words, "is the variance for that instrument with the highest variance something to be concerned about or are they all insignificant?" The empirical results don't answer this question.

The Intermediary Model

The other primary model, developed in Section V, relates to institutional behavior. This model assumes as its objective function "the minimization of the variance of the real rate of return on shareholder equity." This objective function in my opinion is open to debate. We could, for example, assume as an alternative, that these firms maximize the present value of the wealth of their owners. Or, if we want to simply look at mutual institutions, we might choose an objective function which "maximizes growth, subject to some suitable level of increase in reserves." Either of these alternative objective functions would lead to substantially different conclusions from those derived by the authors.

Not surprisingly their specification of the objective function necessarily leads to the result that intermediaries will strive to be perfectly hedged. On the surface, this result may not appear hard to accept, unless one evaluates it with respect to the behavior of mortgage-lending specialized institutions over the last 20 years. Taking the Post-War II period, from say 1950 to the early 1960s, for example, one observes that a large number of state-chartered savings and loans — with the authority to develop a more perfectly hedged liability structure prior to the imposition of Regulation Q ceilings — did not do so. What one finds is that these institutions tended to emulate the federally chartered associations, which offered only passbook accounts. Thus, these institutions did not choose to

be fully hedged and in fact, they choose to operate by selling short-term liabilities against long-term assets — presumably because of the substantial returns associated with borrowing short and lending long during an extended period of positively sloped term structures.

This particularly is a key point, since the formulation used in the paper implies that lenders do not wish to speculate on changes in the term structure. Thus, I pose the question to the authors that if their model does not adequately represent the appropriate maximization function of the financial intermediary, and I suspect it doesn't, then one of the major criteria which they use to evaluate the benefits of the various non-standard mortgages is inappropriate for evaluating each instrument — namely, relation of interest return distribution to that of lender interest rate structure. (Criterion No. 2)

This leads to a final disconcerting comment. It appears that each of the alternative mortgage instruments has been evaluated by a set of criteria that basically precludes the possibility that both lenders and borrowers are willing to incur interest-rate induced, principal risk despite the opportunity they have to profit from such speculation. My feeling is that criterion two is not important. I suspect that the preferred portfolio and liability composition of any lender cannot be generalized. These decisions will be determined by the lender's expectations as to the level and shape of the yield curve, demands for various types of credit, risk expectations, the cost of acquiring various types of liabilities and his risk-return preferences concerning anticipated gains that might accrue from term structure speculation.

The Problems with a Partial Equilibrium Approach

The models developed in the paper and the general structure used do not allow us to evaluate the results in terms of general equilibrium. Each alternative contract studied as well as the empirical results developed are offered in a partial equilibrium context. Thus, we find ourselves in the unsettling position of having to evaluate — either as a lender or as a borrower — the simulated results of testing the hypothetical contract without discussion of general equilibrium.

The authors begin their discussion of the implementation problem by assuming that the contracts must have an index — "a price index, a reference rate, an equilibrium spread." Having imposed this constraint — the necessity of an index — the authors ignore the possibility that non-standard mortgage contracts can be offered in a market environment without an index. Clearly, one alternative to those analyzed in this paper is to develop a contract (say one calling for a renegotiation of rate every three or six months or every five years) and allowing the interaction of buyer and seller to agree on a price for the contract. Having precluded this alternative, however, the question emerges: "Will any of these instruments with fixed contractual terms hold up in the market?"

If these instruments are to be successful, by this I mean used in large numbers, then we must address the problem of how these instruments will

compete in a larger market context. The problem with indices of any sort is that they imply that a rather stable relationship exists between the index, the indexed rate or terms, and other market rates. Previous study of this problem suggests that no such stable relationships exist.[1] What does occur is that rate differentials between the various credit instruments change over time as do regional rate differentials. As a result, an indexed instrument is likely in period t + 1, 2, 3 . . . to have a non-marketable rate, even though it had an equilibrium rate in period t. The result will be that if the return is relatively too low, lenders will stop offering it. If the return is relatively too high, all borrowers will repay and refinance (at virtually no penalty, according to the authors). Take the example of the variable-rate mortgage providing a 3 percent return plus the percentage gain in prices during the quarter. During 1974, this would have earned 15.8 percent, well above other comparable risk debt instruments. The likely outcome would have been wholesale refinancing of these instruments by borrowers. At best then, the indexed rate can only approach a market negotiated rate.

One possibility would be to establish an index which is expected to be above the market clearing price but not well above it. This would help prevent borrower concern over usurious lenders and still allow market forces to establish price.

The point to be stressed here is that without any knowledge of the general equilibrium results there is no guarantee that any of the contracts can exist in the long run in the contractual forms assumed. Rather, each is likely to evolve into free market instruments of negotiable form.

Transition Problem

Another difficulty, which the authors glossed over, deals with the transition costs of moving to a non-standard mortgage contract world. The authors' assumption of a perfectly hedged intermediary necessitates their recommending the elimination of Regulation Q ceilings for savings and loan associations. The elimination of these ceilings, however, points up the problem of how savings institutions will respond in the short run, given the fixed-rate portfolio they currently hold. The authors solve this problem with the recommendation ". . . that the government would have to mitigate the effects on deposit institutions perhaps by buying existing mortgages." This heroic assumption is, however, at the heart of the institutional dilemma. It thus deserves greater treatment than that offered in the paper.

It is significant to point out that uncertainty over transition costs is a major impediment to altering of the structure of financial institutions today. Such new mortgage contracts as advocated in this paper suggest

[1]See Kenneth J. Thygerson and Joe R. Thompson, "Implementation of the Variabl Rate Mortgage: Some Considerations" Working Paper No. 7, U.S. Savings and Loa League, October 21, 1971.

the need for major structural alteration. Taking these transition costs into account, however, it may have been more useful to give thought to which non-standard contracts could provide most benefit under the present institutional structure and statutory authority of the savings and loan business.

Summary

To summarize, I believe this paper is a very valuable addition to the literature dealing with alternatives to the standard, fully amortized, fixed-rate mortgage used today. It provides a relatively unbiased analysis of the various proposals that have been offered. Even more important, this research provides a very important generalized analytical structure to evaluate the merits of each proposed contract. By considering both the needs of borrowers and lenders, it provides the structure for determining the correct approach to resolving the problems of implementing a new instrument.

Extremely important is the authors' conclusion that whatever non-standard contract is developed must recognize the fact that borrowers require the assurance that the ratio of the nominal mortgage payment to income not be subject to substantial volatility. Thus, it seems to me the institution must be given great flexibility in developing contract terms. This will allow borrowers and lenders to negotiate those terms which best fit the life cycle of the borrower, his net worth, and his future expectations.

As a starting point, this research represents a sound springboard upon which additional work can be done. I think that essential extensions of this work are: (1) further analysis of the financial intermediary model; (2) consideration of the response these instruments will have in the capital markets generally; (3) additional consideration to the appropriate criteria to evaluate the merits of the non-standard instruments; and (4) a more elaborate analysis of the transition costs.

Discussion

Donald P. Tucker*

Ken Thygerson's final comment, to the effect that what borrowers really seem to want in the mortgage area is subsidized below-market interest rates on mortgages, gives me a good starting point. It can't be denied that low subsidized mortgage rates would be very nice for borrowers, but I would argue, as have many others, that the size of the monthly payments are equally important, if not more important, to borrowers. It follows from this that any mortgage innovation that reduces their monthly payments relative to their income will be very attractive to borrowers, and if Ken's remark is meant to express doubt about this point, then I must disagree with him.

If this point is correct, namely if each borrower sees his mortgage primarily as a stream of monthly payments, and if his biggest concern is how big the payments will be relative to his income, then this has important implications for the design of new mortgage instruments. Its importance arises from the fact that lenders are primarily concerned with a different aspect of each mortgage, namely the accrual of interest income, since that is what governs the profitability and the main risk characteristics of this financial relationship. The mortgage terms that govern the accrual of interest can, within limits, be set independently of the terms that govern the monthly payments of the borrower. Thus, it is possible to consider alterations in the standard mortgage form that are beneficial to one side without seriously affecting the interests of the other side.

This is certainly not a new point, nor is it entirely accurate either in this simple form. Lenders are clearly interested in the payments stream in relation to borrower income because of what it implies about default risk, and borrowers have a genuine concern about the accrual of interest, even if it has no effect on their current or immediate future payments, because it then impacts directly on the maturity date of their loan if nothing else.

But in spite of this lack of complete separation, I think it fair to say that the *weight* of the borrower's concern is primarily on the level of the present and future monthly payments, whereas the lender, once his needs for protection against default risk have been taken care of, is most heavily concerned with the accrual of interest.

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Cohn and Fischer are certainly aware of this point, and they have made use of it in their analysis. Nevertheless, I feel that their treatment of these issues could benefit by a more explicit emphasis on this separation of interests.

In particular, this separation can form the basis for a different classification of mortgage alternatives, as shown in the table. The columns in the table represent the range of choices of primary interest to borrowers, and the rows represent the range of choices of primary interest to lenders. The various types identified by Cohn and Fischer in their table are classified here. You will note that this table does not distinguish between VRMs pegged to a short rate or index from VRMs pegged to a long rate or index. Thus it is possible to subdivide column 2 into several distinct alternatives to represent these choices. It is the columns of this table, and particularly the subcategories under column 2, that are the primary focus of Cohn and Fischer's analysis of the lender's preferences. This table also does not distinguish between the numerous ways in which the time profile of a graduated payment schedule could be determined, and thus the rows can be further subdivided to represent this range of choices. It is these rows and their subdivisions that are the primary focus of Cohn and Fischer's analysis of the borrowers' preferences.

Now I want to turn to some concrete points of criticism. The element that concerns me most about Cohn and Fischer's study is the rather narrow and unsatisfactory treatment they have given to the lenders' portfolio preferences and what these tell us about the choice of mortgage instruments.

There are two rather different questions that need to be asked:

1. What sort of mortgage instrument would be *ideal* for lenders?
2. What other sorts of mortgage instruments, although not ideal from their point of view, would they accept and find preferable to the current fixed-rate level-payment mortgage, at least for limited use?

Let me deal first with the question of the ideal.[1] In the first place, the question of the ideal from the lenders' point of view is not independent of borrower preferences in the general case, since borrowers do have some concern in general with the pattern and method of interest rate accrual, aside from the level of the interest rate. Not only are they obviously concerned about the maturity date of their mortgage obligation and the variance of that maturity date, but I would assume that many of them will be concerned, perhaps irrationally, with the variance of current and immediate future interest accruals. They may simply be frightened of the volatility of a short-term rate even if it does not affect their current payments and even if the volatility itself has very little effect on the variance of the maturity date. Because of considerations like this, borrowers might

[1]The earlier Cohn-Fischer paper devoted considerable attention to the hedging preferences of lenders and argued strongly for pegging a VRM to a short-term reference rate. [Ed.]

well be reluctant to accept mortgages pegged to a short-rate index if they had the choice of taking instead a mortgage pegged to a long-rate index, unless there were a rate differential in favor of the short-rate mortgage. But if the expected earnings from the short-rate mortgage were going to be less, because of these demand factors, than the earnings from long-rate VRMs, many lenders would undoubtedly regard the mortgage pegged to a *long* rate as the ideal.

This line of reasoning can even be extended to argue that, under certain conditions, some lenders would prefer fixed-rate mortgages to variable-rate mortgages. This would occur if borrowers had a sufficiently strong preference for fixed-rate mortgages that lenders could earn a substantially greater return on them, enough to compensate for the greater risk.

I don't intend to argue that this would necessarily be the case, for I don't know. The point I am making is that trying to determine the lenders' ideal mortgage by examining only the lenders' hedging preferences, as Cohn and Fischer have done, is not valid.

The second point to be made about the lenders' ideal mortgage involves some observations about what the lenders would be hedging against in choosing their ideal mortgage. I have no quarrel with Cohn and Fischer's general point that lenders will have a preference for mortgages whose maturity structure and whose method of interest accrual match those of the liabilities that are financing the mortgages. But Cohn and Fischer appear to have made some incorrect assumptions about the kinds of liabilities that savings institutions will have outstanding.

In applying the hedging principle, they conclude that lenders will not want mortgages pegged to a long-rate index. In their paper they say, and I quote, "Hedging considerations point up the folly of tying interest to the current long-term rate, as does the 'standard' VRM." Then a few moments ago you heard Rich Cohn refer to a VRM pegged to a long-rate as a rather "peculiar" instrument.

Perhaps they are not aware that certificate deposits having an initial term of at least four years already make up almost 25 percent of all deposits in federally insured S&Ls, and that certificate accounts having a shorter term make up another 25 to 30 percent of deposits. But I doubt that they would dispute the conjecture that intermediate-term deposits of this general character will continue to be an important source of funds for savings institutions in the future, with or without Regulation Q ceilings, and clearly the ideal mortgage for savings institutions to use as hedges to these deposits will *not* have its rate pegged to the passbook rate or to some short-rate index. Nor will it be pegged to the current rate on new four-year certificates, for that would make the earnings on the portfolio of mortgages more volatile than the costs on the outstanding certificates. Instead, the appropriate rate or index for pegging these mortgages would behave like the *average yield on outstanding* four-year certificates, and this would have to be called a long-rate index, at least in contrast to the

passbook rate. The FHLBB's proposal of a weighted average of the yields on three- to five-year governments and AAA corporate bonds might be very close to perfect for hedging these accounts.

Another way to state this same point is the following: As one criterion for judging the different mortgage alternatives, Cohn and Fischer have chosen to rate them according to the stability of the ratio of market value to book value; mortgage forms with the most stable ratio rank the highest according to this criterion. My criticism amounts to the observation that this is *not* an appropriate criterion for mortgages that are intended to hedge intermediate-term or long-term liabilities. The market value of these liabilities fluctuates with changes in interest rates, and a mortgage whose market value does not also fluctuate would not be an adequate hedge to these deposits. You *want* a mortgage that fluctuates in value.

More generally, the principle of hedging will imply a *mix* of mortgages in the asset portfolio of the typical savings institution, to complement the mix of deposit liabilities of differing maturity.

Finally, I think something needs to be said about the question of second best. In the real world of institutions, conflicting interests, historical accidents, and occasional irrationality, people very seldom get their ideal. Cohn and Fischer's analysis would be more helpful if it could tell us not only what is *ideal* from the lenders' point of view but also what *compromises* they would be able to live with and get some benefit from. In raising this question of second best and compromises, I still have in mind the question of what sort of index a VRM could be pegged to. More specifically, I am raising the question of whether VRMs pegged to a long-rate index, such as that proposed by the FHLBB, would be of interest to lending institutions as *partial* hedges against their *passbook* deposits, even though they would obviously not be ideal from the point of view of hedging.

This question is of particular interest because there has been a difference of opinion of some importance between the MIT group on the one hand and the HUD and Home Loan Bank Board sponsors of the study on the other over whether VRMs pegged to a long-term interest rate would really be of enough interest to be analyzed. As I understand the MIT point of view, they have been inclined to believe that a VRM pegged to a long-rate index would not be of any interest as a portfolio asset to lenders relying heavily on passbook deposits, and that it might not even be viable in the market place. I have learned of this disagreement primarily from the HUD side, however, and second hand at that, and I was looking forward to having this issue laid out explicitly for comment in the Cohn and Fischer paper, since that is where it would logically have appeared. Unfortunately, it is not treated there, and I am left in the fuzzy position of dealing with an important issue that I sense in the background and that may color their work and their conclusions, but that is not discussed openly in the paper.

As Cohn and Fischer themselves have mentioned, one important criterion that must be applied in judging mortgage alternatives is the criterion of suitability for the secondary mortgage market. The secondary market is heavily dependent on standardization of mortgage instruments, and thus from the point of view of facilitating the secondary market for mortgages, the fewer the distinct types of mortgages in use, the better. In deference to this consideration, the Home Loan Bank Board may decide to impose a regulatory constraint that says that all VRMs, whatever their other characteristics may be, must have their rates pegged to one specific index. They may not allow S&Ls the choice of how to peg their rates.

If that is going to occur, then it may make a lot of difference whether the officially sanctioned index is an index of short rates or of long rates. If Cohn and Fischer have a case to make that a long-rate index would be an unwise choice, even as a second-best or compromise alternative from the point of view of lenders, then it would be important for them to bring forth the analysis that supports that position.

I have indicated several respects in which I feel this paper does not deal adequately with the problem of how to compare the merits of the various mortgage alternatives. However, let me add that this problem is an extraordinarily complex one to treat in true theoretical splendor, and it would be unreasonable to expect it to be completely solved in one pass. I am not disappointed in this paper for not solving that; I am only disappointed that it did not put into better perspective, with more explicit qualifications, the results and analysis it does have to offer, which are very real and valuable.

Relationships Between the Mortgage Instruments, the Demand for Housing and Mortgage Credit: A Review of Empirical Studies

James Kearl,
Kenneth Rosen and Craig Swan*

The examples given in the introduction to this monograph provide persuasive arguments that the combination of inflation and the traditional mortgage instrument imposes burdens on households and thrift institutions, burdens which are likely to have impacts in the housing market and ultimately on the construction sector.

We are interested in whether or not the existing literature, summarizing empirical research, can provide evidence of these impacts and an understanding of how changes in the mortgage instrument would affect the demand for housing and the demand for mortgage credit.

Unfortunately, for such a survey the mortgage instrument is multidimensional, with a variety of characteristics that influence housing finance. Among them are interest rates, amortization-period terms, down payment requirements, prepayment penalties and the resulting initial payment and time path of real and nominal payments.

Our survey of the literature is structured to evaluate the evidence about the impact of these parameters of the mortgage instrument on the demand for housing and mortgage credit. Our discussion places a heavy emphasis on relatively recent econometric models of housing activity and the demand for mortgage credit.[1]

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[1]A number of surveys exist which complement this study: deLeeuw [17], Fronn [27A], Kalchbrenner [41], Grebler and Maisel [31].

This paper is organized as follows: Section II of the paper presents a brief overview of the existing literature on the demand for housing and for mortgage credit. This discussion is designed to introduce the reader to the literature and place work in a historical context emphasizing major themes and conflicts.

Section III reviews the results of Task II and develops a general framework for analyzing housing and mortgage markets. This discussion is necessary since much of the existing literature lacks a cohesive theoretical framework and does not deal directly with some of the proposed alterations of the existing mortgage instruments.

Section IV presents a more detailed discussion of numerous models with an emphasis on the effects of changes in those parameters of the mortgage instrument which distinguish alternative possible instruments to finance housing, detailed in the Cohn-Fischer paper.

An appendix, published separately as MIT Sloan School of Management Technical Working Paper No. 796-75, provides a schematic view of the models surveyed *as estimated* and an annotated bibliography of the relevant literature. The numbers in brackets in this paper refer to that bibliography. The appendix is available from the editors.

I. SHORT-RUN VS. LONG-RUN BEHAVIOR

Most of the literature we examined is relatively recent. Much of this literature is concerned with explaining post-war cycles as measured by quarterly data. Some work, but by no means all, places the explanation of this short-run behavior squarely in models with long-run stock equilibrium properties. Most studies, however, concentrate on short-run flows without explicit treatment of long-run equilibrium considerations. This emphasis on the short run as opposed to the long run has its advantages and disadvantages. A major advantage for our purposes is the general belief, supported by many of the studies we have surveyed, that financial variables and credit rationing have their major impact on short-run flows. This is consistent with a view of housing that holds that the long-run stock demand for housing is primarily a function of income, relative prices, the rental rate of housing services, and the size and age-structure of the population with monetary policy and the parameters of the mortgage instrument having little, if any, impact on these basic demand factors. However, adjustment of the stock, that is, how quickly equilibrium is approached, does seem to be strongly influenced by monetary policy and the parameters of the mortgage instrument. It is also possible that the structure of housing finance implies different, long-run positions.

A major disadvantage of the emphasis on short-run flows is the consequent lack of attention paid to long-run implications. For example, increases in the loan-to-value ratio are usually expected to have a positive impact on the level of housing starts and the demand for mortgage credit. What is ambiguous in most studies is how long such a positive effect is expected to persist. The higher flows will mean a larger stock of both houses and of total mortgage debt outstanding. Does the change in the

loan-to-value ratio mean that there will be permanently larger stocks of houses and mortgages, or does it mean that the economy reaches an unchanged stock equilibrium sooner? Most short-run studies are not designed to answer this question.

The distinction between short-run and long-run behavior is an important one to keep in mind. Proposed policy changes may affect both sorts of behavior. Care must be taken not to draw inferences about long-run behavior from studies that are designed to capture mainly short-term effects.

II. AN OVERVIEW OF THE LITERATURE

A. *Models of the Demand for Housing*

A major part of the literature on housing reflects a long history of debate concerned not with cyclical fluctuations in housing, but with price and particularly income elasticities of the demand for housing services. DeLeeuw [17] has recently attempted a reconciliation of much of this literature by analyzing carefully the varying data used. He concludes that the income elasticity of the demand for housing is most likely in the .8-1.0 range — higher for owner-occupied than for rental housing.[2]

This research effort on income and rental rate elasticities has concentrated primarily on long-run equilibrium impacts, where income and rental rate changes lead to a new, long-run equilibrium in terms of the stock of houses. Financial variables have generally not been included in these studies, certainly not the wealth of financial variables that have appeared in recent econometric models of short-run cycles in housing starts. The implication of the absence of financial variables was not considered important in the determination of the long-run equilibrium.

It is important to note this distinction, since the subsequent concentration of research on housing cycles has tended to obscure the distinction between the long-run and short-run impacts of various economic variables. As a result, the distinction between equilibrium responses and short-run adjustment impacts has not always been clear.

B. *Models of Cycles in Housing Investment and/or Housing Starts*

Turning now to models of cycles in housing investment, Guttentag [33] and Alberts [1] were among the first researchers to emphasize the role of mortgage credit in the housing cycle. The arguments were relatively simple. Mortgages are residual investments for many financial institutions. During periods of tight credit conditions, there is less money for residual investments. Consequently, the flow of funds into the mortgage market

[2]Maisel et al [54] have claimed that grouping the data has led to an upward bias in the estimation of the income elasticity of demand, concluding that the elasticity is in the .62-.70 range.

falls off dramatically, leading to higher mortgage rates or rationing. Income effects on housing demand are dominated by the cost-of-credit effect. Thus the cycle in interest rates causes one in mortgage lending and home building.

A factor contributing to the abrupt changes in funds available for mortgages could have been the fixed interest ceiling on government insured (FHA) or guaranteed (VA) mortgage loans. A number of "fixed-rate theorists," Guttentag [33], Lewis, Smith [69], Schaef [63], and Grebler [29] advanced this argument. Alberts [1] argued that discounting was an effective way to get around ceilings. In recent years, the fixed rate theory has not enjoyed much popularity among researchers as a major explanation of cycles although some elements of the fixed rate view can be found in work by Brady [6] and Clauretie [13]. This lack of popularity may be due, in part, to frequent ceiling changes in response to changing interest rates.

Maisel's studies for the Brookings model [52] [53] were some of the earliest efforts at explicit modeling and estimation of postwar cycles in home building. Maisel's work emphasized demographic factors, measured by household formation, as a basic determinant of demand. Short cycles were seen as coming from the supply side as the result of an inventory response by builders. The only financial variable appearing in Maisel's early empirical work was the Treasury bill rate. Subsequent work in this tradition is represented by Sparks [73] and Huang [35] [35a].

Subsequent work by Maisel and much of the recent work on housing cycles have emphasized the availability of mortgage credit as an important determinant of home building in the short run. Implicit in much of this work is the view that the mortgage rate is not a sufficient indicator of the state of mortgage markets; that one may not be able to get a mortgage loan at existing mortgage rates; that some form of credit rationing is an important element in housing markets in the short run.

In the early 1960s, in a review of the literature for the Commission on Money and Credit, Grebler and Maisel [31], concluded:

> . . . No matter how housing problems are defined, credit has almost invariably been singled out as the key to the solution.

A decade later, after considerable research, Friend [27], wrote,

> The greater impact of monetary stringency on housing than on the rest of the economy apparently is due mainly to a capital rationing effect, resulting from deficiencies in current institutional arrangements for providing mortgage credit; and probably also to an interest rate effect, reflecting a greater interest elasticity of housing demand than of demand generally.

There are two major elements to the view that concentrate on the importance of mortgage credit. One element is the importance of mortgage

credit to the purchase of housing units. The other element is the belief that mortgage markets are often in disequilibrium and that the mortgage rate is not a complete measure of the availability of mortgage credit.

In his 1968 paper, Maisel [51] speaks to the first point, the importance of mortgage credit:

> The reasons for expecting monetary shifts to influence housing starts are clear. By its nature, monetary policy should, in the first instance, affect those units whose spending is highly dependent on either the cost or the availability of credit. Among these groups, the degree of impact will vary. The variations will depend on the proportion of purchases made with credit, the amount of credit required per unit of expenditure, the ability or willingness to absorb higher interest rates, the institutional character of the market, and the degree to which traditional lenders are influenced by policy changes. Housing ranks high in sensitivity to monetary policy on all these counts.

An emphasis on the availability of mortgage credit appears in a number of studies in different forms. Brady [6], [7] and Huang [35] have included measures of loan-to-value ratios and amortization periods in housing starts equations. A number of investigators have included some sort of quantity measure of mortgage supply or possible supply. Maisel [51] includes a measure of the inflow of funds to financial institutions and a measure of FNMA purchases. Sparks [73], after some substitution to eliminate a term for credit conditions, includes a quantity measure of mortgage acquisitions and commitments. Brady [7] has used mortgage commitments at life insurance companies as a determinant of FHA and VA starts. In later work, Brady [8] uses FHLB advances to help explain total starts. In Swan [76], the inflow of funds to savings institutions is the prime determinant of housing starts. The MPS [60] model includes a variable measuring the change in mortgage commitments.[3] The Bosworth--Duesenberry [5] model uses current and lagged net changes in the stock of mortgages. DRI [14] includes a measure of mortgage commitments as well as changes in the stock of mortgages.

All of the above studies have added measures of credit availability to essentially single equation explanations of housing starts. Other work has attempted to estimate both demand and supply curves for housing starts. In one of the earliest efforts, Huang [35] includes FNMA mortgage purchases as a determinant of the supply of VA starts. Savings flows at S&Ls and FHLB advances are seen as influencing the supply of conventional starts. In more recent work, Kearl and Rosen [43] include the net change in total residential mortgages as a determinant of the supply of total starts.

[3]As detailed below the mortgage market of the MPS model is estimated in a way that allows for possible disequilibrium and credit rationing.

In some interesting work, Fair [24] has developed a monthly model of housing starts that not only includes savings flows as a determinant of the supply of starts but also explicitly allows for market disequilibrium and the failure of the mortgage rate to always be a market clearing rate. Swan [76] has followed up on Fair's original work with a quarterly disequilibrium model with similar qualitative results.

The general conclusion reached by most of these studies is that both cost and availability of credit are important determinants of short-run fluctuations in housing activity. A vocal dissenter to much of the tradition represented by the preceding work is Meltzer [34]. He argues that this conclusion is simply wrong.

> Public policy toward housing is based on the conjecture that the "availability" of mortgage credit is an important — perhaps the most important — determinant of the demand for housing. Policy appears to be misconceived. We have found no evidence that the availability of the particular type of credit has any important or lasting effect on the type of assets individuals acquire. If the housing market is the market in which "availability matters" or matters most, there appears to be very little if any empirical basis for the conjecture or the public policies based on it.

A good deal of confusion surrounding Meltzer's position seems to arise from a failure to distinguish between short-run adjustment behavior and long-run equilibrium. Meltzer uses long-time series of annual data whereas most of the analysis mentioned above uses postwar quarterly data.[4] It is unlikely that few, if any, of the researchers who found evidence of credit rationing would argue that the availability of mortgage credit would have a substantial impact on the long-run equilibrium size of the housing stock. They are instead more concerned with cyclical fluctuations and feel that the availability of mortgage credit is an important short-run constraint.

C. *Demand for Mortgage Credit*

Most early postwar studies of mortgage markets emphasized the supply of mortgage credit from financial institutions. For example, Klaman's monograph [46] gives extensive treatment of mortgage types, lenders and the structure of the market. However, the discussion of demand for mortgage credit takes less than one page and emphasizes the strong pent-up demand for housing after World War II.

Most formal modeling efforts of the demand for and supply of mortgages date from the mid-sixties. Huang's 1966 study is the earliest included in our discussion.

[4]See Swan [80] for a detailed critique of Meltzer's major empirical effort.

Almost all studies emphasize the demand for houses as the major factor affecting the demand for mortgage credit. This emphasis is surely not surprising given traditional collateral requirements. The studies we have surveyed differ as to whether they include a measure of the stock of houses or the flow of housing starts. These studies also differ as to whether they include a direct measure of the stock or flow or whether they include variables such as income and price to represent the demand for the stock or flow.

III. MODELING HOUSING AND MORTGAGE MARKETS

A. *Implicit or Explicit Measures of Housing Activity*

The choice of an explicit or an implicit measure of housing activity has at least two implications. One implication is the interpretation of coefficients on other variables in the equation for the demand for mortgage credit. For example, consider the mortgage rate. A change in the mortgage rate will have a direct effect on the demand for mortgage credit as the change in the mortgage rate affects people's desired equity position in houses. Note that this effect will occur with an unchanged level of housing activity measured on either a stock or flow basis. There will be a further indirect effect on the demand for mortgage credit to the extent that the change in the mortgage rate affects either the amount of homebuilding or the desired stock of houses. In models with an explicit measure of housing activity, the coefficient on the mortgage rate measures only the direct effect of mortgage rates on the demand for mortgages. (The indirect effect is already captured in the explicit measure of housing activity.) In models with only implicit measures — i.e., the basic determinants of housing activity — the coefficient on the mortgage rate captures both the direct and indirect effects of the mortgage rate on the demand for mortgages.

There is a further implication of using an explicit or implicit measure of housing activity. Implicit measures have tended to be justified on the grounds that they measure the desired amount of housing. If credit rationing is an important phenomenon, there may well be times when the actual stock of houses or amount of homebuilding is less than desired. Thus, while people want more housing and hence would like more mortgage credit, they may be unable to get more housing and their effective demand for mortgages may well be reduced. This possible distinction between desired and effective demands raises the further question of possible disequilibrium in mortgage markets and how one allows for any disequilibrium when estimating. Of the studies of the mortgage market we have surveyed, only Jaffee [38] directly incorporates possible disequilibrium into the specification of his model. Jaffee assumes that the mortgage market is always characterized by excess demand.

B. *Models with Explicit Long-Run Properties*

Virtually all the studies we have looked at use a measure of the flow of mortgages as the dependent variable. However, some studies use net

flow data while others use gross flow data. Some studies use data on total mortgage flows while other studies disaggregate by either type of structure — 1-4 family or multi-family — or by type of mortgage — FHA, VA or conventional. Besides these data differences, only a few studies — Silber [65], Jaffee [38], and Data Resources [14] — are formulated in a long-run framework with explicit long-run stock equilibrium implications. All these studies include a measure of the lagged stock of mortgages in a partial adjustment framework. In the other studies the implications of the cumulation of past flows do not play an explicit role in the equations.[5]

The three studies formulated with explicit long-run equilibrium properties include a measure of the stock of houses as the basic demand variable. They do not include other implicit determinants of the demand for the stock of housing.

C. *Models without Explicit Long-Run Properties*

The other studies, which do not have explicit long-run equilibrium properties, are more varied as to how they treat the demand for housing. In particular, some of these "flow" models of the demand for mortgage credit, Huang [35], Sparks [73], Kearl and Rosen [43], include measures of the flow of housing activity while others, Huang [35A] and Clauretie [13], include variables that represent the demand for the stock of houses.

Almost all studies have used the mortgage rate as the price variable that affects the demand for mortgages.[6] Only a few studies — Jaffee, Kearl and Rosen and DRI — include other interest rates. These three include some measure of the corporate bond rate although the DRI model also includes a measure of rates paid on deposits at savings institutions.

For most studies, the mortgage rate is the only direct element of the mortgage instrument that is included. Jaffee [38] recognizes that other elements of the mortgage contract would be expected to influence the demand for mortgage credit, but he does not include them in his equation citing negative findings of earlier authors and possibly bad data. It is interesting that Jaffee subsequently finds evidence of incomplete adjustment of mortgage rates resulting in short-run credit rationing. It is possible that some or all of this effect might have been caught by the inclusion of non-rate terms. Silber [65] reports that he attempted to include both the loan-to-value ratio and the amortization period. However, in his preferred equation, estimated by first differences, neither term appears. Huang has experimented with both terms. His 1966 and 1967 studies use the change

[5]The precise role of the stock of mortgages in Huang's work [35] is difficult to sort out. Huang's equations do include the lagged mortgage stock. However, the lagged stock appears in ratio form divided by the total holdings of financial assets.

[6]Huang [35] is the one exception. The mortgage rate enters only indirectly through its effects on housing starts.

in the amortization period. This variable is found to have a strong positive impact in both studies. Huang's 1969 study uses a constructed variable called per annum payment which is the quotient of the loan-to-value ratio and the amortization period. The coefficient for the per annum payment is negative in all equations for FHA, VA and conventional mortgages. The interpretation of this coefficient is a bit difficult as one would expect that both terms in the ratio would have a positive impact on the demand for mortgages.

The Clauretie study includes all three parameters of the mortgage contract — the mortgage rate, the loan-to-value ratio and the amortization period. The coefficients on the mortgage terms always have their expected sign — the mortgage rate coefficient is negative and both the loan-to-value ratio and the amortization period coefficients are positive. The Clauretie study is potentially very valuable for examining the impact of changes in mortgage terms. However, as suggested, there appears to be a basic misspecification in the Clauretie study that raises some question about the interpretation of the effects of the mortgage contract terms. All of Clauretie's equations deal with the flow of mortgage credit. No measure of the stock of mortgages appears in any equation, yet Clauretie's measures of housing demand — income, relative prices and a population variable — are clearly related to the demand for the stock of houses, not the flow of new houses. This misspecification is perhaps reflected in Clauretie's problems with these basic demand variables. They are frequently of the wrong sign, statistically insignificant, or have been dropped from an equation.

IV. THE INFLUENCE OF MORTGAGE INSTRUMENTS

The introduction strongly suggests that the demand for houses may well be influenced by more than permanent income and/or net worth, relative prices and real interest rates. In particular, during inflationary periods nominal interest rates, through their effect on the stream of real payments over time, are very likely to have an effect on the ability of a segment of the population to buy a house.

While there is no clear cut way to model such factors, the earlier discussion does suggest that things like the initial payment-to-income ratio and the faster buildup of equity are important features and may well affect the ability of individuals to buy houses.[7]

No study that we know of has reported attempts to measure the impact of such variables as the initial-payment-to-income ratio or some measure of the tilt of the stream of real mortgage payments. Of course, these

[7]If future incomes were known with certainty and if capital markets were perfect in the sense that individuals could borrow and lend at the mortgage rate, and, in particular, if they could borrow against future income, then there would be no problems with the level payment mortgage. Individuals could borrow on future income to finance their initial high mortgage payments.

effects presumably correlate somewhat with movements in things such as nominal interest rates, loan-to-value ratios, amortization periods and house prices. The following tables and discussion present in more detail implications from existing literature on the impact of some of these parameters of the mortgage instrument.

A. *Interest Rates*

There is virtually unanimous agreement that increases in mortgage rates reduce demand for mortgages and the number of housing starts. Table I shows mortgage interest rate elasticities of housing starts.[8] The simple correlation between starts and mortgage rates might be of ambiguous sign. On the one hand, higher mortgage rates lower demand. On the other hand, higher mortgage rates might increase the availability of mortgage credit and thus increase starts. For investigators who estimated demand and supply functions for starts, Table I reports only demand elasticities. Other investigators have estimated some sort of reduced form relation. Their interest coefficients, while still negative on balance, are some mixture of demand and supply effects. On balance, the single equation elasticities estimates appear to be substantially lower than the demand equation elasticities. It should also be noted that some elasticities deal with a subset of total starts.

There are several channels through which mortgage rates might affect the demand for housing starts. One effect is through a change in the real mortgage rate, which would be expected to have a negative impact. Another effect is through the impact on monthly payments. Even if the real mortgage rate is unchanged, a higher nominal rate raises mortgage payments immediately and would be expected to reduce the demand for starts. A third effect might work through an expectations effect. When the mortgage interest rate rises, individuals might postpone purchasing a house in the expectation of lower mortgage rates. To adequately model this effect would require some expression for expected future mortgage interest rates.

Few studies we have surveyed have made a systematic effort to sort out these various effects. Almost all of the studies have used simple nominal interest rates. Swan [80] mentions an unsuccessful attempt to measure the real mortgage rate. He speculates that the failure of the real rate to work properly is related to the question of the financing gap, but does not pursue the point with any measure of the gap. No other empirical study reports on any measure of a financing gap.[9] We conclude that while the

[8]Attempts to get elasticities for mortgage demand were less successful. Few authors reported elasticities; only Huang [36] published his data; measurement units were often ambiguous.

[9]It should be mentioned that the precise measurement of a financing gap would involve other variables besides the mortgage rate. The size of the financing gap would be related to the size of the loan, the maturity of the loan and the rate of inflation.

Table 1

THE EFFECT OF NOMINAL INTEREST RATES ON HOUSING STARTS

Investigator		Dependent Variable	Loan Parameter	Elasticity
MPS 1956:3-1972:2	Q	Value of single family starts	Mortgage rate	- .5[1] (Long Run) -1.00[1](Short Run)
Brady 1960:3-1970:2	Q	Conventionally financed single family starts	Mortgage rate	-2.78[1]
Brady 1960:3-1970:2	Q	All starts	Mortgage rate	-2.02[1]
Arcelus-Meltzer 1915-40	A	All starts (demand)	Triple A — corporate	-1.75[1]
1948-68	A	Single family starts (demand)	Triple A — corporate	-1.36[1]
DRI (old) 1961:1-1973:2	Q	Starts	New corporate bond rate	- .3[2]
Fair 1959:6-1969:12	M	Starts (demand)	Mortgage rate	- .59[2]
Huang 1953:2-1965:4	Q	Starts FHA (demand)	Mortgage rate	-2.36[3]
Rosen 1962:4-1972:4	Q	Single family starts (demand)	Mortgage rate	-1.33[1]
Kearl-Rosen 1962:4-1972:4	Q	All starts (demand)	Mortgage rate	-1.52[3]
Maisel 1952-1965	Q	Starts	Mortgage rate	- .56[1]
Swan 1958:1-1965:4	Q	Starts (demand)	Mortgage rate	-1.92[2]
Smith Canada		Single family starts	Mortgage rate	-1.56[1]
Bosworth-Duesenberry	SA	Value of residential construction ($1958)	Mortgage rate minus triple A corporate	-1.86[3]
Wharton 1953:3-1970:1	Q	Non-farm residential construction	Triple A	- .67

[1]Reported by author

[2]Reported by W. Gibson in "Protecting Homebuilding from Restrictive Credit Conditions", *BPEA*, 1973:3, p. 659

[3]Estimated

existing literature overwhelmingly suggests the negative impact of increases in nominal mortgage rates on the demand for starts, it is impossible to disentangle that effect into its several components.

There are other points to be taken into account when assessing these interest rate elasticities. As noted above most studies we have surveyed do not have explicit long-run equilibrium properties. For example, imagine that the interest rate falls. One would expect the demand for housing and home building to increase. The higher level of home building will increase the stock of houses above what it otherwise would have been. As the stock of houses approaches its new long-run equilibrium, one would expect the rate of home building to decline. Any permanent effect of lower interest rates on home building would work through the stock — depreciation of a larger stock — and through price effects — new families would demand larger houses in response to lower interest rates. The mechanism we have described is the familiar stock adjustment mechanism where the initial response of the flow to a change is larger than its long-run response. As mentioned before, the studies we have surveyed have concentrated on the flow of starts. Little attention has been given to long-run properties, and most studies have looked at the number of starts rather than the quantity of home building (size or quality times number). When considering starts it would appear that the long-run equilibrium number of units in the housing stock is dominated by demographic factors. The long-run influence of income, prices and interest rates on the number of units started would have to work through effects on either household formation, the demand for second units, the rate of removal or rates of turnover in the existing stock and hence a larger equilibrium level of vacant units and a larger stock.[10]

Another thing to keep in mind when looking at the elasticity estimates is the problem of possible disequilibrium in housing markets. If, as many observers believe, credit rationing is, at times, a real constraint on home building, then some observations would not be expected to lie on the demand curve. Inclusion of those points in estimation could bias estimates of the elasticity upwards. Only if these data points were somehow adjusted for the amount of rationing would the bias be eliminated. Investigators have different views on the importance of rationing. Those who believe that rationing is important have included different variables in an attempt to measure credit rationing. (Two models with explicit allowances for rationing are Fair [23] and, following Fair, Swan [76]. Fair reports an interest rate elasticity of the demand for starts of -.59 while Swan reports an interest rate elasticity of -1.92.)

[10]There may be a simultaneous effect of changes in the price of housing services on net household formation or, at least, households occupying separate units. An increase in rents can cause two or more generations of unrelated individuals to share housing, the "doubling" phenomenon, even though this possibility is usually not very attractive.

Finally, it is important what one's view of the structure of this sector happens to be. Several models have an explicit structure of demand and supply equations for starts. An alternative view conceives of a demand for capital (housing) because of the services provided, both old and new. Given the existing stock, a price is determined. The flow investment (starts) is then determined by the construction sector producing for profit. There is no separate demand for housing starts. Focus is on the process of credit allocation and response to prices and costs by those who construct homes.

This view of investment also implies that most studies of housing starts have been misspecified. To talk of the demand for starts is clearly inconsistent with the capital asset pricing view. Particular starts equations might be better or worse approximations as they include good or bad proxies for the capital asset pricing model. The FMP model is the only one we have surveyed that is specified in the spirit of the capital asset pricing model.

B. *Other Mortgage Terms*

Other mortgage terms used in regression models are the loan-to-value ratio and the amortization period. The evidence of the impact of these terms is less extensive than that of interest rates. The absence of such terms from many models can be interpreted in several ways. Some investigators simply did not consider these variables either because of the lack of data, the belief they were correlated with other included variables, or the belief they were not important. Other investigators may have considered these variables during their preliminary work, did not get statistically significant results, and then eliminated the variables from their discussion. A small number of investigators report on "unsuccessful" attempts to include such variables.[11]

Loan-to-Value Ratio

With respect to the loan-to-value ratio, the existing estimates, as shown in Table II, suggest a very strong response of housing starts to the loan-to-value ratio. When the number of starts is the dependent variable, elasticity estimates range from 1.18 to 5.61.[12] The Lee [48] study, which uses the value rather than the number of starts, finds a substantially lower elasticity. However, the Lee study is the only one that uses annual data. His data period runs from 1920-1941. All other studies use postwar quarterly data. If movements in the loan-to-value ratio are used to ration

[11] By "unsuccessful" is meant a lack of statistical significance and/or an unexpected sign. This use of "unsuccessful" is a bit misleading. If a variable does not belong in an equation, the lack of statistical significance should not strictly be considered a failure.

[12] It should be noted that not all the elasticity estimates apply to total starts; some apply only to a subset.

Table 2

THE EFFECT OF OTHER LOAN PARAMETERS ON HOUSING STARTS

Investigator		Dependent Variable	Loan Parameter	Elasticity
Brady 1960:3-1970:2	Q	Conventionally financed single family starts	Loan-to-value	2.54[1]
Brady 1960:3-1970:2	Q	All starts	Loan-to-value	4.6[1]
Huang 1953:2-1965:4	Q	FHA starts (demand)	Loan-to-value Amortization	1.18[2] .22[2]
Rosen 1962:4-1972:4	Q	Single family starts (demand)	Loan-to-value	5.61[1]
Kearl-Rosen 1962:4-1972:4	Q	All starts (demand)	Loan-to-value	2.37[2]
Lee 1920-1941	A	Value of Starts	Loan-to-value	.865[1]
			Mortgage rate times amortization period	-.277[1]

[1]Reported by author

[2]Estimated

people out of the housing market in the short run, it would not be surprising to find a much larger response with quarterly data.

All the empirical estimates in Table II report a positive impact of the loan-to-value ratio on housing starts. Virtually all investigators have expected a positive impact although there were several possible ways that changes in the loan-to-value ratio could affect the demand for units. One can distinguish between a downpayment effect and a monthly payments effect. These two partial effects would be expected to work in opposite directions. The total impact of a change in the loan-to-value ratios would thus be the sum of the two partial effects. The findings of a positive impact suggests the dominance of the downpayment effect.

Lower loan-to-value ratios mean higher downpayments and may thus eliminate families with little wealth from buying a house. Such an effect might mean no-house-purchase or the purchase of a smaller house. The latter impact would not mean a reduction in starts, only a reduction in the average size of units started. Undoubtedly some combination of effects on both the number and size of units takes place for those families who are constrained as to down payments. This discussion also suggests that a more appropriate way to measure the impact of loan-to-value ratios would include some measure of the wealth of potential home buyers and the price of houses.

The other way changes in the loan-to-value ratio could affect starts is through its effect on monthly payments. Other things equal, a higher loan-to-value ratio entails larger monthly payments. Larger monthly payments may eliminate some potential buyers.[13] This monthly payments effect suggests that higher loan-to-value ratios would reduce the amount of homebuilding. Again there could be effects on either the number of units, the size of units, or both. Only one study Huang [35] has suggested a negative impact of loan-to-value ratios on housing activity. All other studies we have surveyed, and Huang's equations for FHA and conventionally financed starts, report a positive impact of increases in loan-to-value ratios on housing activity. We thus conclude that the downpayment effect exceeds the monthly payments effect.

As with the mortgage rate, the interpretation of the empirical results on loan-to-value ratios needs to recognize the lack of an explicit long-run

[13]In a world with perfect capital markets (see footnote 7) one would expect that both constraints of initial equity and monthly payments would be jointly binding or not binding. One would not expect that only one constraint would be binding. An individual with too much income and too little wealth could borrow against his future income and increase this initial equity. In fact, capital markets are not perfect. Thus some individuals may be constrained by their low initial wealth and other individuals may be constrained by their low income. However, there is a presumption that it is more difficult to convert future income into current wealth than it is to convert current wealth into income. Such a presumption suggests that the downpayment constraint may be the more important empirical phenomenon. This expectation is also consistent with the observed positive impact of an increase in the loan-to-value ratio on housing activity.

equilibrium model. The implications of possible disequilibrium in housing markets may not be as serious for interpreting coefficients on the loan-to-value ratio as it is for the mortgage rate. Some investigators have argued that the loan-to-value ratio is, in fact, one measure of possible disequilibrium. Finally if the capital asset pricing view is correct, many starts equations may have been seriously misspecified.

To briefly conclude the discussion of the loan-to-value ratio, we find suggestive evidence of a substantial impact of the loan-to-value ratio on housing starts.

Amortization Period

Evidence on the impact of amortization periods on housing starts is more sparse than that for the loan-to-value ratio. Huang finds a small positive elasticity while Lee finds a small negative elasticity. However, Lee enters the amortization period multiplicatively with the mortgage rate, which makes the interpretation of his coefficient quite difficult.[14] We conclude that in the existing literature there is some suggestion of a small positive impact on housing starts of lengthening the amortization period.

With regard to the demand for mortgage credit, there is more limited evidence of a positive impact of both the loan-to-value ratio and the amortization period. Clauretie found large, positive and significant coefficients for both variables. Huang is the only other investigator to find any impacts of the non-rate terms on the demand for mortgage credit. His earlier work [36] finds a positive effect of changes in the amortization period. His later work [35] has the peculiar variable measuring per annum payments. Those results indicate that increases in the loan-to-value ratio decrease the demand for mortgage credit. Huang's use of the per annum payment variable necessarily implies that the loan-to-value ratio and the amortization period will have effects of opposite sign.

In the interpretation of this evidence one should distinguish between the indirect effect of non-rate terms on mortgage demand through their effect on starts and any additional direct effect on the demand for mortgage credit. In the Clauretie study, the non-rate terms have to be measuring both effects. However, other questions about the specification of his equation suggest caution in interpreting his results. In Huang's earlier study the change in the amortization period is also capturing both effects while in his later study the per annum payments variable is measuring only any additional effect. The equation already includes the value of new starts which in turn are influenced by both non-rate terms. We conclude that the existing literature offers only a limited suggestion of a direct effect of non-rate terms on the demand for mortgages. The largest effect would have to be derived from any impact on housing activity.

[14]Unfortunately his specification does not include the mortgage rate as a separate variable; if it had, interpretation of this variable would be possible.

V. SUMMARY

To briefly summarize our survey, there is strong evidence to suggest that parameters of the mortgage instrument affect both the amount of homebuilding and the demand for mortgage credit. Almost all researchers agree as to the sign of effects. There is less of a consensus as regards the magnitude of effects.

None of the studies we have surveyed have been specified in the detail necessary to evaluate the impact of proposed alternative mortgage instruments. The proposed instruments would affect things like initial payments to income ratios and the time path of payments. None of the studies we have surveyed have attempted to measure these effects.

A number of studies have concluded that credit rationing is an important influence on housing markets in the short run. To the extent that alternative mortgage instruments help financial institutions compete for funds, the instruments may help alleviate problems of credit rationing.

Discussion

Frank de Leeuw*

This is a very useful and able survey of what has been done. It turns out, as the authors state clearly, that nothing has been done that really addresses the central ideas of this conference. This is of course unfortunate, but it certainly is not the authors' fault.

What I want to do instead of reviewing the authors' review is to spend a few minutes talking about possible ways of empirically testing the central idea on the demand side — the idea that the time-path of mortgage payments in constant dollars has an impact on the demand for housing. At the present time we are living in a downward-tilting real payments world because of inflation. We want to know how much impact that has on the demand for mortgages.

It seems to me that what needs empirical study is not the *existence* of some time-path effect of this kind. Arithmetic examples are dramatic enough to compel agreement that the very high initial payments-to-income ratio at the present time is having some effect on new housing purchases. What we want to appraise is the *magnitude* of the effect, with a view toward getting some handle on the potential demand for and effect of an alternative mortgage instrument.

One of the possibilities for empirical testing is further analysis of U.S. quarterly time series data. I am not too sanguine about obtaining convincing evidence from this source. Most of those who work with these series have more or less memorized them by now, and can use them to support a fairly wide range of contrasting propositions.

It seems to me that the most useful possibility for empirical headway would start from the proposition that the high initial real-payment effect that we are talking about should be quite unequal in its impact on different kinds of households. The impact should be strongest on those households which have a strong propensity to own their own home but which do not have other assets or lines of credit — typically, young, middle-income, first-home buyers. These households can afford the high initial cost of a conventional mortgage in an inflationary economy only by reducing

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other forms of consumption, not by making a portfolio adjustment. The effect should have less impact on households which have other assets, either because of general wealth or because of accumulated unrealized capital gains from a house they already own. It should have less impact on these households because they do not have to meet the high initial payment-to-income ratio by reducing current consumption; they can make a portfolio adjustment instead.

The high initial cost problem should also have less impact, it seems to me, on many developers of rental housing. I am thinking here of investors who are attracted by the tax advantages of rental housing. Like homeowners, they are borrowers in the mortgage market but many of them are in a position to accommodate the declining stream of real payments by other portfolio adjustments rather than by current consumption adjustments.

Because of these differential impacts empirical work could be based on a comparison of subgroups of households in a low inflation, low mortgage rate setting on the one hand and a high inflation, high interest rate situation on the other. The expectation is that middle-income, young households would cut back on housing standards more than other households in the second setting, and also that middle-income households would reduce their propensity to own rather than to rent. Of course it would be necessary to control for other influences — in particular, for demographic variables such as the number of children and for relevant price variables such as the price of structures. It seems to me that it is possible to find data that would permit such a study, either longitudinal data or cross-section data from different years. The study itself would not, of course, reveal exactly what the response to a price-level-adjusted mortgage might be. But finding out which groups of households are likely to be strongly affected and how much they might be affected is a way to get some feel for the potential market for a new mortgage instrument.

I have one final point relating to the difference between the initial impact and the ultimate impact of a declining real-payment mortgage instrument. The biggest initial impact, it was argued above, is on young, middle-income households that are potential homeowners. The final impact, it seems to me, would be much more widely diffused. The reason is that the number of housing starts over any extended period has a critical influence on the amount and price of a wide range of existing housing. In the long run, the price of existing housing would be driven up by a reduction in the demand for new housing. While the initial impact of a declining real-payment mortgage instrument might be on a small group of middle-income families, the ultimate impact would fall on a much larger group of families.

Discussion

George M. von Furstenberg*

The paper by Kearl, Rosen, and Swan provides not only a competent review of the influences of the terms of financing and other factors on the demand for housing and mortgage credit, but it also contains an interesting hypothesis about the effect of inflation on the attractiveness of the standard fixed-rate mortgage. According to the authors, the inflation premium in interest rates tilts the schedule of real payments upwards at the front end and thereby raises real payments in the initial period of the contract above those corresponding to the constant stream of payments without inflation. During this period, the household "must either increase the proportion of income allocated to housing (if possible) or reduce the amount of housing purchased."

There is no question that inflation speeds up the reduction in *real* indebtedness under any level monthly payments schedule although higher interest rates slow the reduction in the *nominal* balance of the mortgage during the initial years of the contract. What can be questioned is whether this speed-up reduces the demand for mortgage credit since there are several conflicting factors.

For taxpayers itemizing deductions, inflation premiums in interest rates reduce taxable income even though such premiums do not constitute payment for the services of capital but merely provide for maintenance of the real value of indebtedness. In other words, the inflation-induced reduction in real indebtedness becomes deductible to the extent an inflation premium is contained in the contract interest rate. Hence, compared to a non-inflationary environment, given the discounted present value of the real stream of mortgage payments to the lender, the real net payments made by the borrower are lower the higher the rate of inflation, once adjustment is made for this tax saving. Indexing the tax structure, so that only the pure interest payment and not the inflation premium becomes deductible for the borrower and taxable to the lender, would eliminate this anomaly.

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The reduction in the default risk on mortgages to lenders that is due to the faster rate of equity build-up on homes financed with standard mortgages might have the effect of lowering the required real rate of return on mortgages in an inflationary setting if the rate of inflation is steady. Since high rates of inflation are inherently unsteady, both borrowers and lenders may raise their total risk premiums nonetheless. In that event both the supply and the demand schedule for mortgage credit would shift inward. However, it is not obvious that uncertainty about future rates of inflation and the redistribution of real mortgage payments across time that is due to inflation outweigh the effect of the favorable tax treatment of inflation premiums on the demand for mortgage credit.

While I doubt that the fixed-rate mortgage has done much to reduce the demand for mortgage credit under inflationary conditions, it clearly has reduced the quantity of mortgage credit supplied whenever inflation and market interest rates have risen. My point is merely that the inefficiency of this instrument grows with the rate of inflation from the supply side rather than the demand side. Alternatives to this instrument are sorely needed since both borrowers and lenders are expected to benefit from innovations that increase the supply of mortgage credit and its stability even if they do not raise the demand schedule appreciably. In fact, provided a choice of instruments is maintained, borrowers will benefit from the introduction of new instruments' lower rates even if these instruments would be less desirable from the borrower's point of view at equal expected costs over the life of the contracts because risks are shifted from the lender to the borrower under viable new instruments such as the variable-rate mortgage.

Price-Level-Adjusted Mortgages in Brazil

Richard Anderson and Donald R. Lessard*

I. INTRODUCTION

Brazil has adopted price-level indexation of financial contracts to a much greater degree than any other country. Indexation was adopted during the mid-1960s, following a period of extremely high and volatile inflation, in response to virtual stagnation in financial markets and a host of related problems. Although there is considerable controversy over the extent to which indexation has contributed to Brazil's subsequent economic growth and the diminution of inflation, there is little question that, in combination with reductions in the rate of inflation, it has been a major factor in revitalizing financial markets and increasing the volume of funds available for housing.

Virtually all mortgages are price-level adjusted and, in the majority of cases, are financed directly or indirectly by indexed liabilities. Of special interest to this study is the fact that various government-controlled pension funds, whose liabilities (benefits) are price-level indexed, are major suppliers of mortgage credit.

Since mortgage indexation is part of a much more general scheme, we begin with a brief overview of indexation in Brazil.

II. A BRIEF HISTORY AND OVERVIEW OF PRICE-LEVEL INDEXATION IN BRAZIL[1]

Brazil adopted indexation in 1964 as a response to the bleak performance of the economy in the early 1960s. The 1950s had been a time of modest if uneven growth and inflation rates. Under the populist government that ruled from 1959 to 1963, inflation rose from 30 percent to almost 100 percent per annum, and average real wages fell 15 percent in

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[1]This section of the paper draws heavily upon Baer and Beckerman (1974), Campiglia (1974), Fishlow (1974), and Kafka (1974).

spite of a 13 percent gain in labor productivity. The progressive personal income tax had no automatic adjustment for inflation and only *ad hoc* adjustments were made during the 1950s. Housing was stifled by rent control at fixed nominal levels. Corporations were subject to an excess profits tax on illusory inflation profits due to both historical-cost-based depreciation and "inventory profits." Medium and long-term capital markets had disappeared entirely with the exception of Brazilian government development funds and U.S. AID loans.

The military government that came to power in 1964 chose to encourage expanded employment and more rapid growth in GDP rather than attempt a rapid reduction in the rate of inflation. Indexation was instituted as a temporary measure to reduce the costs and distortions from the higher interim rates of inflation; it was not suggested as a permanent solution. Inflation was reduced to under 30 percent per annum by 1967 and to a low of 16 percent in 1973. In 1974, it accelerated to over 30 percent, largely in response to the external shocks of oil and commodity price increases. Over this same period, real GNP growth jumped, reaching an average level of 11 percent from 1970 to 1973.

A. *Indexation in Financial Markets*

The Mechanics of Price-Level Indexation. Before the reforms of 1964, usury and legal tender acts enacted in 1933 had barred nominal interest rates above 12 percent, as well as any price-level adjustment of the principal value of assets. Since 1964, two types of indexation have been allowed in Brazil for selected assets.

The first type is post-indexation, where assets are issued with a fixed interest rate but have periodic adjustment of the nominal principal value to compensate for inflation. The index used for adjustment and the timing of adjustments are legally mandated. The increase in the nominal principal value of the asset is treated as a capital gain and effectively escapes taxation.

A series of laws from 1965 to 1967 led to the second type, a "pre-indexation" scheme for short-term assets. The 12 percent usury ceiling on interest rates had often forced short- and medium-term financing to be done on a "banker's-discount" basis through the sale of promissory notes on the Brazilian stock exchange. Further, the full income from these short-term assets was taxed as current income even though the effective yields, of course, included a substantial inflation premium as compensation for expected declines in the real value of the principal.

With pre-indexation, an implicit inflation forecast is incorporated into the nominal interest rate, just as is the case in the United States. However, that portion of the interest income received by the holder which is merely compensation for the decline in the real value of the asset is exempt from taxes and from usury ceilings. The size of the exemption is determined by applying to the initial nominal principal value of the asset the same "inflation index" used for principal-adjustment of post-indexed assets.

Post-indexation, therefore, may be viewed as providing a fixed *real* rate of interest but a variable *nominal* rate of interest and pre-indexation as providing a fixed *nominal* rate of interest and a variable *real* rate of interest. The investor's choice between the two types of instruments depends upon his expectations of the future level and variance of the rate of inflation.[2] If all investors perfectly anticipated inflation, and short rates reflected that expectation, then the real rates of return on post-indexed and pre-indexed assets would differ only as a reflection of the term structure for the various maturities. Since variance in the *ex ante* rate of inflation presumably increases with the term of the asset, it is understandable that post-indexation has been used for all long-term assets and pre-indexation for short-term assets.

History since 1964. The first indexed financial assets offered in Brazil were one, two, and five-year post-indexed Treasury bonds issued in 1964 at a 6 percent interest rate, with monthly price-level adjustment of principal based upon a three-month moving average of the Vargas Foundation's wholesale price index, lagged three months (five-year bonds were adjusted quarterly).[3] Purchase of the bonds was compulsory for firms subject to taxation.

Favorable market response to indexed federal debt led to the extension of indexation, on the same post-indexed basis, to mortgages in 1964 and 1965, and in July 1965 to long-term corporate debt, most time deposits, and all medium-term debt instruments.[4] Indexation has since been extended to state government bonds, promissory notes, and made compulsory for savings and time deposits of two years' maturity or more. No indexation is permitted on demand deposit accounts.

In 1967 pre-indexing was made available for private assets, and in 1970 the federal Treasury issued new pre-indexed short-term bills to coincide with the beginning of open-market operations by the Central Bank of Brazil (itself a product of the 1964 reforms).

In 1973 concern over acceleration of inflation led to a new inflation-index for medium and long-term debt under both post and pre-indexing: the price-level adjustment of principal was linked to a moving average of *actual* inflation in the wholesale price index for the past three months plus *official forecasts* for the next two months. In July 1974 this index was mandated for short-term pre-indexing as well, and now governs all indexed financial assets in Brazil.

[2]See Fischer (1975) for an extensive analysis of the portfolio effects of indexed assets.

[3]The wholesale price index is based only on commodities, and thus potentially omits differential effects of increased prices of services. Table 1 shows that changes in the wholesale price index and thus the computed monetary correction rates have often been below increases in consumer prices of goods and services.

[4]While the compulsory introduction of indexation partially halted income transfers resulting from inflation, it also restored a positive real rate on loans and helped induce a recession in 1965 and 1966.

Table 1 shows the dramatic increase since 1969 in savings, both voluntary and compulsory, in indexed as compared to non-indexed assets.

Many of the indexed sources, including mortgage bonds, time deposits, and the Seniority Security Fund, channel funds into housing. This is reflected in the rising share of total domestic credit going to housing — from 13.4 percent in 1969 to 22.6 percent in 1973.

B. *Indexation and Wage Adjustments*[5]

Wages in Brazil have been implicitly based upon price increases since the early 1950s. Formal control through a mixture of indexation and income policies was introduced in 1965 for federal employees and minimum wage employees, and extended in 1966 to all workers subject to collective bargaining or labor court awards. The 1966 legislation provided that all labor contracts would be for 12 months and must be calculated according to a government-mandated formula in three parts: the first part allowed for an increase in the nominal wage sufficient to restore the *average* real wage that prevailed during the past 12 months, the second for a nominal increase sufficient to maintain that average real wage during the next 12 months if inflation follows the official government forecast, and the third for a nominal increase to reflect gains in labor productivity. The use of the past actual *average* real wage coupled with over-optimistic government predictions of inflation caused real wages to fall, under formula adjustment, from 1964-1967. Further, the government has consistently awarded only about one-half of productivity gains to labor, explicitly trading off even higher real wages for higher employment.[6]

In 1968 the adjustment formula was changed to use the average real wage that would have prevailed last period if the government forecast of inflation had been correct. The cumulative effects of government underestimation of inflation were thereby halted; over the 1968-1973 period wage adjustments ran about 2 percent more than inflation, but still well below the growth rate of labor productivity or the growth rate of real GDP. In 1974, wage adjustmens were held substantially below the rate of inflation; forecasts of upcoming inflation, which are part of the formula, appear to have been biased downward as a matter of policy. The adjustments for 1975 appear to be aimed at making up some of the discrepancy. Minimum wages and wages of public employees are not calculated by these formulas, and have not kept pace with inflation.[7] From 1964 to

[5]This section draws heavily upon Kafka (1974) and Fishlow (1974).

[6]The new economic policy makers who assumed control in 1968 displayed a definite preference for full employment and rapid growth while relying on indexation to reduce many of the distortions from inflation. From 1967-1971, the average urban real wage rose 12 percent and productivity rose 24 percent; the average industrial real wage rose 11 percent while productivity rose 32 percent.

[7]The 1975-1976 minimum wage adjustments are, for the first time, well above the anticipated rate of inflation.

Table 1

GROWTH OF SELECTED SAVINGS INSTRUMENTS — 1966-1974

End-of-year Levels in Millions of Cruzeiros

	Voluntary Sources							Compulsory Sources	
Year	Treasury Bonds (post-indexed)	Treasury Bills (pre-indexed)	Mortgage Bonds (post-indexed)	Commercial Bills of Exchange pre-indexed)	Savings Deposits (post-indexed)	Time Deposits (pre-indexed)	Time Deposits (non-indexed)	Seniority Security Fund (post-indexed)	Other Funds (post-indexed)
1966	1,401	—	7	906	18	141	127	—	—
1967	2,482	—	140	2,105	86	469	138	597	—
1968	3,491	—	461	4,558	330	1,055	312	1,604	—
1969	5,881	—	922	6,172	893	1,938	74	2,832	—
1970	9,412	700	1,724	9,756	2,081	4,283	75	4,345	—
1971	11,565	3,880	2,762	14,390	3,761	9,319	88	6,332	1,008
1972	15,975	10,204	4,566	22,305	7,713	16,803	133	9,038	2,648
1973	20,944	17,400	6,259	37,129	14,122	26,399	113	12,907	7,559
1974*	23,650	16,650	6,720	41,459	16,554	25,958	118	14,797	8,587

*April, 1974 — Preliminary

Source: Central Bank of Brazil, *Bulletin,* 1974.

1967, real minimum wages fell 16 percent, while average industrial real wages rose 7 percent.

Since 1968 a government policy of reducing geographic wage differentials has meant smaller increases in minimum wages in high wage areas and larger increases in low wage areas. Preliminary comments indicate some success in narrowing wage differentials. The government has also allowed increases in excess of formula adjustments for industries whose productivity gains allow such increases without pressure on prices. The continuance of the boom that began in the 1960s has seen manufacturing employment grow 9.1 percent in 1973 and nearly 9.9 percent in 1974, forcing increased competition for all forms of labor and steady upward market pressure on wage rates.[8]

C. *Indexation and Public Sector Finances*

The advent of indexation in the fiscal sector has sharply reduced the fiscal deficit, which had been as large as 4 percent of GDP in the mid-1960s. Past-due tax liabilities were immediately indexed in 1964, and new corporate and personal income tax laws in 1966 saw the cruzeiro limits for rates, exemptions, and deductions indexed with annual adjustments.[9] The consolidation account of general government has been in surplus consistently since 1970, and the central government cash budget ran a surplus in 1973; predictions are for a small 1974 deficit when final data are available.

Expenditures have been kept at a roughly constant proportion of GDP by freezing employment and indexing government wages below the actual rate of inflation.[10]

Revenues, based principally upon ad valorem commodity taxes, have grown faster than money GDP, in spite of numerous tax reductions for specific policy goals. This is mainly because of a concentration of the taxes in the fastest growing sectors of the economy and the rapid increases in the labor force by social security and the Unemployment Insurance Fund.[11]

[8]Automatic cost-of-living increases have been dropped for employees in the highest income categories. This step apparently was taken to allow a narrowing of wage differentials, which had become extreme due to an acute shortage of high-level managers and other professionals during the early years of the current economic regime.

[9]The question of proper indexation of corporate fixed assets for depreciation is a difficult one. Although Brazil allowed some indexation of assets for the 1951-1966 excess profits tax, indexation for depreciation purposes was not allowed under the regular corporate income tax until 1964. Adjustment of working capital was allowed after 1964.

[10]These expenditures do not include subsidies provided by quasi-governmental semi-autonomous agencies. Although these amounted to nearly 1 percent of GDP in 1973, they were reduced substantially by adjusting domestic oil prices to world levels in April 1974. These figures also exclude capital expenditures of the semi-autonomous agencies.

[11]Substantial revenue also is collected through indexed corporate and personal income taxes.

For housing finance, the seniority security and social integration funds are of great potential importance and will be discussed in the next section. The Seniority Security Fund (Fondo de Garantia do Tempo do Servico-FGTS), which provides lump sum benefits upon termination or retirement, was created in 1966 and is financed by an 8 percent tax on wages and salaries. The fund has grown steadily, and the net proceeds are used to finance the National Housing Plan.[12] Further, workers are permitted to draw upon balances in their FGTS accounts for housing purchases.[13]

Finally, the introduction in 1970 of Central Bank Open Market Operations in Treasury bills, and recent heavy Central Bank sales of bills to absorb inflows of foreign capital, have substantially reduced monetary authority holdings of federal debt. An indexed tax structure, expenditure restraint, and continued sales of federal government debt to the public have been central causes of the reduction of inflation rates in Brazil, and the subsequent partial rebirth of medium-term credit markets.

III. DESCRIPTION OF BRAZILIAN PRICE-LEVEL-ADJUSTED MORTGAGES

Virtually all mortgages in Brazil are price-level adjusted, although a significant proportion have payment streams which are linked to a wage index.

A. *Variations in Mortgage Terms*

Brazilian mortgages differ in terms of maturity, interest rate, and repayment patterns depending upon the size of the loan and the household's income. Loan sizes are expressed in terms of units of constant purchasing power (Unidades de Padrao de Capital - UPC) to automatically correct for price-level changes while income levels are usually expressed in multiples of the minimum wage.[14] Mortgage terms are set by the National Housing Bank (BNH), which regulates institutions that finance housing and is a major supplier of credit to these institutions. Differences in these terms reflect, to a large extent, an effort to redistribute income through the housing finance system.

[12]Such withdrawals have been negligible, but recently regulations have been liberalized to encourage their use.

[13]PIS (Social Integration Fund) and PASEP (Government Employees' Participation Fund) are similar forms of compulsory savings, the former with the proceeds of a gross receipts tax plus 5 percent of corporate income taxes and the latter with a percentage of government revenue. Both funds support industrial development.

[14]The dollar value of the UPC was $12.85 in 1973 and remains fairly constant since Brazil's exchange rate is adjusted periodically to reflect inflation relative to that of the United States. The relation between UPCs and the minimum wage (actually there are various minimum wages for different areas) is not absolutely constant, since they are adjusted according to different formulas. In 1973, 1 minimum wage was equal to approximately 3.75 UPCs.

Low-income borrowers are given relatively favorable treatment as part of the Home Income Housing Finance Program (SIFHAP) which is administered by the National Housing Bank. Through these programs, BNH provides advances at concessionary interest rates against loans for up to 900 UPC (roughly US$11,500) to households with monthly incomes of up to 13.3 UPC minimum wages (roughly US$650) and requires that lenders allocate specified proportions of their loans to specific income groups.[15]

Families whose incomes are above the levels served by the low-income financing program are eligible for mortgages of up to 3500 UPC (roughly US$45,000) from the Housing Finance System, comprised of savings and loan associations, savings banks, and real estate credit companies acting as agents of the BNH which provides advances against eligible mortgages.

Table 2 summarizes interest rates, limits on the ratio of payments to income, maximum loan-to-value ratios, and maximum maturities for loans eligible for either the special financing programs or SFH mortgages.

Larger loans are available from savings and loans, savings banks, and real estate credit companies, but are not eligible for BNH advances. Interest rates on these loans generally are 12 percent, the maximum allowed by law.

B. *The Mechanics of Mortgage Indexation*

The *principal value* of each loan is adjusted each quarter by applying a *monetary correction factor* — usually the percentage change in the value of readjustable treasury bonds which in turn is linked to official price indices — to the outstanding principal. The base interest rate, fixed for the life of the mortgage, is then applied to the adjusted principal.

Payments, in contrast, are adjusted either by the *monetary correction factor* or a *wage index.* For loans up to 1,800 UPC (roughly US$23,000) the borrower may choose to have payments adjusted by either index. Over 1,800 UPC, payments are linked to the monetary correction factor.

In the case of loans with payments linked to the wage index, adjustments are made once a year in proportion to changes in the legal minimum wage. Since the principal obligation is adjusted by price-level changes, actual payments may fall short of or exceed the amount required to fully amortize the loan. At maturity, any shortfall is made up by the Salary Variation Compensation Fund set up by the BNH. Any overpayments go to the Fund.

Two types of *amortization schedules* apply. For mortgages eligible for wage-linkage, scheduled payments involve equal amortization of principal over time (prior to wage or price-level adjustment). Thus, they are scheduled to decline in real terms over the life of the mortgage. For loans over

[15]The program serves three categories of households — "popular" with monthly incomes up to 1.6 minimum wages (US$75); "economic" with incomes up to 4.3 minimum wages (US$200); and "intermediate" with incomes up to 13.3 minimum wages (US$650).

Table 2

MORTGAGE TERMS ACCORDING TO SIZE OF LOAN[1]

UPCs	Loan Size in US$[2]	Maximum Interest Rate[3]	Maximum Payment-to-Income Ratio[4]	Maximum Loan to Value Ratio	Maximun Maturity
		%	%	%	Year
0-100	0-2,570	1.0	18	90	25
100-300	2,570-3,855	2.6	20	90	25
300-400	3,855-5,140	3.3	25	90	25
400-500	5,140-6,425	6.0	25	90	25
500-600	6,425-7,710	6.6	25	90	25
600-700	7,710-8,995	7.3	25	90	25
700-800	8,995-10,280	7.9	25	90	25
800-900	10,280-11,565	8.6	25	90	25
900-1000	11,565-12,850	9.3	25	90	15-25
1000-3500[5]	12,850-44,975	10.0	25-40	70-90	15-25

[1]These rates went into effect in 1975. Previously a similar but more complex scheme v in force.

[2]For the third quarter of 1974, the UPC had nominal value of CR$ 89.90 or appro mately US$ 12.85.

[3]This is the "real" rate. The nominal cost includes this rate and the rate of inflation.

[4]Initial periodic payment to income with the constant amortization plan described belo

[5]Prior to July 1975, this limit was UPC 2250 (roughly US$ 29,000).

1800 UPC, borrowers may choose either level total payments (prior t monetary correction) or level amortization of principal.

IV. THE BRAZILIAN SYSTEM FOR FINANCING HOUSING[16]

Housing finance in Brazil is provided by four types of institutions: th National Housing Bank (Banco Nacional de Habitaçao-BNH), specialize financial institutions, general purpose financial institutions, and pr motional entities which are engaged primarily in construction but al perform a financing function.

[16]This section is based on *Sistema Financeiro da Habitaçao,* IBMEC (Brazilian I stitute for Capital Markets).

The National Housing Bank controls and supervises the entire system and supplies credit via other intermediaries.

Specialized financial institutions include savings and loan associations, real estate credit companies and government sponsored savings banks.

General financial institutions which finance housing include state development banks, investment banks and commercial banks. The promotional entities which also perform financing functions are state housing companies and cooperatives.

Table 3 shows the relative importance of the various mortgage lenders.

Overlaying these institutions are various housing programs and housing finance systems administered by BNH. The Housing Finance System (SFH), aimed at middle income groups, encompasses the savings and loans for which the BNH acts as central bank as well as a variety of other institutions which are BNH agents. The Low-Income Housing Finance System (SIFHAP) is a subsystem of the SFH and is based on a set of special BNH lending relationships with the various institutions. It, in turn, is directly related to the Low Income Housing Program (PLANHAP), through which BNH promotes low-income housing.

A. *The National Housing Bank*

The National Housing Bank (BNH), founded as part of the 1964 financial reforms, serves as central bank to the savings and loan associations and supervises the housing finance activities of the other specialized housing finance institutions. It is responsible for all government housing programs comprising the National Housing Plan and serves as an investment banker for the construction and building materials industries. As such, it combines the activities carried out in the United States by HUD, the Federal Home Loan Board, FNMA and GNMA. Nearly 80 percent of its assets are advances against mortgages held by other financial institutions, with most of the remainder being held in Treasury securities.

BNH as currently organized is an autonomous public enterprise which does not depend upon direct public funding. However, nearly 80 percent of its liabilities represent the assets of the Seniority Security Fund funded by an 8 percent payroll tax. Thus, the primary assets of Seniority Security system — whose benefits are adjusted for price-level changes — are advances against price-level-adjusted mortgages. BNH also is empowered to issue mortgage bonds, but these represent less than 1 percent of total liabilities. Most of these have been issued to the Social Security Trust Fund in payment for land owned by the Fund which has been used for public housing projects.

B. *Specialized Financial Institutions*

Savings and loan associations are mutual institutions similar to their U.S. counterparts. Over 90 percent of their assets are price-level-adjusted

Table 3

RELATIVE IMPORTANCE OF MAJOR MORTGAGE LENDERS — 1973

	Total Mortgages	Refinanced by BNH
	Millions of Cruzeiros	
Real Estate Credit Companies	13,924	5,344
Savings Banks	7,386	709
Savings and Loan Associations	2,748	1,550
Commercial, Investment, and Development Banks	N.A.	5,647
Housing Companies	N.A.	2,958
Housing Cooperatives	N.A.	3,462
Other	N.A.	950
Total Refinanced by National Housing Bank		20,620

Source: IBMEC, *Sistema Financeiro da Habitaçao* and *Conjuntura Economica.*

mortgages. Their liabilities include passbook savings deposits, mortgage notes, and BNH advances. Savings deposits are the most important source of funds, followed by BNH advances. Although BNH deposits represented 57 percent of total liabilities in 1973, they provided funding for less than one-fourth of the new loans in that year. Savings deposits accounted for the bulk of the remainder.

Real estate credit companies are private stock companies which engage in real estate finance. Most of their assets, 84 percent in 1973, are mortgages and construction loans. Their prime sources of funds are mortgage bills, which represented as much as 60 percent of total liabilities and net worth in the late 60s but have fallen steadily since then, to 38 percent of total liabilities and net worth in 1973. The difference has been made up by BNH advances, which have increased from 17 percent to more than 34 percent over the same period, and savings deposits, which grew from 5 percent to 16 percent of total liabilities and net worth.

Savings banks are the oldest among the specialized financial institutions, but have changed considerably since the incorporation of their real estate finance activities into the system controlled by the BNH. These banks are sponsored by federal or state governments. Their assets, in contrast to the previous two groups of institutions, include a much higher proportion of government securities. Mortgages account for roughly 30 percent of their total assets. Although eligible for BNH finances, most

savings bank funds are obtained from savings deposits. Two types are offered — regular passbook accounts and accounts linked to future purchases of housing.

Savings Instruments Issued by Specialized Financial Institutions

As noted, specialized financial institutions offer three types of financial instruments to the public: savings deposits, mortgage bills, and mortgage notes. All are price-level adjusted.

Passbook savings accounts are price-level adjusted and bear a fixed rate of interest, currently 6 percent. Price adjustments are made quarterly according to the official price index and are applied to the lowest deposit balance in the previous quarter. Interest payments and "monetary correction" adjustments to principal are tax exempt below specified limits. Savings deposits are available only to individuals, not to corporations.

Mortgage bonds are negotiable securities with a fixed interest rate and price-level adjustment. They are issued with a variety of maturities, from three to ten years. Two basic types are issued: *income bonds* and *savings bonds.* Income bonds pay out both interest and the monetary correction on a quarterly basis. Savings bonds pay out only interest and the monetary correction accumulates until maturity. Interest payments, but not the "monetary corrections," are taxable. However, special exemptions apply to these instruments and serve to reduce the effective tax rate which applies to them.

Mortgage bonds are guaranteed by the BNH, which charges an insurance fee of .125 percent per quarter and controls the amount issued by any institution.

Mortgage notes are similar to mortgage bonds, but are backed by specific mortgages and are repaid according to the same amortization schedule which applies to the mortgage.

Of the three, savings deposits are the most important and also show the fastest growth, rising from 2 percent of all financial assets in the hands of the public in 1967 to 6.6 percent in 1973. From 1970 to 1973, the number of individuals holding savings accounts increased at an annual compound rate of 54 percent. Mortgage bonds, in contrast, accounted for 2.4 percent in 1969, rose to 3.3 in 1972, but fell to 2.9 in 1973.

V. EXPERIENCE WITH PRICE-LEVEL-ADJUSTED MORTGAGES

A. *The Ability of Households to Meet Rising Nominal Payments*

With rates of inflation ranging from 20 to 30 percent, it is clear that "monetary correction" represents a major part of the nominal cost of a loan. Understandably, borrowers complain about this price-level adjustment and in recent years certain groups whose wages did not keep up with general price-level changes found the adjustments very burdensome and delinquency became more frequent. As noted earlier, wage earners who are either civil servants or earn wages linked to the maximum wage

(who account for well over half the urban work force) have seen their real wages fall steadily through 1974.

In response to this situation, the government introduced wage-linked payments coupled with a constant amortization of principal. Wage-linkage provides a form of insurance against further divergence between wages and prices while the constant amortization payment schedule, by forcing real payments to decline through time, provides an extra cushion. The government also has avoided foreclosures wherever possible, and seeks to renegotiate mortgages where necessary.

When the wage-linked option was first offered, it was chosen by three-quarters of the eligible borrowers. By 1975 the proportion had risen to over 95 percent. Most higher income borrowers, who had a choice between level payment and constant-amortization payment plans, elected to remain with the former system.

B. *Indexation and the Success of Government Housing Programs*

Given the much larger proportion of low income households and the paucity of adequate housing in comparison with the other countries reviewed, Brazil faced a substantially different task. Stabilization may have been an issue, but it was overshadowed by the need to increase the total level of housing construction. Since changes in mortgage markets were accompanied by drastic changes throughout the economy, it is impossible to accurately determine the role of the financial system in subsequent developments. However, the Housing Finance System claims to have financed over 1,000,000 houses since its inception in 1964, compared to 120,000 units financed through mortgages during the previous 25 years. It currently accounts for over 70 percent of all units financed.

Housing starts, as measured by permits granted, have shown an enormous growth. In 1974, permits were issued for 122,000 units in major urban centers, compared to 37,000 units in 1968.

In terms of the distributional goals, an accurate evaluation is even more difficult.[17] The government has endeavored to shift financing toward lower income groups via two mechanisms: advances at concessionary rates from the BNH and limits on the proportion of mortgage lending to lower (minimum limit) and upper income (maximum limit) groups for institutions comprising the SFH. While the minimum "spread" between the mortgage rate and the BNH advance rate is 1 percent, it goes as high as 3 percent to loans in the 400-500 UPC category.

These concessionary advance rates to lower income groups are not subsidized by the government budget, but rather from BNH's own operations.[18] Thus the BNH to some extent, serves as a redistributive device.

[17]For an extensive evaluation of the redistributive aspects of the Brazilian housing finance system see Reynolds and Carpenter (1974).

[18]The only element of external subsidy might be the 3 percent earnings rate applied to FGTS funds.

From 1961-1971, two-thirds of the SFH financed housing units were for families of one to six minimum wage incomes, with an average per unit cost of about US$7,500, and one-third of housing units were financed for those over six minimum wages, with a maximum per unit cost of roughly US$29,000. The increased 1973-1974 inflation altered the picture somewhat. For 1974, one-third of housing units were for families of one to eight minimum wage incomes, and two-thirds of units for families of eight or more minimum wage incomes. In addition, rapid cost increases led to an increase on July 1, 1975 in maximum financing under SFH to UPC 3500, and extended the 10 percent interest rate ceiling (and the corresponding right to BNH advances at 9 percent) to the same level.

VI. SUMMARY AND CONCLUSIONS

The volume of mortgage credit in Brazil has risen steadily both in absolute terms and as a share of total domestic credit. Although it is impossible to determine the extent to which this growth can be attributed to the introduction of indexed mortgages and savings instruments, it seems quite clear that indexation had a major impact.

Since this paper involves a very partial analysis of indexation in Brazil, concentrating on housing finance, it should not be taken as a general statement on the desirability of indexation. Further, it should be clear that indexation in Brazil is related to a complex scheme of wage and price controls which may or may not be desirable in some general sense. However, it does suggest that indexation in housing markets can enable them to operate efficiently even in periods of high and uncertain inflation.

An issue that has been raised about PLAMs and similar instruments is that they are hopelessly complex and therefore will not be accepted by borrowers, savers, and financial institutions. The Brazilian experience shows that this is not true.

Another issue with price-level-indexed mortgages is whether household income will keep up with mortgage payments. This has been a problem for lower income groups in Brazil, since contrary to the common view, wages are not automatically adjusted along with prices and the two series have diverged for short periods. However, the Brazilians have alleviated this problem by the use of wage-indexed plans and the adoption of amortization schedules which imply a real decline in payments over time.[19]

Finally, it has been argued that lessons from the experience of Brazil result from a general indexation of prices and wages and therefore are not applicable to the United States. While there may be some merit to this argument, it should be noted that "post-indexed" assets have not driven out all other financial assets and that wages have not been linked directly to prices but have often lagged inflation by a substantial margin.

[19]The rate of decline, however, is much smaller than that of a standard mortgage under similar conditions. Further, it does not depend on the rate of inflation.

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Roll-Over Mortgages in Canada

Donald R. Lessard*

I. INTRODUCTION

The Canadian system for financing housing differs in a number of important respects from the U.S. system. Of greatest interest for this study is the absence of interest rate ceilings on deposits or mortgages and the fact that nearly all single-family mortgages are of a "roll-over" variety with interest rates fixed for only a fraction of the total amortization period.

These two differences, as we shall show, allow Canadian institutions to avoid the interruptions in the supply of mortgage credit and the deterioration in reserve positions typical of U.S. institutions with their unmatched assets and liability structure and deposit rate ceilings.

II. DESCRIPTION OF MORTGAGE INSTRUMENT

A. *Basic Type(s) of Mortgage Instruments*

There are two types of housing loans in Canada, government guaranteed loans made under the provisions of the National Housing Act (NHA), and conventional mortgage loans. In the case of single-family dwellings, both types of loans are typically "five-year roll-over loans," loans written for a five-year term at a fixed rate with amortization based on a term from 20 to 30 years for conventional mortgages and up to 40 years for NHA government guaranteed mortgages. Large-scale residential developments typically are financed by fixed-rate mortgages.

B. *The Five-Year "Roll-Over Loan"*

In 1973 virtually all single-family residential mortgages were of the five-year roll-over variety. Roll-over mortgages have been used for conventional loans for many years, dating back at least to the 1930s, and were instituted by lending institutions in reaction to "The Interest Act" which allowed homeowners to pay off mortgages after five years with a maximum penalty of 90 days interest.

Prior to 1969, all NHA loans were required to be written with a fixed rate for a term of 25 years or longer. In 1969, the law was changed to permit five-year rollover contracts to be amortized in not less than 25 years.

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Interest. Rates for the five-year term are dictated by market forces and are not linked to any external reference rate. The highly concentrated structure of Canadian capital markets relative to the U.S. market coupled with nationwide branching tends to minimize differences among rates charged by different institutions at any point in time.

Mortgage rates bear a close relationship to interest rates paid on five-year term deposits which provide the bulk of funds for mortgage lending. The spread between rates on NHA and conventional mortgages is typically about one-half of one percentage point. This reflects the lower risk of the government guaranteed mortgages, their greater marketability, and the absence of required reserves for losses on NHA mortgage holdings of regulated financial intermediaries.

Refinancing and Prepayment Provisions. At the end of the five-year term, the principal becomes due and payable. With a conventional loan the borrower has the option of paying off the unamortized principal or refinancing it with a new five-year loan at the going interest rate with payments geared to fully amortize the principal over the remainder of the original amortization period. Therefore, if interest rates have increased over the five-year period, the borrower's monthly payment will be increased. NHA loans provide the additional option of extending the maturity up to 40 years to maintain the original payment.

This normal refinancing does not involve any new closing costs. Further, certain changes can be made without incurring closing costs. For example, the borrower can repay part of the loan or reduce the amortization period. However, if the borrower wishes to increase the amortization period or increase the loan, this will be treated as a new loan and will involve closing costs.

If the borrower does not wish to refinance at the rate stated by the lenders, he probably will find that to switch to another lender will provide little or no interest rate advantage but will involve closing costs.

Prepayment provisions differ between NHA and conventional mortgages. With NHA mortgages the terms are dictated by law and allow the borrower to prepay up to 10 percent of the loan in each of the first two years of the mortgage and the whole amount at any time after this period. A penalty of three months interest is charged for prepayment.

For conventional mortgages the terms of the contract vary more from lender to lender. Most mortgages are written for a five-year term but are amortized over a longer period. Most contracts do not provide for prepayment during the first five years but most lenders will allow prepayment under certain circumstances upon payment of a penalty. After a mortgage has been in existence for five years and the mortgage has been renewed with a new five-year loan, the borrower can prepay the balance of the loan at any time upon payment of a three-month interest penalty.

Loan-to-Value Ratios. For NHA loans, the loan may be up to 95 percent of the first $31,580 of house cost or appraised value, if lower, and 75 percent of the balance up to a maximum fixed by region, ranging from

$40,000 in Toronto and Vancouver down to $30,000 in much of rural Canada. For conventional first mortgages, the maximum loan amount is 75 percent of the appraised value of the property unless it is insured by a private mortgage insurance company in which case it may go up to 95 percent of the appraised value.

Tax Treatment. Mortgage interest payments are not deductible from income in the computation of personal income taxes. However, housing does enjoy one tax advantage since it is the only type of asset which is exempt from the capital gains tax.

III. INSTITUTIONAL STRUCTURE OF SYSTEM FOR FINANCING HOUSING

A. *Housing in Canada: An Overview*

Additions to the Canadian housing stock have typically been divided in roughly equal proportions between single houses and multi-family structures although the proportions vary substantially from year to year.

The vast majority of housing additions are private and although government aid and loan programs are important sources of financing, private financing also is dominant.

Table 1 breaks down housing starts by the type of financing.

Table 1

HOUSING STARTS BY SOURCE OF FINANCING — 1963-1973

	Public Funds		Institutional Funds		
Year	Loans & Low Income Aid	Direct Government Housing	NHA Mortgages	Conventional Mortgages	Other
	(number of dwelling units)				
1963	23,752	1,620	28,505	71,983	22,867
1964	29,886	1,398	26,118	85,090	23,166
1965	31,440	1,220	24,172	88,669	21,064
1966	39,496	1,453	12,438	55,208	25,879
1967	43,564	1,761	20,829	64,683	33,286
1968	24,435	2,266	48,542	80,926	40,709
1969	28,108	1,769	55,645	85,680	39,213
1970	57,878	1,773	49,612	40,255	41,010
1971	37,881	2,067	87,802	55,625	45,860
1972	37,786	2,424	96,033	64,250	49,421
1973	30,027	2,243	75,469	96,641	67,149

Source: *Canadian Housing Statistics,* 1973

B. *Primary Mortgage Lenders*

There are four main types of financial intermediaries active in the Canadian mortgage market. These are: (1) trust companies with assets in excess of $11.0 billion, roughly 70 percent of which is invested in mortgages, (2) mortgage loan companies with assets of $6.0 billion, 80 percent of which is in mortgages, (3) life insurance companies with assets close to $20.0 billion, about 50 percent of which is in mortgages and (4) chartered banks with assets in Canada close to $70.0 billion, about 10 percent of which is in mortgages. Two of these, trust companies and mortgage loan companies, specialize in housing finance while the others are general financial intermediaries. In addition there are institutions like pension funds, credit unions, Quebec Savings Banks, etc. which are also active in the Canadian mortgage market. The trusteed pension funds only buy mortgages from other lenders.

The total mortgage holdings of the major lenders are shown in Table 2.

Table 2

MORTGAGE HOLDINGS BY LENDER

Year	Trust Companies	Mortgage Loan Companies	Life Insurance Companies	Chartered Banks	Credit Unions	Pension Funds
			(millions of dollars)			
1963	1,103	1,188	4,560	885	549	479
1964	1,449	1,492	5,094	846	622	542
1965	1,975	1,839	5,662	810	695	623
1966	2,167	1,949	6,248	778	883	676
1967	2,414	2,073	6,636	840	1,013	724
1968	2,727	2,235	7,107	1,057	1,142	776
1969	3,264	2,508	7,490	1,324	1,242	863
1970	3,829	2,868	7,723	1,481	1,351	1,022
1971	4,480	3,152	7,880	2,338	1,659	1,169
1972	5,462	3,749	8,145	3,543	2,254	1,296
1973	7,160	4,745	8,700	4,566	3,360	1,460

Trust companies and mortgage loan companies are privately owned stock companies. Most of the estimated 150 such firms are small local firms, but several are affiliated with major chartered banks. *Trust companies* perform a full range of trust functions and accept deposits. They are chartered either under provincial or Federal law and can branch on a nationwide basis. At the end of 1973 there were an estimated 50 trust companies.

Trust company *assets* include demand deposits, bills, and commercial paper for liquidity, government and corporate bonds, mortgages, personal loans, and equities. Mortgages are the dominant asset, having increased from 47 percent to over 68 percent of total assets over the last ten years, with an offsetting reduction in holdings of government securities.

Trust company *liabilities* include demand deposits, time deposits, and shareholders' equity and reserves. Time deposits take the form of *guaranteed investment certificates* with a fixed rate of interest for a term which may vary up to five years. These deposits may be withdrawn before the term expires with an interest penalty and are not traded in secondary markets. To the extent possible, asset and liability maturities are matched and, therefore, the bulk of deposits are for five years to match the roll-over mortgages. From 1963 to 1973, one- to five-year deposits have increased from less than 45 percent to more than 60 percent of total liabilities, with a corresponding decrease in short-term deposits from 35 percent to less than 20 percent of the total.

Trust companies offer a variety of special savings plans to take advantage of tax laws favoring individual retirement plans. In these plans, the investor typically has the option of investing in a fixed income portfolio including bonds and mortgages, an equity fund, or a fund guaranteed as to principal which pays the same rate each year as newly issued three-year time deposits.

Mortgage loan companies, also stock companies, have a similar asset and liability structure, but with a somewhat longer average maturity. Their *assets* include a higher proportion of mortgages, over 80 percent in 1973, and fewer liquid assets than the trust companies. This is reflected in the generally longer structure of *liabilities* with fewer demand and savings deposits and a much higher proportion of deposits, notes or debentures with maturities over five years. Mortgage loan company term deposits are technically debentures and are traded in secondary markets.

Four types of non-specialized intermediaries — life insurance companies, chartered banks, credit unions, and pension funds —also are major lenders. The relative importance of mortgages as investments for each of these is summarized in Table 3.

Mortgages continue to be the largest component of *life insurance company* assets although the proportion has been falling in recent years. Their holdings are concentrated in nonresidential and multi-family residential loans which do not have the roll-over feature.

Chartered banks are re-emerging as important mortgage lenders. Their role was reduced during the 1960s by statutory interest rate ceilings on NHA insured mortgages to which they were restricted. In 1969, these restrictions were removed but in their place new regulations were set which limit mortgages to 10 percent of total assets. They currently are the most important lenders for new residential construction. In addition, a number of the banks, of which there are only ten, control mortgage loan companies.

Table 3

MORTGAGE INVESTMENT AS PERCENT OF TOTAL ASSETS - NON-SPECIALIZED INTERMEDIARIES

Year	All Life Insurance Companies	Chartered Banks	Credit Unions	Pension Funds
		(millions of dollars)		
1962	44.2	4.5	28.6	9.1
1963	44.8	4.0	28.6	9.3
1964	46.8	3.5	28.1	9.4
1965	48.4	3.1	27.3	9.5
1966	50.6	2.8	26.5	9.3
1967	50.6	2.7	26.4	9.0
1968	51.3	2.9	26.7	8.6
1969	51.8	3.1	26.6	8.6
1970	50.6	3.1	25.9	9.2
1971	47.9	4.3	26.0	9.4
1972	45.2	5.6	27.0	9.3
1973	45.8	5.7	32.2	N.A.

N.A. — Not Available

Source: *Canadian Housing Statistics, 1973*

Credit unions and *pension funds* are the other major mortgage lenders. Credit unions initiate mortgages but pension funds acquire them in secondary markets.

C. *Government Intervention in Mortgage Markets*

The Federal Government through its Crown agency, *Central Mortgage and Housing Corporation* (CMHC), intervenes in the housing and mortgage markets in Canada. CMHC administers the National Housing Act and advises the Government on housing policy. There is no agency which makes advances to specialized mortgage lenders. reduction in holdings of government securities.
functions similar to those of the FDIC in the United States. The CDIC insures the deposits of most deposit-taking institutions. All federally incorporated institutions must belong to the CDIC.

Each of the provinces in Canada has either a Ministry of Housing or a Provincial Crown Corporation. Many of the NHA programs administered by CMHC involve the cooperation of these provincial agencies.

One of the CMHC's main functions is to insure mortgages under the NHA. Aside from the mortgage insurance function, government involvement in the mortgage market is largely in the area of low and moderate income housing. The major programs are as follows:

Under the *Assisted Homeownership Program* (AHOP) direct loans are provided by CMHC and subsidies are given to enable low- and moderate-income families to own a home without spending more than a specified proportion of their income on mortgage payments and municipal taxes.

In *public housing,* the Federal Government makes loans of up to 90 percent to provinces, municipalities and public housing agencies for the construction of public housing projects. It shares the subsidy costs on a 50-50 basis. It may also enter into a partnership arrangement with a province for the construction or acquisition of public housing units. In this case both the capital costs and the operating losses or subsidies are shared 75 percent by the Federal partner and 25 percent by the province.

In private *low rental housing,* CMHC will make *loans* up to 95 percent to persons or organizations at *preferred rates* for the construction of rental units. Charitable organizations may receive up to 100 percent of the lending value and a 10 percent direct contribution to the cost of the project (taking the form of a reduction in the mortgage amount). Start-up funds are also available where required.

CMHC also provides *direct loans* for cooperative housing both under AHOP and under a Federal-provincial partnership scheme.

Direct CMHC loans are also available for student housing for up to 90 percent of the cost of the project.

Aside from these functions, CMHC acts as a lender of last resort where funds cannot be obtained by a low- to moderate-income borrower from the private sector. During the late 1960s in particular, an attempt was made to use the CMHC lending programs to alleviate cyclical shortages of mortgage funds. CMHC also has experimented with various programs to reduce seasonal fluctuations in housing construction.

The government recently has proposed two *tax measures* favorable to mortgage and housing markets. One calls for an exemption of $1000 of interest received on securities of banks, trusts and mortgage loan companies, and government bonds. The other allows persons who have never owned a home to *deduct from income and deposit* up to $1000 a year for up to ten years to build up a *home purchase fund.* If this fund is used for this purpose, the proceeds also are tax free.

Finally, in 1973 Federal legislation authorized the creation of the *Federal Mortgage Exchange Corporation* to trade in residential mortgages and stimulate the development of a secondary market. It is not intended to become a major holder of mortgages.

IV. EXPERIENCE

A. *Acceptance of Roll-Over Mortgages*

The roll-over concept appears to have been well accepted for single-family housing by borrowers and lenders alike. Government officials report virtually no complaints about refinancing provisions, even though interest rates have risen substantially in recent years. However, since NHA

mortgages, which are government backed and involve low- to moderate-income families, have just begun to roll over, it is quite possible that pressures will develop since the rate change will be from roughly 9 1/2 percent to 11 or 11 1/2 percent.

In the case of large-scale residential and commercial developments, fixed mortgages matching the amortization period continue to be favored. Apparently, borrowers prefer the fixed contracts due to fears that rent increases will not match interest and price level increases, which has been the case in recent years, and the dominant lenders for large-scale projects, life insurance companies, prefer the longer-term contracts.

There is considerable pressure from some lenders to reduce the roll-over period on residential mortgages to one year. Reasons for this have not been clearly articulated but presumably, include the greater attraction of one-year deposits and the fear that public resistance may develop to the infrequent but potentially large increases with the existing instruments. It has also been suggested that the one-year roll-over mortgage would be more attractive to institutional investors. However, this appears to be at odds with the behavior of at least one such group, the life insurance companies.

B. *The Behavior of Mortgage Interest Rates*

As noted earlier, interest rates on term deposits and mortgages are determined by market forces and are not limited by law. Generally, interest rates on prime conventional mortgages have been one to one and one-half percentage points above the rate on prime industrial bonds. Rates on NHA mortgages have been below those for conventional mortgages but the spread has been declining, especially with the introduction of private mortgage insurance. Term deposits, the prime source of funds for mortgage lending, typically have been one-half of 1 percent below bond rates, although the spread has been more volatile. Mortgage and deposit rates for 1963 to 1973 are shown in Table 4.

Given the generally higher rates of interest in Canada compared to the United States and the lack of restrictions on mortgage rates, these rates have been above U.S. rates by a substantial margin briefly reaching a peak of 12 percent in 1974.

C. *Behavior of Housing Costs*

Canada has experienced very rapid increases in housing prices in recent years. The impact of increases on ownership costs has been exacerbated by the effect of inflation and high interest rates on initial mortgage payments given the level nominal payment pattern (within each five-year period) of Canadian loans. Table 5 illustrates the joint impact of these forces on the total monthly carrying cost of quality adjusted housing.

D. *Developments in Mortgage and Housing Markets*

The volume of mortgage financing has risen dramatically since 1966, rising more than $23 billion to $40 billion by the end of 1973. This gain

Table 4

INTEREST RATES ON NHA
AND CONVENTIONAL MORTGAGE AND TRUST
AND LOAN COMPANY DEPOSITS

Annual Averages - Percent

	Mortgage Interest Rates		Deposit Rates		
Period	N.H.A.[1]	Con-ventional	Demand and Savings[2]	1 Year Term Deposits[2]	5 Year Term G.I.C.s
1963	6.35	6.97	3.67	4.61	N.A.
1964	6.25	6.97	3.72	4.70	N.A.
1965	6.25	7.02	3.88	5.14	5.52
1966	6.83	7.66	4.00	5.83	6.06
1967	7.34	8.07	4.00	6.06	6.34
1968	8.64	9.06	4.00	6.79	7.01
1969	9.40	9.84	4.00	7.67	8.03
1970	10.06	10.45	4.00	7.96	8.52
1971	9.04	9.43	3.63	5.94	7.72
1972	8.95	9.21	3.50	5.89	7.62
1973	9.40	9.59	3.79	7.37	8.21

N.A. — Not Available

Source: OECD Table I.B/04 & *Bank of Canada Review*, May 1974

[1]Mortgage rate for owner-occupied houses. Rates for rental units dip slightly.

[2]Savings deposit rates refer to chequable savings deposits only; both these rates are based on a survey of a few large trust and loan companies, hence are "typical" rates. This survey is conducted by Bank of Canada every month. These data are obtained from their internal documents.

reflects a substantial increase in new construction and a rapid increase in the price of the existing housing stock.

Housing starts in the 1960s followed a cyclical pattern similar to that of the United States, with a somewhat smaller percentage decline in 1966 but a larger one in 1969-1970. From 1971 to 1973 they were more stable than in the United States. However, 1974 again witnessed a precipitous decline, dropping from an annual rate of 286,000 units in January-February to 165,000 in November.

Although it is impossible to adequately segregate the effects of supply and demand factors on starts, several observations are in order. The recovery of housing following the 1969-1970 downturn can be attributed to

Table 5

HOUSING PRICES, PAYMENT RATIOS, AND TOTAL CARRYING COSTS

	Housing Price Index[1] (1)	Mortgage Interest Rate (2)	Index of Initial Payments[2] (3)	Total Cost Index (4)=(1)x(3)	Consumer Price Index (5)	Relative Price Index (6)=(4)(5)
1963	100.0	6.87	100.0	100.0	100.0	100.0
1964	103.9	6.97	100.0	103.9	101.7	102.2
1965	109.0	7.02	100.0	109.0	104.3	104.3
1966	117.9	7.66	105.6	124.5	108.2	115.1
1967	123.4	8.07	109.5	135.1	112.0	120.6
1968	132.0	9.06	119.5	157.7	116.6	135.2
1969	142.4	9.84	126.5	180.2	121.8	147.9
1970	145.9	10.45	132.6	193.5	125.9	153.7
1971	152.1	9.43	122.6	186.5	129.5	144.0
1972	162.1	9.21	120.3	195.0	135.7	143.7
1973	179.8	9.59	124.1	223.1	146.0	152.8

[1]Adjusted for size changes.

[2]Represents relative initial monthly payment on a new 25-year mortgage at current conventional mortgage rate.

both supply and demand forces. On the supply side, the CMHC removed ceilings on NHA loans and allowed them to be written on a five-year roll-over basis. This made mortgages more attractive to lenders and brought the chartered banks back into the market. On the demand side, the CMHC instituted "high ratio" loans up to 95 percent and relaxed various income tests.

Further positive measures, including private mortgage insurance, buoyed the market into the 1970s. Price increases were substantial, but again it is difficult to determine whether these had a dampening or strengthening effect on demand.

The decline in starts in 1974 appears to have been primarily due to demand forces. In contrast to the United States, there was little evidence of credit rationing. In the current decline, multi-family starts are more affected. This is attributed by observers to uncertainty about whether rental rates will keep up with the inflationary expectations reflected in the high interest rates and, perhaps, to some overbuilding. In the case of single-family residences, the CMHC cut back on "high-ratio" mortgages to stem price rises and this certainly had an effect. However, the initial carrying cost factor, shown in Table 5, undoubtedly is a major contributing force.

V. SUMMARY AND CONCLUSIONS

The Canadian housing finance system with its roll-over mortgages which allow a high degree of asset and liability matching for lenders and

with no rate ceilings appears to have avoided the credit rationing, the disintermediation and the accompanying squeeze on lender profits which has plagued U.S. housing markets. However, given that the roll-over mortgages involve level nominal payment streams, the real time stream of payments for home purchases have been seriously distorted by inflation and high interest rates. The resultant rapid rise in the initial carrying costs of housing has undoubtedly contributed to the current downturn in construction activity.

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The Financing of Housing in Finland With Special Reference to the Application of the Index Clause

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I. INTRODUCTION[1]

Finland provides an interesting case study since it adopted indexation of financial assets in the 1950s, but abandoned it in 1968. The Finnish system for financing housing is distinguished by the lack of a separate mortgage market, the extensive government support of housing, the relatively large downpayment requirement, the short period of amortization of bank loans, the use of variable interest rate contracts, and in the years 1955 to 1968, the use of index clauses in loans and deposits. These features of the housing sector reflect the structure of financial markets in general. The bond and equity markets are unimportant, partly because of tax treatment; and there is no short-term money market. The banking system is the dominant intermediary and interest rates are institutionally rigid. Credit rationing is the main instrument of monetary control.

Despite the difficulties of financing the purchase of a dwelling, the share of owner-occupied dwellings is quite high in Finland by European standards — some 60 percent. The ownership of a dwelling is a very attractive investment because of tax treatment, inflation and lack of alternative assets.

From this perspective indexation of financial assets may have helped to channel savings to more efficient uses through the financial institutions. A judgment on this question is difficult, however, because at the same time the substantial tax benefits given to residential construction in the 1950s and early 1960s were gradually eliminated in the 1960s.

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[1]No references are given in the text. A bibliography is provided at the end. The information on housing is largely obtained from a report of the National Housing Board prepared by M. Lujanen and S. Seppavaara. The author wishes to thank D. Lessard and Modigliani for helpful suggestions. They are not, however, responsible for any errors that remain.

II. PRICE-LEVEL INDEXATION IN FINLAND

A. *The Introduction of Indexation*

Indexation of financial contracts was first introduced in 1945 when the government granted index-linked bonds to the evacuees from the ceded territories.[2] There was really no alternative to indexation to solve the problem of the evacuees since the government was in no position to compensate in kind or in cash, and since rapid inflation was widely expected after the war. After the indemnity loan the application of the index clause began to spread to other sectors in the financial markets. The National Pension Fund, private insurance companies and municipalities began to issue index-tied loans. The government issued another index-tied loan in 1953 to those entitled to a redemption of the 1945 indemnity loan. In 1954 the government issued the first index-tied loan to the public. In the following year the banks began to accept index-tied deposits.

Indexation of wage contracts was introduced already during the war, and the practice continued throughout the post-war period of galloping inflation and re-emerged in 1957-1958 and in 1964-1968. Agricultural prices also were indexed during much of this period.

B. *Mechanics and Extent of Indexation in Financial Markets*

The banks introduced price-level indexed deposits for the first time in May 1955. The main reason for the introduction of the index account was that the banks felt that the persistence of inflation was affecting their deposit growth adversely, particularly because of the competition from index-linked government bonds, first issued for public subscription in 1953. The banks also felt that it was their duty to protect the interests of the savers — the only group that was not organized in a pressure group. At that time both wages and farm incomes were index-linked so that the burden of inflation tended to fall heavily on those who had accumulated financial assets.

The index deposits were tied 100 percent to the cost of living index. The minimum deposit was 300 marks and the period of deposit 12 months. The rate of interest was at first 4.25 compared to 6.0 percent on ordinary six-month deposits. Furthermore, unlike other deposits, indexed accounts were not tax exempt. In 1956 commercial banks did not accept indexed deposits, nor did any banks in the Helsinki region. Since 1956 was a year of high inflation, these banks lost customers to the savings and cooperative banks. In 1957, a tax-free but only 50 percent index-linked account was introduced with otherwise similar conditions.[3] From January

[2]The nominal value of the so-called indemnity loan was 180 million marks, and it was to be redeemed over ten years. The capital value was tied 100 percent to the wholesale price of Finnish goods. Over the life of the loan the government paid 612 million in index compensation.

[3]With 50 percent indexation the capital value of the asset is adjusted by only one-half of the percentage change in the price level.

1959 to May 1963 new index-tied deposits were accepted only in the 50 percent accounts. The interest rate on these accounts was 0.5 percent below the 5.0 percent rate on the ordinary six-month account. In these years the public showed little interest in these accounts. The 100 percent account was reintroduced in June 1963 but it was only from May 1964 when the 100 percent account was made tax exempt that a rapid growth in indexed deposits occurred. The 50 percent account was discontinued in June 1966. The interest rate on the 100 percent account was 2.5 percent in 1964 and 1965 and 3.0 percent in 1967-68, compared to 4.5 percent on ordinary accounts. The index clause was abolished in April 1968 in connection with the Stabilization Agreement.

The index compensation took the form of an adjustment in the capital value of the deposit. In practice the adjustment was made on basis of the (full) percentage rise in the cost of living index from the month previous to the deposit to the month previous to withdrawal. The amount of the deposit was not to be reduced if the cost of living index were to fall.

Bank loans were not directly index-tied, although some other financial institutions did grant such loans. The share of all loans of the financial institutions indirectly tied to the index fluctuated between 30 and 50 percent. The share of directly index-tied loans, mainly from other financial institutions, was around 25 percent.

The main principle of indirect indexation was that the cost of index premiums paid to depositors was borne equally by all borrowers. The savings banks and cooperative banks all indexed charges through their central banks and divided the burden equally between individual banks and borrowers. The proportion of index deposits was in general higher in savings and cooperative banks and hence their index charges were also higher.

This way of indexing loans reduced the effect of inflation on the loan rate quite considerably and except for periods of rapid inflation, the charge was only 0.5 to 1.0 percent per annum even though inflation reached 11 percent in some years.

In 1954-55 most *government bond issues* had either a 50 percent or 100 percent index claim. From 1956 most new issues carried an index clause, but only for 50 percent of the price change. The proportion of index-tied loans in the total outstanding stock rose from 12 percent in 1954 to 76 percent at the end of 1967. The details of the form of indexation varied considerably. The cost of living index and the wholesale price index were both used. On some loans only the interest was index-tied. The index-tied bonds were tax exempt, with the exception of some issues in 1961, 1962, and 1967. *Local authority bonds* were issued only on a small scale and were generally 50 percent index-tied and mostly bought by banks.

Most *bonds sold by financial institutions* from 1953 were 50 percent index-tied. Several indices were used, including the sterling rate and the export price index. Most of these bonds were taxable and were purchased

by other financial institutions. *Non financial firms* were authorized to issue index-tied bonds in 1957. In the 50s and the 60s most issues were index-tied. Of the outstanding stock at the end of 1967, 23 percent was index-tied. The stock of private bonds is very small compared to the supply of government bonds, less than 10 percent in 1967.

National *pensions* have been tied 100 percent to the cost of living index since 1957. All employment pensions within the employment pension insurance system introduced in 1962 were 100 percent tied to the general wage level. Table 1 shows the growth of both indexed and non-indexed bonds and savings deposits from 1952-1967.

C. *The Abolition of Index Clauses*

After a period of steady growth in output and employment since 1959 — only briefly interrupted in 1962-63 — the Finnish economy moved to a position of disequilibrium in the balance of payments accompanied by slow growth and increasing unemployment. To rectify this situation, the markka was devalued by 24 percent in October 1967. The devaluation was accompanied by a comprehensive stabilization program based on an agreement signed by the biggest labor market organizations and the Central Union of Agricultural Producers in March 1968, and an Economic Special Powers Act passed by the parliament in April 1968. The stabilization program comprised complete control of prices, an incomes policy limiting wage increases to growth in productivity, and abolition of all index clauses with the exception of outstanding index-tied government bonds, insurance policies and pensions.

It was generally agreed at the time that with indexation, the devaluation would only increase prices in proportion and would contribute little to the desired change in relative prices. In the years preceding the devaluation, the rate of inflation in Finland exceeded the average inflation rate in the main trading partners. With the exchange rate fixed, the prices of internationally traded goods — exports, imports and import-competing goods — increased only moderately. Wage rates and other wage costs increased much in excess of productivity growth. In the sheltered sectors, increased costs were passed on in the form of higher prices, while in the open sectors price increases were limited by external competition. In consequence, there was a shift in demand towards imported goods and a decline in the profitability of industries in the open sector. This was reflected in the increasing current account deficit. The devaluation - cum - incomes policy succeeded in reversing this trend. The rate of price and wage inflation was moderate in 1968 and 1969, the current account went to a surplus and the growth rate picked up towards the end of 1968.

It is not clear how much indexation contributed to the problems described above. Only three index adjustments were made in the period 1959 to 1968 — two 3 percent adjustments in 1964 and a 3 percent adjustment in the beginning of 1968, after the devaluation. The three-year agreement for 1966-68 provided for another adjustment in wage rates in December 1968 to compensate for a rise in the cost of living index in excess of 4

Table 1

THE USE OF INDEX CLAUSES IN THE FINANCIAL MARKET 1952-1967

	Index-Linked Bonds:[1]			Index-Tied Loans Outstanding at the End of Year		
Year	Cost of Living Index Change %	Issued during the year % of total	Outstanding the end of year % of total	Index-Linked Savings Deposits: Year End % of total	Indirectly Index-Tied Loans % of total	Loans with an Index Clause % of total
1952	4.0	13.3	0.1			
1953	1.8	16.5	8.5			
1954	- 0.5	67.6	21.5			
1955	- 3.0	73.4	28.2	0.1		
1956	11.4	84.3	31.5	7.0		
1957	11.4	82.8	38.7	24.3		
1958	6.5	52.9	44.6	21.6	54.7	25.1
1959	1.6	29.5	42.2	6.2	29.2	25.2
1960	3.3	80.1	50.5	2.8	29.4	23.4
1961	1.9	50.9	54.1	0.6	37.5	22.4
1962	4.4	73.6	62.3	1.0	35.5	25.2
1963	4.8	24.1	52.4	3.9	43.1	23.9
1964	10.4	46.9	51.0	15.8	52.5	24.8
1965	4.9	61.5	56.1	18.2	44.8	25.7
1966	3.9	60.7	66.1	21.2	53.5	25.5
1967	5.3	78.3	74.3	34.6		

[1]Excluding government indemnity bonds.

Source: K. Puumanen, "The Index Clause in Finnish Markets: The Finnish System in Retrospect. *Kansallis-Osake-Pankki Economic Review* (1973) No. 3:110; Bank of Finland, Institute of Economic Research, "The Index Clause in the Finnish Money and Capital Markets," Series D:2, Mimeographed Studies, January 1969, p. 16.

percent. This increase did not take place because of the stabilization agreement. The two 3 percent adjustments in 1964 were to a large extent prompted by a tax reform which increased the prices of consumer goods and lowered those of investment goods. It is likely that even without indexation there would have been a pressure to compensate for the rise in the cost of living index.

Another reason for the abolition of indexation in 1968 was that the index premiums increased substantially before and right after the devaluation, both because of higher inflation and a rise in the proportion of indexed deposits. In the beginning of 1968, the index charge added 2 percent to the loan rate charged by commercial banks, and as much as 4 percent to the loan rate charged by cooperative banks. It was felt that these increases were inappropriate at a time when investment activity had come to a standstill. It is not clear why lower interest rates could not have been achieved if they were desired, by reducing the nominal rate rather than by abandoning the index clause. Continuation of index claims in the financial markets would have been difficult, however, without indexation of wages, because the risk of price level changes would have fallen completely on the borrowers, and because it would have been regarded as unjust by the wage earners who gave up the right for index compensation in 1968.

III. INSTITUTIONAL STRUCTURE FOR THE FINANCING OF HOUSING

A. *An Overview of the Housing Situation*

Some 60 percent of all dwellings in Finland are owner-occupied. Of some 50,000 dwellings completed in 1970 two-thirds were in multi-story buildings and one-third were single-family houses or rowhouses. The dwelling density has declined steadily in the post-war years and reached 1.1 persons per room in 1970. Despite the improving housing standard, 25 percent of the population is still housed in units with two or more persons per room. The housing stock is relatively young, some 65 percent having been built since 1945.

The secular growth in the demand for housing services is related to the increase in per capita incomes; to the significant regional and sectoral movement of population from agriculture in the northern and eastern parts of the country to the industrial and service sector in the southern part of the country; and to the fact that the large age groups born after the war began to enter the labor market and form families in the early 1970s.

B. *Housing Investment in Relation to Total Saving and Investment*

The share of gross savings in GDP has increased secularly in the post-war years from some 25 percent in the early 1950s to more than 30 percent in the 1970s. In the 1960s the household sector accounted for some 40 percent of the total saving, the corporate sector for slightly less than 30

percent and the public sector for slightly over 30 percent. The share of the latter two has been increasing in recent years at the expense of the household sector because of a shift in the share of disposable income increases away from the households. The saving propensity of households has, however, increased moderately, as one might expect from the demographic data given above. Part of this increase from the early 1960s has taken the form of increases in social security funds (included in household saving). According to estimates the household sector invested on average 80 percent of its savings during the 1960s, mainly in housing, and as much as 90 percent during the residential boom of the early 1970s. The public sector's surplus was around 20 percent during this period. These two sectors were not, however, able to finance the deficit of the corporate sector. With the exception of two years after the devaluation the current account has been in deficit every year from 1960. The deficit has been financed by long-term foreign borrowing, a major part of which has been channeled through domestic financial institutions.

Cyclical instability of investment has been a major problem in Finland in the postwar years, but the housing sector has not been noticeably more unstable than other components of fixed investment. One reason why housing investment is not affected differently is that housing loans are granted by the same institutions as all other loans.[4]

C. *The Structure of Financial Markets*

No data exist on the flows of funds between and within sectors but most of the flows undoubtedly go through the financial institutions. Financial markets in Finland are dominated by the banking system consisting of two big and five smaller commercial banks, savings banks, cooperative banks, the Post Office Bank and some smaller financial institutions. There are no specialized institutions for financing housing. The bond and security markets are poorly developed and there is no short-term money market. The government dominates the bond market Until the late 1960s, bonds issued by private firms were taxable, whil government bonds and bank deposits were not. Although this differentia treatment no longer exists, all private bond issues have to be approved b the government. There is hardly any secondary trading in bonds, whic are typically held until maturity. The equity market is almost equally nar row partly because tax treatment discourages equity financing. The own ership of stocks is concentrated and the annual turnover very small.

[4]All components of investment have been prone to sharp cyclical fluctuations par caused by lagged response to sharp cyclical movements in export earnings. Finland is a ve open economy and hence the typical boom starts with a rapid growth in exports, i provement in the balance of payments, and an increase in the monetary base. The multipli effects, together with the expansionary monetary impulse, transmit the boom to other sect in the economy. As investment and purchases of consumer durables pick up, the current count begins to deteriorate. The increasing deficit has tended to coincide with a slowdown exports. Both of these factors contribute to the slowdown of the boom. Monetary and fis policies traditionally have not been very successful in offsetting the destabilizing effects export fluctuations.

A further characteristic of the financial markets is the institutional rigidity of interest rates and the prevalence of credit rationing as the main instrument of monetary policy. The discount rate of the Bank of Finland was fixed at 7 percent from 1960 to 1971. The interest rate on six-month deposits was fixed at 4.5 percent from 1959 to 1968. The average lending rate of banks has also been historically stable except for changes resulting from the index change described above.

D. *The Financing of Housing*

The three main sources of financing of housing are the banking system, the government and the households themselves. After the war the government subsidized as much as 70 percent of new housing construction mainly because of the problem of resettling the evacuees from the ceded areas. The share, however, declined steadily to only 25 percent in 1963. In the late 1960s it again increased substantially and in 1970 44 percent of new dwellings produced were partly subsidized by the government. In total some 16 percent of all loans granted for housing were from the government in 1970. The banks' share of the total was 42 percent and the share of self-financing 31 percent. A detailed description of the sources of housing loans is given in Table 2.

IV. GOVERNMENT SUPPORT OF HOUSING

A. *Main Form of Support and Intervention*

Presently the main form of state support to housing is the granting of low interest loans to specific buildings or on a personal basis. At present 50 percent of housing production is supported by low interest government loans.[5] These loans are administered by the National Board of Housing which is under the Ministry of the Interior. The second form of government support is the granting of housing allowances for needy families with children and for the elderly. In the 1950s and early 1960s the main form of support to housing took the form of extensive tax privileges, in particular exemption of rent and capital value from taxation. They were eliminated by the laws of 1962 and 1966 and in 1973 all tax privileges were abolished. Rent control was enforced in the postwar years but has not been in force since then except for the period of price freeze after the 1967 devaluation. The government engages in housing production only to the extent that housing is needed for state employees.

Local authorities support housing in the form of loans and build rental units themselves. The municipal authorities also participate in the overall planning of housing policy with the National Housing Board.

The Bank of Finland participates in housing policy by its recommendations to the banks concerning the priority to be given to various forms

[5]State housing loans comprised some 70 percent of all government lending in 1970, roughly 4.3 percent of total expenditure.

Table 2

FINLAND, LOANS GRANTED FOR HOUSING PRODUCTION IN 1970

	Millions of Marks	Percent
Commercial banks	515.7	17.2
Savings banks	395.3	13.2
Cooperative banks	206.4	6.9
Postal Bank	130.8	4.4
Mortgage credit institutions	34.4	1.1
National Pension Institute	3.8	0.1
Insurance companies	133.4	4.4
Pension foundations	8.5	0.3
Pension funds	35.9	1.2
Municipalities	60.9	2.0
Churches (individual congregations)	11.3	0.4
State budgetary funds	466.1	15.5
Industry and business enterprises, construction industry	66.9	2.2
Self-financing by individuals	930.6	31.1
	3,000.0	100.0

Source: Lujanen and Seppovaara, *Asuntotuotannon Rahoitus,* Asuntohallitus, Tutkimus-ja suunnitteluosasto, Sarja A:7, page 16, table 3.

of loans. These recommendations are not, however, binding. The Central Bank has also granted special credits to the banks to be used for housing production loans.

B. *Low Interest Loans and Allowances*

The government gives loans for owner-occupied dwellings or for the construction of rental dwellings. The former consist of the so-called basic loan and additional loan. The basic loan can be given to a housing corporation for the construction of a house or to an individual for the construction of a one-family dwelling or the purchase of shares in housing not otherwise supported by a government loan. A government loan may amount to a maximum of 30 percent of the building costs (which have to be approved by the National Housing Board). The interest rate is 3 percent and the amortization period is 25 years for the loans to housing corporations and 15-25 years for loans to individuals.

The additional loan is granted to low-income families who wish to purchase a dwelling in a house already supported by a government loan.

The loan is limited to a maximum of 30 percent of building cost. It is interest-free for the first eight years and amortization begins in the ninth year. The length of the loan, a maximum of 25 years, varies with the income, property, and family circumstances of the individual.

Those who cannot afford to buy a dwelling with this government support can either rent an apartment or a government-subsidized house or purchase a dwelling in a state-subsidized housing cooperative. For such cooperatives — few of which are in existence — the loan conditions are less stringent than for ordinary loans.

Rental dwellings supported by government loans are constructed by local authorities, insurance companies and corporations, and they are mainly built for low income families. The proportion of government subsidized rental dwellings constructed in recent years has been very large.

Given the attractive terms of government loans it is clear that they have to be rationed. Eligibility depends on the income, property, and housing need of the applicant. All applicants need to be approved by the Housing Board. It is also obvious that the price and occupancy of state-subsidized dwellings have to be controlled. Since 1970 it has been possible for occupants of subsidized dwellings to sell their dwelling at the market price after the state loan has been fully repaid. This change became necessary to facilitate mobility of labor and movement of families to larger units. A person who sells his dwelling is no longer entitled to a government loan.

In addition to loans the government gives housing allowances to needy families with children and to the elderly. The purpose of these allowances is to reduce the share of rent in monthly income. The maximum allowance is 70 percent of the rent. In addition the recipients of government loans receive supplementary loans from the banks with much longer amortization periods than in the case of private housing loans.

C. *Tax Treatment*

The main form of government support to housing in the 1950s and early 1960s was the granting of all kinds of tax concessions. In the laws of 1948, 1953, 1958 and 1962 dwellings and shares in housing corporations were exempted from state and municipal taxes for the years 1948-1972. The tax exemption was limited to new owner-occupied dwellings in 1962. The favorable tax treatment of existing dwellings was phased out by 1966, and of all dwellings by 1973. The imputed income from the occupancy of owned dwellings was subject to income taxation until June 1973. Thereafter it has been exempt for dwellings whose tax value does not exceed 100,000 marks — 3 percent of the exceeding value is subject to income tax. Since 1972 profit from the sale of a dwelling has been tax exempt provided the owner has occupied it at least for a year and buys a new dwelling within a year.

These concessions do not apply to second dwellings or summer cottages. The interest on loans used to buy single-family dwellings is exempted from state and municipal taxes (before 1973 the exemption from

municipal taxes was limited to owner-occupied dwellings). However, this exemption is now limited to the deduction of interest from income taxes — 15,000 marks for housing loans and 5,000 marks for other loans.

No studies exist which would measure the total impact of these tax concessions. The evidence for the 1950s and early 1960s suggests that substantial benefits occurred to those who could afford to invest in housing — in particular at times of high inflation. Given the fact that similar tax exemptions were not granted to other forms of investment the policy tended to favor private housing at the expense of other investments. When the tax benefits were reduced, there was a noticeable increase in the growth of savings deposits, in particular after index-tied deposits were made tax exempt in May 1964.

V. SELF-FINANCING OF HOUSING

The main problem in the financing of housing is the large down-payment requirement and the short amortization period, particularly for those who do not receive state loans. In order to purchase a dwelling, an individual has to save for a number of years before he is eligible for a bank loan. According to a survey conducted in 1970, the average age of a house buyer is 42.9 years in the case of buyers who receive no government support and 36.3 years in the case of those who receive government support.[6] The survey also reveals that the average age of a housebuyer varies inversely with income. Furthermore it appears that the share of self financing also decreases with income. This may reflect the fact that the banks are more willing to lend to individuals with high incomes. Part of the explanation may also be that the short amortization period forces lower-income families to reduce bank borrowing in order to be able to handle the repayment in a short time period.

The main remaining tax incentive now is the right to deduct interest payment from income tax, while the imputed rent is not counted as income. There is no question that this implies a substantial transfer payment, especially to those who are in high income brackets because of progressive income tax. The main allocative effect of this tax policy is to increase the share of owner-occupied dwellings.

VI. HOUSING LOANS FROM FINANCIAL INSTITUTIONS

As is evident by now there is no mortgage market in Finland. Housing loans are granted by banks much in the same way as other loans. The share of housing loans of total bank lending is around 25 percent being much higher in the case of savings banks, 43 percent in 1970.[7] There is no

[6]Lujanen and Vanhanen, *op. cit.*, pages 36-47.

[7]This was relevant during the period of indexation since the savings banks also had a larger proportion of indexed deposits, which probably meant that a disproportionately large share of index premiums was charged from housing loans.

standard mortgage contract. The loans to individuals or corporations that receive government support are of relatively long-term maturity, more than 80 percent over 20 years in 1970. However, loans to individuals or corporations that do not receive such support are of much shorter maturity, more than 50 percent of them less than ten years. The practices regarding amortization vary but often the annuity method is applied. There is no evidence whether the banks allowed smaller repayments at the time of index changes.

The downpayment for private loans is very high; it can be as high as 80 percent. In general, banks grant a so-called reciprocal loan for one-half of the amount saved by the borrower. In these cases the self-financing requirement is some 40 percent of the cost of the dwelling and the period of amortization from five to ten years.

The interest rate on mortgages is tied to the general level of interest rates and it tends to be in the first or second lowest category. The loan rates are determined, within a margin, by the discount rate of the Bank of Finland. As was already pointed out, the discount rate has been changed rather infrequently. The loan contracts are variable-rate contracts. Whenever the discount rate is changed, all loan rates change with it. The interest rate level has generally been below the market clearing level. There appears to be no differentiation of loan rates according to risk and maturity of the housing loan. The available supply of loanable funds has been rationed to competing claimants with preference for investments in the export and import sectors and especially in recent years for housing. To some extent, of course, the banks can change the effective loan rate by changing the self-financing requirement or by adjusting the amortization period. No evidence exists on the extent of these practices, however.

VII. SUMMARY AND CONCLUSIONS

Finland's experience with and eventual abolition of indexation in financial markets neither proves nor disproves the merits claimed for indexation. Its implementation left much to be desired, and its abandonment can be traced directly to a much broader set of issues facing small open economies.

The response of investors certainly revealed a preference for indexed assets. It is difficult to conclude much more on the beneficial effects. Nothing can be said about the effect on the rate of saving without a careful analysis of the effects of a multitude of other factors — such as demographic changes, development of the social security system and changes in the distribution of income. There is clear evidence that the share of indexed assets in the total of financial assets was responsive to changes in the rate of inflation. Although the share of bank deposits to GDP has increased steadily in the post-war years, it would not seem that the years 1955 to 1968 were exceptional. After 1968 most funds in indexed accounts were placed in new high interest accounts, which have grown rapidly ever since.

However, the basic problems of the financial system were not corrected by indexation except to the extent that some element of flexibility in the interest rate was obtained. Tax treatment continued to discourage efficient allocation of investment between sectors and credit rationing continued to be important in allocating credit to established customers.

With reference to housing, the main arguments for indexing mortgage contracts are that the typical fixed-interest, level-payment mortgages cause a disproportionate share of amortization and interest payments to fall in the beginning years when the borrower is least able to afford large payments on housing, and that indexation of deposits will help steady the flow of funds to the financial institutions financing mortgages and also reduce the risk to the intermediary caused by changes in the short-term rate of interest due to changes in inflationary expectations.

In the case of Finland, neither of these arguments applies. First of all, all mortgage contracts have a variable interest rate. Secondly, the indexation of mortgage loans was indirect and its incidence quite random. Not only did it depend on the rate of inflation in the economy, but it also depended on the portfolio preferences of depositors. The only potential benefit to the borrower was that the system may have increased the availability of loans to the home buyers, but even that is not clear. There is no evidence that the downpayment requirement declined, or that the amortization period was lengthened. The extent of government support if anything increased during this period.

The use of variable rates is understandable when there are substantial variations in the rate of inflation and no indexation. One may argue that the borrowers can more easily hedge against changes in the rate of inflation because the change in nominal income is quite closely correlated with the rate of inflation. Why the use of indexation did not result in the use of fixed interest loans of longer maturity is somewhat of a puzzle. One reason could be the fact that a short amortization period, like the downpayment requirement, increases the effective cost of loans and is therefore a substitute for a market clearing interest rate.

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Price-Level-Adjusted Mortgages in Israel

Alex Cukierman*

I. INTRODUCTION

The high rates of inflation that characterized the Israeli economy during the early fifties brought the flow of financial savings to an almost complete standstill. In an attempt to re-open this channel of funds, the government and private investors started offering financial obligations that were denominated in some constant purchasing power unit.[1] The outstanding principal and the remaining interest payments were adjusted periodically in line with a price level index. The most commonly used indices were the consumer price index (C.P.I.) and the price of the U.S. dollar in terms of the Israeli pound. By the mid-fifties, almost all of the long-term capital raised through bonds by the government or financial intermediaries was linked to the dollar, the C.P.I., or some combination of the two. As a result, users of funds were required to repay their loans with similar linkage stipulations. The same was true in the housing mortgage market. Virtually all new mortgages from the mid-fifties were linked to one or both indices.

II. DESCRIPTION OF MORTGAGE INSTRUMENTS

Since price-level-indexation arrangements varied over time in response to changes in political and economic forces, we start this review with a short historical description of the developments in this area, in order to provide a clearer perspective.

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[1]This tendency was probably encouraged by an old Ottoman law which put a legal ceiling on the interest rate, thus preventing the nominal rate of interest from adjusting to the rate of inflation.

A. *Introduction of Alternative Mortgage Instruments and Historical Review*

Price-level-indexed mortgages appeared around 1956; they prevailed until 1967-70, when they were gradually discontinued owing to a series of governmental decisions.[2] The February 1962 devaluation of the Israeli pound (IL.)[3] was a turning point in the history of mortgage indexation. Until that devaluation, the borrower could choose (at the time he got the mortgage) between linkage to the C.P.I. and linkage to the U.S. dollar. Since the C.P.I. increased monthly and devaluations of the pound occurred infrequently, linkage to the dollar did not involve frequent adjustments in the mortgage payment — but did involve the risk of a big adjustment when the rate of exchange did change.

Up to 1962, most borrowers chose linkage to the dollar; only a minority chose linkage to the C.P.I.[4] At the February 1962 devaluation, borrowers with dollar-linked mortgages saw the value of their obligations increase by 66 percent overnight. This unleashed an outcry which brought about a revision in the terms of both existing and new mortgages. Basically all post-devaluation new mortgages became linked to the C.P.I., and homeowners with existing dollar-linked mortgages could, under certain conditions, convert the dollar linkage to indexation to the C.P.I. These changes were introduced by governmental decision, and the government covered the resulting losses to the mortgage banks.

Most borrowers with dollar-linked mortgages chose to convert to C.P.I. linkage so that by 1963 most mortgages were index-linked. By 1964, however, political pressures from various beneficiaries of government or government-subsidized long-term loans resulted in the gradual replacement of linkage, by a fixed premium on agricultural and industrial loans. At first, the mortgage market was unaffected by these tendencies. The C.P.I. indexation prevailed — but the lag between increases in the C.P.I. and in actual linkage payments grew longer, decreasing the effective linkage rate below 100 percent.

In 1965, a governmental commission (the Sherman Commission) recommended using the cost of living allowance (C.O.L.A.) instead of the C.P.I. as the reference index for mortgage linkage, on the ground that it yielded better synchronization between increases in wages and increases in

[2]But mortgage banks continued to raise capital by issuing bonds linked to the C.P.I. We shall return to this point in the section on "Experience."

[3]From IL.1.80 to the dollar to IL.3.00 to the dollar.

[4]This was due mainly to the preference of bond buyers who supplied the mortgage funds for the dollar linkage. In order not to take unnecessary risks, the mortgage banks pushed the dollar-linked mortgage harder, even though the borrower could choose the type of indexation. Their success is probably explained by the lack of financial sophistication of the population at that time, and its strong preference for delaying linkage payments into the future. Whenever the borrower did not specify his preference (and this was common), the bank chose the dollar-linkage for him in order to "save" him immediate linkage payments.

mortgage payments.[5] During 1966 and part of 1967, new mortgages were usually linked to the C.O.L.A. In 1967, a government decree replaced the linkage clauses with a 3-4 percent annual premium on most new government-regulated mortgages. During 1968 and 1969, this arrangement was extended to existing mortgages as well, and all new mortgages (including those from private sources) switched to this arrangement. Borrowers with existing mortgages gradually converted their linked mortgages to the new unlinked ones; by the beginning of the seventies, the outstanding stock of linked mortgages was reduced to a relatively small balance that is still shrinking. However, mortgage banks continued to raise capital with index-linked bonds. The risk that their obligations would increase faster than their assets was assumed by the government, which took upon itself the obligation to cover the cost of linked borrowing, provided that the mortgage banks observed some constraints pertaining to the size of the mortgages which they granted from these funds.

With the increase in the rate of inflation well above 3-4 percent in the beginning of the seventies, the demand for unlinked mortgages soared. However, the supply of government-regulated mortgages did not respond to the demand, owing to the Treasury's power to abstain from insuring mortgage banks if they did not follow governmental instructions.

Linked mortgages are still available today, but, in view of the present high rate of inflation and the availability (though in limited amounts) of unlinked mortgages, hardly any new linked mortgages are being asked for.

In all cases, the initiator of the changes in mortgage conditions was the government, which responded to various public pressures. Whenever the changes involved taking some of the load from the holders of existing mortgages, the government assumed all resulting losses to the mortgage banks.

B. *Price-Level-Adjusted Mortgages — Main Features*

At the time the mortgage is granted, the interest and principal payments are usually spread over the life of the mortgage so as to yield equal payments before indexation. Actual payments are determined by increasing the fixed repayment by the rate of increase in the reference index (usually the C.P.I.) from the base period to each repayment period.

There are substantial differences between mortgages from private and governmental sources with respect to maturity, contractual rate, lags in the adjustment mechanism and length of time between payments. The terms of government-subsidized mortgages are determined mostly by the degree of subsidization that the government wants to grant the mortgagor. Therefore, the following discussion distinguishes between private and government mortgages.

[5]Virtually all wage contracts in Israel are linked to the C.P.I., but actual cost-of-living allowances are paid just once or twice annually only if the C.P.I. increased 5 percent since the last increase in the C.O.L.A. As a result there are short-run differences between the two indices.

Mortgages from Private Sources. The *contractual rate* is usually 8 percent, which, for at least part of the period, is also the maximum rate allowed legally. The linkage applies to both principal and interest. The mortgage is usually for a period of 10 to (at most) 15 years.

Prior to the 1962 devaluation, payments were adjusted monthly according to the increase in the C.P.I. from the base period to the current one.[6] After the 1962 devaluation, payments were set six months at a time to the increase in the C.P.I. over the preceding six months (including adjustments for indexation which should have taken place during the six-month period) and broken into six equal monthly payments. After the mid-sixties, the lags in indexation charges grew longer as part of the gradual abolition of indexation.

Mortgages from Governmental Sources. Since the government uses the term of mortgages as a policy instrument to achieve varying degrees of subsidization, there is a wide variation in the terms of those mortgages. The *contractual rate* varies between 3 and 8 percent. *Maturity* is usually longer than in private loans, and varies between 15 and 30 years. In some cases, only a certain percentage of the loan is linked.

For government mortgages the lag in *adjustment* to the C.P.I. was larger than in private loans and in many cases the adjustment was made only if the C.P.I. had increased a specified percentage, usually 5 percent, since the last adjustment.

C. *Tax Treatment*

Landlords are allowed to charge interest and linkage charges on interest as expenses for tax purposes.

According to the Income Tax Ordinance until the end of the sixties, a homeowner who lived in his own home had to impute to his income for tax purposes the value of the services he got from the home. Against this income, he was allowed to charge expenses of interest and *linkage charges on interest* from any mortgage used to finance the house. In practice, most such homeowners did not impute the value of the housing services and did not claim the interest expenses.

D. *Mixed Government-Private Funding of Loans*

In many cases, the mortgagor eligible for government help got a loan financed by some composite of government and mortgage bank funds. The loan was administered by the mortgage banks. However, by agreement between the government and the mortgage banks, the mortgagor repaid the bank first — usually within a ten-year period — and only then started paying the government loan. Since both the contractual rate and

[6]This procedure had the psychological effect of surprising people unpleasantly each time they went to pay.

the percentage linkage of the portion from the mortgage bank's funds were higher than in the portion financed by government money, the mortgagor usually had a larger monthly payment (before linkage) during the first ten years.[7]

III. INSTITUTIONAL STRUCTURE OF THE SYSTEM FOR FINANCING OF HOUSING

A. *Position of Mortgage Lenders*

Over 95 percent of all mortgage loans in Israel are made by mortgage banks. The rest is insignificant, and comes mostly from insurance companies and private builders.

Most mortgage banks are public corporations whose shares are held by commercial banks, the government and the general public. The mortgage industry is highly concentrated; the four largest mortgage banks hold over 85 percent of the combined assets of the mortgage banks. The government has a controlling interest in the largest mortgage bank. Each of the other three large mortgage banks is affiliated with one of the three largest commercial banks which dominate the commercial banking business.

Table 1 summarizes the *relative position of mortgage banks* in the Israeli financial structure in terms of their share in the total assets of the financial system. During the fifties, their share hovered *around* 4 percent; at the beginning of the sixties, it climbed swiftly to around 12 percent, and stabilized there throughout the sixties. Since the beginning of the seventies, their share has been declining as a result of government restrictions designed to dampen the boom in the construction industry.

Relation of mortgage lenders to others. Long-term savings from the private sector are channelled mainly into provident funds (social insurance funds), insurance companies, and Treasury bonds for the government's development budget. These funds are then re-channelled (either directly or through the purchase of bonds) to development banks which specialize in long-term financing of various sectors of the economy such as agriculture, industry, tourism or construction and to mortgage banks which specialize in providing credit for housing short-term funds flow through the banking system.

B. *Assets and Liabilities of Mortgage Banks*

The assets and liabilities of mortgage banks are summarized in Table 2. The bulk of the assets is accounted for by loans against mortgages, plus deposits with the Accountant General at the Treasury. This last item requires some clarification: The Israeli Government uses the mortgage

[7]Government loans in these cases usually had amortization periods of between 20 and 30 years.

TABLE 1

THE SHARE OF FINANCIAL INTERMEDIARIES
IN THE ASSETS OF THE FINANCIAL SYSTEM
(PERCENTAGES)

Year	Commercial Banking Institutions	Mortgage Banks	Industrial Development Banks	Agricultural Development Banks	Development Banks (Other than Industrial Agricultural)	Investment Companies	Companies Lending to Households	Mutual Funds	Provident Funds	Insurance Companies	Total (Percentages)	Total Financial Assets in Millions of IL.
1962	57.0	8.7	9.2	4.5	2.1	2.4	0.6	0.2	13.0	2.3	100.0	6,550.5
1964	51.5	11.7	7.9	3.9	4.6	2.8	0.5	0.5	14.0	2.6	100.0	10,162.2
1966	50.0	13.2	6.7	3.6	4.0	3.9	0.5	0.3	15.0	2.8	100.0	14,105.1
1968	53.1	13.1	5.8	4.0	3.0	3.4	0.4	0.3	14.0	2.9	100.0	19,551.5
1970	56.7	9.2	4.9	3.3	2.5	3.8	0.3	0.8	15.1	3.4	100.0	26,301.1
1972	62.9	7.8	4.7	2.9	2.3	2.5	0.3	1.0	12.4	3.2	100.0	46,361.6

Source: Bank of Israel; Annual Reports Various Years (1) and Ben-Shahar, Bronfeld & Cukierman (4)

TABLE 2

ASSETS AND LIABILITIES OF MORTGAGE BANKS (PERCENTAGES)

	1958	1960	1962	1964	1966	1968	1969	1971	1973
Liabilities									
Governmental deposits ear-marked for loans	72.6	67.2	45.3	44.6	36.4	33.8	34.8	34.3	29.8
Bonds	5.1	9.8	33.4	26.9	28.0	32.6	32.1	36.5	35.4
Other deposits ear-marked for loans	12.2	14.0	11.2	14.0	20.9	21.9	20.9	15.3	18.1
Own capital	3.0	4.3	7.7	8.5	5.7	5.0	4.9	4.7	4.3
Other liabilities	7.1	4.7	2.4	6.0	9.0	6.7	7.3	9.2	12.4
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Assets									
Loans	92.4	93.9	75.9	83.4	77.8	71.8	71.3	73.4	70.4
Deposits at the Accountant General	4.6	3.4	21.2	13.8	18.1	23.5	24.6	24.9	28.3
Other Assets	3.0	2.7	2.9	2.8	4.1	4.7	4.1	1.7	1.3
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total (Millions of IL.)	109	227	550	1,073	1,901	2,567	2,951	3,810	6,552

Sources: 1958-1964 Barnea (2); 1966 and on: Bank of Israel, Research Department.

banks (as well as the other intermediaries that allocate funds to the real sector) as channels for some of the government bonds issued to the public. According to this arrangement, the mortgage bank issues bonds bearing its name and deposits the proceeds with the Accountant General, who guarantees the bank the same terms that the bank offered to the bond buyers, plus a commission.

On the liabilities side, the major item is government deposits earmarked for loans. Through these deposits, the government supplies the mortgage banks with funds for various groups that the government wants to subsidize. Naturally, the terms of these mortgages are determined by the government (and not necessarily in line with the price that the government pays to secure the funds for these mortgages). The other deposits earmarked for loans are similar: they are mostly deposits by various builders and contractors earmarked for mortgages to their customers. In both cases, the mortgage banks handle the paperwork but do not determine either the terms or the allocation of the funds; these decisions are made by the depositors.

The mortgage banks do have some discretion with respect to the funds that come from the issuance of long-term bonds which are not for the Accountant General, and from ownership capital. However, even here there is a certain degree of government intervention that will be discussed at some length in the next section.

There is little *asset diversification* by the mortgage banks. This is due to the high proportion of asset composition that is determined by depositors, particularly the government, and to the fact that the major risks which face the banks are either eliminated or assumed by the government.

The two major risks are:

1. default by the borrower.
2. losses as a result of different rates of return on assets and liabilities.

The first risk is minimal — because the mortgage banks lend a maximum of 40 percent of the value of the mortgaged asset, and only against a first mortgage. Since 1967-69, the second risk has become rather serious, at least in principle, because the mortgage banks borrow through linked bonds and lend with no linkage clauses.

After the abolition of linkage on mortgages, with no similar abolition on long-term bonds issued by the mortgage banks, the government assumed the responsibility of paying the linkage charges to the banks — in exchange for a 3-4 percent premium from the banks, provided that the banks observed certain restrictions on the use of these funds. Hence, the second risk has also been shifted away from the mortgage banks.

C. *Forms of Government Intervention in Mortgage Markets*

Housing construction in Israel is a leading industry. Its activity closely impinges on issues of social policy and on the goal of population dispersion. Being a country of large and erratic immigration, Israel often

found itself with the need to provide dwellings quickly for waves of immigrants. This put a severe strain on the private construction industry. To alleviate this strain, the government formed several large government-owned construction companies soon after the establishment of the State in 1948. Their major task was to build for newcomers, but they gradually expanded into building for all segments of the population.

Hence, the government intervenes in both the real side of building and its financing. However, a substantial portion of construction, particularly the more expensive, is handled by the private sector. The relative importance of government versus private construction can be appraised from the tables on housing in the statistical record.

Direct and Indirect Government Financing of Mortgages. The government intervenes in the mortgage market directly by owning a majority interest in the largest mortgage bank, which executes, to a large extent, government policy on mortgage terms and allocation. The government also deposits its funds with large private mortgage banks, and instructs them to follow the government's policy directions on terms and allocation.[8]

The government also determines, to a substantial degree, the terms and allocation of mortgages from the mortgage banks' own capital by making *ad hoc* financial package deals with the banks. In such deals, the Treasury would deposit a substantial amount of money with a particular mortgage bank earmarked for loans (on which the bank would make a commission) on the condition that the bank allocate a specified proportion of its own funds for the same purpose. The bank would charge its customers more on loans from its own capital, but the allocation would be made according to the government's guidelines.

In addition to these interventions, on several occasions the government has changed the terms of both new and existing mortgages from the banks' own sources. Striking examples of such interventions are the replacement of dollar-linked mortgages by C.P.I.-linked mortgages, and the gradual replacement of linkage by a higher interest rate. In both cases, the government ultimately had to assume the position of the borrower with respect to the mortgage banks; the latter had to be covered, since their obligations remained linked to the dollar in the first case and to the C.P.I. in the second. The mortgage banks passed on to the government all the payments from the borrowers who opted for index linkage in the first case, and for a higher fixed interest rate in the second. The government, for its part, paid the mortgage banks according to the original linkage terms of the loans; this amounted to a subsidy to most of the previously linked mortgagors.

[8]These funds originate in the government's development budget, which is financed mostly by long-term bonds issued by financial institutions.

Since 1967-68, all new mortgages from both government and private sources have been unlinked. However, the mortgage banks continue to mobilize most of their own capital by issuing C.P.I.-linked bonds. In order to cover the banks, the government offered them reimbursement of their linkage payments if they observed certain restrictions in the use of the funds and paid the Accountant General a 3-4 percent premium. This premium was raised, with a very long lag, as the rate of inflation accelerated in the early seventies and attained 8 percent at the margin recently.

In some instances, the Accountant General makes short-term advances to the banks, and also pays them the bond rate linked interest plus commission for any short-term funds they care to deposit with him. Hence, the *Accountant General performs some (but not all) of the functions of the Federal Home Loan system* in the United States.

Government Intervention in the Markets for Long-Term Bonds and Savings Deposits. The largest portion of mortgage banks' funds is mobilized through long-term bonds usually maturing in 10 to 17 years. The government intervenes in this market in several ways. First, it sells its own bonds and deposits part of the proceeds, earmarked for loans, with the mortgage banks. Second, it grants tax benefits and a government guarantee to some long-term bonds issued by the mortgage banks.

Hence the *government assumes part of the role of the FSLIC* [9] in the United States by insuring some of the mortgage lenders' obligations; however, the bulk of these obligations are long-term linked bonds rather than savings deposits. Most savings deposits in Israel are administered by commercial banks which have to invest them in long-term government bonds or in "approved" long-term bonds issued by various financial institutions (including mortgage banks). By giving or denying its approval to particular issues, the government can increase or decrease the market facing particular financial intermediaries. Usually, the bonds of the larger mortgage banks are "approved."

Tax Benefits. The government grants tax benefits at various stages of the saving process. First, all receipts from principal adjustments on long-term bonds and savings deposits are tax free.[10] Savings deposit interest, and linkage payments on interest, are also tax free. Most long-term bonds issued by mortgage banks are exempted from tax on interest and linkage, or carry a maximum tax of 25 percent.[11]

[9]As a result of the recent default of the British-Israeli Bank, a bill proposing the establishment of a Deposit Insurance Corporation to insure all deposits of up to IL.25,000 is being considered by the Israeli Parliament.

[10]However, linkage payments received by mortgage banks and other financial intermediaries are considered to be regular taxable income.

[11]This is a substantial benefit in a country in which the tax structure climbs rather quickly to a marginal tax rate of 70 percent.

Until the early seventies, homeowners, occupying their home could deduct interest charges plus linkage on interest, but only against the imputed income originating in home ownership. Such deductions are still allowed to landlords.

Interest Subsidies. The government grants various interest subsidies to mortgagors. These subsidies have taken the form of a low direct interest rate, a larger amortization period, a proportion of indexation lower than 100 percent, lags in the payments of indexation charges, and retroactive cancellation of dollar linkage and C.P.I. indexation charges.

After 1962, the forms of subsidization changed. For example, in mortgages for new immigrants, linkage charges were forgiven if the loans were paid off during the first five or ten years. During this period no interest or amortization payments were due. If the loan was repaid during this period, the accumulated interest payments were due from the borrower; if it was not paid off, the accumulated interest plus 35 percent of the linkage charges due for the initial period was added to the principal and from that time on, this total was fully linked.

After the cancellation of linkage, subsidies usually took the form of a low nominal interest rate and a long amortization period.

IV. EXPERIENCE

Part II, Section A gave a historical overview of the introduction of changes in and elimination of mortgage indexation. The focus here is mainly on the benefits and problems of the various mortgage instruments, and on major political interventions that brought about changes in the instruments.

A. *Major Political Intervention and Changes in the Terms of Existing Mortgages*

The introduction of linked mortgages in the mid-fifties was motivated by economic forces and backed by the government, which appointed a special committee that recommended linking a wide array of financial assets and liabilities — including the assets and liabilities of the mortgage banks.[12] The 1962 devaluation, which found most mortgages linked to the U.S. dollar, unleashed an outcry that soon pressured the government into providing some form of relief.

The experience of the public with dollar-linkage, as well as the total abolition of linkage on loans to various other sectors of the economy, raised the question of abolition of linkage on mortgages as well. Following some of the recommendations of the Sherman Commission appointed in 1965 to investigate this problem, the government started by

[12]See "Report of the Lehman Committee," 1955 and 1959.

freeing some of the most recently granted mortgages from indexation. However, once this precedent had been set, most existing indexed mortgages were given similar options — and most were substituted for unlinked mortgages with a higher *fixed* rate of interest. In all cases, the resulting risks were shifted to the taxpayer.[13]

B. *Lessons and Proposals for the Future*

Several lessons may be drawn from this experience. First, one of the major elements that unleashed popular resistance to mortgage indexation was the *lack of synchronization* between increases in salaries and increases in mortgage payments. This was particularly striking after the 1962 devaluation, when both the principal balance and the periodic payment increased overnight by 66 percent with no matching increase in wages. This moved the Sherman Commission to recommend that mortgage payments be increased only when a C.O.L.A. is actually paid, since there is a divergence between increases in the C.O.L.A. and increases in the C.P.I.

The lack of synchronization between wage increases and indexation increases in mortgages seems to have been at the root of the wide resistance to mortgage indexation which eventually caused its abolition. It follows that indexation may have been more durable and bearable if the reference index used had been some index of *wages* rather than an index of *prices.*

C. *Other Benefits and Problems of Indexation*

Benefits. The main benefit that indexation of the assets and liabilities of financial intermediaries brought about was the renewal of the flow of financial savings to construction and other industries. This was particularly striking in the early fifties, when the rate of inflation reached 60 percent per year. Before indexation, the flow of financial savings and the new-issues market dried up completely; with the introduction of indexation of long-term bonds, the new-issues market reopened — and ever since has been a substantial source of funds for mortgages.

A related benefit of price-level indexation is that it reduced the volatility of savings inflows to mortgage banks and other financial institutions. Although mortgage bank assets and liabilities are quite closely matched — long-term mortgages backed by mortgage bonds — they do attract some funds in the form of savings deposits. Since these deposits are indexed, however, whenever there is an increase in the rate of inflation, savers get compensated by the linkage clause. Hence, the flow of funds to such savings deposits increases when nominal interest rates lag

[13]At the time the substitution was made (1966/7), inflation was slight so the increased interest more than compensated the government for waiving the linkage. However, the situation has been reversed since 1970.

behind the acceleration in inflation.[14] This is further reinforced by special savings plans. An example is the "Savings for Housing Plan," which was established by the government in 1955. It is linked to the cost of construction index, yields a rate of interest between 4-6 percent (the longer the saving period, the higher the rate of interest), and is tax free if used as a down payment or if it is not withdrawn for three years. In addition to his accumulated savings, the saver is eligible, after several years, for a C.P.I.-linked mortgage whose size increases monotonically with the size of the original savings.

Savings deposits are for shorter-time periods than are mortgages, and may not be withdrawn before the end of the specified saving period. In practice, however, they are repaid on demand — but with a substantial loss of benefits to the saver. As a result, existing savings are not very volatile.

Problems. Some of the problems associated with linked mortgages arose as a result of the borrowers' misunderstanding of the nature of their obligations. This was due to a lack of financial sophistication on their side, as well as to slow and unsuitable administrative practices by the mortgage banks, particularly in the early years of indexation.

For example, mortgage banks sent invoices for unadjusted payments, and would adjust the payments for accumulated linkage charges only when the mortgagor came in to pay. This created repeated frustration on the part of borrowers. Later, this problem was eased by the increasing computerization of the mortgage industry.

Another problem was created by premature mortgage repayments. Owing to the fact that the initial payments had a large interest component, coupled with a rate of inflation that customarily ranged during the sixties between 6 percent and 12 percent, mortgage recipients who wanted to repay their mortgage prematurely found that after making payments for several years they still owed more (in nominal terms) than they had initially received. This led some mortgagors to believe that they would never be able to amortize their mortgages.

Since at least some of those psychological effects are based on misconceptions, they can easily be remedied by suitable information on linked mortgages *before* this liability is assumed by the individual.[15] More importantly, in my view, the home buyer should be able to choose between an unlinked mortgage at a high interest rate and an indexed one at a lower interest rate. If this alternative had existed in Israel when indexed mortgages were offered, many people would have blamed themselves rather than the government when the time to pay indexation charges arrived.

[14]Institutional forces prevent nominal interest rates from adjusting fully to the rate of inflation.

[15]Some proposals to deal with those psychological effects are discussed in A. L. Gaathon, *Economic Productivity in Israel,* New York: Praeger, 1971.

D. *Particular Problems Associated with the Abolition of Mortgage Linkage*

The abolition of indexation on mortgages, without similar abolition on the liabilities side of the mortgage banks' balance sheet, was made possible by the government, which assumed all the resulting risks. This increased the government's already substantial involvement in the capital market, and decreased the mortgage banks' range of free action.

It may be argued that since the government, as a financial intermediary, borrows with linkage clauses and lends without them, it has an additional incentive to prevent inflation. This is probably true for mild inflation as in 1968-70. However, the acceleration of inflation during the early seventies seems to demonstrate that this element is too weak to overcome stronger forces working for inflation.

In the transition period from indexed to non-indexed mortgages, there was a retardation in the demand for mortgages due to the feeling that "favorable changes" for mortgagors were about to be enacted. As a result, when indexation was abolished, the demand for mortgages increased — helping to terminate the 1966-67 slump in the construction industry. It is interesting that most of the mortgagors who were given the option of replacing the linkage with a 3-4 percent increase in the interest rate chose to do so, even though actual prices had hardly increased at that time. This phenomenon indicates that the public expected the long-run rate of inflation to be higher than the abnormally low rates of inflation during 1966-68, and in particular that it would be higher than the 3-4 percent premium.[16]

E. *Experience with Other Index-Linked Financial Contracts*

Until the mid-sixties, most long-term financial contracts were linked to the C.P.I. These included long-term bonds, savings deposits, life insurance, pensions, provident funds, wages (through the almost universal C.O.L.A.), and term loans from the government and financial intermediaries to various industries. During the second half of the sixties, the linkage clause on most loans to industries was replaced by a fixed increase of 2-4 percent in the interest rate. However, all other financial contracts (mostly between savers on one side and financial intermediaries and the government on the other) remain linked to the C.P.I. until the present time. All the risks created by this divergence between the borrowing terms of financial intermediaries and the government on one hand, and their lending terms on the other, were either directly or indirectly assumed by the government.

[16]Robinson, p. 179, who attributes this view to the Bank of Israel, explains this by claiming that the public "preferred the certainty of fixed principal and interest payments over the uncertainty and risk involved in linked loans." Note that this explanation attributes money illusion to the public.

During the early days of statehood, there were attempts by the Treasury to manipulate the C.P.I. in order to prevent general increases in wages through the C.O.L.A. Later, such direct attempts stopped. However, the government usually gave large subsidies to some of the goods which weighed heavily in the index, in order to increase the lag between the C.O.L.A. and the C.P.I.

The experience with linked bonds and savings deposits has been, on the whole, quite favorable. With a relatively high and volatile rate of inflation, the linked bond market provided a steady avenue of funds for long-term investments, and protected the small saver against inflation. It is quite probable that its existence decreased inflationary hoarding of real goods, thus helping to decrease the rate of inflation. After the Yom Kippur War, for example, when the rate of inflation jumped from 20-25 percent to almost 50 percent on an annual basis, the demand for new issues of linked bonds almost quadrupled. With no such financial instrument, constant in real terms, this demand would have been directed at the goods' market.

As a result of the abolition of linkage on loans, taxpayers subsidize the loan recipients whenever the rate of inflation increases above a certain level and the size of the real subsidy increases with the increase in the rate of inflation.

V. SUMMARY AND CONCLUSION

The indexation of mortgages in Israel began in the mid-fifties as part of a general adoption of indexation in broad segments of the capital market as well as of the labor market. The drying up of funds for home building caused by a combination of high inflation and legal ceilings on rates of interest hastened the adoption of indexation by mortgage banks. The mortgage banks issued price-level or dollar-adjusted bonds and to match these obligations, mortgages with matching adjustments. This move renewed the flow of funds to home building. Until the 66 percent devaluation that occurred in February 1962 most mortgages were exchange-rate adjusted. From then and until the final abolition of mortgage indexation in 1968 most mortgages were price-level adjusted and the reference index was the C.P.I.

Mortgages were usually granted for a period of around ten years with an escalated rate of interest of up to 8 percent. Price level adjustments were usually made with a lag. Since there was an almost perfect matching of assets and liabilities of the mortgage lenders both in terms of maturity and reference index, no "locked-in effect" (akin to the one found in the American mortgage industry) arose in the Israeli mortgage industry.

Government intervention in both the building and the mortgage industry was and still is substantial. Government corporations carry out a substantial amount of the building activity. Through the mortgage banks, the government granted subsidies to particular classes of mortgagors in

the form of lower interest rates, partial or no escalation of the mortgage and longer maturities. During the transition from dollar to C.P.I.-adjusted mortgages and later from those mortgages to regular mortgages with a higher interest rate, the government assumed the responsibility for the differences that this move created between the assets and liabilities of the mortgage banks, on new as well as on most seasoned mortgages.

Since 1968 price-level adjustments no longer exist in most long-term loans to housing, industry, agriculture and various other industries. However, financial institutions and the government continue to raise funds with C.P.I.-adjusted bonds. The resulting differences are covered by the government. Thus the taxpayers subsidize the recipients of loans. Moreover, since the rates paid by the borrowers are very sluggish, the size of the real subsidy becomes a function of the rate of inflation.

It would seem to the superficial observer that the ultimate abandonment of mortgage indexation in Israel suggests the failure of this mortgage instrument. I would be inclined to take a less pessimistic view. The introduction of indexation on bonds and savings deposits was certainly very beneficial since it assured a steady flow of savings to finance mortgage loans and eliminated the adverse dependence of those flows on the rate of inflation. Most of the problems that indexation brought were on the side of borrowers. However, in my view they were created mainly because of a shortsighted implementation of mortgage indexation. The choice of the price of the dollars in terms of local currency as a reference index for mortgage adjustments created very serious problems of synchronization between the wages of the mortgagors and the monthly mortgage payment once a devaluation actually occurred. The size of the 1962 devaluation made this problem even more acute and put many borrowers in a difficult situation. As a result the government had to intervene and provide relief by assuming some of the mortgagors' obligations. But once such a precedent has been established, demands for abolition of price-level-adjusted mortgages multiplied even though the synchronization problems of those mortgages were far less serious. In my view the lessons to be learned from this experience are not that mortgage indexation does not work but rather that certain rules should be observed in its implementation: Firstly, the choice of reference index should assure a substantial degree of synchronization between the mortgage payment and the wage of the mortgagor. Possibly an index of wages or several wage indices, according to the borrower's profession, should be used. Secondly, the borrower should be given the choice between a regular mortgage at a high interest rate and an indexed mortgage at a lower rate. Finally, the risks involved in the choice of each mortgage type should be clear to the borrower *before* he decides which type of mortgage he will take.

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Mortgage Innovation To Facilitate Investment In Housing: The Case in Sweden

David L. Cohen and Donald R. Lessard*

I. INTRODUCTION

The Swedish system for financing housing is but one of many mechanisms reflecting the high priority placed on housing. Monetary policy seeks to assure a steady flow of funds to housing, and the government is active as a direct supplier of housing. Mortgage terms are liberal, relative to most countries, both in terms of maturity and of allowable loan-to-value ratios, and the mortgage "package" incorporates a rising schedule of payments which further increases the amount of housing that households can afford.

II. DESCRIPTION OF MORTGAGE INSTRUMENTS

A. *The Mortgage Package*

In general, up to 70 percent of the appraised value of a new residence may be borrowed from private credit institutions. Most prominent are mortgage banks, credit companies, savings banks and insurance companies.

Until 1965 a primary mortgage and a smaller secondary mortgage were included in this 70 percent. Since 1965, most new mortgages involve a single "unity loan" for the full 70 percent.

In approximately 90 percent of all new dwelling purchases the unity loan is supplemented by a government mortgage. The extent of governmental financing assistance varies with the category of the building owner:

- municipalities and semi-public housing organizations obtain government loans corresponding to 30 percent of the appraised value
- housing cooperatives up to 28 percent
- owner-occupiers up to 20 percent
- private investors up to 15 percent (under certain circumstances 20 percent)

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In addition, some households add a "top loan" which further increases the proportion of value which can be financed. These are provided by savings banks and the postal saving system, and generally are for maturities of 15-20 years.

B. *Mortgage Terms According to Lender*

Different institutions specialize in terms of the part of the mortgage package they provide, the type of mortgage instrument they employ, and the type of housing they finance, and there are substantial interdependencies between these characteristics of their lending behavior and the sources and instruments they use to obtain funds. Because of this specialization, the description that follows is organized by institution, rather than by the various aspects of the mortgage instrument.

Bond-Financed Institutions — mortgage banks and credit companies — are Sweden's largest providers of housing credit. They acquire funds by issuing bonds, generally with a 20-year maturity, whose interest rates are adjusted to the prevailing market level after ten years. The maturity of loans made by mortgage institutions is also 20 years. As with their bonds, interest rates are fixed for ten years with a provision for adjustment at that time. The loans are repaid in equal annual installments based upon an amortization period of 60 years for multi-dwelling houses and of 40 to 50 years for one- and two-family homes.

Thus, after 20 years, the mortgage falls due for repayment with the major part of the loan still outstanding. Generally, the borrower is offered conversion of his matured loan into a new loan on terms prevailing at the time. In effect, then, the mortgages are 40- to 60-year fixed annuities with rates adjusted at ten-year intervals.

The terms for repaying a loan before maturity are specified in the mortgage contract. If the interest rate on new loans at the time is lower than the rate charged on the outstanding loan, the borrower must pay a penalty charge equal to the capitalized value of the interest margin during the remainder of the ten-year period for which the interest rate is fixed.

Insurance companies provide mortgages on the same fixed-rate basis as mortgage banks. Again interest rates are fixed for ten-year intervals.

Most insurance company mortgage lending is for multi-dwelling houses.

Savings banks primarily offer variable-rate mortgages on which they are free to alter the rate at any time. Although no external reference rate is specified in the contracts, the central bank discount rate is typically used. The mortgages are generally of a variable payment (as opposed to variable maturity) nature, with rate changes altering monthly payments. Maturities typically range from 40 to 50 years.

Savings banks concentrate their mortgage lending on one- and two-dwelling homes (as opposed to mortgage banks which also provide significant advances for multi-unit dwelling) and provide most of the "top-loans" employed by purchasers of single-family homes.

Commercial bank activity in the housing field is oriented toward short-term construction credits which are replaced by long-term financing from other sources upon house purchase. To the extent that they do provide long-term mortgages, these are generally on the same variable-rate basis as those of savings banks.

Government loans figure in the financing of almost 90 percent of all housing units. They typically are amortized over 30 years and carry a rate of interest which corresponds to that paid by the government on its long-term borrowing plus an administrative charge (0.25 percent in 1973).

Prior to 1968, the government subsidized these mortgages by charging borrowers a lower rate than that on government bond issues. At the same time, repayment took the form of equal annual amortization payments (1/30 of the loan) plus interest on the outstanding debt. Consequently money payments were highest in the early years and declined over time. In addition, the government provided interest grants to reduce the rate paid on primary and secondary mortgages.

These subsidies were abolished in 1968. In order to avoid a sharp increase in the carrying costs on new mortgages, however, the new government loans featured a graduated stream of payments with initial payments on the mortgage package no higher than they would have been under the previously subsidized arrangement. Subsequent increases in the payments of the so-called "parity loans" were linked to a construction cost index.

An illustration of the stream of payments associated with an Skr 1000 mortgage package incorporating a 70 percent "unity loan" and a 30 percent "parity loan" is presented in Table 1. The following assumptions are made: 1) the unity loan has a 40-year maturity and a 6 percent rate of interest, implying an annuity of 6.16 percent of the original loan balance (6.16 percent x 700 = 43.12); 2) the government loan carries a 6 percent rate of interest and a planned (although not necessarily actual) maturity of 30 years; 3) the total payment is calculated as the original payment times the "parity number," (assumed to increase at 3 percent per year in this illustration); and 4) the initial payment, Skr 51, is based on the 5.1 percent annuity figure established by the government to apply to such loans, presumably reflecting the initial payment on a package including a unity loan (along with a government interest grant) and a low-interest government loan.

It is interesting to note that, given these assumptions, the outstanding principal on the government loan rises until year eight and does not fall to the original level until year 15. This arrangement thus involves additional government loans in place of subsidies. It is geared to the assumption that the borrower's income and thus his capacity to repay will rise over time.

Owner-occupiers of one- and two-dwelling houses are still given the option of repaying their government loan at 1/30 each year. When the new loans were first introduced, approximately 25 percent chose this level pattern, with the remainder opting for the upward sloping "parity" payments schedule.

Table 1

PAYMENTS, INTEREST ACCRUALS, AND OUTSTANDING PRINCIPAL WITH "UNITY LOAN"/"PARITY LOAN" MORTGAGE PACKAGE

Year	Parity-number	Total payment	Nominal annuity of the unity loan	Remains for the government loan	Interest on government loan	Amortization of government loan	Governmental loan outstanding	Total loan debt outstanding
	1	2	3	4	5	6	7	8
1	1.0	51.00	43.12	7.88	18.00	- 10.12	310.12	1008.65
2	1.00	52.53	43.12	9.41	18.61	- 9.20	319.32	1016.30
3	1.0609	54.11	43.12	10.99	19.16	- 8.17	327.49	1022.83
4	1.0027	55.73	43.12	12.61	19.65	- 7.04	334.53	1027.53
5	1.1255	57.40	43.12	14.28	20.07	- 5.79	340.32	1032.08
6	1.1593	59.12	43.12	16.00	20.42	- 4.42	344.74	1034.56
7	1.1941	60.89	43.12	17.77	20.68	- 2.91	347.65	1035.41
8	1.2299	62.72	43.12	19.60	20.86	- 1.26	348.91	1034.50
9	1.2668	64.60	43.12	21.48	20.93	+ 0.55	348.36	1031.65
10	1.3048	66.54	43.12	23.42	20.90	+ 2.52	345.84	1026.70
11	1.3439	68.54	43.12	25.42	20.75	+ 4.67	341.17	1019.46
12	1.3842	70.60	43.12	27.48	20.47	+ 7.01	334.16	1009.73
13	1.4258	72.72	43.12	29.60	20.05	+ 9.55	324.61	997.31
14	1.4685	74.90	43.12	31.78	19.48	+12.30	312.31	981.97
15	1.5126	77.15	43.12	34.03	18.74	+15.29	297.02	963.47
16	1.5580	79.46	43.12	36.34	17.82	+13.52	278.50	941.55
17	1.6047	81.84	43.12	38.72	16.71	+22.01	256.49	915.95
18	1.6528	84.30	43.12	41.18	15.39	+25.79	230.70	886.36
19	1.7024	86.83	43.12	43.71	13.84	+29.87	200.83	852.47
20	1.7535	89.43	43.12	46.31	12.05	+34.26	166.57	813.96
21	1.8061	92.11	43.12	48.99	9.99	+39.00	127.57	770.46
22	1.8603	94.87	43.12	51.75	7.65	+44.10	83.47	721.61
23	1.9161	97.72	43.12	54.60	5.01	+49.59	33.88	666.99
24	1.9736	100.65	43.12	57.53	2.03	+55.50	—	627.79

III. INSTITUTIONAL STRUCTURE OF SYSTEM OF FINANCING HOUSING

A. *Housing in Sweden: An Overview*

Multi-family housing is dominant in Sweden, both in terms of the existing stock and additions to the stock. However, one- and two-family housing is on the increase, accounting for almost 45 percent of all new units produced in 1972, up from 36 percent in 1967.

This pattern reflects substantial government involvement in the production of housing. Government units and semi-public housing corporations regularly account for over 40 percent of all housing units produced and, together with housing cooperatives, for virtually all multi-family units.

The discussion which follows concentrates on the financing of one- and two-family housing in which the private sector plays a larger role.

B. *Position of Mortgage Lenders*

The four major lenders for housing are the Urban Mortgage Bank, the credit companies, the savings banks, and the government through the National Housing Board. Table 2 summarizes their relative importance in terms of net changes in outstanding loans in recent years.

TABLE 2

RELATIVE IMPORTANCE OF MAJOR MORTGAGE LENDERS

Percentage of net change of total outstanding loans

Lender	1967	1968	1969	1970	1971	1972	1973
Stadshypotekskassan (the Urban Mortgage Bank)	24	28	35	32	38	23	23
Credit companies	29	26	36	27	29	29	32
Insurance companies	2	1	1	2	3	1	3
Commercial banks	14	18	-5	7	3	14	6
Other banks	22	19	16	9	6	13	16
The National Housing Board	9	8	17	23	21	20	20

Source: Annual Reports of Sveriges Riksbank and accounts from the National Housing Board.

Mortgage Institutions. Of the four groups, the bond-issuing institutions traditionally have been the largest providers of mortgage loans. These include the Urban Mortgage Bank and the credit companies. The oldest and largest of the mortgage institutions is the Urban Mortgage Bank. It is in principle an association owned by the borrowers themselves. A central institution raises funds while 21 local societies grant mortgage loans.

The credit companies are generally owned by commercial banks or savings banks, but are in other respects structurally similar to mortgage banks. Two credit companies dominate the field.

The purchasers of bonds issued by these institutions include commercial banks, savings banks, insurance companies, and most importantly, the National Pension Insurance Fund. The Fund handles the rapidly growing contributions paid by employers to finance the National Supplementary Pension. By 1972, it accounted for over one-third of the supply of funds to Sweden's organized capital markets. The fund held 18 billion Skr or 48 percent of its assets in housing bonds in 1970.

Savings banks are run on a non-profit basis and are supervised by the state authorities. They have their own private central bank, the Sparbankernas, Bank for Savings Banks, which provides advances to its members.

The government's role is described in the following section.

C. *Government Intervention in the Mortgage Market*
Direct and Indirect Government Financing of Housing

As noted above, the government provides supplementary loans on a large scale. At the same time, through the National Pension Insurance Fund, it provides indirect financing as well. In addition, it provides direct housing subsidies for various special groups.

Intervention in the Capital Market. In its general conduct of economic policy, the Swedish government has typically opted for deficit spending coupled with tight money. In a free market economy this would normally lead to high interest rates. The monetary authorities, however, have developed an elaborate system of credit allocation which channels funds into preferred uses. They utilize a number of tools to insure that housing, typically high on the list of social priorities, is provided with sufficient credit by the capital market:

(i) The "Bond Queue" — According to legislation passed in 1952, the Riksbank (Central Bank) must approve the timing, interest rate and repayment schedule of all prospective bond issues. Mortgage banks, however, are granted access to the bond market without having to gain permission from the Riksbank and are thus in a favored position; but the Riksbank still controls the terms of issue.

(ii) Credit "Agreements" and Credit Ceiling — The Riksbank exercises moral suasion to insure that commercial banks provide sufficient construction credit for the annual residential building target established by the government. Although nominally "voluntary agreements," the banks

know that the Riksbank can make them legally binding if cooperation is not forthcoming.

Occasionally, a formal ceiling on bank credit is established, with housebuilding loans exempted. In August 1969, commercial banks were instructed to reduce outstanding credit (other than home building loans) to the January 1969 level. Again in April 1970, with the Swedish economy under strain, a ceiling of 106 percent of the December 1969 level was imposed.

(iii) Liquidity Ratio — To help insure that purchasers are found for mortgage bank bonds, the Riksbank allows the bonds to qualify as liquid assets in satisfaction of banks' liquidity ratio requirement. Currently, the largest commercial banks are obliged to maintain a liquidity ratio of 30 percent; for savings banks, the figure is 20 percent. After government bonds, mortgage bonds are their most important liquid asset.

(iv) Investment Ratios — For the insurance companies and the National Pension Insurance Fund, investment guidelines are applied, based on agreements between the institutions and the Riksbank. The insurance companies must invest two-thirds of their net increase of funds in priority assets, i.e., government securities, *housing bonds* and *mortgage loans* for dwellings and other objects receiving government loans. Similar rules apply to the Fund.

The net effect of these various actions has been to reduce interest rates for housing relative to the general level, as shown in the summary at the start of this chapter, and to increase the flow of funds to housing.

Tax Benefits to Mortgagors — Swedish tax laws are not as geared toward promoting home ownership as are American laws. Although interest on debt can be deducted from income, a certain proportion of the taxable value of property is reckoned as income. However, this taxable value is smaller than the tax shield of the debt, so there is thus some net tax advantage for the mortgaged home owner.

IV. EXPERIENCE

A. *The Government "Parity" Mortgage*

In practice, the payment stream mechanism introduced in 1968 did not function as anticipated. During the first several years of the new scheme, interest rates rose very rapidly, and construction costs rose at a relatively slow rate. As a result, there was an unexpected buildup of principal on outstanding parity loans. Since 1972, interest rates have continued to rise and construction costs have risen at a relatively high rate. If fully reflected in mortgage payments, this combination of rising costs of new construction and high interest rates would have led to rapid increases in carrying costs for new and existing housing through the parity mechanism. Because of this, the government did not increase the parity number in direct relation to construction costs, but allowed it to lag considerably which led to an even greater buildup of government mortgage financing.

As of this writing, the Swedish Government is planning to abandon the parity loan and replace it with a "low-start" interest subsidy program linked to family incomes. A low interest rate will be applied at the outset and annually increased up to the market rate. Under this policy, the government will subsidize the difference between the stated interest rate and the market rate.

B. *The Flow of Funds to Housing*

Even during periods of monetary restraint, the Swedish mortgage market has enjoyed a steady flow of capital. It has been the other sectors of the economy that have contracted (as opposed to the United States where business has generally captured the largest share and housing has been most severely hit in times of credit stringency).

This experience has been due in large part to the Riksbank's policies described above that actively channel funds into the housing sector via mortgage bank bonds. Also helpful has been the National Pension Insurance Fund with its sizable bond purchases.

The relatively smooth growth in the flow of credit to housing compared to the business sector was illustrated in the summary. In the years 1965 through 1969, for example, the proportion of Swedish GNP devoted to gross investment was 23-24 percent. The portion of this investment claimed by housing (including maintenance) remained remarkably stable between 26 percent and 29 percent. This was despite the fact that restrictive monetary measures were in effect in 1965, 1966 and 1968-9.

The mechanism through which short-term construction credits are transformed into long-term mortgages was strained in 1972-73. Partly because of increased state borrowing operations, housing finance institutions were unable to place their bonds in sufficient amounts to meet loan demand. As a result, many commercial bank construction credits could not be replaced by long-term financing. An agreement was finally reached with the government whereby commercial banks would cooperate by providing Kr 2.5 billion toward final housing financing. This took the form of increased housing bond purchases of Kr 1.5 billion plus the conversion of Kr 1 billion in outstanding construction credit to temporary loans with interest rates corresponding to those on new mortgages granted by mortgage banks.

C. *Level and Volatility of Housing Construction*

As can be expected from the set of measures described above, Sweden has succeeded in increasing the total flow of new housing as well as moderating swings in that flow. The total number of dwellings produced has risen for nine years with only one deviation from the upward trend. Further, while the average annual growth rate of capital outlays for housing has been almost as high as that for all gross domestic fixed capital formation (a compound rate of 5.6 percent versus 6.5 percent), fluctuations in the annual rate of change have been lower for housing (a standard deviation of 2.6 percent versus 3.8 percent).

V. SUMMARY AND CONCLUSIONS

The Swedish system demonstrates the wide range of instruments which can be brought to bear to stimulate and stabilize housing production. Monetary policy and financial market controls have assured a steady flow of funds to the housing sector. A mortgage package has been devised which provides a high financing ratio for new housing. Most interesting for this study, however, is the development of schemes to provide a rising time pattern of payments, the parity loan and the proposed low-start subsidy program. The fact that the parity loan scheme is being abandoned does not reflect a rejection of graduated payment mechanisms, rather a decision to provide even greater relief in early years.

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Experience with Variable-Rate Mortgages: The Case of the United Kingdom

David L. Cohen and Donald R. Lessard*

I. INTRODUCTION

Variable-rate mortgages have been advocated as one means to alleviate the effects of high and volatile rates of inflation and interest on the housing market and, in particular, on institutions which specialize in housing finance. The experience of the United Kingdom is especially interesting in this regard since it has employed variable-rate mortgages on a large-scale basis within an institutional structure similar to that of the United States during the current inflationary period.

The majority of U.K. mortgages are variable-interest rate, fully amortized, level-payment contracts. The dominant lending institutions, the building societies, are mutual institutions similar to U.S. savings and loan associations including the fact that their liability structure is composed almost entirely of sight and term deposits.

II. DESCRIPTION OF THE MORTGAGE CONTRACT

Individual building societies began to experiment with variable-rate clauses as far back as 1930. By 1967, more than 80 percent of all housing loans were variable-interest rate contracts and today virtually no building society will grant a fixed-rate mortgage, although they are still available on a limited basis from insurance companies and local government authorities.

The typical mortgage has a *maturity* of 20 to 25 years and is fully *amortized* on a level-payment basis. Loan-to-value ratios are typically 70-80 percent, although they go as high as 95 percent with insured mortgages.

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The *interest rate* on U.K. variable-rate mortgages is not tied to any external reference rate, but is set at the discretion of the lender. In practice, changes in the mortgage rate as well as the rate paid on savings deposits are recommended by the Council of the Building Societies Association, the trade association of the dominant lending institutions. These rates are "sticky" relative to other interest rates, since, in order to avoid unfavorable reactions to increases, the Building Societies Association recommends increases in rates on savings and mortgages only after societies as a group experience a clearly adverse change in their flow of funds and the general movement of market rates seems certain not to reverse itself soon.

When rates are increased, borrowers traditionally have been given the option of *increasing their monthly payment* to fully amortize the loan over the remaining maturity or of maintaining the same payment by *extending the maturity of the loan.* In either case, a new annual stream of repayments (interest and principal) is computed at the new interest rate.

Although the "model clause" long recommended by the Building Societies Association gave the lender power to require an increased *payment,* in general this was not invoked until 1969. This was because between 1955 and 1965, the mortgage rate slowly climbed in steps of 1/4 and 1/2 percent from 5 percent to 6 3/4 percent. With property prices rising steadily, societies were little concerned with moderate extensions in borrowers' terms of repayment.

The sharper increases in mortgage rates since 1965 have created situations where original monthly payment levels are barely, if at all, sufficient to meet interest changes. For example, rates jumped from 6 percent in mid-1964 to 8 1/2 percent in 1969, and to 11 percent in 1973. An individual who had made all adjustments on a 25-year mortgage (closed in mid-1964) by extending the maturity would have reached a point by 1969 where amortization of principal became negative. As a result, building societies have been obliged in numerous cases to insist upon increased monthly payments.

The standard contract enables the building society to vary the rate on an outstanding mortgage after giving "reasonable notice" as specified in the original contract. When the Building Societies Association recommends a shift, the rate on new mortgages changes immediately, while there is a short lag before outstanding borrowers are affected. Until recent years the notice period was typically three months. In light of the recent trend toward larger adjustments in the deposits and mortgage rates, however, the period has been shortened to one month in most new contracts.

Statutory and Contractual Limits on Interest Rate. In earlier days, variable-rate mortgage contracts incorporated absolute limits on the rate of interest, but today, typically, they merely stipulate that the new rate shall be no higher than what the building society charges on new mortgages of a similar class. From time to time since 1920, there have been statutory bars to mortgage interest increases, but they have largely disappeared.

In general, on the giving of notice of increase, the borrower is permitted to *redeem* his mortgage within a stated period *without prepayment charges.* The Building Society Association suggests that if a society finds it necessary to levy a charge for premature redemption that it do so only if the loan has been in existence for not more than five years. If the loan is newer than that, they recommend a maximum charge of three months interest on the outstanding balance. Many societies impose no prepayment penalties at all.

The interest component of mortgage payments is *tax deductible,* although the Finance Act of 1974 has the effect of limiting the interest deduction to the first £25,000 of the loan.

III. INSTITUTIONAL STRUCTURE OF SYSTEM FOR FINANCING HOUSING

A. *Housing in Great Britain: An Overview*

Although the primary focus of this report is on the type of financing associated with owner-occupied housing, it is important to note that publicly owned rental units have for many years accounted for roughly 30 percent of all housing units, while privately owned rental housing has declined steadily from 25 percent in 1961 to 13 percent in 1972.

B. *Primary Mortgage Lenders*

The British market for home mortgages is dominated by the *Building Societies,* akin to American Savings and Loans. They ordinarily account for four-fifths, or more, of annual mortgage flows. Of the 174,000 private new houses and flats constructed in 1970, 133,000 (76 percent) were purchased with building society mortgages.

Although there exist a large number of building societies (456 at the end of 1972), a small group have branches nationwide and account for the bulk of society savings and mortgages. In 1971, the five largest accounted for over half of total assets.

Building societies are mutual institutions. In earlier days borrowers were generally also depositors in the society. More recently the granting of a mortgage was not normally conditioned on the would-be borrower previously having been a depositor. Within the last few years, however, in the face of savings flow instability, many societies have once again granted loan preference to savers.

The two other mortgage lenders of any significance are the insurance companies and local (i.e., municipal) authorities.

Insurance company loans for house purchase consist mainly of loans to policy holders. A decline in building society advances during a credit squeeze is frequently met by an increase in insurance company lending to policyholders unable to secure mortgage money through normal channels. A common procedure is for the loan to be secured by an endowment life assurance policy. While the policy is in force, the holder pays premiums

on the policy plus interest on the loan. When the policy matures (or on the prior death of the holder), the proceeds are used to repay the loan.

Municipal authorities, in addition to providing housing for rent, represent a source of mortgage finance for homebuyers. Many of the loans enable tenants of authority houses to buy their homes. Much of their other lending is oriented towards second-hand, rather than new, property as the building societies shy away from older homes. Local authority lending is by its very nature subject to the vagaries of the government finance. In 1969 as part of its general economic policy the central government sharply reduced its allocation of funds to local authorities. Their mortgage advances thus dropped to £42 million that year from the £144 million of 1967.

Until the end of 1971, *commercial banks* (clearing banks) restricted themselves to home purchase loans for their own staff and short-term bridging loans to enable a customer to buy one house before he sold another. Since then, they have begun to provide normal house purchase loans to customers, but these are rarely for longer than ten years.

C. *Channels for Personal Savings*

Building societies attract funds primarily from households. They compete for personal savings with insurance companies; the "national savings movement" which includes trustee savings banks, post office savings banks, and government savings certificates and bonds; and with commercial banks.

D. *Financial Characteristics of Building Societies*

Building societies have virtually no *asset diversification* as they are required by law to advance money only on the security of a first mortgage of property within the United Kingdom. The bulk of these (97 percent in 1965) go to owner-occupied dwellings.

Cash and investments are held so societies can meet withdrawals and honor commitments to make advances even in the face of fluctuations in the inflow of funds. Investments are confined by law to certain government and municipal securities of the fixed interest type.[1]

The bulk of building society *liabilities* are personal savings which fall into two categories: shares and deposits. The greater part of these are semi-permanent by nature. Their average period of turnover has been around six years.

[1]To qualify for membership in the Building Societies Association and for trustee status, at least 7 1/2 percent of total assets must be in the form of cash and investments. In practice, most societies maintain a figure on the order of 15 percent for this liquidity ratio.

A *shareholder* is an investor (saver) who has agreed to certain conditions regarding the withdrawal of money. The withdrawal period of notice technically varies between societies, ranging from one to several months. In practice, the bulk of society assets are withdrawable on very short notice.

Depositors are technically creditors, having a prior claim over shareholders on a society's assets in the event of liquidation. In return for this advantage, deposit rates are usually 1/4 percent below shareholder rates. Deposits in 1972 were only £592 million compared to £13,821 million in shares.

In response to recent experiences of heavy withdrawals brought on in part by increasing savings mobility, many societies have introduced "term shares" which offer interest premiums for funds left on deposit for stipulated periods (e.g., one, two or three years). At the same time, given that larger savers tend to be quicker in shifting their money to where interest is highest, societies have recently begun a practice of offering interest premiums for balances over £5,000. By July 1974, over one-third of building society balances were in the £5,000 and greater class, compared to less than one-fifth in 1971.

Table 1 provides a percentage breakdown of the asset and liability structure of building societies in 1972.

Table 1

ASSET AND LIABILITY STRUCTURE
OF BUILDING SOCIETIES — 1972

Percentage of Total

Assets		Liabilities	
Cash and Investments	16.6	Shares	90.7
Mortgages	82.3	Deposits	3.9
Premises	1.0	Reserves	3.6
Other	.1	Other	1.8
	100.0		100.0

Source: Jack Revell, "UK Building Societies," *OECD*, 1973, p. 12.

E. *Government Intervention in the Mortgage Market*

Tax Benefits to Borrowers. Borrowers are permitted to deduct the interest component of their mortgage payments from taxable income. Since individuals in lower income brackets do not pay enough taxes to realize the full benefit of this relief, the government introduced an "option scheme" in 1968. Through it, people in lower tax brackets are charged

lower mortgage rates, with the government making up the difference through a subsidy.

Tax Benefits to Savers. The interest paid to depositors and shareholders is net of personal income taxes. The building society pays these taxes according to a "composite rate." In 1974, the nominal share rate of 7.5 percent represented the "grossed up" equivalent of 11.19 percent to individuals paying the basic income tax rate of 33 percent. Meanwhile, with a composite rate of 26.25 percent, the cost of money to societies equals 10.17 percent inclusive of the tax paid by them on behalf of savers.

An important consequence of this arrangement is that building societies tend to attract the savers with tax rates above the composite rate in contrast to trustee savings banks which are oriented toward households in lower marginal tax brackets.

Government Institutions. There is no British counterpart to the FDIC that insures savings deposits nor to the FHLB system that provides regular advances to building societies.

Direct or Indirect Government Financing. As already indicated, local authorities in Britain provide a certain amount of mortgage financing. In light of the skyrocketing interest rates, a proposal was made in 1973 to establish a government-sponsored mortgage refinance agency. Its role would be to purchase standard mortgages from the building societies (recently 11 percent), and transform them into index-linked mortgages with a 5 percent real rate. Index-linked bonds could be sold to finance the process. It has been suggested that building societies could purchase some of these bonds and use them to back index-linked deposits for savers. As yet, however, there has been little serious discussion in the Building Societies Association of this idea.

Interest Subsidies. In May 1973 when, to remain competitive, building societies raised shareholder rates to 6 3/4 percent, which represented the equivalent of 8.82 percent including the tax paid on the interest, they sought to increase mortgage rates to 10 percent to retain their margin. Instead, the government provided grants totaling £15 million to subsidize a 9 1/2 percent rate for three months. The hope was that after this period of time, credit conditions would have sufficiently eased so as to make a higher rate unnecessary. However, came August, the scheme expired and most building societies raised mortgage rates to 10 percent.

IV. EXPERIENCE

A. *Rate-Setting Behavior, Mortgage Flows, and Housing Starts*

Prior to World War II, mortgage and deposit rates typically were tied to the bank (rediscount) rate set by the Bank of England. By using this independent yardstick, societies could claim that the mortgage rate was not susceptible to manipulation on their part. This arrangement eventually proved unsatisfactory, however, as the bank rate was not an accurate barometer of prevailing market conditions. By the late 1940s, most societies

had switched to the present discretionary adjustment mechanism. Since the mortgage rate as well as the deposit rate is set by the building societies, they have been extremely reluctant to increase rates along with competitive rates and, in general, do not act until they experience large outflows of funds. Similarly, they avoid reducing rates as competitive rates fall, if they believe they will have to raise them again in the near future. As a consequence, they experience marked variations in the net inflow of funds as the margin varies between theirs and market rates generally. Further, there is a one-month lag between the recommendation and the change which induces further instability. Net mortgage lending follows a similar irregular pattern, with a lag of three to six months, as advances are committed on average three months prior to disbursement. (Revell analyzes this behavior in some detail.)

Increasing investor sophistication has reduced societies' flexibility as they feel more pressure to remain competitive or face heavy withdrawals. For example, when market rates soared in 1973, building societies were obliged to increase rates three times for a total of 2 1/2 percent.

One consequence of the building societies' reluctance to adjust mortgage and deposit rates is widespread credit rationing. Operating on a "cost plus" basis, they make little use of the mortgage rate as a means of influencing demand. The effect of this rationing can be seen in the pattern of mortgage advances and housing completions, summarized in Table 2. In general, deviations in advances from the growth trend accompany large differences between interest rates paid on shares and on competitive instruments. This is particularly notable in the decreases in 1965 and 1969, and the 1972-1973 surge in lending.

B. *Government Intervention in Rate Setting*

A large factor in the process by which building societies adjust mortgage rates is *government pressure.* With mortgages such a big item in so many family budgets, no government can be expected to welcome an increase in rates, particularly as it affects outstanding variable-rate mortgages.

As a result, when it becomes known that the Building Society Association is contemplating recommending a rate increase, the officers are invariably invited for "consultation." The government will then pressure the Association to postpone its action as long as possible and to increase rates by as little as possible. Because the Association is privileged by its exemption from such government measures of credit control as lending ceilings that have been imposed upon banks in recent years, the societies are very subject to this moral suasion.

In May 1966, when the Building Societies Association recommended that mortgage rates should be increased from 6 3/4 to 7 1/8 percent, the government expressed dissatisfaction. The Association amended its recommendation so that while rates on new mortgages rose immediately, the increase as it applied to existing borrowers was deferred until January 1967.

Table 2

HOME MORTGAGE ADVANCES AND HOUSING COMPLETIONS

Year	Mortgage Advances (£ millions)				Housing Completions (thousands of dwellings)		
	Building Societies	Local Authorities	Insurance Companies	Total	Private	Public	Total
1962	618	94	118	830	178	136	314
1963	852	119	107	1078	178	130	308
1964	1052	195	132	1379	221	162	383
1965	965	244	163	1372	217	174	391
1966	1245	134	147	1526	209	187	396
1967	1477	168	124	1769	204	211	415
1968	1587	111	168	1866	226	200	426
1969	1556	69	179	1804	186	192	378
1970	2021	157	154	2332	174	188	362
1971	2758	175	148	3082	196	168	364
1972	3649	198	149	3996	201	130	331
1973	3447	387	259	4093	191	113	304

In 1973, as general market rates rose, building societies found themselves confronting intensified government resistance in their attempts to follow suit. In March, when societies were compelled to raise shareholder rates in order to remain competitive, the government prevailed upon them to postpone any increase in mortgage rates.

In May, when investors' rates were raised once more, and societies sought a 10 percent mortgage rate, the government provided £15 million in subsidies to hold the line at 9 1/2 percent for three months. Rates were raised to 10 percent in August, however, and as credit conditions tightened even further, the government, facing elections, dreaded another mortgage increase.

In an attempt to shield the building societies from competitive pressure, the Exchequer introduced a British mini-version of Regulation Q in September. It limited the amount that banks could pay on small deposits (under £ 10,000). Later in the month, however, the Building Societies Association proceeded to recommend a mortgage rate increase to 11 percent, claiming that it might have been greater, but for the government's action.

The escalation of market rates continued into 1974, with building societies suffering net savings outflows in two months as withdrawals increased. While anxious to maintain the flow of housing finance, the government was determined to restrain mortgage rates from rising above 11 percent. A similar view was shared by many building societies who, in light of the 2 1/2 percent rise in 1973, were concerned whether many recent borrowers could afford yet another rate hike.

In April 1974 short-term government loans totaling £ 500 million were offered to the building societies so as to increase mortgage lending without altering rates. The advances, which carried a 10 1/2 percent interest rate, were made available at £ 100 million per month for five months. An allocation formula based upon assets limits the amount that any single building society can borrow. Acceptance carries the obligation not to raise mortgage rates for one month. Repayment of the loans began as scheduled in October 1974.

C. *Rate Changes and Building Society Operating Margins*

In general, the recommended mortgage rate and the deposit rate are changed simultaneously in order to maintain the desired margin between the two, but on one recent occasion the mortgage rate lagged the deposit rate. Further, as rates have risen, external pressures have kept the building societies from increasing mortgage rates sufficiently to maintain normal operating margins. This is easily seen in Table 3 which lists the margins, prior to operating expenses, provided by the various mortgage and share rate changes. In this table, the margin is computed between the mortgage rate and the gross cost which includes the tax paid by the building society. The interest paid to depositors and shareholders is net of personal income taxes. The building society pays the tax on their behalf

Table 3

BUILDING SOCIETY SHARE RATE, MORTGAGE RATE, AND OPERATING MARGIN

Building Society Share Rate				Mortgage Rate		
Applied to Shares From	Net Rate (1)	Gross Cost % (2)*	% (3)	Applied to Existing Mortgages From	Applied to New Mortgage From	Operating Margin (3) — (2)
July 1960	3.50	4.77	6.00	September 1960	June 1960	1.23
October 1961	3.75	5.14	6.50	October 1961	July 1961	1.36
April 1963	3.50	4.80	6.00	April 1963	February 1963	1.20
February 1965	3.75	5.42	6.75	May 1965	February 1965	1.33
January 1967	4.25	6.18	7.125	January 1967	June 1966	.95
May 1968	4.50	6.63	7.625	August 1968	May 1968	1.00
April 1969	5.00	7.38	8.50	July 1969	April 1969	1.12
January 1972	4.75	6.88	8.00	January 1972	November 1971	1.12
October 1972	5.25	7.61	8.50	November 1972	October 1972	.89
February 1973	5.60	7.32	8.50	—	—	1.18
April 1973	6.30	8.24	8.50	—	—	.26
May 1973	6.75	8.82	9.50**	June 1973	May 1973	.68
September 1973	6.75	8.82	10.00	October 1973	September 1973	1.18
October 1973	7.50	9.80	11.00	November 1973	October 1973	1.20
April 1974	7.50	10.17	11.00	—	—	.83

*Gross cost is net rate plus tax paid by building society at composite rate which applied for the year.

**This figure does not include the 1/2% subsidy paid by the government to building societies for a three month period.

Source: Jack Revell, "Flexibility in Housing Finance," *OECD,* April 1974, p. 23.

under a special arrangement with the government. The tax is paid according to a "composite rate" related to the average marginal basic tax rate of all investors of the society. The narrowness of this margin under current conditions is illustrated by the distribution of the 11 percent mortgage interest which was as follows:

Mortgage rate	11.00
Less	
Interest received by investors	7.50
Income tax on interest	2.67
Gross margin	.83
Less	
Management expenses	.73
Corporation tax	.04
Surplus	.06

D. *Mortgage Rates and the Cost of Housing*

The combination of rising interest rates and rapidly rising house prices has, in recent years, led to an extraordinary and politically intolerable increase in the monthly carrying cost of owner-occupied housing.

This is illustrated in Table 4, where indexes of hypothetical monthly repayments are computed for an average price house financed by a 25-year mortgage. Over the 10 years from 1963 to 1973, the monthly cost of buying a home has risen almost five times, more than double the increase in the general price index.

In reaction to this staggering price situation, numerous proposals have been put forward to enable families to afford adequate housing. These include subsidy schemes, a variety of "low-start" mortgages with graduated payment streams, mortgages in which the lender participates in the increase in the value of the house, and price-level-adjusted mortgages. In all cases, the objective is to modify the payment stream so that it will more nearly match the behavior of the standard mortgage under non-inflationary conditions.

The "low-start" schemes involve nominal, variable-rate mortgages with payments computed using a relatively low interest rate in early years, increasing to the current rate within five years. At that point, payments are recomputed over the remaining term to fully amortize the principal, which include the accumulated interest shortfall, on a level-payment basis. In general, these plans provide the borrower with tax deductions equivalent to the total interest rate rather than the rate used to compute early payments.

At least one indexed scheme, currently being offered by an insurance company, links increases in principal to increases in the value of the mortgaged property. This plan is funded by participation certificates in the pool of mortgages. Other plans call for complete price-level indexing. Objections to these innovations appear to center on three points. On the one

Table 4

"RENTAL" COST OF NEW HOUSING

Year	Consumer Price Index (1)	House Price Index (2)	Mortgage Rate % (3)	Monthly Payment Index (4)*	"Rental" Index (2) X (4) (5)	Relative Index (5) / (1) (6)
1963	100	100	6.00	100	100	100
1964	103	107	6.00	100	107	104
1965	109	118	6.75	107	126	116
1966	113	126	6.75	107	135	119
1967	115	134	7.125	111	149	129
1968	121	141	7.625	116	164	135
1969	127	151	8.50	125	189	149
1970	135	161	8.50	125	201	149
1971	148	181	8.50	125	226	153
1972	157	231	8.50	125	289	184
1973	172	317	11.00	152	481	280

*(4) is an index of the monthly payment on a new 25-year mortgage, per unit of principal.

hand, given the experience of 1972, where house prices rose in an apparent reaction to the surge in mortgage lending, there is a widespread fear that a sudden change in mortgage terms could lead to another round of rapid increase in house prices. A second and more general objection, however, appears to be the conviction that contracts which allow nominal principal to build up are bad for the borrower. Although this may appear to be irrational in a society which has been experiencing inflation at an annual rate in excess of 15 percent, it nevertheless is the most common source of opposition. Finally, there are those who claim that any such innovation is an admission that inflation is permanent and therefore should be resisted.

V. SUMMARY AND CONCLUSIONS

The level-payment variable interest rate mortgage, at least as employed in the United Kingdom, has not provided a satisfactory solution of either of the two key inflation-related difficulties in housing finance — those related to the ability of financial institutions, through matching of assets and liabilities, to maintain a steady flow of funds and an acceptable operating margin and those related to the distortion of the stream of real payments from the perspective of the borrower.

Although in theory the variable-rate nature of both mortgages and deposits should allow the building societies to adjust quickly to changes in market forces, their behavior is characterized by "sticky" rate setting which often lags market adjustments for considerable periods. This, in turn, leads to fluctuations in inflows which is translated directly to fluctuations in mortgage advances. Thus we see credit rationing even in the absence of official rate ceilings and other ingredients to market clearing. Further, pressure on the rate-setting process has narrowed operating margins. These problems, notwithstanding, the building societies have fared relatively better than U.S. institutions since rates on both assets and liabilities can be adjusted, even if with a lag.

Payment streams clearly have been distorted. With an 11 percent mortgage rate and a 10 percent rate of inflation the real payment in the first year of a 25-year mortgage is 1.6 times the real payment in year five and 10.8 times the real payment in year 25. This problem has been recognized and is being addressed by numerous proposals for change. The inflation-induced distortion of the payment stream, particularly its translation into very high initial monthly payments, is undoubtedly one of the major reasons why the political mechanism has felt obliged to intervene in mortgage markets. In turn, this intervention has vitiated one of the major potential benefits of variable interest rate contracts — the ability to provide a steady flow of funds by matching competitive interest rates. Therefore, we conclude that variable-rate mortgages are unlikely to be totally effective unless they are combined with some mechanism which reduces the distortion of mortgage payment streams and thereby do not impose intolerable increases in housing carrying costs. From the discussion in the United Kingdom press, it appears that many observers share this conclusion.

Discussion

Robert M. Fisher*

I have been asked to discuss and reflect upon the relevance and implications for the United States of experience abroad with alternative types of mortgages, with special reference to the papers — prepared for the MIT Mortgage Study — which provide an essentially descriptive review of developments in certain foreign countries.

One conclusion to be drawn from experience abroad is that efforts have been under way for some time in numerous countries to devise alternative financial arrangements to the traditional level-payment mortgage that bears a fixed rate of interest. In addition to Brazil, Canada, Finland, Israel, Sweden, and the United Kingdom which are listed in Professor Lessard's useful table, such countries as Belgium, Columbia, Denmark, France, the Netherlands, Norway, Switzerland, and West Germany have already put into practice plans under which traditional mortgage repayment patterns have been altered to some extent.[1] These efforts abroad have often reflected concerns, among others, about the disruptive impact of inflation on mortgage borrowers, mortgage lenders, or both. Such efforts have led to arrangements which attempt to tailor mortgage payments more closely to the course of prices, interest rates, borrower incomes, and/or lender cash-flow needs.

What I find missing in most discussions of nonconventional mortgages either here or abroad is much analysis of experience with nonconventional arrangements in our own country. Contrary to what has been asserted elsewhere, we have accumulated a good deal of such domestic experience already, although much of it remains to be studied formally. Despite familiar economic, social, legal and political obstacles to innovation, data from the Survey of Residential Finance indicate that by 1970 about one in every eight — or several million — mortgaged residential properties in the United States carried first-mortgage loans on which

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[1]Details about plans in a number of these countries appear in *Housing Finance, Present Problems* (Paris: OECD, 1974).

the interest rate could be changed in some manner during the life of the loan.[2] In addition, we have recorded nearly four decades of experience with our federally aided public housing program in merchandising space in apartments under the conditions of short-term financial arrangements geared to the user's ability to pay in nominal terms.

I suggest, indeed, that we may already have a mine of experience with certain types of nonconventional mortgages here at home that should be explored further. This includes a close monitoring of the foray just announced by four large West Coast savings and loan associations into the variable-rate loan market, and the recent issuance by a number of life insurance companies of variable-rate farm loans, apparently in response to similar lending practices of the Farm Credit Administration.

Foreign experience amply documents the widespread extent abroad of practices designed to shift some of the risks of rising market interest rates from mortgage lenders to mortgage borrowers. Experience in numerous foreign countries, including Brazil, Israel, and the United Kingdom, suggests, however, that there are practical limits on how far these risks can be shifted at times of rising interest rates, especially when inflation is strong and governments attempt to enforce stringent income and price stabilization policies. Unfortunately, analysis of the character and level of such limits is often lacking — an oversight that needs attention. But it appears that the shifting of interest risks to mortgage borrowers from mortgage lenders has worked out with least difficulty in periods of minimal changes in prices and mortgage interest rates — when, of course, there is less pressing need to restructure financial arrangements in this manner.

Experience abroad also indicates that these practical limits have been breached for one reason or another in various countries during recent years of accelerated inflation. As a result, more of the incidence of interest-rate risk has been shifted one step further on to the government and hence the taxpayers. With the greater socialization of this risk has come, understandably, more public controls, whose implications for so-called private mortgage and capital markets, as well as for government budgets, have not always been spelled out fully.

I must confess that a review of experience abroad has given me a deeper appreciation of several basic features of the old-time level-payment fixed interest rate mortgage — features whose absence in nonconventional mortgage arrangements poses some difficult practical problems. First, the old-time mortgage avoids the problem of selecting an appropriate index to use as a peg to shift the risk of interest-rate changes from lenders to borrowers — hopefully in an equitable and efficient manner, and without

[2]U.S. Bureau of the Census, Census of Housing: 1970, Vol. V, *Residential Finance* (Washington, D.C.: U.S. Government Printing Office, 1973), Tables 5a and 5. For properties with conventional (i.e., not federally underwritten) first mortgages, the incidence of changeable-rate loans was one in every six.

producing redistributional consequences that are deemed to be undesirable. In the search for an appropriate index, foreign experience emphasizes that it is extremely important to choose the right one, although it often offers no firm guidelines about how to be sure that a correct choice has been made. That what may initially be thought to be a proper index may not always stand the test of time is illustrated perhaps most graphically by the fate of mortgages in Israel on which payments were linked to the dollar in the United States. As Professor Cukierman points out in his paper, "at the February 1962 devaluation [of the Israeli pound], borrowers [in Israel] with dollar-linked mortgages saw the value [i.e., the unpaid balance] of their [mortgage] obligations increased by 66 percent overnight. This unleashed an outcry which brought about a revision in the terms of both existing and new mortgages."[3]

Along these lines, the current difficulties of real estate investment trusts in the United States that specialize in short-term construction and development loans caution further that the tying of both assets and liabilities of a financial institution to the same index (in this case, the bank prime rate) may not resolve all financial problems, either. One thing that REIT experience suggests to me is that one needs to look beyond the index formula itself to examine the likelihood that the financial institution's debtors (in this case, builders) will themselves be in a position to meet their obligations to it promptly when due. This, in turn, poses the broader issue of what I am tempted to call the IIR — the index infinite regress; that is, once one type of financial obligation has been indexed, how far must you go toward indexing other types of obligations, incomes, or capital values, too, in an effort to keep the indexing system afloat?

Second, judging from foreign experience with nonconventional mortgages, the old-time loans have the advantage of avoiding the need to "educate" borrowers to commit themselves to the largest of all household financial obligations on terms under which the ultimate cost, the full amount, or both, of the debt remains uncertain until the obligation has been retired. On this point, Professor Cukierman offers a recommendation spiced with a political insight that is rather sobering. It is that "the home buyer should be able to choose between an unlinked mortgage at a high interest rate and an indexed one at a lower interest rate. If this alternative had existed in Israel when indexed mortgages were offered, many people would have blamed themselves rather than the Government when the time to pay [increased] indexation charges arrived."[4] Third, the old-time mortgage contracts have the advantage of incorporating no arbitrary assumption that the income of the borrower, or the value of the property

[3]Alex Cukierman, "Index-Linked Mortgages in Israel," prepared for the Sloan School Mortgage Study, p. 2.

[4]*Ibid.*, p. 27.

pledged as collateral, will inevitably change in some predetermined fashion. Here again, Professor Cukierman notes that "the lack of synchronization between wage increases and indexation increases in mortgages seems to have been at the root of the wide resistance [in Israel] to mortgage indexation which eventually caused its abolition."[5]

On this point, census data for the United States clearly document the fact that during a period when average incomes and average property values rise sharply, incomes of individual borrowers as well as values of individual residential properties may vary either downward or upward. Not all households, for example, shared in the gains in income experienced by the typical homeowner during the 1960s. The census figures show that of all homeowners with incomes of $15,000 or more in 1959 who still lived in the same dwelling in 1970, approximately 15 percent reported that they earned less in 1970 than they had 11 years earlier.[6]

Furthermore, of all the same one-family dwellings valued at between $17,500 and $19,999 in 1960 that were still owner-occupied in 1970, about 11 percent were reported to be in a lower-value bracket in 1970 than a decade before.[7] Clearly, indexed mortgages issued to these borrowers, or on these properties, which might have called for increasing debt-service payments over time or which might have involved a building-up rather than a retirement of principal in the early years of the life of the loans, would quite possibly have spelled trouble.

I must confess, too, that most reviews of foreign experience appear to me to be limited insofar as presenting a comprehensive evaluation of the full costs and benefits of various nonconventional mortgage arrangements. Complex as such an evaluation must be, I believe that it should give some attention to a number of subjects that are usually overlooked.

One neglected feature in most reviews of foreign experience is much reference to what in the United States has become the most dynamic — and most destabilizing element — of the private housing market — namely, multifamily properties. Here is a market where, presumably, borrowers should be more sophisticated and perhaps more willing than single-family homeowners to gamble on a nonconventional financing arrangement as a trade-off for a lower initial interest rate, a larger loan, or a lower annual percent constant. I suspect that if we had more information than is now available about lending practices on multifamily mortgages in the United

[5] *Ibid.*, p. 24.

[6] Based on unpublished tabulations of the U.S. Department of Commerce, Social and Economic Statistics Administration, Bureau of the Census, from the 1970 Components of Inventory Change Survey.

[7] U.S. Bureau of the Census, Census of Housing: 1970, *Components of Inventory Change*, Final Report HC(4)-1, United States and Regions (Washington, D.C.: U.S. Government Printing Office, 1973), Tables 2, 3, and S-4.

States, it would confirm the existence of a wide variety of nonconventional contracts. Insofar as foreign experience sheds light on this issue, only the paper on Canada offers any comment. It concludes that "in the case of multifamily housing, fixed mortgages matching the amortization period continue to be favored. Apparently, borrowers prefer the fixed contracts due to fears that rent increases will not match interest and price level increases, which has been the case in recent years, and the dominant lenders for large scale projects, life insurance companies, prefer the longer-term contracts."[8]

Another neglected feature of experience abroad which seems even more regrettable is any analysis of the impact on house prices of nonconventional mortgage arrangements which may allow borrowers (at least initially) to service more debt with a given monthly payment than would be possible with a traditionally structured mortgage. I look in vain to the students of foreign experience to give us some clues about the conditions under which, and the extent to which, the special terms of nonconventional mortgages have been capitalized in higher house prices rather than enabled borrowers to obtain better houses for the same price. Lacking such clues, I remain skeptical about statements that (as in Sweden), "the mortgage 'package' incorporates a rising schedule of payments which further increases the amount of housing that households can afford."[9]

Finally, I see a problem encountered by lenders both here and abroad in trying to match the maturities of their assets with the maturities of their liabilities, no matter whether conventional or nonconventional mortgages are involved. On either type of mortgage arrangement, it needs to be recognized that periodic payments of scheduled principal, prepaid principal, and interest create a variable pattern of cash flow that is generated by no other type of capital market instrument, and belies the flat simplistic statement that to lend on fixed-rate level-payment mortgages is to lend long.[10] This unique pattern of cash flow — which provides a fluctuating stream of funds that must be reinvested continually — poses a special problem for asset and liability management that goes beyond the need to match contractual or effective maturities, despite such comments that, as in Canada, "the bulk of deposits [of trust companies] are for five years to match the roll-over mortgages."

[8]Donald R. Lessard, "Roll-over Mortgages in Canada," prepared for the Sloan School Mortgage Study, p. 18.

[9]David L. Cohen and Donald R. Lessard, "Mortgage Innovation to Facilitate Investment in Housing: The Case of Sweden," prepared for the Sloan School Mortgage Study, p. 1.

[10]For further details, see Robert Moore Fisher, "Mortgage Repayments as a Source of Loanable Funds" (Federal Reserve Staff Economic Study, 1971).

In conclusion, it seems to me that foreign experience provides a useful summary of the features of a far greater variety of nonconventional mortgage contract experiments than we could ever hope to test in the United States during any brief period of time — or in some cases might ever want to test. Here I am thinking of such schemes as the United Kingdom's variable-rate mortgage arrangement which operates with a constant mark-up between the cost of funds to the building societies and the rates which these dominant home mortgage lenders charge on new and outstanding mortgage loans. That is hardly a plan which commends itself to public policy, since the fixed mark-up offers no incentive to improve the efficiency of the intermediation process over time.

Foreign experience also suggests a good deal about the nature of many of the likely costs and benefits associated with certain types of nonstandard mortgage contracts. Often lacking, however, is a comprehensive presentation and a careful weighing of advantages versus disadvantages, in some cases because data are fragmentary or because nonconventional lending arrangements have been adopted only recently.

Having extracted these insights from experience abroad that has occurred within a variety of social, economic, political, and legal environments, I suggest that what we need to do now is to look inward more deeply to ponder the lessons of domestic experience with nonconventional mortgage arrangements within the context of our own particular institutional structure. This effort should help us see whether and how we might best adopt the fruits of both foreign and domestic experience, tempered by the keen insights derived from work going on here at MIT and elsewhere, to our own on-going system of mortgage finance.

Discussion

Hirsh Tadman*

Don Lessard has done an excellent job of describing the Canadian mortgage instrument and the institutional structure of the residential mortgage market. Therefore, I do not propose to go into a lot of repetitive detail. What I propose to do is to briefly describe our mortgage instrument and how it has worked in Canada, provide a comparison between the institutional framework of the residential mortgage markets in the United States and Canada including some basic capital markets differences, and briefly describe some of the options open to the small "saver" in Canada.

In general, one could argue that Canada is much more committed to a mixed economy than is the United States. However, especially when one looks at that portion of the capital markets which affect the mortgage market, we have fewer restrictions than you do in the United States. Our capital markets are freer to operate in response to market, rather than administered, forces. We have no such thing as usury laws. We do have a Small Loans Act which regulates loans up to $1,500, but this Act has no applicability to the mortgage market. So we find that in the Canadian mortgage market, interest rates are more freely determined by market forces than they are in the United States. Historically, this has tended to make the cost of housing — due to higher mortgage servicing costs — more expensive in Canada. Another factor which has tended to make housing more expensive in Canada is that we do not have income tax deductibility of mortgage interest. So we are talking about a substantially higher cost of home ownership in Canada relative to the United States.

Let us take a brief look at some of the institutional differences. We have a much more uniform residential mortgage interest rate across the country, partly due to competitive reasons and the institutional structure of our market. We generally do not have comparable restrictions on our thrift institutions as far as lending radii are concerned (there are some exceptions with respect to credit unions and caisses populaires) such as are imposed on your savings and loan associations. But this is not the major

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institutional difference. The biggest difference is that whereas if you look at the total number of commercial banks, savings and loan associations and mutual savings banks in the United States, the number must total some twenty thousand. We have ten banks in Canada with the five largest banks controlling over 90 percent of the total bank assets. They do, however, have 6,500 branches across the country. Our thrift institutions most closely comparable to your savings and loan associations and mutual savings banks — trust companies and mortgage loan companies — total no more than about 125. Large ones total no more than 15. Thus, we are talking effectively of about 20 large institutions with thousands of branches across the country, with much greater opportunity for funds to flow from surplus areas to deficit areas, leading to a much smoother distribution of funds.

Let me move now to a brief discussion of our mortgage instrument characterized by Don Lessard as a five-year roll-over instrument. If we want to put this in the context of yesterday's discussion, I guess our mortgage instrument was not really included in the spectrum of instruments described by Rich Cohn. We do not have too much trouble on the supply of funds side. We have taken care of the credit rationing problem to a large degree in comparison with the U.S. situation. This can be rated as good to excellent. You might want to criticize us a little more heavily on the demand side — the demand for funds by borrowers for housing — and I will get into that shortly.

Our mortgage instrument has been called a five-year roll-over mortgage. Most residential mortgage contracts are written with a 20-30 year amortization period but with a five-year term. The rate is market determined and generally uniform across the country. An individual can walk into a financial institution for a mortgage and the contract will be written with, say, a 25-year amortization period. He will pay the then current market rate of interest for the mortgage. At the end of the five-year term the contract is rewritten at the then current market rate for a further five-year term but now amortized over 20 years. It is in effect a form of variable-rate mortgage. This instrument is not restricted to conventional mortgages but also to our government-guaranteed mortgages, which some people find unique.

How can our thrift institutions underwrite such mortgages? They can do so because they do not have major problems in matching assets and liabilities. Our trust and mortgage loan companies have a wide range of liabilities. Unlike your S&Ls, they do issue demand deposits which are checkable. They also issue passbook savings accounts and term deposits ranging from under 30 days to 5 years. The bulk of their liabilities are in five-year term certificates and since their assets are largely in five-year term mortgages, they are more or less matched and operate on the spread. I wish I could say that we developed this system because we have such brilliant insight into how the market was going to work, and that we looked at your market and foresaw the disintermediation problems. But it did not work out that way. Perhaps it was just a quirk of fate or because

of some visionaries of many decades ago when our Interest Act was written. One of the clauses of this Act says that for noncorporate mortgages, whatever the term of the contract, the borrower has the right to repay the loan at any time after five years with no more than a three-month interest penalty. I assume that our institutions developed the five-year term mortgage so as to avoid the potential problem of being faced with repayment at any time after a mortgage has been in existence for five years. Conventional mortgages have been written with a five-year term since 1931 without any major problems. Government-guaranteed mortgages have been written on this basis since 1969. Don Lessard pointed out that we are about to be faced with the first test of the roll-over of government-guaranteed mortgages. So far, we have not had many complaints from borrowers. But as he rightly pointed out, the mortgage market back in 1969 was relatively high, ranging from 9 1/4 percent to 9 3/4 percent. Currently rates are well over 11 percent but falling. We may not face the test until 1976 or even beyond because the mortgage rate in 1970 was 10 percent. Moreover, individual homeowners have benefited by the substantial capital appreciation of their houses.

What happens at the maturity date of a five-year term? What obligation is there on the part of the lending institution to renew the loan for a further five-year term? We would be in quite a bind if an individual, having received notification of the expiration of the contract, was informed that a balloon payment is due and that the institution is requiring repayment of the loan. Although there is nothing fixed in the law which says that an institution must renew a mortgage loan, experience has shown that they do renew these loans. There is a pretty big moral obligation on their behalf to renew them. I am not sure though what would happen if we were faced with a massive credit crunch.

The mortgage renewal generally takes place without any problems. The borrower does not face any new closing costs with a straight renewal. At the five-year date he can repay any portion of his loan without penalty. He generally can also shorten the remaining amortization period. If however he wishes to extend the amortization period or increase the loan amount, he will be faced with additional costs.

As I pointed out earlier, our mortgage rates are market determined and this can mean relatively high rates. They did reach a peak a few months ago about 12 1/4 to 12 1/2 percent. On the other hand our savers also get market-determined rates. Our institutions were paying up to 11 percent on five-year certificates a few months ago. So our small saver is not faced with the disadvantages of Regulation Q. Professor Modigliani asked me yesterday about the small saver who does not want to tie himself up for five years. He has a whole range of alternatives from five-year term deposits on down to passbook savings accounts. At the height of the market these passbook accounts were paying 9 1/4 percent, with no minimum deposit requirements and no time restrictions other than the necessity to maintain the deposit for the entire month in order to earn interest for that month.

Getting back to the mortgage market, the supply side problems are less in Canada than in the United States. But what about the demand side? Obviously, as I mentioned earlier, our homeowner is faced with a much higher cost of funds and no income tax deduction for mortgage interest. But we have come around to assisting the homeowner over some of demand side problems — the initial down-payment problem and the monthly payment problem. Some of the solutions arose out of the unusual economic conditions that we were faced with in early 1974. The first quarter of 1974 was extremely strong in Canada. We ended the year with close to 4 percent real growth in GNP, most of it due to the strong first quarter. The demand for funds for housing, as for other purposes, was quite large. One of the things that was put into place to try and temper the demand for funds for housing was what became known as a registered home ownership savings plan. This plan allows individuals who do not currently own homes to deduct from their taxable income up to $1,000 per year, and to a maximum of $10,000. These savings plus the earnings on them accumulate, tax free, provided that when they are withdrawn, they are used for the purchase of a home or for home furnishings. This plan was developed to try and temper some of the demand for housing and to enable individuals to more easily save for the down-payment for a house.

Another program was established to try and temper the monthly payment problem for lower-income earners. Depending on the region in which an individual lives, and depending on his income, and depending on regional house price ceilings, the government will subsidize an individual's monthly mortgage payment up to $50 per month. The commitment on the part of the government is for a five-year term after which the subsidy is re-evaluated. This program applies not only to home purchasers but also to renters.

A third program introduced by the government was to give grants of $500 to those purchasers of new homes who qualified on the basis of regional house price limits and of income.

I wish to conclude with a few brief comments on indexation and the price level adjusted mortgage. I cannot recollect any Canadian experience with an indexed mortgage instrument and, given the balance sheet structure of our thrift institutions, I am not sure that the pure PLAM makes much sense unless one can also introduce some form of indexation on the liability side of the balance sheet also. I am also concerned about the impact of such an instrument on the rest of the capital market and on the pricing of indexed capital market liabilities. As Professor Grebler asked yesterday, how would you price them? Would you auction them? Would you put them in the market and ask how much over par one would be willing to pay for such an instrument? I think these problems need to be explored in some depth before a PLAM can be introduced. I am also concerned about how a PLAM would be traded in secondary markets. None of these comments, of course, are meant to detract from the excellent work done to date on the PLAM and other nonstandard mortgages.

Macroeconomic Simulations of Alternative Mortgage Instruments

Dwight M. Jaffee and James R. Kearl*

I. INTRODUCTION

This paper reports on the results of simulating the macroeconomic effects of alternative mortgage instruments using the MPS econometric model. The MPS model (which is a recent version of the model developed by the MIT-Federal Reserve model project) was chosen principally because of the extensive detail in its financial sectors. This depth of detail allows the various effects of alternative mortgage instruments to be distinguished. Additionally, the principal investigators on the MIT Mortgage project were fully familiar with the operation of the MPS model, and this allowed a wide variety of mortgage instruments to be implemented and tested with assurance and speed.

The results presented here must be interpreted as preliminary findings on the macroeconomic effects of the alternative mortgage instruments tested. This "caution on use" is stressed for several reasons. First, the basic model was developed with specification and estimation methods that are subject to errors, while the results are presented as simple point estimates of the expected effects. Second, the technique for implementing the alternative mortgage instruments in the model involves changing certain structural features of the model, which no doubt introduces additional uncertainty into the results, although of an unknown amount. Third, there are several points in the MPS model where the values of specific coefficients necessary for implementing the alternative mortgage instruments are not known. To proceed, therefore, we had to make *ad hoc* guesses of the values of these parameters, and in some cases to simulate the instruments for alternative values to test for sensitivity. These points of uncertainty are stressed in the text below, and are listed in the conclusions under the agenda for future research. Finally, we have carried out only "partial equilibrium" simulations of those sectors of the MPS model in which the mortgage instruments have their direct impacts. The results, consequently, do not allow for the full feedback of the general economy on the sectors of initial impact.

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The mortgage contracts tested in this study have resulted from the continuing discussions among the participants in the MIT mortgage project. Most, if not all, of the instruments have been therefore discussed in some detail in the other studies contained in this volume, and reference is made hereto. However, an attempt has been made to outline the main features of the proposed instruments, and thus the present paper is self-contained in this sense, and indeed may provide a useful summary of some of the principal findings of the MIT mortgage study. Also note that the order in which the alternative instruments are tested represents an attempt to develop in a logical manner the key features of these instruments, and therefore does not represent a view as to the desirability or relative desirability of the contracts.

The paper has been structured to allow for the possibility of reading on three different levels. First, the actual results are presented and discussed in a relatively self-contained manner in Section III. Second, more general background on the MPS econometric model and the structure of the experiments is provided in Section II just below. Third, specific details on how the instruments were included in the actual programming of the MPS model are available in Section V. Summary conclusions and an agenda for future research are given in Section IV.

II. GENERAL FRAMEWORK FOR THE SIMULATIONS

A. *The MPS Model*

Complete and technical descriptions of the housing, mortgage, and savings deposit sectors of the MPS model are available in Gramlich and Jaffee (1972). Fortunately, for present purposes, the equations of basic interest for the simulations can be usefully presented without the details of dynamic lags, proxy variables and empirical approximations, and the like. The relevant equations, making a closed system, are:

(II.1)	KH$	= KH$ [PAYO, LVR, RM, RP, . . .]
(II.2)	MD	= MD [RM, RO, KH$, REP, . . .]
(II.3)	MS	= MS [RM, RO, D, REP, . . .]
(II.4)	MD	= MS
(II.5)	RD	= RD [RM, RO, . . .]
(II.6)	D	= D [RD, RO, . . .]
(II.7)	RES	= RES [INT, RD, D, . . .]
(II.8)	PAYO	= function of mortgage instrument
(II.9)	PAY	= function of mortgage instrument
(II.10)	INT	= function of mortgage instrument
(II.11)	REP	= function of mortgage instrument

Symbols in these equations and others which enter later in the discussion are defined as follows:

c	constant spread between RD and RMS reflecting the costs of intermediation
CB	commercial banks
D	supplied stock of time deposits
GMF	gross mortgage flow during period
GP	graduated-payment mortgage
IN	price-level-indexed mortgage
INT	interest income received by savings and loan associations
KH$	current value of housing stock
LIC	life insurance companies
LVR	maximum available loan-to-value ratio
MD	demand for stock of mortgages
MS	supply of stock of mortgages
MSB	mutual savings banks
PAY	aggregate mortgage payments in period (including both interest and repayment of principal)
PAYO	initial payment on relevant mortgage contract
PH	price of standard house
PLAM	price-level-adjusted mortgage
RCB	long-term bond rate
RCP	commercial paper rate
RD	time deposit interest rate
REP	repayments of principal on mortgage contracts
RES	transfers to reserve accounts of savings and loan associations
RM	long-term conventional mortgage interest rate
rm	real rate of interest on mortgage
RMS	short-term mortgage interest rate
RMS_o	initial short-term mortgage interest rate
RO	"other" rates, typically the long-term corporate bond rate
RP	current rate of inflation
$\hat{RP}$	expected rate of inflation over the duration of the contract
RP_o	initial rate of inflation
$(RMS-RM)_o$	difference between short-term and long-term mortgage rates at initial date of contract
SLA	savings and loan associations
T	maturity of the mortgage
u	degree of graduation, i.e., annual rate of increase in total payment
u_o	initial graduation rate
VRM	variable-rate mortgage

The above equations are briefly described as follows:

(1) *Housing.* In the current MPS model, the housing stock and housing investment are developed from a series of reduced-form equations of the housing market. The housing stock responds positively to various income and demographic variables that increase demand, and responds negatively to the relative price of housing and to the cost and availability of housing finance. The present model does not, however, incorporate the effects of either loan-to-value ratios (LVR) or the initial payment size (PAYO) on housing demand, and the treatment of inflation rates (RP) is not completely satisfactory for present purposes.

James Kearl is currently developing a housing sector that will properly estimate these effects. For present and immediate purposes, however, we have had to make an *ad hoc* adjustment to the model. Following the work of Poole (1972), the main effect to capture is the impact of higher intial payments (PAYO) in reducing housing investment. Because individuals operate within cash flow constraints in terms of the maximum value of PAYO they can afford, mortgage instruments with higher PAYO values will result in individuals buying smaller houses or not buying at all.

This impact has been implemented in the model in the following way. First, we calculated over the simulation period the value of PAYO that would have been (or actually was) associated with the conventional mortgage contracts in force. We denote this time series of values $\overline{\text{PAYO}}$, and note that it will rise and fall with the mortage rate on newly issued mortgages, following the specific formula given in Section V. Second, we calculated within the simulations the value of PAYO associated with the mortgage instrument being studied where again the specific formulas are given in Section V. Thus, thinking of a case in which a new mortgage instrument lowers the initial payment, the saving in cash flow amounts would be given by $\overline{\text{PAYO}}$ - PAYO, and the proportional saving which we denote as β would be given by $\beta = (\overline{\text{PAYO}} - \text{PAYO})\ \text{PAYO}$.

Our assumption is that individuals fully use this saving to purchase additional housing, so that we can increase the housing investment that would have been generated by the model by the factor β to account for the stimulus of the new mortgage instrument. It would be clearly wrong, however, to assume that *all* individuals are actually constrained by these cash flow problems, and therefore it would be wrong to count this full impact on housing. Instead, we assumed that some proportion of households, denoted as α, were actually constrained by cash flow considerations, and thus we counted as a stimulus to housing the multiplicative factor αs.

As for the actual value of α, we were frankly agnostic, other than knowing it was bounded between 0 and 1. In the simulations, unless otherwise noted, we have used what we think to be the conservative value of .25. In one simulation reported below we also tested with a value of .75, and found the effects on housing essentially tripled, implying the model is near linear in this sense.

(2) *Mortgage Demand.* The demand for mortgages is derived from the stock of houses to be financed, and, in fact, MD is proportional to KH$. The factor of proportionality, however, is negatively related to the mortgage rate (RM), reflecting the fact that individuals will opt for lower loan-to-value ratios when RM rises, and, perhaps more importantly, more individuals will choose full equity financing for their housing as RM hits threshold values. Note that the RM elasticity of mortgage demand depends on both the proportionality factor and KH$, since the latter is itself a function of RM.

(3) *Mortgage Supply.* The supply of mortgages is derived basically from the available sources of funds. For savings and loan associations (SLAs), mutual savings banks (MSBs), and commercial banks (CBs), the funds are mainly time deposits, while for life insurance companies (LICs) the driving variable is reserves. In addition, except for SLAs, there are important portfolio allocations whereby mortgage supply rises with RM and declines with other rates (RO). There are also complicated dynamic structures in the model to take into account the commitments process of mortgage lending. These remain in the simulated system in their original form, but are not discussed here since they do not interact in important ways with the changes in the mortgage instruments.

(4) *Mortgage Market Equilibrium.* The MPS mortgage sector allows for disequilibrium in the mortgage market with a mechanism by which the mortgage rate responds only slowly towards its equilibrium value, and this is also retained in the simulated system. Conceptually, however, this affects only the short-run dynamics of the model, and thus it is easier to assume a full equilibrium model for the discussion that follows here.

(5) *Deposit-Rate Setting.* Deposit-rate setting by SLAs, MSBs, and CBs is based on a model of modified profit maximization. For SLAs, for example, deposit rates are set at a level such that the marginal cost of deposit funds equals the yield available on newly issued mortgages. Also, there are certain dynamic factors affecting the rate-setting, but they do not cause the deposit rate to differ significantly from the static profit maximizing level. There are, however, two other constraints that potentially affect the deposit rate. One constraint is the Regulation Q ceiling which, when it is binding, has the effect of suspending normal rate-setting behavior. The role of Regulation Q ceilings in our simulations will be discussed below. The second constraint that can affect deposit rate setting derives from the Federal Home Loan Bank requirements for transfers to reserves from current operating profits by SLAs. Concern for this condition was a basic factor responsible for the enforcement of deposit rate ceilings in 1966, 1969-70, and 1973-74. Our simulations, as indicated below, will have the effect of removing deposit rate ceilings at the same time that a new mortgage contract is introduced. We anticipate that the net effect should be to improve, not hurt, SLA reserve transfers. It is possible, particularly for some of the less preferred mortgage innovations, that SLA reserve transfers may actually fall. Since RES is a variable of the model, such a situation would be indicated in the simulation.

(6) *Household Supply of Time Deposits.* The MPS model deposit equations follow a mechanism through which household net worth and current savings are balanced first between time deposits and other financial and real assets, and second, between the various depository institutions. The spreads between deposit interest rates and other interest rates determine the allocations and balance at both levels.

(7) *Reserve Transfers of SLAs.* There is now available for the MPS model a series of equations that determines the reserve transfers of SLAs. The two main variables are the mortgage interest income and deposit interest costs for SLAs, but, in addition, taxes and other income and costs are accounted for. A description of these equations is provided in Section V, and their use in simulating the effects of removing Regulation Q ceilings is available in Jaffee (1973).

(8) *Size of Initial Payment.* PAYO is a new variable to be added to the MPS system in order to simulate the effects of changes in the size of initial payment on housing demand. It enters the model in the housing equation (1) as discussed above. The formal specification of PAYO is given below in Section V.

(9) *Aggregate Payments.* Whereas PAYO is the size of the initial payment of a standard mortgage, PAY is an aggregate variable for the total amount of payments made on mortgages during each period. It is used in the model as the basis for calculating INT and REP, its two constituent parts. The effect of alternative mortgage contracts on PAY is discussed in Section III and formulas are given in Section V.

(10) *Mortgage Interest Income.* INT is necessary in the model in order to calculate the reserve transfers of SLAs. It is currently used to simulate actual experience under conventional mortgages, and thus it has to be changed, in the manner described in Section III and V below, for alternative mortgage instruments.

(11) *Mortgage Repayments.* The MPS econometric model incorporates mortgage repayments in a structural way. On the supply side, the "recyling" of repayments take some time, so that an increase in repayments at least temporarily depresses net mortgage supply. Similarly, an increase in repayments depresses net mortgage demand, and this effect continues into the steady state on the grounds that mortgage borrowers rarely adjust their repayment pattern once it is initially set. The variable will be of some importance in the simulations since the timing of repayments depends directly on the conditions of the mortgage contract. The formal specification of REP is discussed below in Section V.

B. *General Points on Simulation Strategy*

(1) *Initial Conditions and Phasing-in of New Instruments.* The simulations were run from a point early in the 1960s, specifically 1962:I, through the latest possible quarter, specifically 1973:IV. The initial conditions for such simulations were necessarily those of a conventional mortgage environment. Consequently, the simulations show the dynamic

effects of introducing the new instruments to portfolios initially based on conventional mortgages. By the end of the simulation period, however, lenders hold almost entirely new instruments since the stock of initial conventional mortgages is almost fully repaid. This would appear an advantageous situation since one observes both the dynamics of transition in the early years and then the new instrument equilibrium in the later years.

(2) *One Instrument at a Time.* We have simulated the effect of each new instrument by allowing it alone in the market during the simulation period. An alternative procedure would be to allow two or more instruments to exist together in the market, with borrowers able to choose among them. We feel, moreover, as a matter of policy that conventional mortgages should co-exist with the new mortgage instrument(s). But, at this point, both in terms of gaining experience with simulating new instruments and in terms of interpreting the results, a regime of one contract at a time was followed.

(3) *No Innovation in Time Deposit Markets.* For similar reasons, the simulations assume no fundamental changes in the nature of the time deposit contract. For example, although as a matter of policy we would be inclined to consider seriously the possibility of indexing time deposits, it was felt we should first simulate and isolate the effects of the new mortgage instruments. Also, it should be stressed that we do allow for any changes in intermediary deposit-rate setting that should result from the introduction of new mortgage instruments.

(4) *Partial Equilibrium Simulations.* One advantage of using a large-scale econometric model, like the MPS model, to simulate the alternative mortgage instruments is that it allows one to calculate the full general equilibrium effects of the innovations. However, in doing so one introduces a variety of complications, including the determination of the proper role for monetary policy in such a setting. Due to time limitations, we have not yet been able to carry out such general equilibrium simulations, and thus this is on the agenda for future research. Instead, the simulations reported here allow for the full interaction of only three sectors of the MPS model — the mortgage, savings deposit, and housing sectors — as summarized above in equations (II.1) to (II.11). The rest of the model was treated as exogenous and fixed for the purposes of the simulations.

(5) *Regulation Q Ceilings.* The mortgage instrument innovations considered here are appropriately viewed as alternatives to a regime of Regulation Q ceilings. In other words, a major objective of the simulations is to evaluate how much better things would have been if new instruments had replaced deposit-rate ceilings over recent historical periods. Consequently, this would imply that the mortgage instrument simulations should be carried out without deposit-rate ceiling constraints on deposit-rate setting. A dilemma will arise, however, if the combination of removing the deposit-rate ceilings and adding the new mortgage contract does not simulate an improvement in the status of SLAs. The dilemma is that the model will continue to function normally in such a situation,

whereas, in reality, the mortgage and housing industries would be seriously disrupted were the SLAs to go out of business. Fortunately, the model generates values for reserve transfers, and therefore for each simulation we compare the reserve transfer being generated by the system with the reserve transfer observed with deposit-rate ceilings. Assuming the transfers to reserves with deposit-rate ceilings were near the minimum amount acceptable (without disrupting the industry), a condition for a feasible instrument innovation is that the simulated amounts exceed the observed minimum. In essentially all cases we do find an improvement in reserve transfers, and thus this magnitude is important only in comparing simulations.

(6) *Treatment of Individual Lenders.* The current MPS mortgage sector structurally distinguishes four private mortgage lenders — SLAs, MSBs, CBs, and LICs — and also includes government-supplied mortgages (FNMA et al.) in the total mortgage supply. This separation will be continued in the simulations. The following points should be noted:

- Government-supplied mortgages are treated as exogenously determined at their historical levels. Within the model, it is straightforward to consider changes in these policy variables, but time limitations indicated these should be evaluated in later work.
- It is assumed that all intermediaries (including the government agencies) issue the new mortgage instrument, given that only one mortgage contract will be allowed in the market in each simulation. In reality, of course, we anticipate a multi-contract regime will evolve and that certain lenders may prefer certain contracts (in particular, insurance companies may continue to prefer fixed interest-rate, long-term contracts). Again, however, simulations of multi-contract regimes must be on the agenda for further work.
- The variables REP and INT cannot be calculated for all the intermediaries. REP is not included in the model for CBs since data on commercial bank repayments are available for only the most recent periods. This should not have an important bearing on the results. INT is explicitly calculated in the model for only SLAs. Since there is no causal feedback from INT to the rest of the model, the simulation results are not affected by this. INT, however, is a variable of interest by itself, and the case of SLAs should serve as a good indicator of the status of the other intermediaries.

III. RESULTS OF THE SIMULATIONS

A. *Simulations of Standard Mortgage Contracts With and Without Deposit-Rate Ceilings*

A useful starting point is to show how the MPS model traces the historical conditions under which all mortgage contracts were standard instruments and under which deposit-rate ceilings acted as constraints at

times on the deposit-rate setting of the intermediaries. Table 1A shows the actual historical values for ten variables of interest, and Table 1B shows the corresponding values simulated by the model. Since the same format is used in almost all the tables below, it is important to be clear on the arrangement. The definitions of variable symbols are:

RSL	deposit rate of savings and loan associations (not more than the deposit-rate ceiling when the ceiling is enforced as a binding constraint)
RM	mortgage interest rate on standard mortgage instruments
DESL	total savings deposits at savings and loan associations
MOST	total mortgage portfolios of savings and loan associations
MTotal	total mortgage portfolio of SLAs, CBs, MSBs and LICs.
MINT	mortgage interest income on savings and loan association mortgage portfolios
DINT	deposit interest paid by savings and loan associations to depositors
TRANSFERS	funds available and transferred to reserve and surplus accounts of savings and loan associations
RESERVES	the accumulated sum of transfers by savings and loan associations
EH$	investment in residential housing (National Income Accounts concept)
KH1	accumulated stock of single-family dwellings in constant dollars
HS1$	nominal value of single-family housing starts — quarterly rate

All interest rates are measured in percentage points. All values are in billions of current dollars unless otherwise noted. All flow variables except HS1$ are at annual rates.

The columns in the tables give the relevant data for specific points in actual time: 1965:IV, 1966:IV, and so on through 1973:IV. The computer simulation results, in fact, are available for each quarter from the beginning of our simulation period in 1962:I through the end of the period in 1973:IV. We have presented the results for only the last quarter of each year beginning in 1965 to simplify the presentation. In particular, there is relatively little of interest before 1965 in the simulations, and after that the fourth quarter of each year generally hits the quarters of major interest such as 1966:IV and 1969:IV.

A comparison of the historical values of Table 1A and the simulated values of Table 1B gives an indication of how well the model is fitting. For most of the variables, and for almost all the time, it can be seen the fit to history is remarkably close. Not to overstate the result, however, it

Table I

STANDARD MORTGAGES WITH DEPOSIT-RATE CEILINGS

A. Historical Values (Levels)

	1965:IV	1966:IV	1967:IV	1968:IV	1969:IV	1970:IV	1971:IV	1972:IV	1973:IV
RSL	4.34	4.78	4.96	5.16	5.25	6.00	6.00	6.00	6.50
RM	5.95	6.72	6.66	7.35	8.38	8.44	7.82	7.73	8.78
DESL	110.40	114.00	124.60	132.00	135.90	146.80	174.90	207.70	228.10
MOSL	110.30	114.10	121.60	130.90	140.40	150.60	174.60	206.70	235.50
MINT	6.15	6.63	6.95	7.60	8.45	9.31	10.86	12.99	15.46
DINT	4.49	4.99	5.59	6.01	6.45	7.19	8.60	10.21	12.04
TRANSFERS	0.82	0.65	0.61	0.87	1.05	0.90	1.29	1.73	1.85
RESERVES	8.70	9.35	9.96	10.83	11.88	12.78	14.07	15.80	17.65
EH$	27.40	22.10	28.80	31.40	30.90	33.80	47.50	56.90	54.00
KH1	453.90	461.90	468.20	476.50	484.00	489.20	499.00	512.10	524.60

B. Simulation with Deposit-Rate Ceilings (Levels)

RSL	4.43	4.70	4.90	5.25	5.25	6.00	6.00	5.98	6.33
RM	5.97	6.57	6.88	7.27	8.22	8.87	8.03	7.68	8.20
DESL	109.60	114.30	125.00	133.80	133.40	138.10	163.90	190.20	199.90
MOSL	109.50	114.10	122.70	132.30	135.40	134.70	158.80	189.10	205.00
MTOTAL	263.20	279.80	300.40	322.20	330.70	332.60	387.00	458.30	500.50
MINT	6.25	6.60	7.25	8.04	8.42	8.52	10.70	13.21	14.64
DINT	4.70	5.18	5.78	6.40	6.39	7.71	8.63	9.93	10.99
TRANSFERS	0.66	0.45	0.81	0.91	0.65	0.28	1.44	2.12	1.73
RESERVES	8.72	9.23	10.00	10.92	11.70	11.74	12.91	14.90	16.73
EH$	29.10	25.90	30.00	31.90	31.20	31.90	51.80	55.20	61.00
KH1	453.30	461.60	468.40	476.50	483.80	489.10	497.70	510.30	525.70
HS1$	3.95	3.16	4.08	4.24	3.74	4.02	5.89	7.78	8.78

should be stressed that Regulation Q ceilings constrain deposit rates over much of this period, and that the simulations treat most of the MPS model — all except the mortgage, saving deposits, and housing sectors — as exogenous. Also, there are some deviations of note. For example, starting in 1969, deposit levels (and therefore mortgage levels) for SLAs grow at a much slower pace than the actual history. Similarly, the flow variables such as TRANSFERS and EH$ sometimes have rather large percentage deviations from history; the worst of these, for example, appears in 1973:IV when the simulation value for EH$ exceeds the historical value by $7.0 billion (at annual rates).

Turning next to Table 2, we show results of simulations still with standard mortgage contracts, but now without the existence of binding deposit-rate ceilings. Table 2A shows the simulated levels of the variables, and thus can be directly compared with Table 1B. Alternatively, in Table 2B, the same results are tabulated in deviations form by subtracting the results of Table 1B (with deposit-rate ceilings) from the results of Table 2A (without deposit-rate ceilings). (Here and below comparisons are always made between two simulation results, and not against the actual history, since we have seen the model does deviate from history at times and this washes out only when two simulations are compared).

We will not go into the results on the removal of deposit-rate ceilings in depth since a more thorough study of essentially the same data is available in Jaffee (1973). The main points, however, are easily noted. It is clear that removing the ceilings has practically no effect in the model before 1969:IV. The reason is that, at least within the model, the ceilings were not found to be significantly binding on the rate-setting of the relevant institutions until 1969. In particular, ceilings were imposed on SLAs after the 1966 credit crunch, so it is not surprising that their removal has no effect during this period. Starting in 1969:IV, however, there is more action, and in particular the deposit rate of SLAs is simulated to increase by 68 basis points, reflecting the effect of removing the ceilings.

Turning to the deposits of SLAs (DESL), one finds positive increments between 1969 and 1971, and then negative increments in 1972 and 1973. This result is basically the sum of two effects. In the first set of years, the SLAs are simulated to raise their deposit rates rather strongly upon the removal of the ceilings, while the commercial banks (not shown in the table) respond much more slowly. Thus the SLAs are able both to attract deposits from the capital markets and to hold more than their own in competition with the commercial banks. In the last two years, in contrast, the commercial banks raise their deposit rate considerably more than the SLAs with the result that the SLAs lose deposits compared to the baseline with deposit-rate ceilings. In fact, the loss of deposits for the SLAs would have been worse were it not that the average level of deposit rates is considerably higher without the ceilings, with the effect that the depository intermediaries in aggregate attract deposits from the capital markets. Also note that the extent to which commercial banks would

Table 2

STANDARD MORTGAGES WITHOUT DEPOSIT-RATE CEILINGS

A. Simulation Without Deposit-Rate Ceilings (Levels)

	1965:IV	1966:IV	1967:IV	1968:IV	1969:IV	1970:IV	1971:IV	1972:IV	1973:IV
RSL	4.37	4.70	4.90	5.28	5.93	6.53	6.55	6.26	6.48
RM	5.97	6.57	6.88	7.27	8.15	8.74	8.50	7.70	8.20
DESL	109.60	114.30	124.90	133.80	137.70	149.10	169.20	189.40	195.70
MOSL	109.40	114.10	122.70	132.30	138.30	146.20	165.80	188.00	201.30
MTOTAL	263.00	279.80	300.40	322.20	334.80	348.90	399.80	466.60	508.50
MINT	6.25	6.60	7.25	8.04	8.65	9.50	11.29	13.17	14.39
DINT	4.70	5.18	5.78	6.44	7.45	9.05	9.73	10.35	11.01
TRANSFERS	0.66	0.45	0.81	0.89	0.20	0.01	0.82	1.78	1.32
RESERVES	8.72	9.22	10.01	10.91	11.40	11.35	12.03	13.53	15.02
EH$	29.00	25.90	30.00	31.90	31.80	33.10	47.20	55.30	61.20
KH1	453.30	461.60	468.40	476.50	483.80	489.40	498.00	510.50	525.80
HS1$	3.95	3.16	4.08	4.29	3.80	4.04	5.88	7.73	8.72

B. Simulation Without Deposit-Rate Ceilings (Deviations: 2A-1B)

RSL	-0.06	0.00	0.00	0.03	0.68	0.53	0.55	0.28	0.15
RM	0.00	0.00	0.00	0.00	-0.07	-0.13	-0.03	0.02	0.00
DESL	0.00	0.00	-0.10	0.00	4.30	11.00	5.30	-0.80	-4.20
MOSL	-0.10	0.00	0.00	0.00	2.90	11.50	7.00	-1.10	-3.70
MTOTAL	-0.20	0.00	0.00	0.00	4.10	16.30	12.80	8.30	8.00
MINT	0.00	0.00	0.00	0.00	0.23	0.98	0.59	-0.04	-0.25
DINT	0.00	0.00	0.00	0.04	1.06	1.34	1.10	0.42	0.02
TRANSFERS	0.00	0.00	0.00	-0.02	-0.45	-0.27	-0.62	-0.38	-0.41
RESERVES	0.00	-0.01	0.01	-0.01	-0.30	-0.39	-0.88	-1.37	-1.71
EH$	-0.10	0.00	0.00	0.00	0.60	1.20	-4.60	0.10	0.20
KH1	0.00	0.00	0.00	0.00	0.00	0.30	0.30	0.20	0.10
HS1$	0.00	0.00	0.00	0.00	0.06	0.02	-0.01	-0.05	-0.08

compete with SLAs for deposits were Regulation Q ceilings to be removed has been a question of considerable debate. The simulations presented here and below assume commercial bank competition of the type last observed in 1967 before the onset of binding deposit-rate ceilings. It is possible, however, that were the ceilings removed today, then commercial banks might compete much more strongly, implying the possibility of more negative results for SLA deposit flows.

A second point of primary note in Table 2 concerns how the SLAs are simulated to do in terms of reserves and transfers of reserves without the protection of deposit-rate ceilings. Looking at the variable RESERVES for 1973:IV, we find that the SLAs accumulate approximately $1.71 billion less in reserves when Regulation Q protection is removed. So the simulations do show some protection for the SLAs from deposit-rate ceilings. We will not consider here, however, whether this magnitude is sufficiently large to make a case for the ceilings (see Jaffee (1973) for an extended discussion including the appraisal for alternative degrees of commercial bank competition).

It is useful to consider the results for housing from removing the deposit-rate ceilings. Looking at the stock of housing KH1 in 1973:IV the final effect over the full simulation is a negligible $0.1 billion (compared to the final level of about $525 billion). In other words the results indicate that the deposit-rate ceilings were essentially neutral over the period with respect to housing. Moreover, it is noteworthy that the removal of the ceilings actually stimulated housing in the low investment quarter of 1969:IV, while it depressed housing in the rather strong quarter of 1971:IV. Thus, it would appear that cyclically, the ceilings were actually slightly destablizing in their effects on housing investment (for a more complete analysis of the effects of ceilings on housing see Fair and Jaffee (1972)).

Finally, examination of the stocks of mortgage holdings of all intermediaries and those of savings and loan associations alone indicates that proportionate holdings change. This changing pattern of mortgage stock portfolios of the various intermediaries results from changing patterns of deposit rates, now free of ceiling constraints, which lead to different patterns of deposit flows and consequently mortgage holdings. It is possible for SLA holdings to move quite differently from the total stock. Indeed, this phenomenon is found to be important in interpreting some of the simulations reported below.

B. *Graduated-Payment (GP) Mortgages*

GP mortgages are the first class of alternative mortgage instruments that we consider. GP mortgages differ from standard mortgages in that the payment made each period grows at a rate set in the contract. Thus, if the first payment were say $100 and the graduation rate were 5 percent, then the second payment would be $105. Otherwise, GP mortgages are the same as standard mortgages in terms of fixed interest rate, fixed maturity,

and the accounting whereby interest is subtracted from the payment to determine the repayment. The main advantage of GP mortgages is that they allow the initial payment (PAYO) to be lower than the payment on an equivalent standard mortgage (this lower initial payment is balanced, of course, by higher payments over the later life of the mortgage due to the graduation).

Since GP mortages reduce PAYO, they should stimulate housing investment by relieving the cash flow constraint of meeting the first payment (see discussion above). On the other hand, one would expect no more than secondary effects from GP mortgages on SLAs. There are no direct effects on SLAs in that the mortgage contract continues with a fixed-rate feature. The secondary effects occur through a mechanism whereby increased housing demand generates increased mortgage demand, and therefore there should be upward pressure on the mortgage rate with a positive impact on SLA reserve transfers. Also, it can be anticipated that repayments of mortgages will decline, at least in the early years of the simulation, since the reduction in the payment rate will be reflected in a reduction in the repayment rate (interest is always subtracted from the payment first). Finally, it could be expected that the cyclical variation of housing investment (as distinct from the level) is unlikely to be significantly affected. In particular, GP mortgages would offer no real solution to the SLA problem of disintermediation which appears as an important factor determining the housing downturns in, for example, 1966, 1969-1970, and 1973-74. However, if the demand effects emphasized throughout this volume are important contributors to cyclical variation, appropriate graduation may ameliorate the variation.

To see how the MPS model must be modified for GP mortgages, it is useful to refer to the model of Section II.A. It can be seen that PAYO (equation II.8) and therefore PAY, REP, and INT (equations II.9, II.10, and II.11) must all be suitably modified to account for the payments schedule of a GP mortgage. The precise formulas used for this purpose are given in Section V. The remainder of the model, however, is adequate in its present form, in the sense that no functions will be *shifted* by the introduction of GP mortgages. For example, the KH$ values (II.1) will vary with PAYO and any induced changes in RM and RP, but the equation will not shift due to GP mortgages. Similarly, there will be induced movements along the MD and MS schedules, but the schedules themselves do not shift. This ease of implementation is due to the fact that GP mortgages are the same as conventional mortgages in all respects except for the graduation.

We have distinguished two alternative simulation schemes for determining the rate of graduation on GP mortgages: *fixed graduation* and *new issue graduation.* Fixed graduation means that the amount of graduation is fixed once and for all at some initial value. The graduation is thus constant over the life of each mortgage contract as well as over time as new mortgages are issued. New issue graduation retains the feature that

the graduation is constant over the life of each mortgage contract, but allows the degree of graduation associated with each "vintage" of newly issued mortgages to vary. There is also a third possibility for graduation, namely that the graduation is allowed to vary even over the life of each mortgage contract. This *outstanding stock graduation* is closely related to price-level indexed mortgages and is simulated as the constant-payment sector variable-rate mortgage in IN.1 below.

(1) *Fixed Graduation (GP.1).* For fixed graduation GP mortgages, the rate of graduation must be set once and for all as a constant. For our simulations, the value was the average rate of inflation over the simulation sample, 1962 to 1973. Alternative graduation rates could also have been tested, of course, but the average rate of inflation serves as a useful benchmark for comparison with the new issue graduation to be discussed below. Also, the inflation rate is a natural measure for the graduation rate since this ensures that real payments over the life of the mortgage will be constant (i.e., the nominal payments will rise with the inflation rate). Of course, this situation is somewhat idealized in that in practice one could use only an *expected* inflation rate, whereas in the experiment here we have the benefit of hindsight and use the realized inflation rate.

The results of simulating the fixed graduation GP mortgages are shown in Table 3. The levels are shown in Table 3A, and it is to be stressed that deposit-rate ceilings were not allowed to be binding here (or in any of the results that follow). In Table 3B we show the deviations between the simulation values of Table 3A and the simulated history with deposit-rate ceilings presented above as Table 1B. Consequently, the results of Table 3B show the net outcome of both removing deposit-rate ceilings and introducing the GP mortgages. The one exception is that we also show the variable RSL (a) which is the deviation calculated against the no deposit-rate ceilings simulation of Table 2A. This is introduced so that the change in RSL induced by the GP mortgage alone can be seen clearly.

Checking first for the effect of GP mortgages on housing investment, it can be seen that by the end of the simulation (1973:IV), the stock of real housing has risen by $9.3 billion. This, it should be recalled based on the conservative value for α of .25. Had we chosen a larger value, say $\alpha = .75$, then the result on housing would also have approximately tripled. In any case, it appears that we do confirm that GP mortgages can provide an important stimulus to housing demand.

We can next check for the effect on SLAs, using as the measure their accumulated reserves. By the end of the simulation their reserves have actually declined relative to the history simulation by $3.88 billion. Referring back to Table 2B, we find that $1.71 billion of this decline can be attributed to the removal of the deposit-rate ceilings, which leaves over $2 billion of the decline to be attributed to introduction of the GP mortgages. This might seem peculiar in that we had noted above that the secondary effects on SLAs should be positive, albeit perhaps weak. In fact, moreover, the secondary effects do work in the indicated direction. The

Table 3

GRADUATED-PAYMENT MORTGAGES

A. Simulation GP.1: Fixed Graduation Rate (Levels)

	1965:IV	1966:IV	1967:IV	1968:IV	1969:IV	1970:IV	1971:IV	1972:IV	1973:IV
RSL	4.50	4.76	4.96	5.33	5.99	6.57	6.61	6.36	6.60
RM	6.08	6.67	6.98	7.37	8.23	8.80	8.16	7.91	8.39
DESL	110.90	115.60	126.10	135.40	140.50	152.40	172.60	193.40	201.80
MOSL	110.90	115.50	124.20	134.00	141.00	149.90	170.30	192.80	207.20
MTOTAL	268.10	285.20	306.50	329.20	343.30	358.50	412.00	482.70	528.20
MINT	6.28	6.68	7.17	7.94	8.70	9.41	11.09	12.95	14.48
DINT	4.83	5.31	5.90	6.59	7.68	9.31	10.02	10.75	11.57
TRANSFERS	0.57	0.39	0.62	0.70	0.09	-0.28	0.44	1.30	1.04
RESERVES	8.41	8.85	9.49	10.21	10.55	10.31	10.63	11.69	12.85
EH$	29.80	26.60	30.80	33.00	33.00	34.20	42.50	56.10	61.00
KH1	457.10	466.30	473.80	482.60	490.80	496.90	506.10	519.10	535.00
HS1$	4.20	3.35	4.31	4.53	4.04	4.27	6.12	7.98	9.08

B. Simulation GP.1: Deviations (3A-1B)

RSL	0.07	0.06	0.06	0.08	0.74	0.57	0.61	0.38	0.27
RSL[1]	0.13	0.06	0.06	0.05	0.06	0.04	0.06	0.10	0.12
RM	0.11	0.10	0.10	0.10	0.01	-0.07	0.13	0.23	0.19
DESL	1.30	1.30	1.10	-1.60	7.10	14.30	8.70	3.20	1.90
MOSL	1.40	1.40	1.50	1.70	5.60	15.20	11.50	3.70	2.20
MTOTAL	4.90	5.40	6.10	7.00	12.60	25.90	25.00	24.40	27.70
MINT	0.03	0.08	-0.08	-0.10	0.28	0.89	0.39	-0.26	-0.16
DINT	0.13	0.13	0.12	0.19	1.29	1.60	1.39	0.82	0.58
TRANSFERS	-0.09	-0.06	-0.19	-0.21	-0.56	-0.56	-1.00	-0.82	-0.69
RESERVES	-0.31	-0.38	-0.51	-0.71	-1.15	-1.43	-2.28	-3.21	-3.88
EH$	0.70	0.70	0.80	1.10	1.80	2.30	-3.30	0.90	0.00
KH1	3.80	4.70	5.40	6.10	7.00	7.80	8.40	8.80	9.30
HS1$	0.25	0.19	0.23	0.29	0.30	0.25	0.23	0.20	0.30

Addendum: GP.2: New Issues Graduation (Levels)

EH$	29.10	26.70	30.70	33.70	34.20	35.00	48.80	55.30	65.90
KH1	454.10	463.10	470.60	479.80	488.60	495.60	505.20	518.00	534.90

[1]Deviation calculated against "no Regulation Q" value of Table 2A.

increase in housing demand does stimulate mortgage demand, with the result that the mortgage rate is generally higher in the simulation (19 basis points at the end) and outstanding mortgages are also higher ($2.2 billion at the end).

What has happened to hurt the SLAs, is that the graduated payments have lengthened the average age of a mortgage in the SLA portfolio. In a stationary economy this effect would disappear, but here in a growing economy more and more mortgages are issued at the low PAYO values and the SLAs never catch up although each vintage of mortgages is graduated. This impacts on SLA transfers since, over the simulation period, interest rates are generally rising, and thus a shift to older mortgages also means a shift toward lower-yielding mortgages.

Effects of this sort indicate both why simulations can be instructive and why they must be interpreted with caution. In particular, had we simulated a history in which mortgage rates were generally declining, then the implications for GP mortgages would have been just reversed. That is, the aging effect on the mortgage portfolio would have been a net benefit to the SLAs since a larger part of the portfolio would have had high interest rates.

(2) *New-Issue Graduation (GP.2).* For comparison, we now turn to the new-issue GP mortgage in which the graduation rate is changed period by period on newly issued mortgages. Specifically, for each vintage of mortgages we set the graduation rate equal to the average inflation rate observed over the previous four quarters. As indicated above, once the graduation rate is set for a vintage, the rate is then retained for the rest of the life of the mortgage. Otherwise, the mechanics of implementing GP.2 are essentially the same as GP.1.

One would expect the basic response of the system to be roughly the same for GP.1 and GP.2. Our simulation results bear this out, and in fact the levels are so close that we have not presented a separate table for GP.2. The one possible difference, however, is that new-issue graduation might be expected to stabilize housing in terms of cyclical variations more than fixed graduation. This would occur because the graduation rate on newly issued mortgages is increased under GP.2, and hence PAYO is decreased, in periods of high inflation, which have tended to coincide with low levels of housing activity.

One empirical measure of this effect can be seen in the bottom of Table 3 where we have shown the simulation levels for housing investment and the housing stock generated by the new-issue graduation. Comparing this with the levels of the same variables generated by the fixed graduation in Table 3A, one does find some sign of stabilization due to the new-issue graduation. For example, one finds some sign of stimulus in the low investment quarters of 1966:IV and 1969:IV. An alternative measure of this effect is shown in Table 9 below. To generate the values of Table 9, we regressed the simulated values of real housing investment against a constant and a linear time trend, and then tabulated the resulting standard errors of estimate. These values then represent a measure of the deviations in housing investment around the time trend. From Table 9, i

can be seen that GP mortgages tend to stabilize housing relative to the actual historical values and relative to the simulated paths with conventional mortgages and either with or without deposit-rate ceilings. Moreover, the path with new-issue graduation (GP.2) fluctuates less than the path with fixed graduation (GP.1).

(3) *Default and Risk on GP mortgages.* It has been argued that while GP mortgages may serve some purpose in stimulating housing demand, they are unlikely to be accepted by lenders because GP mortgages would have a higher rate of default. The higher rate of default is based on the contention that the critical period for default occurs during the first years of a mortgage, and GP mortgages have a lower amortization rate just at this time, due to the low value of PAYO. Factually, this is all correct, but it overlooks the fact that GP mortgages have been recommended for use primarily in periods of inflation. In periods of inflation, the collateral value of houses will generally be rising, and thus, although the loan may be slowly amortized, the collateral itself will be rising in value. Indeed, if the graduation rate is set equal to the inflation rate, and if housing appreciates with the general price level, then the effective loan-to-value ratio on a GP mortgage will have the same time path as would a standard mortgage contract in a period of no inflation. This path, of course, will have a higher loan-to-value ratio than would a standard mortgage in an inflationary period, but this is a positive feature, not a drawback of GP mortgages.

C. *Variable-Rate (VR) Mortgages*

The major issue with respect to VR mortgages is to balance the value of a fluctuating short-term yield to the lender against the cost of a fluctuating yield to the borrower. The advantage to the lender is that his liabilities are mainly short term, and therefore his asset-liability maturity balance is enhanced the shorter the term of the asset. The disadvantage of a fluctuating yield to the borrower can take two forms: the cost of fluctuations *per se* given that the borrower is risk averse; and the possibility of a cash flow crisis should the cost rise early in the life of the contract. The expected cost of the contract over the full maturity, however, is not itself a function of how much the yield fluctuates. That is, given an expectations theory of the term structure, the *ex ante* cost of a mortgage contract corrected for liquidity preference should be the same regardless of whether it is a fixed long-term rate or a series of fluctuating short-term rates. This does not deny that specific individuals, with expectations that differ from the market's, may have a preference for the long or short versions.

A variety of techniques have been suggested as the means for finding a compromise that allows the lender the advantages of a fluctuating yield while protecting the borrower from the more extreme possibilities. One set of techniques limits the frequency and/or absolute amount by which the yield is allowed to fluctuate. In our simulations we have not used such

"dampers," but it is possible that future simulations could experiment with such possibilities.

A more important determinant of the fluctuations inherent in a VR mortgage is the maturity of the instrument to which it is pegged. As usually construed, the pegging mechanism works by having the VR mortgage issued at some initial rate, and then over time adding to or subtracting from this rate the fluctuations in the pegging rate. This means that different "vintages" of borrowers may pay different rates during the same period, due to differences in the original "spread" between the mortgage rate and the "pegging" rate. It also means that it is likely that cases will arise in which "old" borrowers will be paying rates higher than the current new-issue rate. Consequently, in order to avoid an arbitrage flow of funds into new contracts at such times, it is generally considered important that prepayment costs be enforced to eliminate such flows.

The basic scheme studied in our simulations can be interpreted as one in which the VR mortgage is pegged to the new-issue rate itself. This is denoted as VR.1 and has a variety of useful features:

(i) All borrowers, regardless of the time they originate the mortgage, will pay the same rate under this scheme. This is true since in each period a borrower of an existing VR mortgage has his yield updated by exactly the change in the new-issue rate.

(ii) An immediate implication of (i) is that neither the borrower nor the lender has any incentive to arbitrage between existing and newly issued VR mortgages. Moreover, there will then be no need to create prepayment costs simply in order to stop such arbitrage. This is important since prepayment costs would also stop arbitrage between VR mortgages and conventional mortgages, assuming both do exist at the same time. Arbitrage between VR and conventional mortgages should not be discouraged. but prepayment costs would have this effect.

(iii) A further implication of (i) is that the rate on VR mortgages is necessarily that of a short-term security with maturity equal to the interval between rate changes. This is true because the yield on an existing VR mortgage is set equal to the newly determined new-issue rate in each decision period. This is advantageous to the lender, but perhaps disadvantageous to the borrower, as discussed above.

(iv) A further feature of our plan is that the VR rate can be interpreted as using the time deposit rate as the pegging rate. This is important since it allows the borrower to interpret the rate he pays each period as equal to that period's time deposit rate plus a suitable markup to cover the costs of intermediation. This is implemented in simulation VR.1A below.

A possible disadvantage of our plan is that the period-by-period cost to the borrower will fluctuate in the manner of a short-term rate. Thus, it would be desirable, at least for purposes of comparison, to simulate VR mortgages that try to correct for this. We, in fact, have considered several alternatives. First, under simulation VR.2A, we have experimented with an instrument developed by the MIT study and termed a "dual-rate" VRM. The basic idea is that while the interest payments are allowed to fluctuate each period with the short-term rate, the total payments are stabilized by being pegged to a long-term rate. This, of course, necessarily implies that the principal repayment acts as the residual from period to period. A potential problem with the plan, consequently, is that a series of low repayments will accumulate such that "balloon" payments will be required toward the end if the short rate is greater than the long mortgage rate over an extended time period. These results which are developed in Chapter 2 of the MIT mortgage study indicate this is not a serious problem, however, and our simulations below tend to confirm this.

A second alternative to moderate the variations in the interest rate on a VR mortgage is to peg the interest rate to a longer maturity. For example, the Federal Home Loan Bank Board (FHLBB) has proposed pegging the VR rate to either a three-to-five year government bond rate or to the new-issue rate on conventional mortgages (assuming conventional mortgages continue to be issued along with VR mortgages). In simulation VR.3 below we report the results of tests on the FHLBB proposal where the rate on the VR mortgages is tied to the new-issue rate on conventional mortgages.

A third alternative to correct for the variations in the interest rate is to mix a VR mortgage contract with some type of graduated-payment mechanism. In this way, every time the VR rate rises, the rate of graduation may also be increased, thus eliminating or at least reducing, the cash flow impact of the change. Again a variety of schemes have been proposed and these are discussed and simulated in Section III.D below.

(1) *The Basic, Short-Term VRM (VR.1).* The key feature of our VR.1 plan is that the interest rate on all outstanding variable-rate mortgages (VRMs) would be a short-term rate appropriate for one-period mortgage loans. We denote this rate as RMS, and since the model is quarterly it can be interpreted as the one-quarter mortgage rate. The problem is to generate this value within the model. In principle, of course, the rate would be determined through a mechanism of demand and supply in the mortgage market, and at least to a first approximation this is what we have done. The details of the method are given in Section V.

Even though we have generated the short-term rate RMS, there remain important questions as to where this rate will apply in the model. Specifically, RMS is taken as the relevant rate in determining the size of the initial payment (PAYO), in determining the amount of interest payments to SLAs (INT), and as the base rate for the deposit-rate setting of SLAs. Similarly, RMS is the relevant rate in determining the demand and supply of mortgages (MD and MS). Thus, in terms of the model presented in Section II.A, the functions just noted will all depend on RMS for

the VR.1 simulations. At one point in the model the demand for housing, a long-term mortgage rate concept is more valid. This arises because housing is a durable asset, and thus an investor would be concerned with the long-term cost of capital, not the current one-period rate, RMS. In order to determine such a rate, one must specify how an investor would translate the observed short-term rate RMS into a long-term equivalent. We denote this long-term equivalent as RM, which is the interest rate on conventional mortgages, since our conversion technique amounts to making the long-term equivalent the same as the conventional mortgage rate. Specifically, our conversion has the form: RM = RMS + (RCB-RCP). RCB is the long-term corporate bond rate, and RCP is the four-to-six month prime commercial paper rate, so the formula indicates that investors would translate the short-term RMS into the long-term equivalent RM using the same term-structure relationship that holds for comparable securities in the corporate securities market. The formal details of this adjustment, and the other specification for VR.1 are given in Section V.

The results for our simulations of VR.1 are presented in Table 4. Table 4A shows the levels of the variables, while Table 4B shows the deviations against the simulation of history with Regulation Q ceilings. It should be noted in Table 4A that RMS is the short-term mortgage rate applicable on all VRM contracts, while RM is the long-term equivalent used for the housing investment decision. In Table 4B the deviations for both RMS and RM are calculated against the simulation value for RM in the history simulation of Table 1B. For RMS this means that the deviation gives the total change in the rate in going from a conventional to a VR mortgage, including any differences due to the term structure. For RM, the deviation represents the change in the level of interest rates, holding constant the maturity of the contract at its long-term level.

The primary expectation for VR mortgages is that the reserves of SLAs should improve, and our results bear this out. For example, at the end of the simulation reserves are $.66 billion higher. Moreover, this simulation eliminates deposit-rate ceilings, which themselves have the effect of reducing SLA reserves by $1.71 billion (see Table 2B), so that the VRM contract by itself contributes a gross gain to reserves of $2.38 billion. Also, it can be noted that the gain is actually greater in 1970:IV, before the years of 1971 and 1972 in which VRM contracts had a depressing impact on SLA profits. The depressing impact is due to the low level of RMS in those years, which in turn is due to the low level of short-term interest rates in the same years. For example, in 1971:IV, RMS is only 5.93, which is 210 basis points below the standard mortgage rate simulated in the historical baseline. Thus, in total, it appears that VRMs can help SLAs, although with the *caveat* that in periods of sharply ascending term-structure yield curves the reverse can actually occur.

Turning to the housing variables of Table 4, one finds that the net effect at the end of the simulation is a negligible decrease of $.7 billion in the real stock. This result is the net effect of two forces. One force comes from the effect of VRMs on the PAYO variable. Since the term-structure

Table 4

SHORT-TERM VARIABLE-RATE MORTGAGES I

A. Simulation VR.1: Basic, Short-Term, VRM (Levels)

	1965:IV	1966:IV	1967:IV	1968:IV	1969:IV	1970:IV	1971:IV	1972:IV	1973:IV
RSL	4.34	4.82	4.92	5.18	6.07	6.63	5.99	5.10	6.11
RMS	5.98	7.28	6.21	7.05	9.32	7.15	5.93	6.18	9.77
RM	6.12	6.66	6.95	7.33	8.17	8.77	8.20	7.99	8.44
DESL	98.70	104.70	117.20	128.10	136.00	147.60	157.60	163.20	166.70
MOSL	98.70	103.90	115.30	126.10	135.80	145.70	156.60	164.10	169.60
MTOTAL	251.60	268.30	291.50	315.20	332.20	348.60	393.90	451.50	483.60
MINT	5.59	6.58	6.58	8.20	11.24	11.10	9.64	9.14	16.34
DINT	4.15	4.87	5.44	6.05	7.52	9.10	8.28	7.27	8.84
TRANSFERS	0.59	0.84	0.56	1.48	2.46	1.11	0.42	0.70	4.51
RESERVES	8.73	9.41	10.26	11.44	13.21	14.73	14.74	14.97	17.39
EH$	28.50	25.70	30.40	32.20	30.80	32.40	50.10	54.80	52.20
KH1	452.80	460.90	467.70	475.90	483.30	488.70	497.40	510.20	525.00
HS1$	3.87	3.14	4.11	4.27	3.73	4.01	5.87	7.68	8.24

B. Simulation VR.1: Deviations (4A-1B)

RSL	-0.09	0.12	0.02	-0.07	0.82	0.63	-0.01	-0.88	-0.22
RSL[1]	-0.03	0.12	0.02	-0.10	0.14	0.10	-0.56	-1.16	-0.37
RMS[2]	0.01	0.71	-0.67	-0.22	1.10	-1.72	-2.10	-1.50	1.57
RM	0.15	0.09	0.07	0.06	-0.05	-0.10	0.17	0.31	0.24
DESL	-10.90	-9.60	-7.80	-5.70	2.60	9.50	-6.30	-27.00	-33.20
MOSL	-10.80	-10.20	-7.40	-6.20	0.40	11.00	-2.20	-25.00	-35.40
MTOTAL	-11.60	-10.60	-8.90	-7.00	1.50	16.00	6.90	-6.80	-16.90
MINT	-0.66	-0.02	-0.67	0.16	2.82	2.58	-1.06	-4.07	1.70
DINT	-0.55	-0.31	-0.34	-0.35	1.13	1.39	-0.35	-2.66	-2.15
TRANSFERS	-0.07	0.39	-0.25	0.57	1.81	0.83	-1.02	-1.42	2.78
RESERVES	0.01	0.18	0.26	0.52	1.51	2.99	1.83	0.07	0.66
EH$	-0.60	-0.20	0.40	0.30	-0.40	0.50	-1.70	-0.40	-8.80
KH1	-0.50	-0.70	-0.70	-0.60	-0.50	-0.40	-0.30	-0.10	-0.70
HS1$	-0.80	-0.02	0.03	0.03	-0.01	-0.01	-0.02	-0.10	-0.54

[1]Deviation calculated against "no Regulation Q" value of Table 2A.

[2]Deviation calculated as RMS value (Table 4A) minus RM value (Table 1B).

yield curve over our sample is generally ascending, the mortgage rate (RMS) applicable on VRMs was generally lower than the rate (RM) applicable to standard mortgages. Consequently, PAYO was generally reduced by the introduction of VRMs, and this helped housing. On the other hand, deposit rates are also a function of RMS, and thus lower values for RMS will translate into smaller flows of funds into the lenders which is seen clearly in Table 4. This in turn reduces the supply of mortgage funds and creates upward pressure on the mortgage rate.

The downward pressure of RMS on SLA deposit rates is particularly strong in the last three years of the simulation, and is worthy of further interpretation. Specifically, one of the functions that SLAs have performed over the historical period is sometimes called "term-structure intermediation." That is, SLAs borrow short and lend long. Now to the extent that they can successfully carry out such intermediation, the SLAs will attract deposits in considerable amounts since they are providing a valuable service. In fact, however, we know that in recent years this has proven to be impossible without at least the protection of deposit-rate ceilings. The simulations here show that the SLAs will carry out less intermediation in a world in which they reduce the amount of "term-structure intermediation" that is attempted.

(2) *Short-Term VRM with Deposit-Rate Spread (VR.1A).* As suggested above, it is possible and intriguing to augment our basic, short-term VR mortgage with a feature that ties the short-term rate, RMS, with the short-term deposit rate paid by the thrift institutions. This has been implemented by replacing the deposit-rate equation of the model (equation (II.5) of the simple model above) with the alternative: RD = RMS - c. Here c is interpreted as the required spread between the mortgage rate and the deposit rate for SLAs to cover costs and make adequate transfers to reserves. An equation of this sort has been implemented for each of the depository intermediaries in the model, but with different c coefficients so that the spreads between deposit rates are maintained at the values that would otherwise have been simulated. For SLAs, for example, the spread constant c cannot exceed 150 basis points.

The results of this simulation, in the form of deviations from the historical simulation with deposit-rate ceilings, are shown in Table 5A. These results can be usefully compared with the deviation values of the basic, short-term VR mortgage presented in Table 4B. The main structural difference between the two contracts comes from the fact that the fixed spread condition of VR.1A generally leads to both a higher deposit rate and a lower mortgage rate (RMS). This in turn leads to two main features of the results. First, the accumulated reserves of the SLAs are less under the fixed-spread condition, reflecting the fact that the constraining spread value is somewhat lower than that achieved with the basic VRM (VR.1). Second, the level of deposits with the fixed-spread condition declines much less (or, in fact, rises) compared with the basic, short-term VRM (in which deposits decline considerably by the end of the simulation). This, of course, is the result of the higher deposit rates simulated under the fixed-spread condition.

Table 5

SHORT-TERM VARIABLE-RATE MORTGAGES II

A. Simulation VR.1A: VR.1 With Deposit-Rate Spreads (Deviations from 1B)

	1965:IV	1966:IV	1967:IV	1968:IV	1969:IV	1970:IV	1971:IV	1972:IV	1973:IV
RSL	0.01	0.97	-0.03	0.22	2.31	0.53	-0.05	-0.88	1.67
RSL[1]	0.07	0.97	-0.03	0.19	1.63	0.00	-0.60	-1.16	1.52
RMS[2]	-0.03	0.60	-0.75	-0.30	0.84	-1.89	-2.17	-1.51	1.30
RM	0.11	-0.02	-0.01	-0.02	-0.31	-0.27	0.10	0.22	-0.03
DESL	-8.10	-1.20	1.90	5.30	27.40	36.40	13.30	-6.30	5.40
MOSL	-8.20	-3.00	2.80	4.40	22.10	39.80	14.80	-4.80	-0.50
MTOTAL	-7.80	-8.00	6.70	12.00	37.70	64.30	52.10	41.40	54.20
MINT	-0.55	0.29	-0.15	0.80	4.16	4.69	0.24	-3.12	4.30
DINT	-0.34	1.00	0.05	0.55	4.70	2.88	0.63	-1.74	3.26
TRANSFERS	-0.14	-0.29	-0.21	0.37	0.40	1.09	-0.94	-1.42	1.22
RESERVES	-0.20	-0.52	-0.51	-0.46	-0.67	0.57	-0.55	-2.34	-3.24
EH$	-0.20	0.60	0.40	0.40	1.00	0.60	-3.70	0.00	-7.10
KH1	-0.40	-0.40	-0.20	-0.10	0.30	0.70	0.90	1.10	0.80
HS1$	-0.05	-0.06	0.05	0.07	0.13	0.02	0.00	-0.05	-0.24

B. Simulation VR.1B: VR.1 With Reserve Constraint (Deviations from 1B)

RSL	-0.09	0.24	0.04	0.33	2.23	1.58	-0.17	-0.86	-0.25
RSL[1]	-0.03	0.21	0.04	0.30	1.55	1.05	-0.72	-1.14	-0.40
RMS[2]	0.00	0.70	-0.70	-0.25	0.95	-2.03	-2.22	-1.60	1.49
RM	0.14	0.08	0.04	0.03	-0.20	-0.41	0.05	0.21	0.16
DESL	-9.50	-8.40	-5.30	-2.50	15.20	40.50	21.20	-1.00	-8.90
MOSL	-9.50	-9.00	-4.90	-3.40	10.40	40.40	27.60	0.00	-9.90
MTOTAL	-8.60	-8.40	-3.40	-0.90	18.90	61.40	55.90	43.00	35.40
MINT	-0.59	0.06	-0.56	0.31	3.32	4.23	0.71	-2.81	4.20
DINT	-0.49	-0.14	-0.20	0.28	3.74	4.89	0.88	-1.47	-0.91
TRANSFERS	-0.07	0.31	-0.29	0.25	0.52	-0.32	-0.92	-1.36	3.53
RESERVES	-0.13	0.02	-0.08	0.09	0.34	0.25	-1.08	-2.81	-1.87
EH$	-0.70	-0.30	0.90	0.30	0.50	2.10	-3.40	-0.10	-9.10
KH1	-0.04	-0.60	-0.50	-0.40	-0.10	0.40	0.90	1.10	0.60
HS1$	-0.07	-0.02	0.05	0.05	0.09	0.16	0.00	0.00	-0.62

Addendum: VR.2A; "Dual-Rate" Version of VR.1A (Deviations from 1B)

EH$	-0.20	0.70	0.20	0.30	1.30	0.50	-4.70	-1.60	-6.30
KH1	-1.20	-1.10	-0.80	-0.90	-0.40	0.20	-0.20	-0.90	-1.60

[1]Deviation calculated against "no Regulation Q" value of Table 2A.

[2]Deviation calculated as RMS value (Table 4A) minus RM value (Table 1B).

(3) *"Dual-Rate" VRM with Deposit-Rate Spread (VR.2A).* Simulation VR.2A is the same as simulation VR.1A just discussed, except that the payments made by the borrower are smoothed through a device involving the long-term mortgage rate RM. Specifically, it is assumed here that the changes in payments made by borrowers are based on the rate RM, not RMS, although, in terms of the interest received by the lender, RMS is used. This means, therefore, that when RMS rises relative to RM, a larger proportion of the payment is credited to interest (on the basis of RMS) and a smaller proportion is left for repayment of principal.

The results for VR.2A are very close to those of VR.1A in terms of levels, and we have not provided a separate table. However, at the bottom of Table 5 we show as an addendum, the deviations for the housing variables of VR.2A that are comparable to the values shown in Table 5A for VR.1A. Two points are worth noting. First, the level of housing achieved at the end of the simulation is slightly reduced by the smoothing scheme of VR.2A. This arises because PAYO is based here on RM, not RMS, and RM is generally above RMS in the simulations. Second, some stabilization in housing investment (EH$) is achieved through the smoothing mechanism of VR.2A. This can also be confirmed in Table 9, in that more stable time paths for housing investment are achieved by VR mortgages than by history, and in that the path of VR.2A is similar to the paths for GP mortgages.[1]

(4) *Short-Term VRM with Reserve Constraint (VR.1B).* Another variant of the basic, short-term VRM is achieved by placing a maximum limit on the reserves that can be accumulated by the SLAs. This constraint is motivated by the fact that in simulations to be presented below, in some cases the SLAs are able to accumulate considerable amounts of reserves above the values simulated with history. It was suggested, therefore, that in practice the SLAs would pay these funds out to depositors via higher deposit rates. To maintain comparability with the results to be presented below with this feature, it has been introduced here for the basic, short-term mortgage (VR.1). Specifically, we have taken the reserves accumulated under the historical simulation with deposit-rate ceilings as the baseline (see Table 1B), and forced thrift institutions to pay out any excess to depositors.[2] (The constraint is directly enforced on the SLAs, but

[1]Our results may understate the stabilization power of VR.1 because of the link between RMS and the deposit rate. When RMS rises, deposit rates should also rise, and this should stabilize the flow of housing finance. However, in the model the link between RMS and deposit rates occurs with a long lag; so long, in fact, that a stimulus to housing may occur not during a current trough, but during the next boom. A better specification would eliminate the lag.

[2]The deviations (Table 5.B) are not zero since the initial reserve pay-out leads to different deposit rates and shifting patterns of deposit flows and mortgage holdings and, hence, changes in reserves. No effort was made to adjust by iteration the pay-out procedure to insure it caused actual reserves to trace the history under deposit-rate ceilings exactly. Since we do not know how depository institutions would react to large changes in reserve positions, this is only one of several arbitrary mechanisms that allow the reserves to affect deposit-rate-setting behavior.

is implied for the other depository intermediaries since we retain the spread between deposit rates that would otherwise have been simulated).

The results for this simulation are shown in Table 5B, in the form of deviations from the historical simulation with deposit-rate ceilings. Compared with the basic, short-term VRM (Table 4B), it can be seen that the reserve constraint (Table 5B) has about the same results as the deposit-rate spread (Table 5A). This is not surprising since both of the latter simulations have the effect of reducing the profit margins for SLAs, with the result that reserve transfers are reduced and higher deposit levels are achieved.

(5) *FHLBB VRM with Reserve Constraint (VR.3).* The last of the VRMs to be considered here is a plan similar to that suggested by the Federal Home Loan Bank Board. The main feature is that after the new-issue rate is established, for any given contract, the rate over time is determined by the movements in some pegging rate. The case developed here is where the pegging rate is the long-term mortgage rate RM (standard mortgage rate). It is useful to recall in this context that although standard mortgages do not actually exist in any of our new instrument simulations, we are able to calculate an RM value following the procedure noted above (see also the discussion in Section V).

The main difficulty with implementing this mortgage instrument in the simulations is to determine the appropriate interest rate when the contract is first issued. It can be shown that the new-issue rate would have to fall between the bounds set by RM and RMS. Otherwise, either the lender or the borrower would prefer a standard mortgage instrument. It was not possible, however, to estimate where within these bounds the actual new-issue rate would fall. Consequently we have defined the new-issue mortgage rate by the formula: $RMA = \partial RM + (1-\partial)\, RMS$. And we have simulated two values for ∂ : .25 and .75. Since RM generally exceeds RMS in our sample period, lenders will generally be better off the higher the value for ∂ they can enforce. It is our guess that the lower value of .25 is a more plausible one for lenders to sell this contract successfully, but there is room for debate.

The results of these simulations are shown in Table 6 in the form of deviations from the historical simulation with deposit-rate ceilings. Table 6A shows the results with $\partial = .25$, and Table 6B shows the result with $\partial = .75$. In both cases the reserve constraint condition, as discussed above for VR.1B, is enforced. This is done since the results without this constraint indicated large reserve accumulations by the SLAs and implausibly small deposit levels. Results similar to those of Table 6 were also obtained when the fixed deposit-rate spread constraint replaced the reserve constraint.

Looking first at the results of Table 6A, the simulation values are very close to those obtained for the basic, short-term VRM with the reserve constraint (Table 5B). The chief difference is that the mortgage interest income of the SLAs (MINT) is less volatile under the FHLBB scheme than it is under the short-term VRM. This arises because the FHLBB instrument is a mix of a short-term and long-term contract, and

Table 6

FHLBB VARIABLE-RATE MORTGAGES

A. Simulation VRM.3: FHLBB VRM With Reserve Constraint; $\partial = .25$

(Deviations from Table 1.B)

	1965:IV	1966:IV	1967:IV	1968:IV	1969:IV	1970:IV	1971:IV	1972:IV	1973:IV
RSL	-0.09	0.08	0.01	-0.07	1.33	1.59	0.27	-0.67	-0.20
RSL[1]	-0.03	0.08	0.01	-0.10	0.65	1.06	-0.28	-0.95	-0.35
RMS[2]	-0.04	0.68	-0.73	-0.31	0.99	-1.97	-2.39	-1.77	1.39
RM	0.10	0.06	0.01	-0.03	-0.16	-0.35	-0.12	0.04	0.06
DESL	-8.10	-7.60	-6.60	-5.10	6.20	26.30	17.90	-2.30	-8.30
MOSL	-8.10	-8.00	-6.30	-5.60	2.90	25.60	22.20	-0.80	-10.20
MINT	-0.68	-0.30	-0.18	0.05	1.45	3.45	1.87	-0.76	-0.74
DINT	-0.43	-0.26	-0.30	-0.32	1.99	3.89	1.38	-1.22	-0.80
TRANSFERS	-0.20	0.05	0.13	0.43	0.12	-0.09	-0.14	-0.05	-0.03
RESERVES	-0.41	-0.48	-0.45	-0.10	0.13	0.25	0.05	0.00	-0.02
EH$	-1.00	-0.50	2.10	1.80	-1.90	4.50	3.50	-1.10	10.60
KH1	-0.10	-0.30	-0.30	-0.30	-0.10	0.40	0.90	1.40	0.90

B. Simulation VRM.3: FHLBB VRM With Reserve Constraint; $\partial = .75$

(Deviation from Table 1.B)

RSL	-0.01	0.04	0.01	0.54	1.47	1.71	0.69	0.07	0.46
RSL[1]	0.05	0.04	0.01	0.51	0.79	1.18	0.14	-0.21	0.31
RMS[2]	-0.08	0.66	-0.73	-0.35	0.92	-2.03	-2.44	-1.80	1.32
RM	0.06	0.04	0.01	-0.07	-0.23	-0.41	-0.17	0.01	-0.01
DESL	-2.60	-2.60	-2.40	-2.60	16.50	37.40	35.40	22.00	18.00
MOSL	-2.50	-2.80	-2.10	1.30	13.50	36.20	38.60	23.40	16.80
MINT	-0.23	0.18	0.25	0.58	2.30	4.32	3.35	1.68	2.03
DINT	-0.12	-0.07	-0.10	0.81	2.81	4.88	3.07	1.27	1.85
TRANSFERS	-0.09	0.24	0.30	0.05	0.12	-0.12	-0.16	0.00	0.01
RESERVES	-0.35	-0.26	-0.04	0.11	0.19	0.31	0.09	0.05	0.11
EH$	-0.70	-0.10	1.10	2.10	1.60	3.80	-2.50	-2.00	-8.10
KH1	-0.20	-0.40	-0.40	-0.40	-0.10	0.50	0.80	0.80	0.30

[1]Deviation calculated against "no Regulation Q" value of Table 2A.

[2]Devaluation calculated as RMS value (Table 4A) minus RM value (Table 1B).

therefore the yield on the contract varies somewhat less than RMS on the short-term VRM.

The results of Table 6B, on the other hand, indicate a significantly more expansionary effect on deposits and mortgages than any of the simulations reviewed so far. The mortgage interest income (MINT) is much greater because the assumption of this simulation allows the VRM to be issued at a relatively high interest rate (that is, with a large ∂ weight on RM). This then generates profits for the SLAs which, under the reserve constraint, are paid out to depositors, creating a high deposit rate (RSL), and a large amount of interest paid to depositors (DINT) with the outcome that deposits increase dramatically. The impact on housing, however, remains negligible. This occurs because the positive effects through mortgages are offset by the relatively high value for PAYO that comes with the high new-issue mortgage rate. Finally, it should be stressed that the results of this simulation depend critically on whether a contract of this form could actually be sold at a new-issue rate as close to the standard mortgage rate as is assumed.

(6) *Concluding Comments on VRMs.* It is frequently argued that VRMs would have considerable benefits for lenders, particularly the SLAs, but that this would be at least offset by a cost to borrowers. Our results are in this general direction, but show a smaller advantage to SLAs and essentially no negative impact on housing. It is thus important to see why this is the case.

First, with respect to the lenders, the assumed benefits are frequently based on the premise that SLAs would be able to issue VRMs at essentially the same interest rate as standard mortgages. Our analysis, in contrast, has stressed that VRMs are basically short-term instruments, and that generally the term-structure yield curve in the United States has had short-term rates below long-term rates. Consequently, lenders will actually lose on this account. This is made up, however, in that over the simulation period the level of all interest rates has been rising, and that VRMs allow the yield on mortgages to remain current with this movement. In fact, the net gain for the lender is surely positive, but it is less because of the term-structure aspect.

Second, with respect to borrowers, the main costs of VRMs are frequently related to the uncertainty associated with the interest rates to be paid over the contract's life. It is thus concluded that risk-averse individuals would shy away from such mortgage financing and with a detrimental effect on housing investment. Our simulations have not included such an effect for the primary reason that we have no means by which to estimate empirically its magnitude. Moreover, we feel that the importance of this risk-aversion argument has been exaggerated. In particular, to the extent that variations in short-term interest rates reflect variations in inflation rates, a borrower will find that his mortgage financing costs will rise at the same time he is obtaining capital gains on his house and a higher wage income through the inflation effect. Of course, payments are likely to rise more abruptly than wages and it is difficult to realize the

capital gain, thus causing some cash flow difficulties. These cash flow effects could be eliminated or greatly reduced through variations on the basic VRM (see III C above and III D below). However, it is not clear that even the basic VRM is more risky than standard mortgage contracts which necessarily introduce risk because they are fixed-rate contracts, and thus will work out either better or worse for the borrower depending on the outcome for inflation. In fact, of course, over recent years inflation has occurred at rates that are much higher than those expected at the time most current mortgages were taken out. Consequently, current holders of mortgages have generally done very well under standard mortgages. However, it is very doubtful that the trend could continue as interest rates have tended to incorporate a growing premium for expected inflation and the reluctance of borrowers to pay the resulting high interest rates currently being required on standard mortgages suggests that they share this view.

D. *Constant-Payment-Factor Variable-Rate and PLAM Instruments*

The macroeconomic effects of GP and VR mortgages stand in contrast. GP mortgages stimulate housing demand directly due to the effects of the graduation on initial payments. GP mortgages help the SLAs, however, only in the indirect way that increased mortgage demand results in higher mortgage interest rates, and thereby improves portfolio earnings. VR mortgages, in contrast, directly improve the SLA earnings position, by allowing them to earn the rate RMS on their mortgage portfolio which, in turn, allows competitive levels for deposit rates. VR mortgages, however, are unlikely to help housing investment both because of the PAYO effects and because of the risk aversion toward fluctuating mortgage rates. Consequently, it is an appealing notion that some combination of GP and VR mortgages will have the joint virtues of stimulating housing investment (the graduated-payment feature) and helping the SLAs (the variable interest rate feature). Two instruments that operate in this way are simulated here: the constant-payment-factor variable-rate mortgage and the price-level adjusted mortgage (PLAM).

(1) *The Constant-Payment-Factor Variable-Rate Mortgage*

Donald Tucker of the Federal Reserve System has suggested a type of mortgage that directly combines GP and VRM. The first two papers in this volume confirm the attractiveness of this type of instrument and discuss two specific designs. One of these, which we in the mortgage study have termed the constant-payment-factor variable-rate mortgage, is simulated here.[3]

[3]This instrument is virtually identical to one of the forms of Tucker's proposal. The term constant-payment-factor VRM is applied to clearly differentiate this design from plans which have graduated nominal payment schedules fixed at the time the contract is negotiated.

The VR features of the mortgage have essentially the same form we used in the VR simulations above. Specifically, we use both the basic, short-term VR mortgage (VR.1) and the extension with a fixed deposit-rate spread (VR.1A); these are now denoted respectively as IN.1 and IN.1A. Thus, each period, interest is debited to borrowers at the new short-term mortgage rate RMS. However, payments are based on the constant payment factor, which is an estimate of the real rate of interest, and thus rise over time by the difference between the payment factor and the debiting rate. (It can be readily seen that this is equivalent to computing in each period a new path for payments which is graduated over time by the difference between the payment factor and the debiting rate, such that the contract is fully amortized over its remaining maturity). A different payment factor is used for each vintage of mortgage. The details of our specification are given in Section V.

For lenders, the effect of the constant-payment-factor VR mortgage is basically to retain the advantages of a VR contract. For borrowers, however, the cash flow problems of a VR contract are basically eliminated, since a higher graduation rate, and therefore a lower payment, is allowed to offset the effects of higher RMS interest rates. Of course, if interest rates systematically rise over the life of a mortgage, then ultimately the borrower will have to face up to larger payments in the end. The expectation, however, is that over time short-term rates will approximately average the same value as long-term rates, and then the payment-factor VRM will successfully eliminate the cash flow problems that would otherwise arise.

The results of our simulations for the constant-payment-factor VRM mortgages are given in Table 7. Table 7A shows the deviations from the historical simulation with deposit-rate ceilings for the case with the basic, short-term VR feature. These results can be compared with the simulations of VR.1 (Table 4B), since they are the same except for the GP feature of the constant-payment-factor VRM. The results for interest rates, deposits and mortgages, and the reserves of SLAs are very similar. In this sense the constant-payment-factor VRM does retain the advantages of VR mortgages for the SLAs. On the other hand, in terms of the housing stock, the constant-payment-factor VRM has a considerable positive effect: a gain of $8.6 billion in the real stock by the end of the simulation. The basic VR mortgage of Table 4B, in contrast, achieved a loss, albeit negligible, of $.7 billion.

Table 7B shows a constant-payment-factor VRM simulation where the VR feature includes a fixed deposit-rate spread. This is comparable to the VR mortgage discussed above in Section III.C.2 with results presented in Table 5A. Comparing these results, we again find very little difference in terms of the variables affecting SLA welfare. And again in terms of housing, the constant-payment-factor VRM allows a significant stimulus, $10.0 billion, to the real stock at the end of the simulation, whereas the pure VR mortgage allowed only the negligible gain of $.6 billion.

Table 7

CONSTANT-PAYMENT-FACTOR VARIABLE-RATE MORTGAGES (TUCKER PLAN)

A. Simulation IN.1: Constant-Payment-Factor VRM (Deviation from 1.B)

	1965:IV	1966:IV	1967:IV	1968:IV	1969:IV	1970:IV	1971:IV	1972:IV	1973:IV
RSL	-0.08	0.13	0.04	-0.05	0.84	0.67	0.02	-0.85	-0.20
RSL[1]	-0.02	0.13	0.04	-0.08	0.16	0.14	-0.53	-1.13	-0.35
RMS[2]	0.03	0.74	-0.64	-0.18	1.16	-1.65	-2.06	-1.46	1.64
RM	0.17	0.12	0.10	0.10	0.01	-0.03	0.21	0.35	0.31
DESL	-10.80	-9.30	-7.50	-5.20	3.20	10.50	-4.80	-25.60	-32.10
MOSL	-10.70	-9.90	-7.10	-5.60	1.30	12.00	-1.70	-23.40	-33.70
MTOTAL	-11.00	-10.40	-7.60	-4.90	4.70	19.30	11.50	-2.40	-10.50
MINT	-0.64	0.01	-0.62	0.23	2.94	2.74	-0.93	-3.93	1.92
DINT	-0.54	-0.29	-0.30	-0.30	1.20	1.50	-0.22	-2.56	-2.06
TRANSFERS	-0.07	0.40	-0.24	0.59	1.85	0.87	-1.01	-1.40	2.87
RESERVES	0.01	0.19	0.28	0.56	1.58	3.10	1.97	0.22	0.86
EH$	0.10	0.60	1.20	1.60	1.20	1.70	0.10	1.20	-4.60
KH1	1.30	1.90	2.60	3.50	4.70	6.10	7.20	7.90	8.60
HS1$	0.11	0.19	0.24	0.37	0.46	0.44	0.35	0.21	0.65

B. Simulation IN.1A: Constant-Payment-Factor VRM With Deposit-Rate Spread

(Deviation from Table 1.B)

RSL	0.03	0.99	-0.01	0.26	2.37	0.57	-0.01	-0.85	1.75
RSL[1]	0.09	0.99	-0.01	0.23	1.69	0.04	-0.56	-1.13	1.60
RMS[2]	-0.01	0.62	-0.72	-0.26	0.90	-1.82	-2.12	-1.55	1.38
RM	0.13	0.00	0.02	0.02	-0.25	-0.20	0.15	0.26	0.05
DESL	-7.80	-0.70	2.50	6.20	28.60	38.10	15.40	-4.40	7.30
MOSL	-5.90	-2.50	3.50	5.40	23.60	41.70	20.00	-2.70	1.90
MTOTAL	-6.90	0.90	8.80	15.30	43.00	70.90	58.80	47.60	63.10
MINT	-0.53	0.34	-0.08	0.90	4.33	4.93	0.43	-2.94	4.61
DINT	-0.31	1.06	0.10	0.65	4.88	3.06	0.80	-1.61	3.54
TRANSFERS	-0.15	-0.29	-0.19	0.37	0.40	1.14	-0.92	-1.40	1.25
RESERVES	-0.20	-0.52	-0.51	-0.46	-0.66	0.61	-0.49	-2.27	-3.16
EH$	0.50	1.40	1.10	1.70	2.50	1.80	-2.10	1.40	-2.80
KH1	1.50	2.20	3.10	4.00	5.50	7.20	8.20	9.00	10.00
HS1$	0.13	0.27	0.25	0.41	0.60	0.45	0.36	0.26	0.96

Addendum: IN.2A; "Dual Rate" Version of IN.1A (Deviation from 1B)

EH$	0.50	1.60	0.90	1.60	3.00	1.60	-3.60	-0.60	-1.30
KH1	0.60	1.30	2.40	3.10	4.60	6.70	6.90	6.60	7.00

[1]Deviation calculated against "no Regulation Q" value of Table 2A.

[2]Deviation calculated as RMS value (Table 4A) minus RM value (Table 1B).

Finally, in the addendum to Table 7, we show the results for the housing variables of introducing a "dual-rate" feature to the VR mortgage. As indicated above, Section III.C.3, this contract should serve to stabilize housing investment even further. Comparing the results of Table 7B with the addendum, this can be seen to be the case. Alternatively, the standard deviation measures of Table 9 can be used as the criterion. It can be seen in Table 9 that the constant-payment-factor VR mortgages (IN.1 and IN.1A) have essentially the same housing path as comparable pure VR mortgages. The "dual-rate" constant-payment-factor VR mortgage, on the other hand, achieves a more stable path and is dominated in Table 9 by only GP.2 and IN.3A.

(2) *Price-Level-Adjusted Mortgages (PLAMs).* The last mortgage considered in our study is the PLAM. The key point in the PLAM is that the interest rate set in the contract is a real rate. We denote this real rate as rm, in contrast to the nominal rate RM. The real rate rm is determined in the model essentially through the forces of demand and supply. The rate rm then serves to determine the level of PAYO, which in turn is a main determinant of housing investment. Since rm will generally be below RM, the PAYO effect will stimulate housing in much the way achieved through a GP mortgage.

In two points in the model, however, it continues to be necessary to use a nominal mortgage rate. First, as a determinant of the deposit rate, since savings deposits are not indexed, a nominal mortgage rate should be used. Second, in the housing sector, the model is currently specified to allow for the direct impact of a nominal mortgage rate. In principle this equation could be re-estimated to separate the influences of the real rate and inflation. For present purposes, however, it is expedient to translate the real rate into nominal terms. This is achieved using the formula: $RM = rm + \hat{RP}$, where $\hat{RP}$ is the expected rate of inflation over the duration of the contract. $\hat{RP}$ is measured through an expectations mechanism already in the MPS model.

PLAMs, requiring the calculation of a real rate of interest, must be integrated into the model in other ways. To account for the indexing, the oustanding stock of mortgages is updated each period by the rate of inflation that occurs. We do not, however, have borrowers paying this amount each period. Instead, given the revised amount of the mortgage, and the real rate associated with the specific vintage of the mortgage, the payment is calculated so as to amortize the amount over the remaining maturity of the contract. It can be seen this is closely analogous to the graduation feature built into the constant-payment-factor VR mortgage.

In terms of the accounting for SLAs, however, we do treat the inflation premium on the mortgage stock as interest income. An alternative procedure would be to treat the inflation premium as a capital gain. These techniques could well have different tax implications, and thus we are assuming here that the inflation premium would be treated as regular mortgage income. In any case, the main point is that the inflation premium does get added into income, and then is either paid out to depositors or is

Table 8

PRICE-LEVEL-ADJUSTED MORTGAGES

A. Simulation IN.3: Straight PLAM (Deviations from Table 1.B)

	1965:IV	1966:IV	1967:IV	1968:IV	1969:IV	1970:IV	1971:IV	1972:IV	1973:IV
RSL	0.05	0.04	0.03	0.05	0.70	0.52	0.55	0.32	0.17
RSL[1]	0.11	0.04	0.03	0.02	0.02	-0.01	0.00	0.04	0.02
RM[1]	1.38	-2.46	-2.87	-3.54	-4.62	-4.73	-.3.73	-2.97	-5.17
RM	0.07	0.05	0.04	0.03	-0.07	-0.16	0.04	0.13	0.07
DESL	1.00	0.80	0.50	0.80	5.90	12.60	6.60	0.60	-1.50
MOSL	1.00	0.80	0.80	0.70	4.20	13.30	9.10	0.70	-1.60
MTOTAL	3.40	3.30	3.40	3.20	7.90	19.90	17.60	15.00	16.20
MINT	0.34	1.68	2.02	2.39	4.39	3.06	-2.49	-0.37	9.45
DINT	0.09	0.08	0.06	0.11	1.17	1.43	1.18	0.57	0.27
TRANSFERS	0.21	1.38	1.68	1.97	2.98	1.27	-2.98	-0.72	6.34
RESERVES	0.09	1.47	2.42	4.13	6.83	8.53	8.13	7.21	12.60
EH$	0.00	0.60	0.90	1.70	2.80	3.40	-2.10	1.30	3.10
KH1	0.80	1.30	1.90	2.90	4.20	5.80	7.10	8.00	9.30
HS1$	0.08	0.16	0.24	0.40	0.53	0.47	0.41	0.28	1.09

B. Simulation IN.3A: PLAM With Deposit-Rate Spread (Deviations from Table 1.B)

RSL	0.24	1.09	1.30	0.98	2.26	0.66	0.51	0.30	3.13
RSL[1]	0.30	1.09	1.30	0.95	1.58	0.13	-0.04	0.02	2.98
RM[2]	-1.44	-2.68	-3.10	-3.81	-4.99	-4.97	-3.85	-3.07	-5.57
RM	0.00	-0.17	-0.19	-0.24	-0.44	-0.40	-0.08	0.03	-0.33
DESL	9.90	21.10	26.00	34.50	52.40	57.50	40.70	21.10	56.40
MOSL	9.90	19.90	25.10	33.70	48.80	59.90	44.30	27.60	50.20
MTOTAL	14.90	30.40	41.60	58.40	85.70	107.60	99.00	90.40	131.60
MINT	0.83	2.90	3.77	4.82	8.20	6.64	-1.05	1.19	14.17
DINT	0.70	2.38	3.06	3.18	6.34	4.41	3.07	1.98	10.06
TRANSFERS	0.11	0.62	0.76	1.58	2.11	1.50	-3.69	0.82	3.61
RESERVES	0.56	-0.18	0.21	1.41	3.25	4.97	4.55	3.50	5.67
EH$	0.70	2.20	1.40	2.60	3.70	3.20	-4.60	0.50	9.00
KH$	1.30	2.20	3.20	4.70	6.60	8.60	9.90	10.70	12.7
HS1$	0.12	0.31	0.39	0.57	0.73	0.50	0.39	1.01	1.77

[1]Deviation calculated against "no Regulation Q" value of Table 2A.

[2]Deviation calculated as rm level value (not shown minus RM value Table 1.B).

Table 9

STABILITY OF HOUSING INVESTMENT
WITH ALTERNATIVE INSTRUMENTS[1]

Instrument Code No.	Instrument Description	Standard Deviation Around Time Trend 1962:I to 1972:IV
History	Actual Value of EH	3.53
Simulation of History	With Deposit-Rate Ceilings	3.62
Simulation of History	Without Deposit-Rate Ceilings	3.08
GP.1	Fixed Graduated Payment	3.09
GP.2	New-Issue Graduated Payment	2.71
VR.1	Basic, Short-Term VRM	3.42
VR.1A	VR.1 with Deposit-Rate Spread	3.13
VR.2A	VR.1A with "Dual-Rate" Feature	2.88
VR.1B	VR.1 with Reserve Constraint	3.04
VR.3	FHLBB Contract ($\alpha = .25$)	4.08
VR.3	FHLBB Contract ($\alpha = .75$)	2.81
IN.1	Constant-Payment-Factor VRM	3.41
IN.1A	IN.1 with Deposit-Rate Spread	3.12
IN.2A	IN.1A with "Dual-Rate" Feature	2.77
IN.3	PLAM	2.90
IN.3A	IN.3 with Deposit-Rate Spread	2.45

retained in the reserve accounts. It should be recalled here also that we have not attempted to simulate indexed time deposits, although clearly this would be a natural match with the PLAM.

We have simulated two types of PLAMs. The first of these is shown in Table 8A with the notation IN.3. The results are shown as deviations from the historical simulation with deposit-rate ceilings. For IN.3, the deposit-rate setting of depository intermediaries follows the standard equations of the MPS model. The variable rm in the table shows the difference between the real rate simulated for the PLAM and the nominal rate RM simulated in the historical standard. The large negative values for rm indicate that rm is significantly below RM, as one would expect. The variable RM shows how much the nominal mortgage rate would have changed between the PLAM and the historical standard. The values shown are quite small and frequently positive. This is due to the fact that a similar pattern prevails for deposit rates, and thus deposits and mortgages are slightly lower at the end of the simulation. In contrast, the implications for the SLAs and for housing are much stronger and more positive. In terms of SLA reserves, we simulate a gain of $12.16 billion by the end of the simulation. This is due to the large gain from the inflation that occurred late in the sample period. In terms of housing, the stock of real housing has increased by $9.3 billion at the end of the simulation. This is due to the low value of PAYO that prevails under PLAM contracts, which in turn is due to the level value for the real rate rm.

Table 8B shows a similar simulation of the PLAM, but with a fixed spread between the deposit rate and the mortgage rate (the latter being translated into nominal units for this purpose). This involves the same procedures adopted in Section III.C.2 above, and we denote the contract as IN.3A. The results of IN.3A differ considerably from the results of IN.3 because the deposit-rate spread condition has the effect of forcing the intermediaries to pay out the inflation gains to their depositors. Indeed, by the end of the simulation, deposits at SLAs are up by $56.4 billion and mortgages are up by $50.2 billion. This in turn creates downward pressure on the mortgage rate and stimulates housing, so that there is a net gain in housing of $12.7 billion at the end of the simulation.

Finally, turning to Table 9, we can compare the stability of housing investment under the PLAM with our previous mortgage instruments. The standard deviations for IN.3 and IN.3A are 2.90 and 2.45 respectively. These values indicate exceptionally good stabilization properties.

IV. CONCLUSIONS AND AGENDA FOR FUTURE RESEARCH

It is hoped that the presentation of the simulation results in this study has served several purposes. First, the necessarily concrete setting of a simulation experiment provides a force toward more precise definitions of the alternative instruments to be considered. In the early stages of this study we found that many proposed contracts had not been rigorously defined in terms of the detail necessary to simulate them. Consequently, a

significant part of our effort, in conjunction with the other studies of the MIT mortgage project, was to provide specific and detailed definitions for the contracts.

Second, we feel we have shown that it is practical and useful to simulate the macroeconomic effects of the proposed mortgage instrument innovations. Generally we found that the MPS econometric model was adequate for this purpose. At the same time, a variety of issues do stand out as requiring more work, both in terms of estimating a more complete model, and in terms of more complete simulation procedures. A list of these issues is provided here:

- More complete specification of the mortgage and housing sectors to allow for all dimensions of the alternative instruments.
- Further study of the deposit-rate setting of the depository intermediaries, with emphasis on the competitive response of commercial banks and the mutual response of savings and loan associations when they receive higher profit margins.
- More precision in the definition of the alternative mortgage instruments, like, for example, constraints on the frequency and size of changes in the rate on variable-rate mortgages.
- General equilibrium simulations of the alternative mortgage contracts with particular regard to alternative settings for monetary policy.
- A more complete attempt to "validate" the results. This is probably best done by running the simulations on alternative econometric models.

A third purpose of our simulation results, of course, was to provide at least a guide as to whether implementation of the instruments would be useful. Also, it was felt that simulation experiments would help clarify a number of questions about the properties of the alternative instruments. On both of these levels we feel the study has been successful. In terms of implementation, we found that almost all the results suggested the contracts could be used without disruption, and indeed generally with beneficial outcomes. On the other hand, the simulation results did indicate a variety of effects that are not frequently taken into account, or at least not accorded the empirical significance they seem to have.

More specifically, the results do point to the value of a new contract that would combine the features of graduated payment and variable rates. Both the constant-payment-factor VRM and PLAM contracts that we simulated have these features. In addition, other contracts of a similar nature have been reported elsewhere in this volume.

Finally, we must end with a strong caveat concerning the preliminary nature of these results. As indicated at several points in the text, we have had to make guesses, educated as they might be, on some key parameter values. Consequently, we cannot claim even the level of precision that might be normally associated with common simulation studies of various

multiplier values. Also, simulations of a distinctly new environment add a full new dimension of uncertainty since it is difficult to cover all the possible ways in which the economy may or could adjust to the changes.

V. PROGRAMMING AND OTHER NOTES ON THE SIMULATIONS

A. *Summary of the New Instrument Equations*

As developed in the text, the key equations necessary for simulating the new instrument plans are PAY (payment on mortgages), INT (interest on mortgages) and REP (repayments of principal). In addition, PAYO (the payment size on a standardized house) must be calculated for use in the housing equations. Equations (1) to (4) below define these variables in a form that is general enough to cover all instruments. Then, for each simulation, three parameters — y, u, z — must be set at values appropriate for the particular instrument. y is the interest rate used in calculating PAY and PAYO and will equal RM, RMS or rm (see definitions of symbols just below). u is the graduation rate and is set according to the terms of the graduated contract. z is the interest rate used for calculating INT and will equal y except for "dual-rate" mortgages. v, the vintage, is the quarter in which the mortgage is initiated (first payments come in the following quarter), and t is the current quarter.

Symbols are defined as follows:

M(v, t-l)	remaining principal at end of period t-l of mortgages of vintage v
RM(v)	long-term mortgage interest rate (on mortgages of vintage v)
RMS (t)	short-term, variable rate, mortgage interest rate (same for all v)
rm(v)	real, indexed, mortgage interest rate (on mortgages of vintage v)
RP (t)	inflation rate during quarter
$\overline{RP}$(v)	average inflation rate over four quarters ending in quarter v
$\overline{\overline{RP}}$	average inflation rate over full sample
T(v)	quarter of final maturity of mortgages of vintage v
P(v)	price level during quarter v
PH(v)	price of standard house during quarter v
LVR(v)	loan-to-value ratio enforced during quarter v

The basic equations are:

(1) $PAY(v, t) = (y-u)\left[1-\left(\frac{1+y}{1+u}\right)(T(v)-t+1)\right]^{-1} M(v, t-1)$ (defined for $v \leq t$)

(2) $INT(v, t) = (z)\, M(v, t-1)$

(3) $REP(v, t) = PAY(v, t) - INT(v, t)$

(4) $PAYO(v) = PH(v)\, LVR(v)\, PAY(v,v) / M(v,v)$

The aggregate amounts for PAY, INT and REP are determined by summing over v. Then REP and INT are separated, where required, into the various intermediary proportions using the lagged mortgage stocks as the weights.

The parameter settings, and brief comments, on the mortgage instruments are:

GP.1

$y = RM(v)$

$u = u_o = \overline{RP}$

$z = RM(v)$

Formula (1) is logically equivalent to setting the initial payment as PAY(v, v+1) and then graduating this amount quarter by quarter at the rate u.

GP.2

$y = RM(v)$

$u = u(v) = \overline{RP}(v)$

$z = RM(v)$

VR.1, VR.1A, VR.1B

$y = (RMS(t-1)$

$u = 0$

$z = RMS(t-1)$

All vintages pay the same interest rate RMS under our plan. They must be treated by vintage, however, since the payment also depends on the quarters to maturity.

VR.2, VR.2A

$y = RM(t-1)$

$u = 0$

$z = RMS(t-1)$

VR.3

$y = \partial\ RM\ (t-1) + (1-\partial)\ RMS(t-1)$

$u = 0$

$z = \partial\ RM(t-1) + (1-\partial)\ RMS(t-1)$

$\partial = .25$ or $.75$

IN.1, IN.1A

$y = RMS(t\text{-}1)$
$u = u_o + RMS(t\text{-}1) - RMS_o$; $u_o = \overline{RP}_o$
$z = RMS(t\text{-}1)$

The constant-payment-factor VRM has the effect of keeping the variable y-u equal to the constant value determined by initial conditions.

IN.2, IN.2A

$y = RM(t\text{-}1)$
$u = u_o + RMS(t\text{-}1) - RMS_o$; $u_o = \overline{RP}_o$
$z = RMS(t\text{-}1)$

The values determined in this way are real values. We must thus also index the mortgage stock base used in calculating (1) to (4). That is, we define NM(v, t-1) = M(v,t-1) P(t-1)/P(v), and use NM instead of M in the equations. Care must also be taken to account for the lender's capital gain in determining his income, and the outstanding value of the mortgage stock.

IN.3, IN.3A

$y = rm(v)$
$u = 0$
$z = rm(v)$

In addition to this basic coding, several other changes and points should be noted. First, we account for *prepayments* of mortgages as well as standard *repayments*. With regard to prepayments, we assume if a mortgage vintage has initial maturity TT (in quarters), then each quarter 1/TT is prepaid. This has the effect of changing the effective maturity for the vintage from TT to TT/2. This is roughly in line with the observed facts, where initial maturities run 20 years, but average effective maturities are on the order of 10 years. In this context it should also be noted that the variables T(v), LVR(v), and PH(v) are all currently treated as exogenously determined. Part of the proposed revisions of the mortgage and housing sector would make these variables endogenous.

Second, as noted in the text, deposit-rate setting by the intermediaries was treated differently for the alternative instruments. For GP.1, GP.2, and IN.3 the deposit-rate equations already in the MPS model were used. For VR.1, VR.1B, VR.2, IN.1 and IN.2 the MPS model equations were also used with RMS replacing RM. This change was made since for these simulations RMS, not RM, represents the appropriate yield variable on the mortgage contract. For VR.1A, VR.2A, IN.1A, IN.2A, IN.3A spread constraints were enforced between the mortgage interest rate and the deposit rate. Thus, instead of the equation of the MPS model, equations of the form RD = z-c were used, where z is defined for the individual instruments above, and c is the spread constant. For SLAs the value of c was set equal to 1.50 (percentage points). For the other intermediaries implied values for c were calculated so as to maintain the spread between the deposit rates of the respective intermediaries that would be generated

otherwise by the MPS model. Finally, for the FHLBB simulations, VR.3, the MPS model equations were used, but with the appropriate value of z (see VR.3 above) replacing RM in the equation.

A third change involved the use of the so-called "reserve constraint" in simulations VR.1B and VR.3. The baseline for reserves was calculated from the historical simulation with deposit-rate ceilings. This is taken as representing the minimum level of reserves for SLAs to continue to function effectively. Then in the indicated simulations, the model was allowed first to generate the appropriate solution, including the level of reserves. However, whenever the level of simulated reserves exceeded the baseline, the excess was changed into an equivalent yield and paid out to depositors. In principle, therefore, the reserves finally generated by these simulations should never exceed the levels of the baseline. The observant reader may note, however, that small, but positive values do appear for reserves in Tables 5B and 6. This is presumably due to rounding error.

Fourth, technical care should be taken to distinguish quarterly and annual rates. Since the model period is quarterly, it is easiest to amortize contracts on a quarterly basis, and thus the resulting flows of payments, interest, and repayments are quarterly. To do this, however, interest rates and graduation rates must be set on a quarterly basis, although in model output they are given at annual rates. Similarly, in the Jaffee SLA sector (see V.C below), the equations are set for annual rates and variables must be appropriately transformed when used for those equations.

Finally, it is important to be clear on the timing assumptions used in generating the new instrument equations. We assume that all new mortgages are originated at the very end of each quarter and are reflected in the stocks outstanding listed for the end of the quarter. Mortgage payments, and the separation into repayments and interest, then occur in each quarter based on the stocks outstanding at the end of the prior quarter. The updating for inflation on PLAM contracts is also assumed to occur at the end of each quarter, following the payment, but preceding the flow of newly originated mortgages.

B. *Model Determination of RM, RMS, and rm.*

The text discussion assumed that mortgage interest rates, the long-term RM under graduation schemes, the short-term RMS under variable-rate schemes, and the real rate rm under PLAM schemes, would all be determined in the mortgage sector itself. This can be illustrated in the following way. A simplified version of the mortgage sector as currently available has the form (RCB is the corporate bond rate):

(5) $MS = a_o + a_1 (RM\text{-}RCB)$
(6) $MD = b_o - b_1 (RM\text{-}RCB)$
(7) $MD = MS$

The solution of this system for the mortgage rate RM* is given by:

(8) $RM^* = F[RCB] = (b_o - a_o) / (a_1 + b_1) + RCB = K + RCB$

This is how the current model works in its most simple interpretation.

To use this same system to generate a short-term mortgage rate RMS, following the discussion of the text, one would substitute RMS for RM and RCP for RCB (RCP is the short-term commercial paper rate). If this is done, then the solution for RMS* can be obtained in the same way:

(9) $RMS^* = F[RCP] = K + RCP$

It can also be observed from (8) and (9) that:

(10) $RMS^* = RM^* + (RCP\text{-}RCB)$

In the computer programming of the simulations we have taken advantage of (10) to achieve a short-cut. In particular, we have allowed the model in all simulations to generate RM directly, and have then used (10) to generate RMS. It is also for this reason that we have been able to present results for both RM and RMS. A similar procedure was used to generate the real rate rm. One substitutes in the basic model rm for RM and $(RCB\text{-}\hat{RP})$ for (RCB), and then solves for rm*. The equivalent relationship to (10) is then obtained as:

(11) $rm^* = RM^* - \hat{RP}$.

As presented so far, the method used in the computer programming is logically equivalent to the method proposed in the text, although the programming method has some operational advantages. Both techniques suffer, however, from the potential problem that the a and b coefficients (of equations 5 and 6) are being used to determine RMS or rm, whereas they were estimated and apply to a long-rate regime. This can be defended, and is rigorously correct, if under either variable-rate or price-level adjusted mortgages, both lenders and borrowers convert the quoted rate (RMS or rm) into their long-term nominal, equivalent, and then make their demand and supply decisions on this basis. Two alternative methods are possible. First, one could consider more complicated conversion equations than (10) and (11); that is, one could agree with the principle that participants convert rates to some standard measure, but argue that (10) and (11) are not the correct equations. Second, one could accept (10) and (11), but argue that some adjustment should be made to the a and b coefficients. For present purposes, however, the results of equations (10) and (11) are particularly easy to work with, and do not appear to contradict any reasonable *a priori* constraints one might impose on the relevant partial derivatives.

Turning next to a more complicated model, the actual MPS mortgage sector allows for rationing in the mortgage sector in that the mortgage rate RM adjusts only slowly to the market equilibrium of (8) — the speed of adjustment is, in fact about 1/2. It could be argued, particularly with RMS, that the adjustment might in fact be somewhat slower. That is, if a lender is slow to adjust a short rate, then he is off for one quarter; if he is

slow to adjust a long rate, however, he must live with it for the full maturity of the contract. On the other hand, for our variable-rate mortgages, the rate RMS and the deposit rate RD will be closely tied. Moreover, given the interest elasticities of savers and the elimination of deposit-rate ceilings, lenders may be forced to respond quickly with their deposit rate as other short-term rates move, and this in turn would force a fast adjustment of RMS in order to generate the required income to pay RD. Thus, again, we agree with the principle that the speed of adjustment might change, but we see no strong case for the direction of the change. Thus, our simulations left this parameter unchanged.

Finally, the MPS model has one other quirk that should be noted. The specification of the mortgage demand equation was based, in fact, on the following model:

$$(12) \qquad MD = c_o - c_1 (RM - X_L)$$

where X_L is some unobserved rate that measures the opportunity cost of funds to households. We assumed, furthermore, that X_L is proportional to RCB, so that

$$(13) \qquad X_L = c_2 RCB$$

Combining (12) and (13), we then obtain

$$(14) \qquad MD = c_o - c_1(RM - RCB) - c_1 (1\text{-}c_2)RCB$$

This differs from the specification in (6) above in that RCB enters as a variable by itself. Moreover, it turns out that the two methods described above — (i) solving for RM and then deriving RMS and rm (the computer method); or (ii) directly solving for RMS and rm (the text method) — give different answers in these two cases because of the RCB term. Or more basically, it is clear that when we shift to a short-rate market, then the relevant X must change. When the text method is used, implicitly it is assumed that $X_S = RCP - c_1 (1\text{-}c_2)RCB$.[4] Neither technique can be known to be correct, however, and thus, as above, we opt for the simple coding aspects when RM is solved directly and RMS and rm are derived by (10) and (11).

[4]This comes about as follows:

$$X_L = c_2(RCB)$$
$$X_S = X_L + RCP - RCB$$
$$= RCP - (1 - c_2)RCB$$
$$- c_1(RMS - X_S) = - c_1(RMS - RCP) - c_1(1 - c_2)RCB$$

C. *The Jaffee SLA Sector.*

As noted in the text, it is important to measure how SLA reserve transfers respond to the various mortgage instruments since in the absence of deposit-rate ceilings it is possible that certain plans may not be feasible. The sector works as follows: Define:

MINT	interest income on mortgage portfolio
OINC	other income, net of all (non-interest) costs
FHLB	interest paid to FHLBB on advances
TAX	taxes paid
INCAT	income after taxes and FHLB interest
DINT	interest paid to depositors
TRAN	reserve transfers
RES	stock of reserves

When simulating a new mortgage the sector will behave as follows: MINT is determined as the SLA share of total mortgage interest (INT). OINC is determined from an estimated equation, which bases SLA income on the rate RCB, the share of deposits not invested in mortgages, and the flow rate of deposits, and which bases SLA costs on the stock of deposits and flow rates of deposits. FHLB is exogenous. TAX is derived by taking the SLA effective tax rate as exogenous, and properly defining the tax base using identities on the above variables. INCAT is then derived as an identity. Interest paid to depositors could be calculated as simply the deposit rate times the deposit base. However, the MPS model uses a *marginal rate* for the deposit rate, which in principle is highly weighted toward special accounts. The *effective* SLA deposit rate, in contrast, is much lower. Thus we adjust the model's marginal rate to the effective rate, by using the historical (exogenous) conversion ratio. TRAN and RES are then determined by identities. The estimated equation for OINC is:

$$\underset{\quad(1.4)}{\text{OINC} = -.04} \underset{(9.4)}{- .01\text{DESL}} + \underset{(4.4)}{.03\Delta\text{DESL}} + \underset{(3.1)}{.004(\text{RCB})(\text{DESL})} \underset{(2.3)}{-.003(\text{RCB})(\text{MOSL})}$$

$R^2 = .92$, D.W. = 2.56, $S_e = .04$, Sample: 1953-1970;
(Absolute value of t-statistic in parentheses);

DESL = deposits of SLAs;
MOSL = mortgages of SLAs.

In running the standard (historical) simulations, with conventional mortgages and deposit-rate ceilings enforced, we also used the Jaffee SLA sector, since it provided the model's benchmark for TRAN and RES. The above description remains valid, except that INT must now be calculated on the basis of standard mortgages. The Jaffee SLA sector has separate equations for INT under conventional mortgages, and these were used

only for the standard simulations. They are slightly complicated because they take into account the fact that some SLA loans are of very short maturity — being improvement or construction loans — and an attempt was made to incorporate this. Basically, however, a variable YBAR, the average yield on the portfolio is determined in a recursive fashion, and this is applied to the outstanding stock. Also note that for new instrument simulations there will still be interest income from the old standard mortgage stock. The rate of return on these is fixed as an initial condition (no new standard mortgages are made). See also Jaffee (1973) for the use of this model in simulations that evaluate the impact on SLAs of removing deposit-rate ceilings.

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Discussion

Henry J. Cassidy*

One of the most difficult tasks in econometrics is to forecast what would take place differently if a new option becomes generally available to economic participants, in this case involving one of a number of nonstandard mortgages. This task amounts to defining a new set of structural arrangements heretofore not in existence, and to providing quantitative estimates for the parameters. Given the high degree of difficulty of this task, Dwight Jaffee and James Kearl are to be congratulated for the insight they have brought to bear on it. However, many questions remain unanswered, and perhaps my function as discussant would be best fulfilled by highlighting these questions. In this sense, I am supplementing the many caveats about the simulation results made by the authors themselves.

1. No Forecasts of the Likely Amounts of Each Kind of Nonstandard Mortgage

Jaffee and Kearl simulate each type of alternative mortgage instrument separately under the assumption that only one type was issued throughout the simulation. Thus they did not attempt to forecast the likely amounts of each kind. Someone not familiar with simulation techniques might interpret the results as forecasts, irrespective of the authors' caveats: if a given instrument were to be allowed, the simulation results are not forecasts of the likely end results.

While the authors believed that such a procedure would highlight transitional as well as long-run implications, it failed to do so. As shown in the computer output supplied by the authors, by the end of 1965 the "transitional" period was essentially over. For example, in the VR.3 simulation with α=.25 (reported in their table 6A), by 1965, fourth quarter, over 60 percent of the mortgage portfolio was in this kind of instrument (by 1973, fourth quarter, it was about 93 percent). What is more likely is that the proportion of nonstandard mortgages will remain at less than 50 percent of the mortgage portfolio over a much longer period of time, and in a period involving a much richer assortment of interest rate changes than in the Jaffee-Kearl 1962-65 transition period.

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This implies three things. First, while the simulated impacts (if correct) would exist, they would be drastically reduced in magnitude. Second, the transitional problems associated with the assumed removal of Regulation Q would be exacerbated. The authors do not appear to appreciate the potential magnitude of this problem. Third, the authors' conclusion that "the contracts could be used without disruption" has insufficient empirical justification.

Such a forecast would be extremely useful for planning purposes. There are two major problems in producing such a forecast. The first concerns forecasting the political acceptance of these plans. I do believe the authors are correct in ignoring this problem, but because of the problems cited above, they might have taken more of an interest in forecasting the public's acceptance of the various types, given the ability to choose among alternative instruments.

2. The Inadequacy and Perversity of the Initial Mortgage Payment (PAYO)

All nonstandard mortgages have in common variations in the amount of the (nominal) mortgage payments over the life of the loan (or a change in maturity, which shall be ignored here). The authors select just one of those payments, the initial one (PAYO), as being representative of the whole stream. They assumed (without empirical justification) that an increase in PAYO causes a decrease in housing expenditures.

By ignoring the whole payment stream, this variable PAYO, as specified in the housing expenditure equation, is inadequate and can even behave perversely. For example, if the initial rate on a variable-rate mortgage (VRM) is high because the index to which the current rate is tied is expected to fall, borrowers will anticipate lower future payments, and thus consider the initially high payments as temporary, impacting little on their demand for housing. The authors' use of PAYO, on the other hand, acts to curtail current housing expenditures (under the assumption of a household liquidity constraint). Moreover, if the fixed-rate option were available, and borrowers opted for the VRM, then by definition they believe they are receiving a better deal, implying that their demand would be *increased* instead of decreased.

In addition, PAYO is pre-tax as opposed to after-tax. Because of the deductibility of interest payments, the percentage change in the initial payment of a given instrument as compared to the fixed-rate mortgage is exaggerated. For example, compare the first payment on a 30-year fixed-rate loan at 9 percent to that on one at 8 percent. The result is a pre-tax decrease of 8.8 percent, but at a marginal tax rate (Federal plus state) of 30 percent, the decrease is 7.9 percent, for a "β" (the percentage change in initial payments) that is 10 percent less.

Also, the claim that graduated payment mortgages, for example, will aid housing ignores a response of the mortgage markets that could be very rational. As the initial payment decreases (as the rate of graduation increases), the loan-to-value ratio may decrease to offset the increased risk

of the lower initial borrower's equity that the lower initial payments imply. Thus, the variable PAYO may change little (since the loan-to-value ratio is included in its analytical structure), as opposed to the amount of change used by the authors. Combining the effects of the after-tax analysis and the potential change in the loan-to-value ratio, the change in PAYO would not be nearly as great as they simulated. When added to this the lack of consideration of the whole payment stream and the lack of the empirical justification for the initial payment in the housing expenditure equation, the use of the PAYO variable becomes quite suspect.

3. Treatment of S&L Reserves

Under the various mortgage schemes, S&L reserves are affected. The question not adequately answered by the researchers is: How do S&Ls respond to a change in reserves? Since most S&Ls are mutuals, one such response would be to alter interest payments to depositors. A few of their simulations imposed the condition that reserves are unchanged, but it is possible that reserves would fluctuate other than historically (actually, differently from the way they would in the control solution), because the institutions' assets are of a different effective maturity, and their size is different (in the various simulations). Thus, how much the deposit rates would change is a moot question, but an extremely important one in determining the level and timing of the flow of funds into the housing market. Most of the simulations simply let reserves change with absolutely no feedback. Surely the two extremes are covered; the unanswered empirical question is: Which is the "correct" procedure?

4. Initial Pricing of Variable-Rate Mortgages (VRMs)

Of all the alternative mortgage types studied, the VRM is the one currently receiving most of the publicity, and this form of nonstandard mortgage has been actively pursued by many S&Ls, most recently in California. Jaffee and Kearl attempted to simulate the FHLBB proposal and found that it stabilized the housing market better than any of the other proposals investigated (for one assumption of α — part of the pricing mechanism), over the simulation period (see their table 9). However, they employed a rather arbitrary mechanism to assign an initial price (interest rate) to the VRM, using a term structure model of expectations. This model has the initial rate higher than a hypothetical (or artificial) rate on a fixed-rate mortgage whenever the short market rate (the rate on commercial paper) is greater than the long market rate (the rate on corporate bonds). There is some reason however, to suspect that even with this negatively sloping yield structure,[1] VRMs may be sold at a discount instead of at a premium, as compared to the fixed-rate mortgage rate. The reason has to do with lender strategy: if the index to which the VRM rate is tied

[1]Jaffee and Kearl in places refer to the yield structure as "ascending," or "descending," though no analytic use is made of this concept (as opposed to the shape of the yield curve).

is expected to fall, and the index itself is the long-term mortgage rate (as simulated and reported in their table 6), then in order to prevent refinancing with a fixed-rate contract at a future date when all rates are cyclically low, an initial discount is included. For this reason, when all rates drop temporarily, many borrowers would be unwilling to refinance with a higher rate fixed-rate contract, and thus they become "locked-in" to the VRM through the trough.[2] (In the Jaffee-Kearl simulations, borrowers do not have the option of selecting one of the VRM or the fixed-rate contracts.) In any event, the pricing question needs to be analyzed in more detail.

5. Other Aspects of the VRM Analysis

The analysis of the pricing of the VRM when its index is the new issue VRM rate was very well handled, but several questions remain. They allow this VRM short rate to clear the mortgage market. Using their same expectations framework, I wonder if the rate clearing the mortgage market should not be the long mortgage rate. Borrowers and lenders would look at the expected (as opposed to the current) rate of interest that is effective over the expected life of the loan commitment in assessing their demands for and supplies of mortgages, respectively. Use of the short interest rate implies that borrowers and lenders are rather short-sighted; it is the same kind of assumption of short-sightedness that applies to the use of PAYO in the housing demand equation (see Section 2 above).

Jaffee and Kearl state that ". . . for VR mortgages . . . the reserves of S&Ls should improve and our results bear this out." I might point out that this conclusion is based solely on the fact that over the simulation period interest rates trended upwards. Had they remained stable, for example, and the yield curve had been positively sloped (so that VRMs sold at a discount), the earnings of S&Ls would have been lower. This scenario is one of many that could be forecast for the future. The use of the evidence from the simulations as a basis for inductive reasoning, in other words, is not valid, at least not here.

Another point is that if VRMs had been compared to fixed-rate mortgages, then the expected changes in the price of the house would have no place in the analysis of risk (the authors make such an analysis at the end of Section C), because this remains the same regardless of which instrument is selected, and thus is not relevant to the analysis.

6. Concluding Remarks

In conclusion, the questions raised here and by Jaffee and Kearl themselves are of sufficient importance to merit rethinking of many of the assumptions and procedures. To me, the most important point is that the

[2]For more analysis of the initial pricing of VRMs, see Henry J. Cassidy and Josephine M. McElhone, "The Pricing and Marketability of Variable Rate Mortgages," FHLBB/OER Working Paper No. 53, May, 1975.

simulations are not forecasts. One way to make them look more like forecasts, as well as to be able to understand better the economic effects of the alternative instruments, is to use the MPS model in much the same way as a physical scientist uses a laboratory to conduct controlled experiments. Once the model has been estimated over a wide variety of economic conditions, a researcher could hypothesize alternative scenarios for the movements of the exogenous variables: e.g., steady growth, stagflation, regular cycles, to name a few. Then the researcher could investigate separately the transitional and longer-run consequences of each alternative mortgage contract. As it happened, the transitional impacts were not studied, and the longer-run results are very conditional upon the one given set of mixed economic occurrences over the simulation period. Strengths and weaknesses of instruments could be highlighted by simulating their effects separately for different phases of the cycle, for different longer-run movements of interest rates, and so on. Finally, a forecast is easier to provide given this kind of analysis, since the most likely and alternative scenarios (regarding the exogenous variables) could be selected by anyone desiring to make a forecast.

Discussion

James S. Duesenberry*

Simulations are very useful for a variety of reasons. They teach us a great deal, even though the results depend upon the inputs which we provide.

First, as we go through the process of trying to simulate the effects of any kind of a new policy, we are forced to consider changes in the structure of our financial system, or any other system for that matter. We discover that there are a lot of questions which we didn't even know were there until we tried to run the simulation. Dwight has already mentioned a number of things which just wouldn't have occurred to him had he not run the simulations. Secondly, as we work through the simulations we find that there are a lot of dynamic processes for third and fourth order effects which we never would have thought of if we had taken the numbers and tried to compute the consequences of a particular action. There is a kind of three-cushioned effect here, and the ball doesn't go where we expect it some of the time. I think that it's very valuable to discover those unanticipated effects.

Finally, as Dwight and Mr. Cassidy have already mentioned, it is quite clear that the results of any simulation depend on interaction between the parameters of the model, the economic policies, and the environments which we use as a baseline. To get anything out of the model, a large number of simulations are required in order to test the sensitivity of the conclusions to assumptions about the parameters, to parameter changes or to differences in the kinds of policies that are being used outside the model and to different environments. Part of our problem is that by the time we have enough simulations to search that universe, we have some problem of digesting the results because we wind up with about 200 pages of tables like the ones we had. Nonetheless, I think that's what we have to do.

Let me make one more general point which applies to all these financial models, the one to which Mr. Cassidy alluded at the end of his talk, but which I want to put in a slightly different perspective. In many of these exercises we are engaged in a process of asking whether some policy will remove some of the rationing effects, for instance, from the

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housing market, and therefore provide more cyclical stability into the housing market. When we conduct those simulations on the basis of a given monetary policy, described let's say in a pattern for unborrowed reserves, or M_1 or whatever it is, or as in this case just taking some series of short rates as being given data, we then assume that the central bank is going to be satisfied to have a result which emerges. However, with the new structure it may turn out, for instance, that if they stabilize housing somewhat more, the demand pattern will also change. But if they are looking for deflationary effects and they get a smaller deflationary effect out of housing, then they will provide less unborrowed reserves which will lead to higher interest rates and more feedbacks. A full application of these simulations has to be taken with a realistic view of what are the stabilizers' objectives. Sometimes they only care about M_1, in which case it's perfectly appropriate to simulate the results that way.

Now let me say a couple of things about the problems of this particular set of simulations. I think the first comment I should have made, of course, is that Dwight said he chose this particular model because it was the most structural model. That's open to dispute. But in view of the hour I will just raise two substantive points.

One of them is that in this type of operation the model is structured so that, in effect, the long-run demand for housing is incorporated into one of the equations. Now I think that as a general proposition, and something that Frank DeLeeuw was saying, in the environment in which we've been operating, it seems difficult to learn very much about the underlying demand for housing from the data we have. This is precisely because by underlying demand I mean the response of the unconstrained or unrationed demand for housing to the relative prices, the interest rates, the taxes and all the other things that you might expect to affect the demand for housing. In a world in which the financial constraints, to my mind anyway, have had such an overwhelming influence on the short-run fluctuations in housing, it seems difficult to me to sort out from the data the long-run movements of the demand. We may be better off if we try to get long-run estimates out of entirely different sorts of data, including data from different cities and or other cross sections; or to divide the problem and say that what we're going to look for are things which have to do with short-term variability, and then try to find some devices which free us of the task of trying to estimate the long-run demand simultaneously with the short-run demands.

There are a number of specific problems about the way in which PAYO and such variables enter into the long-run determinants. I want to mention just one point in that connection, which goes back to the earlier discussion about problems of consumers' cash flow in relation to the price-adjusted mortgages. As was said earlier, those are problems for people who are subject to a liquidity constraint. They are the group of people who want to own houses rather than rent them, but who don't have enough net savings to be able to deal with the current cash flow

problem. I would think that that's not such a big group, but that it's important to note here that there is another market for them — the rental market. In the rental market some of the inflationary effects which are bad for the mortgage borrower's cash flow are good for the developer's position, partly because of tax effects, so that it may turn out here that what you're doing by changing the payment rates for mortgages is shifting people out of the owner market into the rental market. The timing may be a little bit different, but over a long period I'm not sure that this should have such an enormous effect on the total demand for housing.

Of course there are also problems here of estimating the response of potential homeowners to the different risks that are involved when they are asked to take one of these mortgages which varies with the price level or with the interest rate. It's not that it's no risk against some risk, but it's a different set of risks, and we really have very little information to tell us how they would respond.

That's one aspect of the problem. The other aspect is one about the market clearing process. I think the way these models are built amounts to finding a rationalization for the pattern of rate adjustments which the institutions made both to their deposit rates and the rates they charge on mortgages, in an environment with a certain set of fluctuations, where the institutions were taking a certain set of risks in that process, and had a certain set of expectations. Now I think one has to be very careful, and I'm not sure the authors have been quite careful enough in examining the question of whether the rate-setting process is a new structural environment in which they are going to be setting the rate on something different, will involve the same time pattern of adjustments to rates as before. So I suspect that there's some danger of inconsistency between the supply and demand equations which go into the calculations for how many mortgages and how many houses people want, and the market clearing process which establishes what the mortgage rate is.

Discussion

Patric H. Hendershott*

Dean Pounds speculated at the outset today that we would probably not hear a single good word for the standard fixed-payment mortgage. I am afraid I must disappoint him. The potential social costs in 1974 of rising mortgage payments due to graduated-payment and/or variable-rate mortgages undoubtedly far outweighed the benefits. During a normal "demand-pull" inflation, such as we experienced in the 1966-68 period, rising mortgage payments seem appropriate. Real incomes are increasing so the payments can easily be made. However, in a year like 1974, when sharp increases in payments to foreigners result not only in increases in prices but also in declines in real incomes, rising mortgage payments could be disastrous to many households. In fact, it was the constancy of the mortgage payment that allowed many of us to afford the rising food and energy prices. Consumer credit lenders, as well as mortgage lenders, were, I am sure, grateful for the general absence of graduated-payment and variable-rate mortgages and the resultant lower levels of delinquencies and foreclosures. While it would obviously be erroneous to base our assessment of the desirability of alternative mortgage instruments on the events of 1974 alone, neither should we be misled into believing that one particular instrument is optimal for all periods.

One other general point regarding the overall conference before getting immersed in the issues at hand and the Jaffee-Modigliani-Kearl paper in particular. The papers before us today address important issues in a clear and concise manner. Cohn and Fischer lay out the implications of various mortgage contracts for real and nominal payment streams and analyze the desirability of the contracts from the viewpoints of borrowers and lenders; Kearl, Rosen and Swan explain how and why these streams should influence the demand for housing; and Jaffee, Modigliani and Kearl illustrate how the impact of the introduction of a variety of nonstandard mortgages on the mortgage and housing market might be analyzed in the context of an econometric model. The papers are all excellent and should be read as a set to gain the full flavor of the issues at hand.

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Inflation and Housing

Movement from a low- to a high-inflation economy (or from a high to a higher) and the resultant rise in nominal interest rates poses two problems for owner-occupied housing. First, given the standard fixed-payment mortgage contract, the demand for real owner-occupied housing falls even for households whose nominal disposable income is rising proportionately with the prices of houses and other goods. This is because the ratio of the monthly payment on new mortgage contracts to the price of houses increases due to the higher mortgage rate.[1] Second, given our financial structure, financial disintermediation occurs and funds shift away from the mortgage market, thereby reducing housing through higher mortgage rates, credit rationing, or both. This is the old portfolio mix problem of the nonbank depository intermediaries. The intermediaries cannot afford to raise their deposit rates by enough to keep funds because they have to pay the higher deposit rate on a greater portion of their liabilities than the proportion of their assets on which they are earning a higher mortgage rate. This problem is, however, only temporary (in the absence of deposit rate ceilings). At some point the intermediary's assets will all have rolled over at the higher mortgage rate, and the higher deposit rate will then be feasible. The first problem — the lower demand for real housing — is permanent and is thus more troublesome.

[1]The payment per period on a standard mortgage contract is computed from the present value formula equating the amount of the mortgage, M, with the discounted values of the future payments, P_s, which are themselves constant (for a standard mortgage) over the life, n periods, of the mortgage:

$$M = \frac{P_s}{1+R} + \frac{P_s}{(1+R)^2} + \ldots + \frac{P_s}{(1+R)^n}, \qquad \text{(i)}$$

where R is the interest rate on a per period basis. (While lenders may not be familiar with this equation, it is what underlies those tables listing the payment per thousand dollars for a given maturity and interest rate.) Collecting terms and solving for P_s, we obtain an explicit expression for the payment:

$$P_s = \frac{M}{\sum_{i=1}^{n} \frac{1}{(1+R)^i}} \qquad \text{(ii)}$$

Since the value of the mortgage itself can be written as the product of the loan-to-value ratio, M/V, and the value of price of the house, V, the ratio of the payment to the value of the house is:

$$\frac{P_s}{V} = \frac{(M/V)}{\sum_{i=1}^{n} \frac{1}{(1+R)^i}} \qquad \text{(iii)}$$

Given the loan-to-value ratio and the life of the mortgage, the ratio of the payment to the price of the house rises as R increases (each of the n terms in the denominator is smaller).

The intermediary problem of the cyclical shift in funds into and out of the mortgage market is also less troublesome because we have designed means of offsetting it. I refer specifically to the activities of the FHLB, FNMA, and all the other agencies recently created to aid the mortgage market. Table I suggests just how successful these activities have been in supporting the flow of mortgage funds. Column (1) indicates the net inflow of deposits at savings and loan associations (SLAs) and mutual savings banks (MSBs) and column (2) presents the net purchase of home mortgages by these two institutions and federally sponsored credit agencies (FSCAs). Note that the sharp decline in deposits flows in 1968 and 1969 was accompanied by a 40 percent increase in mortgage purchases. Also, the $17 billion decline in inflows in 1973, the largest on record, had virtually no impact on mortgage purchases.

In addition to modifying the cyclical impact on housing of the intermediation-disintermediation cycle, the activities of these government agencies have provided secular support for the home mortgage market during the last decade. The sum of the home mortgage holdings of the agencies and FHLB advances to SLAs has increased from $8.5 billion at the end of 1965 to $46.7 billion at the end of 1973. These activities have been responsible for the one percentage point decline in the home mortgage rate relative to the corporate bond rate that occurred during this period.[2]

Thus, policies have evolved to protect housing from many of the difficulties caused by inflation and cyclical movements in interest rates. The question arises, however, as to whether the protection is being provided in a reasonably efficient and equitable manner. Issuing nonmortgage securities and purchasing mortgages does lower mortgage rates, but it also raises costs to nonmortgage borrowers, including the Treasury itself. Mortgage rate subsidies are a direct drain on the Treasury. Regarding equitability, binding ceilings on deposits at savings institutions, in conjunction with restrictions against selling open market securities in small denominations (most specifically, the $10,000 limit on Treasury bills), result in low-income households earning a below-market interest rate. If revisions in the mortgage contract can lead to a reduction in the activities of FSCAs and Treasury subsidies more generally and a removal of deposit rate ceilings, a strong case can likely be made for the revisions.

The Model Simulations

The interim report by Jaffee, Modigliani and Kearl (JMK) I received was an unusually precise and candid discussion of the alternative methods of introducing different instruments into the MPS model and the possible difficulties and weaknesses inherent in the various methods. In contrast to the usual journal article, one could determine exactly what they proposed

[2]See Patric H. Hendershott and Kevin C. Villani, "The Impact of Governmental Financial Policies on Financial Markets and Housing Expenditures," presented at the Winter Meeting of the Econometric Society, San Francisco, December 1974.

Table 1

DEPOSIT FLOWS AND MORTGAGE PURCHASES
(billions of dollars)

	Deposit Inflows at SLAs and MSBs	Mortgage Purchases of SLAs, MSBs and FSCAs
1965	12.1	10.3
1966	6.1	7.4
1967	15.8	9.0
1968	11.6	10.3
1969	6.5	13.0
1970	15.3	13.2
1971	37.7	23.4
1972	42.7	32.2
1973	25.2	31.0

to do and all was not expected to be accompanied by wine and roses. The job was truly professional. I have since learned that this was an in-house working paper not meant for external consumption. I only hope that the final product does not degenerate into the customary obtuse and optimistic report.

Since the model simulations were not available to me before today, I will address myself to the general design of the experiments rather than the results. Two graduated-payment simulations were to be run. In the first the rate of graduation was set at the average inflation rate during the 1962-73 period; in the second the observed inflation rate during the previous year was employed. Neither of these seems to be the conceptually correct rate. The purpose of graduation is to make the initial mortgage payment independent of changes in the mortgage rate due to changes in the rate of inflation.[3] Since the inflation rate imbedded in the mortgage

[3]To see the impact of an inflation-induced rise in the mortgage rate on the initial payment, we rewrite (i) in footnote 1 as:

$$M = \frac{(1+u)Pg}{(1+R)} + \frac{(1+u)^2 Pg}{(1+R)^2} + \ldots + \frac{(1+u)^n Pg}{(1+R)^n},$$

where Pg is the initial graduated payment which is assumed to grow at rate u. Solving for Pg we obtain:

$$Pg = \frac{M}{\sum_{i=1}^{n} \left(\frac{1+u}{1+R}\right)^i} = \frac{M}{\sum_{i=1}^{n} \left(\frac{1}{1+\frac{R-u}{1+u}}\right)^i}$$

since $\frac{1+u}{1+R} = 1/\left(1+\frac{R-u}{1+u}\right)$. For large values of n and small values of u, equal changes in R and u have a negligible impact on Pg. Moreover, the payment on a similarly sized and maturity standard *fixed*-payment mortgage when R reflects no inflation is Pg.

rate should be the expected rate of the inflation over the life of the mortgage, the graduation rate should be equal to this rate. And as I understand it, the model generates such an expected rate based on past rates of inflation.

Two variable-rate simulations were also to be run. In the first, payments and interest were to be tied to the new issue "short-term" mortgage rate. In effect, the variable-rate mortgage is a one-period mortgage where the rate is closely tied to the commercial paper rate. In the second simulation, interest is still tied to the short-term mortgage rate, but the monthly payment varies with the more stable long-term mortgage rate. This reduces the risk to borrowers of large increases in payments.

A more useful experiment, I would think, would be to keep the monthly payment fixed entirely, simply adjusting the maturity of the mortgage as the short-term interest rate changes. This fixed-payment, variable-rate mortgage is, in fact, the only type of variable-rate mortgage that federally chartered SLAs are allowed to issue at the present time. Such an instrument eliminates the risk of varying payments to borrowers, while still allowing the interest income of lenders, and thus their interest expense, to move with market rates in general. Moreover, the default risk to lenders should not be that great. A sustained period of interest rate increases, such as we have experienced during the past two decades, is likely to be accompanied by accelerating inflation and thus considerable increases in prices of houses. Even if households were to repay none of the principal on their mortgage (their fixed payment were to be entirely interest), they would accumulate considerable equity in the house via inflation. And this is what is relevant to the lender.

The meaning of the long-term mortgage rate and the method by which it is determined is, I might add, somewhat uncertain. Since only variable-rate mortgages are assumed to be issued during the period, long-term conventional mortgages are virtually nonexistent by the end of the period. Further, since no conventional mortgages are issued and since the secondary market for mortgages is not active, few conventional mortgage transactions of any kind occur.

Before closing my discussion of the design of the experiments, I wish to comment on proposed modifications of the deposit rate-setting equations. If savings institutions purchase only the new short-term variable-rate mortgages and issue only one-period deposits and if savings institutions are profit-maximizers, then it seems appropriate to tie the deposit rate to the current short-term mortgage rate. The purchases are so limited by assumption, but we know that the liabilities of these institutions have been lengthened considerably in the last decade in an attempt to better match the maturity of assets and liabilities of SLAs. Over half of SLA deposits are in special accounts, many of which have a maturity of four years or more. Thus the deposit rate should still depend on past, as well as the current, mortgage rates. The appropriateness of the profit-maximizing assumption is also questionable. Well over half of SLA and almost all of MSB deposits are at mutual institutions that are legally

required to pay virtually all of their income out as interest to depositors. It would be better to assume that nonbank institutions generally set deposit rates so as to equate average, not marginal, revenue and costs. Such behavior easily explains the observed long distributed lags on asset yields in most rate-setting equations. Moreover, given that conventional mortgages are assumed to coexist with the new variable-rate mortgage, a deposit rate equation based on *average* revenues and costs include past conventional mortgage rates (RM) as well as current and past new variable-rate mortgage rates (RMS).[4]

Whether or not one believes the results of the simulations depends on one's confidence in the underlying financial model as well as in the ingenuity of the authors in manipulating the model to reflect the introduction of the new instrument. While the ingenuity of the authors is beyond dispute, my confidence in the underlying model is limited. First, I have doubts about the workings of the mortgage market. For one thing, the exogenous treatment of FHLB advances and home mortgage purchases by FSCAs seems inappropriate. Advances are more determined by the endogenous desires of SLAs than by the FHLBs, and FSCA mortgage purchases are clearly responsive to developments in the home mortgage market.[5] For another, the mortgage market is defined broadly to include multifamily and even commercial and farm mortgages. Thus substitution between home and other mortgages has no impact on the home mortgage rate.[6] Even more discouraging are the unreasonable simulation results obtained by Jaffee himself. A purchase of mortgages by FSCAs leads the private financial intermediaries to sell more mortgages than were purchased.[7] Not only does this seem unreasonable by itself, it implies a reduction in the supply of mortgages in the face of a decline in the mortgage rate. Second, the failure of changes in relative security supplies to have *any* impact on the term-structure of interest rates in the MPS model is disturbing. The substitution of a new short-term mortgage instrument for the present long-term one is equivalent to a continuing "debt-management" operation of gigantic proportions. One would expect short-term rates (commercial paper, Treasury bill) to rise significantly relative to long

[4]An appropriate equation might be:

$$RD_t = \alpha_1 \Sigma_i w_i RM_{t-i} + \alpha_2 \Sigma_j w_j RMS_{t-j} - \alpha_3;\ t=0, 1, \ldots n,$$

where $\Sigma w_i = \Sigma w_j = 1$, $\alpha_1 + \alpha_2 = 1$ ($\alpha_1, \alpha_2 > 0$), and α_1 declines over time, reflecting the declining importance of conventionals in the portfolios of the institutions.

[5]Hendershott and Villani, *op. cit.*

[6]This is particularly bothersome for analysis of life insurance companies which liquidated $8 billion of home mortgages in the 1967-72 period, while purchasing $20 billion of other mortgages. The all-inclusive definition of the mortgage market also leads one to ask why the mortgage stock does not depend on components of capital other than housing.

[7]Dwight M. Jaffee, "An Econometric Model of the Mortgage Market," Chapter 5 in Gramlich and Jaffee (eds.), *Savings Deposits, Mortgages, and Housing* (Lexington: D.C. Heath and Company, 1972) pp. 170-72.

rates (corporate, municipal). Further, since interest payments on the variable-rate mortgage are effectively tied to the commercial paper rate, they would be significantly greater. Because the relation between long and short rates is purely "expectational" in form in the MPS model, the debt-management effect on interest rates and the resulting impact on interest payments of variable-rate mortgages will be missed entirely, even in the general equilibrium or total model simulations in which the commercial paper and corporate rates are allowed to vary. Analysis of the effects of introducing new mortgage instruments in the context of alternative financial models would be useful.

Tax and Regulatory Problems Posed by Alternative Nonstandard Mortgages

Daniel M. Holland*

I. INTRODUCTION

This report deals with the income tax and regulatory aspects of alternative mortgage instruments. It emphasizes the identification of major issues and problems and the broad lines on which solutions to them might be worked out. It does not pretend to cover the whole range of tax and regulatory considerations that must be faced in designing and implementing the mortgage contracts discussed in the preceding chapters. The objective, rather, has been to identify the major questions alternative mortgages would pose in the context of current law and regulations, and to point out the modifications in mortgage design and/or changes in tax law and various regulations that might be required in implementing these contracts.

There are three primary types of issues:

1. Those related to income taxation.
2. Those related to interest rate limitations.
3. Those related to other regulatory features of mortgage contracts and the financial institutions that offer them.

Of these three areas, particular attention is paid to income taxation which is one of the basic elements of the "rules of the game" in our society. With the interest component of standard mortgages deductible in computing taxable income, alternative mortgages would be severely disadvantaged if they did not receive similar treatment.[1]

*Professor of Finance, Massachusetts Institute of Technology. The author wishes to thank William Andrews, Donald Lessard and Gary Schaberg for their continued interest, guidance and instruction during the preparation of this paper. They have, of course, no hand in the errors of fact or judgment that remain, and do not necessarily agree with the conclusions reached or suggestions made herein. The author is pleased also to acknowledge the advice of: Harvey Berger, Elliott Carr, Richard Cohn, Walter Ericson, James Freeman, Richard Glennon, John Kirk, Saul Klaman, Oliver Oldman, David Pustilnik, Eli Shapiro, Stanley Surrey, and Kenneth Thygerson.

[1]While it has been argued that homeowners enjoy a substantial tax "break" in the nontaxability of the income from their investment, and, therefore do not need the additional boon of mortgage interest deductibility, this point is not relevant to a comparison of the attractiveness of alternative mortgage contracts relative to the standard mortgage whose interest payments are deductible by the homeowner.

From its inception the income tax has been a levy on nominal income (money income).[2] While a tax based on money income is sorely tried by inflation as brisk and protracted as that of the most recent five years, it does not appear that a shift to a real income base is imminent. Moreover, even were the base to be changed to "real" income, the experience of countries most comparable to the United States that have adjusted their income tax for inflation, Canada for example, suggests that the adjustment would be limited to current year's income via indexation of rate brackets and exemptions, without tackling the more difficult task of indexing financial claims (and bringing into account only real capital gains and losses) which would require an additional adjustment.[3] And it is this more complete adjustment that would be required for price-level-adjusted mortgages, and other nonstandard mortgages that involve similar adjustments. Therefore, since the monetary definition of taxable income is likely to persist, we investigate the feasibility of alternative mortgage arrangements under present income tax law and regulation.

However, were the United States ever to adopt thorough-going indexation of the income tax, as in Brazil for example, tax accounting for nonstandard mortgages, PLAMs in particular, would be more straightforward and simpler than the procedures outlined below for our present money income tax base.

The section that follows is concerned with income tax issues. Section III deals with interest rate limitations incorporated in usury laws, and Section IV takes up some other regulatory issues.

II. TAX TREATMENT OF NONSTANDARD MORTGAGE CONTRACTS

Introduction

Three main classes of alternative mortgages are considered in this section.

1. Price-level-adjusted mortgage (PLAM), which incorporates a real interest rate (one which incorporates no premium for anticipated inflation) but has its outstanding principal adjusted in line with changes in some price level index. Therefore, nominal PLAM payments change over

[2]The decision in Bates v. United States [108 F. 2d 407 (7th Cir. 1939), cert. denied, 309 U.S. 666 (1940)] is most explicit on this point. To the taxpayer's argument that no capital gain was enjoyed (and no capital gains tax liability was, therefore, due) on the *nominal* gain he enjoyed on a security purchased prior to the devaluation in 1934, the court held that purchasing power was not a relevant consideration for a nominal income tax: "The standard unit of computation is the money dollar, an abstract unit of account. That standard unit of money has not changed in money value throughout the existence of our monetary system." (Idem at 408.)

[3]See "Inflation and the Federal Income Tax," *Yale Law Journal,* Vol. 82, pp. 716-744, and Roger Brinner, "Inflation, Deferral and the Neutral Taxation of Capital Gains," *National Tax Journal,* December, 1973, pp. 565-573.

time with changes in the index used so as to maintain a constant real payment. For our purposes, it is convenient to view the PLAM as incorporating a nominal rate equal to the real contract rate plus the percentage price change in each period.

2. Variable-rate mortgage (VRM), the interest component of which is determined by a charge dependent on an interest rate index. Scheduled money payments are equal over the life of the mortgage, but are recomputed whenever the interest rate is changed. Therefore, payments vary with the interest rate.

3. Graduated-payment mortgage (GPM), which incorporates a nominal interest rate which may be fixed for the life of the mortgage or varied periodically as with the VRM, but has its *payment* calculated at each point in time as though it were a PLAM with a fixed maturity.[4] Therefore, the GPM payments will be adjusted over time by the difference between the implicit real rate and the current money interest rate. This, in general, will be close to the change in the price level, but not exactly the same.[5]

Illustrative examples for all three classes appear in Table 1. The PLAM appears to cover all the tax complications that face a VRM as well as those that a GPM would have to reckon with. Therefore the discussion that follows concentrates on the PLAM by way of specifics, but its conclusions are applicable to all three classes of nonstandard mortgages.

A. *Standard Mortgage (SM)*

To help in identifying the major tax questions that alternative mortgage instruments would pose, it is useful to contrast them with the standard mortgage (SM) that is the predominant arrangement in residential finance.

Under the SM the loan obtained by the mortgagor is amortized by a series of payments (usually monthly, but taken to be annual for simplicity, in our examples in Table 1) of the same dollar amount each period, with the interest component declining in successive periods and the principal portion rising. The stream of monthly payments has a present value, computed at the interest rate specified in the contract, equal to the initial principal of the loan.

The interest component of each payment is deductible by the homeowner in computing taxable income and reportable for tax as interest income by the lender. The 30 annual payments of $1,453 under the SM of Table 1 have a present value of $30,000 when discounted at 6 percent which is the interest rate applying to the contract. Of the $1,453 payment at the end of the first year, $1,200 is interest and the remainder, $253, goes toward the reduction of principal. The borrower would deduct

[4]In the discussion that follows, the GPM incorporates the same variable interest rate as the VRM, i.e., it is the constant-payment-factor VRM discussed in earlier papers.

[5]Cohn and Fischer discuss an alternative GPM where payments are adjusted precisely in accordance with changes in price level. This mechanism requires a variable maturity.

Table 1

EXAMPLES OF COMPUTATION OF ANNUAL MORTGAGE PAYMENTS
UNDER CONVENTIONAL MORTGAGE AND THREE ALTERNATIVE TYPES*

Year	1	2	3	4
Real Interest Rate, r	3%	3%	3%	3%
Rate of Inflation, q	3%	5%	5%	4%
Nominal Interest Rate, i	6%	8%	8%	7%
Years to Maturity	30	29	28	27
Standard Mortgage (SM)				
Beginning Principal	20000.00	19747.00	19748.82	19194.55
plus Interest (6%)	1200.00	1184.82	1168.73	1151.67
less Annual Payment	1453.00	1453.00	1453.00	1453.00
Ending Principal	19747.00	19478.82	19194.55	18893.22
Price Level Adjusted Mortgage (PLAM)				
Beginning Principal	2000.00	20179.61	20742.33	21296.29
plus Interest (3%)	600.00	605.39	622.27	638.89
plus Revaluation of Principal for Inflation	600.00	1008.98	1037.12	851.85
less Payment	1020.39	1051.65	1105.43	1162.02
Ending Principal	20179.61	20742.33	21296.29	21625.01
Variable-Rate Mortgage (VRM)				
Beginning Principal	20000.00	19747.00	19557.06	19351.93
plus Interest (Nominal Rate)	1200.00	1579.76	1564.57	1354.64
less Annual Payment	1453.00	1769.70	1769.70	1614.45
Ending Principal	19747.00	19557.06	19351.93	19092.12
Constant-Payment-Factor Variable-Rate Mortgage				
Beginning Principal	20000.00	20179.60	20742.30	21296.25
plus Interest (Nominal Rate)	1200.00	1614.38	1659.39	1490.74
less Annual Payment	1020.39	1051.65	1105.43	1162.02
Ending Principal	20179.61	20742.33	21296.29	21625.01

*See Lessard and Modigliani for specific assumptions used in calculations.

$1,200 of interest from taxable income; the mortgagee would report $1,200 of interest for income tax purposes. At the beginning of the second year, the homeowner owes the lender $19,747 on which he pays interest at the end of that year of $1,184.82, leaving $268.18 for repayment of principal, etc.

Note particularly that under the SM, the payment scheduled to be made (once a year in our example) is greater than the interest charge on the loan in that period. The homeowner will always have paid to the lender more than the full amount of interest incurred under the contract over that period and, therefore, he can deduct interest charges of that year in full in determining taxable income. This dovetailing of scheduled payments and interest charges inherent in the design of the SM will not, in general, characterize a PLAM, VRM, GPM or any other mortgage for which the current payment is not tied directly to the current interest rate.[6] Payment as scheduled could fall short of "interest due" alone. Would this pose serious difficulties under the Federal income tax, that would preclude the use of such mortgages, or, alternatively, require major modifications of the tax? Our conclusion, developed at length below is "probably not." It appears quite reasonable to expect that those alternative forms of mortgage contract could be accommodated under current income tax law and practice without undue strain. We emphasize *likelihood,* not *certainty.* Nothing would be certain in this connection until the IRS ruled favorably on it. But the prospects appear sufficiently good for a favorable ruling to support the view that alternative mortgage instruments could be accommodated under present income tax law and practice.

B. *Price-Level-Adjusted Mortgage (PLAM)*

Under the PLAM used as an illustration in Table 1 a modest interest rate, 3 percent in this instance, would be charged on outstanding principal, and additional interest (a positive or negative adjustment) would be due as determined by multiplying the outstanding principal by the change in a specified price index (the CPI in this example). At the start of the year the annual payments required to amortize the mortgage over the remainder of its life (constant nominal interest rate of 3 percent) would be calculated, and this amount would be the payment scheduled to be made at the end of that year. The mortgage document would set forth in detail the formula for determining the interest due under the contract each period. It is reasonable to hold that interest determined as explained above would meet the IRS requirements of interest as payment for the "cost of

[6]While it has been suggested that mortgages involving variable interest rates (or their equivalent) could maintain a constant money payment when the rate rose by extending the term of the contract, this procedure would face two difficulties. For one thing, it could run up against the 30-year term maximum permitted on FHLB mortgages. But, more fundamentally, interest rate changes could quite conceivably be so high that constant nominal annual payments would fall short of the interest due each period, and therefore, the mortgage would not be amortized no matter how long the period over which payments were extended.

money unconditionally owed," and, thus, would be a deductible expense to the borrower and interest income to the lender.[7]

In the PLAM example of Table 1, the payment scheduled under the mortgage at the end of the first year is $1,020.39 which is the level payment on a $20,000 mortgage for 30 years at 3 percent. It is convenient for the borrower to know for certain the next payment required under the contract, and it is also convenient to help in easing the transition to a higher periodic payment (if that should be required) to lag the interest adjustment. Therefore, the payment due at the end of the period is that determined by the interest rate in effect at the start of the period. Thus, the initial payment required under the mortgage is the $1,020.39 as determined at the start of the contract. However, under the formula for computing interest under the contract, this payment would be insufficient to cover interest actually charged over the first year. Specifically the interest obligation incurred over the year is calculated at 3 percent of $20,000 plus an additional amount determined by multiplying the outstanding principal by the inflation rate, which in the example in Table 1 is taken to be 3 percent.[8] Summing 3 percent of $20,000 (= $600.00), which is the adjustment of principal for inflation and 3 percent of $20,000 (= $600.00) which is the portion of interest due to the constant 3 percent specified in the contract, yields an interest total for the first year of $1,200.00 which is $179.61 *greater* than the total payments made at the end of that year.

Here, then, is a complication not encountered in the conventional mortgage, viz., the interest charge in a given period may exceed the payment scheduled for that period. This result follows from the lagged adjustment between scheduled payments and interest obligation incurred over a period. Therefore, obviously, one way of avoiding the problem would be to coordinate the interest incurred and the scheduled payment chronologically. However, it suits the convenience of the borrower not to do so, since the lag gives him certainty as to the next payment due, and "smooths" the stream of payments he is called on to make. Moreover, the ability to incorporate chronologically divergent schedules of payments and obligations makes for greater flexibility in mortgage design, and thus is one of the areas of concern for our study.[9] Indeed, a divergence between "obligations" and payments is built into the PLAM and the GPM by design. (See the section on the constant-payment-factor VRM below for more on this point.)

[7]See, for example, D. Bruce Johnstone, *New Patterns for College Lending: Income Contingent Loans,* (Columbia University Press, New York and London, 1972), p. 174.

[8]This is as if the price level index used in making the adjustment rose from 100 at the start of year one to 103 at its end.

[9]For this reason, procedures for handling the divergence between interest obligation and interest payment are analyzed in what follows. However, were the primary concern simply to prevent such a divergence, for a PLAM it could be accomplished simply by lagging the interest adjustment. In this case the mortgage contract would provide that for determining the payment due at the end of the first year the interest rate shall be 3 percent plus the rate of inflation experienced in the prior year, and so on, for each ensuing year.

To return to the example, the difference between the scheduled payment of $1,020.39 and the interest due of $1,200.00 would be considered additional borrowing amounting to $179.61. While the mortgagee, on the accrual basis, would report $1,200.00 of interest, the homeowner, typically on the cash basis, would be entitled to deduct for income tax purposes in year two only that interest he is considered to have "paid," which would be $1,020.39. A cash basis taxpayer is not considered to have "paid" the interest on a loan where payment is made with his own note. To be deductible the payment must be in cash or its equivalent.[10] At the end of year one, then, in the homeowner's books would be two liabilities which aggregate to $20,179.61 — the principal outstanding at the start of the year, $20,000, and the addition to principal, on the score of interest incurred over the period but not paid amounting to $179.61. It would be better practice and more helpful in preparing tax returns in ensuing years to keep separate running tabulations of the original principal and additions to it because of an interest liability incurred but not yet paid.[11] This result — an increase in principal in excess of the amount initially contracted for — illustrates the point aptly made by Norman Ture about the VRM (but equally applicable to the PLAM) when he notes that it "is not a unique or entirely novel type of mortgage loan. It is properly viewed, instead, as one variant of a generic type of renegotiable instrument, in which the lender's authority to change terms is stipulated in the original contract, thus avoiding the need for the execution of a new one as the occasions for such changes arise."[12]

In principle, no additional complications would be posed should the interest charge in the next succeeding year again exceed the payment scheduled for that year. Following the usual convention (which applies in the absence of a specific provision to the contrary in the contract) the payment would be applied first against accumulated interest of the preceding year and the remainder would go toward payment of the current year's interest.[13] Maintaining separate accounts for original principal and

[10]See Rev. Rul: 70-647, 1970-2 C.B. 38 and cases cited therein.

[11]Commerce Clearing House, *Standard Federal Reporter* recommends that "because the lender's records do not indicate when and how much interest is actually paid by the individual for purposes of deduction under section 163 of the Code, it is incumbent on the individual to keep his own record of loans, interest and payments." (See 1974, Volume 2, 14.160335, p. 19,018.) While it is desirable for the mortgagor to do so, it is not clear that it would be absolutely imperative in this case, since the information now generally provided by banks to mortgagors could be expanded very easily to provide the additional records the homeowners need. And it would be helpful for banks to do so, as many homeowners have no records other than those the bank furnishes them.

[12]*Variable Rate Mortgages: Issues and Prospects,* a report prepared for the United States League of Savings and Loan Association by Norman Ture, Inc., August 30, 1974, p. 5.

[13]While this is the generally accepted convention it would be wise to avoid any possibility of ambiguity and incorporate a statement to this effect in the mortgage contract, stating specifically that all payments are considered first to be made against interest and then principal.

additional debt because of interest accrued but not yet paid would facilitate crediting of next year's payment first against accumulated interest and then against principal.

Since it is possible for the annual interest to exceed the annual payment over a run of years, it appears that there might be a danger that the PLAM (and it applies to the constant-payment-factor VRM or any other GPM and under some circumstances the VRM, too) would be considered to be an equity position rather than a debt since the initial amount borrowed is not being repaid. If this were to be the interpretation of the IRS or the tax court, the homeowner's payments under the arrangement would not be interest, deductible in computing taxable income, but a rental payment that would not be deductible. But this is not a real problem. A mortgage contract, for a specified number of years, by definition calls for repayment of principal at some specified period (with the final payment a "balloon"), and is, therefore, not likely to be considered anything other than a debt. Thus, for example, interest paid in the current year, although accrued over the ten prior years (and never charged on the books before the current year) was held deductible in the current year.[14]

Reverting to our example, the PLAM of Table 1, as far as the mortgagee (the bank or other financial institution) is concerned, at the end of the first year (start of the second) the basis would be $20,179.61 resulting from the addition of the unpaid interest to the previously existing principal. The annual level premium on a mortgage of $20,179.61 at 3 percent for 29 years is $1,051.65, which would be the payment scheduled to be made at the end of the second year.

In year two, applying the rule that unless expressly agreed to the contrary, payments on a debt shall be considered to apply first to interest and then to principal (or, as recommended, just to be safe, the contract have a provision that so specifies) the homeowner would be entitled to an interest deduction of $1,051.65 (equal to that portion of last year's interest incurred but not paid in the preceding year of $179.61 plus $872.04 of year two's interest charge). The total interest charge in year two would come to $1,614.37.[15] Therefore the mortgagor would carry over into year three, $742.03 of interest incurred in year two, but not taken as a deduction in that year. Finally, with the interest charge totalling $1,614.37 in year two, and aggregate payments of $1,051.65 made at the end of that year, outstanding principal will rise by the excess of interest over payments or by $562.72 i.e., from $20,179.61 to $20,742.33.

[14]Jungkind Phot Supply Co. v. Rennmel, (DC), 1926. (It was not apparent in this case whether the taxpayer was on the cash or accrual basis.)

[15]Computed as follows:

Nominal interest rate:	a) 3% ($20,179.61) = $605.39
Interest via inflation adjustment:	b) (5% x $20,179.61 - ($1,051.65 - $605.39)) = $1,008.98
Total interest:	c) $605.39 + $1,008.98 = $1,614.37

While the suggested procedure, outlined in the last several paragraphs, might appear to involve homeowners in some rather complicated record-keeping — viz., a running tabulation with annual indexing of interest due ("obligated") but not paid and, therefore, not taken as a tax deduction — most mortgage records are kept and processed by financial institutions, which have information systems that could easily handle this order of complexity. Presently, for standard mortgages the interest and principal components of the current payment, starting and ending principal, and payment due next period are all computed by the lender, and the information is sent to the homeowner monthly.

The mortgagor need not defer the interest deduction in the manner just described, however. He could if he wished (and the bank or some other lender were willing) borrow additionally from the bank adding to his principal (or other debt) prior to the date the payment was due, take the borrowed money into his checking account, and at a later date pay the bank the full amount of interest due in the current year. Specifically with reference to our illustration, before the end of year one he could borrow an additional $179.61 (raising his principal to $20,179.61) and put it into his checking account. At the end of year one he would give the bank a check for $1,200.00, thus paying the interest of that year in full, and putting himself in a position to take the full payment as an interest deduction in that year. The bank would report interest of $1,200.00, the same as if the mortgagor had deferred a portion of the interest due, and the bank's basis would be $20,179.61 which is also the same as it would be had the mortgagor deferred paying a portion of the current year's interest.[16]

The tax law appears quite flexible. The mortgagor, being on a cash basis, could defer a portion of the interest or take the interest deduction in full currently. This is a specific illustration of the general point that follows from the fact that "the increasing of a primary debt obligation to meet an interest liability is not considered to be a payment of interest for purposes of tax deduction."[17] Thus a taxpayer on the cash basis has "free choice to make payment or delay payment of interest for tax purposes. Given the economic opportunity and availability of credit, a taxpayer can choose to increase a bank note by the amount of the principal due plus accrued interest liability and thereby delay the deduction until a future taxable year. In the alternative, the taxpayer can have the bank increase the amount of the loan and credit taxpayer's account and the taxpayer

[16]There is no inconsistency in law in this asymmetrical treatment of the borrower and the lender. As Kanter notes ". . . unlike many other areas of tax law, the treatments of the two sides of the transaction are not always identical and the proper treatment of the income receipt by the lender may well be on an accrual basis, while that of the borrower or debtor is on the cash basis; these are not inconsistent." (Burton Kanter, "The Interest Deduction: When and How Does It Work," *26th Annual New York University Institute on Taxation* (1968), p. 91).

[17]*Ibid.*, p. 90.

can separately issue a check against his personal funds to meet the interest liability and thereby insure a current deduction."[18]

To be sure the mortgagor will have to pay due regard to the *form* of the transaction. That is why he was described above as borrowing *before* the interest payment becomes due, and taking the proceeds of the additional loan into his checking account prior to payment.[19]

But while this option is available to the homeowner, it is open to question whether many would choose it. The game may not be worth the candle. Assuming, for simplicity, that the mortgagor's tax bracket would be the same in both years, his net advantage in choosing the loan and payment option is the interest on the tax saving (due to interest deductibility) that would otherwise be postponed to the next year. Thus a mortgagor in the 30 percent bracket who had an additional $179.61 of deductible interest would get a tax reduction of $53.88 a year earlier. With the interest rate at 6 percent this is worth $3.23. Certainly not a large sum; and further, quite possibly, this example overstates the tax saving, since he may be in a higher bracket next year, which would make the deferral of the interest deduction less of a penalty. There is no need to belabor the point. The relevant magnitudes are such that the taxpayer stands to gain relatively little by arranging an explicit additional loan and "paying" the interest in full. Most mortgagors would probably defer the payment in those years where interest exceeded scheduled payments, and this would be simpler for all concerned. But those who wanted to take the deduction in full currently could arrange to do so without stretching the tax law.

C. *Variable-Rate Mortgage (VRM)*

The discussion in the preceding section holds in general for VRMs as well.

Turning to the example in Table 1, with the VRM taken out in the first instance at 6 percent, the payment due at the end of the year would be the same as in the SM for 30 years at 6 percent. And, as with the conventional mortgage, of the $1,453 payment to the mortgagee made at the end of year one, $1,200 would be interest reported as income by the bank and deductible by the mortgagor, and $253 would go toward reducing

[18] *Ibid.*, pp. 90-91.

[19] Kanter cites two cases that illustrate the importance of the form in which the transaction is cast. Both appear similar in substance, but differ in form. And under one interest was not deductible, while under the other it was. In the nondeductible case the taxpayer applied for an increase in the loan on his property, which additional loan when granted was paid out in separate checks, one for the principal payable to him, the other by the financial intermediary for the interest payable to itself. The Tax Court held this arrangement to be essentially the renewal of the note for an amount including the interest that had accrued. In the other case, the cash basis taxpayer owed $200,000 together with interest. He arranged for an additional loan prior to the date the interest payment was due, had the proceeds transferred to his account and then, at the appropriate time, "paid" the interest. He was held to be entitled to deduct the interest in full. (p. 92)

principal. In the second year, because the pace of inflation has stepped up to 5 percent, the application of a nominal rate of 8 percent to the outstanding principal of the loan is required. Interest at 8 percent on principal of $19,747 comes to $1,579.76. However, the payment also is adjusted upward to $1,769.70.

D. *Graduated-Payment Mortgage (GPM)*

The example under this category in Table 1, which is the study's "preferred" arrangement (see preceding sections of this volume), is a particular version of this general class which embodies features of both a PLAM and a VRM. It is the constant-payment-factor variable-rate mortgage. As with a VRM, the interest *charges* on the outstanding principal would vary over time with market rates. But this variable interest charge would have relatively little impact on monthly payments since these are escalated (upward or downward) according to the difference between the current interest rate and the implicit real rate. This means that although payments would rise over time in money terms, they would remain roughly constant in terms of purchasing power (depending on the index).[20] And, in addition, under this arrangement it is possible for the periodic payments (annual in our example, but monthly in practice) to start at a considerably lower level than is required under the standard mortgage in a period of high interest rates and inflation.

A divergence between the amount of interest the homeowner is "obligated for" and the amount of interest included in his periodic payment is inherent in the design of this arrangement. But this matter has already been taken up at length above in the discussion of the PLAM, and need not be repeated here. No new issues of principle or practice are posed on this score with respect to the GPM.

Since a difference between interest due and interest paid is built into this version of the GPM, this gap would tend to be more pronounced and more protracted than the discussion of the PLAM example would suggest. Therefore, more homeowners might want to arrange to borrow and pay the interest each year to get the full deduction. Thus it might be desirable for the lending institution to formalize this possibility by providing a line of credit for a separate account for each GPM mortgagor that could be used for this purpose.

E. *Decline in the Price Index*

Tax consequences of sharp declines in the price index (CPI or whatever else is chosen) pose an additional problem for PLAMs, because a decline greater than the constant nominal rate of the contract (3 percent in our example) would lead to "negative" interest for the period. While a fall in the CPI (or any other index that could reasonably be used as a basis

[20]As noted in the introduction, an alternative form of the GPM would involve payments tied directly to the price level and therefore, not influenced by current interest rates. However, it would of necessity have a variable maturity.

for adjusting principal) would be expected to occur less frequently (and be less pronounced) than a rise, it could happen, so the tax accounting consequences thereof must be faced.

With reference to the PLAM of Table 1, assume that instead of increasing by 3 percent in year one, the index had *declined* by 10 percent. The scheduled payment of $1,020.39 (of which $600 was interest on the $20,000 initially borrowed) would be subtracted from an adjusted principal of $18,000 (.9 x $20,000). Thus, the homeowner would owe the bank only $16,979.61. If the homeowner chose this occasion to prepay his mortgage (and assuming no prepayment penalty to keep the example simple) he would in effect be cancelling an indebtedness of $20,000.00 with a payment of $18,000.00, and thereby realizing $20,000.00 of income.[21] The lender would report a loss of the same amount.

Suppose, however, that the mortgagor does not prepay, but simply carries on with the mortgage. Would the doctrine of constructive receipt apply with the consequence that income would be recognized at the time of the principal adjustment? Or would the reporting of income be deferred, to be taken into account, if relevant, in the final settlement when the mortgage is paid off in the regular course? The latter would be the more appropriate treatment for taxpayers on the cash basis, for it is only at prepayment or final payment that the income represented by this negative interest (if any) would be enjoyed when they pay off an obligation at less than its face amount. At this time the income would show up in the taxpayer's cash flow, and it would seem therefore to be the appropriate time to recognize it for tax purposes.

If the mortgage is not prepaid or closed out, the negative interest reflected in the downward adjustment of principal in response to a decline in the price index would probably not be considered income at the time the adjustment is made. The doctrine of constructive receipt would not seem to be applicable, for the same reason that it does not apply to the analagous situation of an increase in the cash surrender value of a life insurance policy. Constructive receipt applies when income could be realized unconditionally, without any loss, hardship, cost or change in underlying relations. But to enjoy the increase in cash surrender value of the insurance, the policy would, in fact, have to be surrendered. Analagously, then, for the PLAM, on a decline in the index, income should be recognized on prepayment or when the mortgage is closed out, but if the homeowner continues under the mortgage, recognition of income should be deferred. This is all the more likely to be the tax treatment since the "income" could be short-lived, disappearing in the face of a price increase (or the accumulated nominal interest charge of ensuing periods) in the future.

[21] IRC Section 61 (a) (12). United States vs. Kirby Lumber Co., 284 U.S. 1 (1931).

For homeowners who remained under the PLAM when principal was adjusted for a decline in the price level, if recognition of income is deferred as suggested, symmetry of treatment would require that the negative interest represented by the decline in the principal be netted against interest payments of succeeding years and that the taxpayer be permitted to deduct only the excess of these interest payments over the accumulation in the negative interest account. In other words, to the extent that the decline in principal exceeds the interest paid that year, a "negative interest" account should be set up and carried over into the following year. And in that next year interest would be deductible only to the extent of the excess of interest paid over the accumulated "negative" interest of preceeding years. The interest of ensuing years would not be deductible except to the extent paid and in excess of the "income" (negative interest) of earlier years.

The treatment suggested here seems reasonable and consonant with present law. However, it would be the better part of wisdom to spell it out in the mortgage contract. Thus, for example, it could be specifically provided that if the negative adjustment exceeds 3 percent (or whatever the constant annual interest rate is) the excess shall be carried over as a credit against the interest that may be deducted in future years.

While the borrower is characteristically on a cash basis, the lender would generally be on an accrual basis. Would the lender, then, report a regular loss, measured by the decline in principal, which resulted from the borrower's having to pay, in effect, a negative amount of interest? The answer is arguable, but appears to be "most probably not." Under the "all events" test in the accounting provisions of the Internal Revenue Code an accrual basis taxpayer cannot take a loss until all events are definite and certain. The IRS might well hold that this is a continuing arrangement until the end of the mortgage term, and that it cannot be determined whether there is a loss or not on this arrangement until the last payment has been made. On the other hand, the taxpayer could argue that he has to file a return on a yearly basis, and therefore must report income to the best of his ability.

While there is merit in both arguments, because of the inherent variability of PLAM annual interest charges, and the strong likelihood that sharp price level declines, which give rise to the problem, will be relatively infrequent events over the full term of the mortgage, we lean toward the view that the "all events" test would probably prevail.[22]

F. *Indexed Deposits*

For financial institutions PLAMs would be an asset that would permit the issuance of indexed liabilities, i.e., notes or deposits which would

[22] *Federal Tax Regulations, 1974,* § 1.446-1 [c(ii)] provide that ". . . deductions are allowable for the taxable year in which all the events have occurred which establish the fact of the liability giving rise to such deduction and the amount thereof can be determined with reasonable accuracy."

carry a specified and low rate of interest, say 2 or 3 percent, plus additional interest (positive or negative) as determined by the application of the percentage change in a price index to the amount on deposit. This arrangement should be attractive to savers in periods of inflation, and could serve to increase the supply of mortgage funds. We have not studied such deposits in depth. The brief discussion of their tax treatment, therefore, presents a course of action that seems "reasonable," but cannot be put forward as "likely" without more careful study.

As regards indexed deposits, the inflation adjustment in connection with price level increases would constitute interest income to the depositor when that adjustment is made — whether the depositor is on the cash or accrual basis — because of the doctrine of constructive receipt under which, for example, interest accruing on savings bank and savings and loan certificates over a period of years is taken into the depositor's income annually for tax purposes even though it is not paid out to him.

With respect to price level declines sufficiently severe for the negative interest determined thereby to be greater than the amount due on the score of the fixed nominal rate, the depositor might well be treated as is the purchaser of a security whose price has declined, i.e., it would be held that a realizable taxable event has not occurred.

Positive interest and negative interest would be treated differently. Positive interest would be a constructive receipt of income; negative interest would not be a deductible loss because a realizable taxable event had not occurred. If the depositor, however, closed out his account at this latter juncture, then the loss (negative interest) would be deductible.

On the other side, with the depositor suffering negative interest, the financial intermediary could be considered to have income, even though in future periods just the opposite might well occur. The difference between this treatment of deposits and that suggested above for PLAMs in the event of a decline in the price index (the "all events" doctrine) is that deposits are payable on demand, whereas the mortgage contract runs over a period of time.

III. USURY LAWS

Usury laws which establish interest-rate ceilings on the basis of tradition and legal norms and adjust to economic conditions slowly and imperfectly, could pose major difficulty for nonstandard mortgages.[23]

Without intending in any way to underestimate the importance of this obstacle and the need to study it further, the following general considerations appear to offer a measure of comfort.

[23]For a complete listing of usury laws by state see Norman N. Bowsher, "Usury Laws: Harmful When Effective," *Federal Reserve Bank of St. Louis Monthly Review*, August 1974, pp. 16-23.

". . . it is an established point of law that if payments are conditioned on future events (e.g., future income) and the minimum possible rate of interest is under the legal rate, the contract is not usurious merely because the maximum possible rate might exceed the legal rate. Presumably a plan can avoid conflict with usury laws if: (1) the relationship between actual interest rates and hypothetical incomes is deemed reasonable and actuarily sound; (2) borrowers know beforehand a range of possible interest rates corresponding to hypothetical income streams (which they must be told to comply with Federal truth-in-lending anyway); (3) the minimum — and probably the 'average expected' — rate of interest is within legal limits; and (4) the lender will not receive an overall rate of return in excess of the legal limit."[24]

For reasons more specifically related to the application of usury laws to mortgage contracts it appears that the alternative mortgage instruments studied in this report might well survive challenges based upon state usury laws. However, the particular nature of each state's laws and legal system makes it impossible to generalize with any certainty across the whole United States. Some states have already addressed themselves to the question of variable interest rates in mortgages.

For example, California Civil Code § 1916.5 regulates the use of variable interest rate clauses in mortgages. Any variable-rate mortgage fulfilling its requirements will survive judicial scrutiny. Other states, although not yet regulating VRMs as such, have statutes under which mortgages in whole or in part, are exempted from usury laws (or have more lenient laws applying to them). In Connecticut mortgages of $5,000 or more, secured by real property, are exempt from usury limits. Approximately 30 other states exempt FHA-insured home mortgages from their usury law. Thus in a majority of states the statutory trend is towards exempting mortgage interest rates from state usury laws.

In those states where mortgages have not been so exempted, nonstandard mortgages may be subject to attack under usury statutes. However, there are some solid legal grounds for their defense. The case of *Helm* v. *Jessie* 28 Ky 428 (1831) might be used in support of price level adjusted mortgages since it was held that where the *value* loaned and repaid are identical, no violation of usury statutes has occurred. This same line of reasoning could be used by analogy with respect to mortgages, under which the *value* of the interest plus principal collected remains the same.

A further argument in defense of nonstandard mortgages could be presented on the basis of the borrower and the public policy focus of usury laws. The alternative mortgages are clearly not intended as a vehicle for evading the usury laws. The absence of proof of usurious intent was held

[24]D. Bruce Johnstone, *New Patterns for College Lending: Income Contingent Loans*, Columbia University Press, 1972, pp. 171-72.

critical by the court in affirming a verdict for the obligee in *Stark* v. *Coffin,* 105 Mass. 328(1970) (cf. also *Rhodes* v. *Fullenwider,* 25, N.C. 415 (1843)).

Usury laws are designed to aid and protect the borrower; nonstandard mortgages it can be argued would aid the would-be borrower by making funds available to him that would otherwise not be forthcoming. Thus there appears to be strong public policy argument in favor of holding alternative mortgages not subject to usury laws. Since their existence could be beneficial to the mortgagee, it might be difficult for the court to rationalize striking them down under a law designed to aid the borrower.

An additional, but less convincing argument, can be based on the contingent nature of nonstandard mortgage arrangements. There is a line of cases in which it has been held that if payment of the *full* legal interest is subject to a contingency, the interest need not be limited by usury statutes. *Miley Petroleum Corp.* v. *Amerada Petroleum Corp.,* 63 P.2d 1210 (1936); but see *Jameson* v. *Warren,* 267 Pac. 372(1928). It may be possible to defend PLAMs and VRMs (whether payments are level or graduated) analagously since their interest is contingent on an independent occurrence (variations in the rate of inflation, etc.).

Conclusion

In brief summary, in states whose legislatures have come to grips with the problems of mortgage interest rates the resulting legislation has been of a type that would allow the implementation of alternative mortgages despite a general usury statute. In other states it would appear that nonstandard mortgages might be successfully defended from challenges under usury statutes through arguments based on 1) the *constant* value of the interest charged, 2) the intent of the mortgagor, 3) the public policy behind usury laws, or 4) the contingent nature of the interest charged.

IV. SOME ADDITIONAL REGULATORY PROBLEMS

With a number of different types of financial institutions each subject to a particular set of regulations offering mortgages, with a variety of regulatory bodies particular to each institution and/or a particular regulatory objective, and with the Federal Government and the 50 states both involved in the regulatory process, it is not surprising that a very large and complex set of regulations bear on mortgages.

Out of this set our discussion has singled out the Federal income tax as of paramount importance, and has taken up also, but in more perfunctory fashion, the usury laws. In this section we list and discuss briefly a few more regulatory problems relevant for nonstandard mortgages.

A. "*Truth-in-Lending*"

The Federal Consumer Credit Disclosure Act, 1968 ("Truth-in-Lending") includes the following among its provisions:

1. The lender must inform the borrower of the annual rate of interest to the nearest one-fourth of 1 percent [U.S. Code 15— § 1606(c)].

2. There must be a periodic disclosure, with each billing cycle, of the annual percentage rate of the total finance charge, the date by which payment must be made to avoid penalty, the outstanding balance, the total amount of interest, etc. [U.S. Code 15— § 1636(1-2), § 1637(a-b)].

In the general case, under nonstandard mortgages neither party can know at the start of each period what the interest charge will be over the period. Therefore, it appears that lenders would not be able in a strict sense at least, to carry out the "Truth-in-Lending" law requirements.[25]

But a strict interpretation may not be in order to serve the purposes of "truth-in-lending" legislation which are to permit borrowers, with full knowledge of costs, to make comparisons,[26] and to "shop for credit."[27] Therefore, a good faith effort on the part of the lender to show the borrower the costs of his mortgage under different contingencies might well be considered in compliance with the Federal "truth-in-lending law" (or the state versions where they applied).

In support of this conclusion, Johnstone cites the general example of college tuition loans whose pattern of repayment is contingent on the income of the borrower over the course of the loan, and notes specifically that for Yale's Tuition Postponement option a statement outlining the range of income possibilities and related interest charges has "been declared in full compliance with the Federal law."[28]

B. *Some Miscellaneous Points*

Finally we note a few other areas in which legal problems would arise with nonstandard mortgages. This is simply a miscellaneous listing, and does not claim to cover all remaining areas in which problems might be expected.

1. Various provisions that limit the maximum amount of a mortgage would present difficulties for nonstandard mortgages under the terms of which the amount of the principal could increase and exceed the legal limit.

Examples of such provisions at present are:

a). The maximum mortgage of $30,000 on one-family dwellings under FHA [Title II: Sec. 203(b)].

b). The requirement that federally chartered savings and loan associations may not make loans on security of one-family dwellings in amounts in excess of 95 percent of value. [FHLBB Revision of 1971, Sec. 545.6-1(a)(5)].

[25]Provisions of the various state laws are substantially similar to the Federal statutes.

[26]Burgess v. Charlottesville Savings and Loan Association C.A. Va. 1973 477 F.2nd 40.

[27]Mourning v. Family Publications Service, Inc. C.A. Fla. 1971, 449 F.2nd 235.

[28]D. Bruce Johnstone, *op. cit.*, p. 173.

2. In some states savings and loan association codes "provide that initial loan contract shall not provide for any subsequent monthly installment of interest and principal of an amount larger than any previous monthly installment with certain specified exceptions."[29] The upward adjustment in payments discussed in detail in the PLAM example earlier in this chapter would violate these code provisions.

3. In connection with the regulations applicable to the insurance of savings and loan accounts, the FSLIC Regulations (Section 561.16) define "slow loans" in such a way that the periodic adjustment of the interest charge under nonstandard mortgages would bring into the "slow loan" category "a contractionally delinquent loan which is less than two years old . . . even if the loan is only one day delinquent when the option to increase the rate is invoked. . . ."[30]

4. Bennewitz notes an additional problem area in connection with negotiability. A variable or contingent interest charge could make the mortgage "note non-negotiable under Sections 3-105 and 3-106 of the Uniform Commercial Code."[31] While this difficulty could be obviated in most jurisdictions by embodying the interest adjustment provision in the "mortgage as a covenant rather than in the note," in some jurisdictions (a small number) even this procedure would not make the mortgage negotiable.[32]

[29]Dallas J. Bennewitz, *Methods of Interest Adjustment,* United States Savings and Loan League, 1970, p. 6.

[30]*Ibid.,* p. 6. Bennewitz has an extended discussion of this point.

[31]*Ibid.,* p. 7.

[32]*Ibid.,* p. 8.

Discussion

Jeremiah Buckley*

I am neither an economist nor a mathematician, and I must confess that as we proceeded through some of the blackboard exercises yesterday afternoon, I began to wonder what I was going to be able to say to this group. And my embarrassment is further compounded by the fact that my fellow discussant on Professor Holland's paper is the man who wrote my law school text in tax law. Since I have not specialized in tax law since my graduation from law school, I think I would probably do better to leave the elucidation of this subject to Professors Holland and Surrey.

That leaves me with about a page and a half of Professor Holland's paper which deals with the subject of usury laws. I studied several law review articles on the subject of state usury laws, and I was unable to find any treatment of the subject of how usury laws would affect the legality of a mortgage contract involving a PLAM or a VRM. I did find an interesting article by James R. Cooper in *American Business Law Journal,* vol. 8, page 165, published in 1971. He makes an interesting observation regarding the 1969 credit crunch, which I thought I would share with you. It reads as follows: "In a recent study" — now remember, this was written in 1970 — "it was shown that homebuilding in the United States in the first half of 1969 fell to the second lowest level since World War II. This shortly followed the disastrous 1966 credit crunch. More importantly, the study showed that the decline in home building activity was concentrated in the nine states where buyers were prohibited by usury ceilings from paying more than 7 1/2 percent. There was no decline in the states where buyers were free to pay whatever interest rates the market required. It is socially significant that apartment building starts by corporate borrowers, on the other hand, were at an all-time high, 27 percent higher than in the previous record year; and apartments make up nearly 55 percent of urban housing starts. It is an economic reality that as interest rates rise they will eventually intersect with our relatively inflexible state usury laws." That information was contained in a study prepared for the Advanced Mortgage Corporation in Detroit, and I thought it might interest you.

If PLAMs and VRMs are to originate on a national basis, some may ask if it wouldn't be simpler for the Federal Government to override state usury laws, at least with respect to PLAMs and VRMs. The farthest the Congress has gone down the road to a Federal override of state usury laws was the enactment of Public Law 93-501 in October of last year.

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That act was passed at the urging of Senator Brock of Tennessee because of the problems created by the usury provisions of the Tennessee constitution which could not be quickly changed. The report on that bill states, "Title I of this Bill would amend the national housing act, the FDIC Act . . . to permit national banks, federally insured state chartered banks, savings and loan associations, savings banks and small business investment companies to charge interest on business and agricultural loans in the amounts of $25,000 or more, notwithstanding any state constitution or statute, at a rate of not more than 5 percent in excess of the discount rate on 90-day commercial paper in effect at the Federal Reserve bank in the Federal Reserve District in which that institution is located. The amendment under this Title will not apply to loans made after July 1, 1977. . . ." And then the report states "Home mortgage, consumer, and other interest rate ceilings established by any state would not be disturbed." That language is extremely important. I talked with Senator Brock's counsel on the Banking Committee, and he said that Senator Brock had to do a tremendous education job with the newspapers and others in Tennessee before he could propose a waiver of the state usury law with respect to business loans. I think that it would be politically unrealistic to expect any further changes, especially with respect to mortgage loans. I do not believe that the Congress will be inclined to override state usury ceilings with respect to mortgage loans, and that the usury problems that arise regarding PLAMs and VRMs will have to be resolved at the state level. You heard last night about Senator Proxmire's experience with a variable-rate mortgage and I have heard Congressman Patman go on for 45 minutes in one Conference Committee meeting preaching against variable-rate mortgages.

It must be kept in mind there is always the possibility that a Federal usury law or its equivalent would be enacted. For example in 1973, Congressman Harrington from our own Commonwealth of Massachusetts introduced HR 10160, a bill to amend the Economic Stabilization Act of 1970. Section 204 of that bill, which was never passed, provides as follows: "Notwithstanding any other provision of this act, a ceiling is imposed on all prices and interest rates at levels no higher than that prevailing on September 12, 1973. . . . Immediately, but not later than 60 days after the enactment of this section, the President shall by written order stating in full the considerations of his action, roll back prices and interest rates to levels lower than those prevailing on September 12, 1973." I don't expect that this type of legislation is going to be enacted in the 94th Congress, but if it were, the effect on variable-rate mortgages would of course be significant.

I'd like to turn briefly to the subject of Regulation Q. Regulation Q authority was extended in October of last year until December 31, 1975, and so its re-extension will have to be considered within the next 12 months. The Financial Institutions Act, which in the 93rd Congress had the number S2591, contained a provision for a five-year phase-out of Regulation Q, and this bill was reported by our Financial Institutions Subcommittee in the fall of the year. However, when the proponents of the

bill requested a full Banking Committee review before the end of the 93rd Congress, this stirred up the National Association of Home Builders who secured time to testify before the markup session on the proposed Act, specifically to testify against the phase-out of Regulation Q. After the Home Builders' testimony the bill was put aside without prejudice. However, it has become apparent that Regulation Q will not be phased out without a fight.

You may be interested to learn that the Norwegian plan was considered by the Senate Committee and an experiment along these lines by the Farmers Home Administration was authorized in the Senate version of the 1974 Housing Act. However, this provision was dropped in conference with the House Committee.

A variable-rate mortgage experiment with FHA-insured mortgages was also authorized in the 1974 Housing Act in the version that passed the Senate, but this provision was dropped in conference with the House.

I am told that the Federal Loan Bank Board would like to go ahead with the issuance of regulations regarding variable-rate mortgages. But I understand that there is an agreement with the Banking Committees of the House and Senate that these regulations will not become effective if there is substantial congressional opposition.

There is one question which occurred to me in the course of the conference which I would like to put to you for your consideration: what would be the role of mortgage insurance, either FHA or private, in connection with PLAMs and VRMs, and can the risks involved in such mortgages be actuarily determined? I don't know whether many thrift institutions would offer VRMs or PLAMs to moderate or middle income homebuyers unless they had mortgage insurance or very large downpayments.

Of course, other general questions occur to the person who works in the political world. For instance, listening to your discussion one gets the feeling that we're accepting inflation as inevitable. It's awfully difficult for a politician to say, "This is a great idea because it's a way of avoiding shortages of mortgage credit in times when we have terrible inflation." His constituents may ask, "Well why don't you address the problem of inflation?" And of course, when the politicians try to address the problem of inflation, they run into the problem of unemployment, and so forth. As you probably noticed, there are very few answers being offered with confidence from Washington. On the other hand, there is probably no consensus in Cambridge about what ought to be done.

I certainly would be happy to answer any questions you might have regarding congressional action on any of the proposals you are considering and I want to thank Professor Modigliani for inviting me to attend this Conference.

Discussion

Stanley Surrey*

Thank you very much. Mr. Buckley gave a disclaimer about knowing anything about tax law, and I'll give a disclaimer about knowing anything about usury law, regulatory law, economics, or anything else. As a matter of fact, since I'm on a sabbatical, I'm off duty on tax matters, and can give a disclaimer as to tax matters.

I'm not clear as to why the people who arranged this program left tax aspects to the last. Does everything build up to it, or is it just a minor detail? At least, however, it's wonderful to see an academic like Dan Holland struggling to maximize tax preference benefits for people in this world. He can really seek admission to the club of those who tailor real estate and other arrangements into attractive tax shelters, at least attractive on computer print-outs. He might do better if he contracted out this whole assignment to an investment house specializing in these tax shelters, who do seek to maximize interest deductions for their clients, and they might really sell this MIT instrument on that basis.

But seriously, I think it is right to have left the tax aspects to the end; and not because it's the grand climax, but for just the opposite reason. I think the real job in all of this, for those who are doing the research, is to tailor and work out the mortgage instrument that they want to meet the tasks or goals that should be assigned to such a mortgage instrument as an aspect of our housing policies and related policies. And I gather that that is what we have been debating for most of this time — just what the design of this mortgage instrument should be, what are all the alternative designs. As a lawyer listening to economists, I sense you're quite a long way from any final decisions on the appropriate design and actual mechanics of the mortgage instrument. Certainly there has not been a good deal of attention paid to the structural details of these particular instruments, but rather more to the theoretical and overall concepts. I am not criticizing that. All I am saying is that once the economists get the right answers as to what they want as to the mechanics, at least as right as any answer can be, then we can ask the question: What constraints must be considered to come from other worlds and other disciplines?

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What constraints come from the tax world, from the accounting world, from the regulatory world, and from the consumer understanding world? Obviously, the aspect of consumer understanding is important, so that the consumer can make rational choices. It seems to me that there is a need for research on this, with some analogies with respect to other complex financial choices such as insurance policies and how they have worked out in our society, so that we can learn something as to what can be done here to make any new mortgage instrument understandable to the consumer.

But back to the tax world. Overall, I doubt that the tax constraints are significant, which is the same conclusion that Professor Holland makes. Clearly in a tax world that gives a deduction to the consumer for mortgage interest, those who deal in mortgages and are selling houses want to make sure the deduction for interest is at least not lost or seriously reduced in any new type of instrument that is devised. But I doubt that there is a real problem here, and I imagine that the tax lawyers can readily handle any rationally designed instrument that the economists produce. Variable interest rate mortgages shouldn't give much of a problem. They exist today. The price level adjusted mortgages, as described in the optimum way yesterday by Professor Cohn if I understood him, seems to me not to be an adjustment of principal, but rather a way of seeing how best to vary the rate of interest. Hence we're still within the interest orbit, and we are adjusting the rate of interest, and we're not really affecting the principal. Dan Holland has talked about some rather complex situations that could arise if you get into a negative interest rate and so forth. But I don't think it's worth time really pursuing those matters at this stage. The real overall goal to keep in mind is, that whatever instrument is designed, as long as the amounts are properly and rationally identified — and the identification between principal and interest must be the same for the borrower and the lender — there is flexibility certainly as to how to arrange the stream of payments, how to divide between interest and principal. But as long as they're clearly identified, then I don't think there are any real tax problems in this area. So that I don't see any need at this stage to go into esoteric cases. You can get to the extremes, you can get to the case where the interest rate turns negative. Of course this does offer some new conceptual problems to tax lawyers. You might have to think of new ways of how to handle that, such as perhaps a carryforward of negative interest to offset positive interest, and other approaches. You can end up with some cases where the principal the person has to pay might be lower than he contracted to pay. We would then have to, as tax lawyers, see how to treat this cancellation of indebtedness. While Dan Holland said it would probably be treated as income, I think we'd pretty soon say, no, we'll treat it as a reduction in the cost of the asset that's been purchased with the mortgage, which is the house itself, which I think would be the more rational treatment.

But the point is that I can stand up here and give you a lot of esoteric tax talk and you would feel just the way I feel when the economists go to

the blackboard and put a lot of equations on the blackboard that I don't understand. Well, I can play the same game, too. I can give you a lot of sections of the Internal Revenue Code and a lot of cases and a lot of tax terms and you wouldn't be any the wiser. But there's no point to doing that right now.

As an aside, the tax reformers do want to reduce the preference being given today for the interest deduction. After all, it is a crazy world, in which we subsidize home ownership by giving the largest subsidies, in the tax system, to those people who are best-off in this world. Which is exactly what we do today, because obviously if you can deduct interest and you're in a 70 percent tax bracket, you're in a lot better position than if you can deduct interest and you're only in a 20 or 14 percent bracket, or you're a non-paying taxpayer and don't get any value from your interest deduction. You see, you have to keep in the back of your mind that the interest deduction which Dan Holland is trying to preserve is an interest deduction which tax reformers don't think very highly of as a method of subsidizing housing in the United States. It's quite possible that with increases in the standard deduction, fewer and fewer people will make the identification of this amount as interest, because they will simply be electing their standard deduction. There are tax reformers who want to reduce the amount of interest that can be deducted, restricting it to the principal residence and so forth. So I just want to acquaint you with that aspect of tax life and to recognize that we are dealing here with a subject which many people think is one of the very poor methods of subsidizing housing in the United States, as far as the interest deduction is concerned. But I suspect that the deduction will be around for some time, upside-down and crazy as it is.

We have heard from our Canadian friend about a similar crazy tax policy that other countries adopt. To say that the first thousand dollars of interest should be tax free and so forth is just simply giving an upside down bonus in view of the progressive rates of tax, and it seems to me that the Canadians wander around between rational direct subsidies and highly irrational tax subsidies.

Back to my main subject, we are essentially asking here how a tax system that is still based on nominal dollars should accommodate and treat an indexed instrument. We don't have much experience on that where the indexing begins to present complex problems, because we haven't had these problems arise under our tax system. We have been able to live with a tax system that is based on nominal dollars and we have been able to live with the rest of the world that is nominal. But when you ask how, while still keeping the tax system nominal, do you start working out its application to indexed instruments, then you are getting into a new world which we haven't been into yet. But I doubt that the mortgage indexing that we've talked about here will get that complex. I think, however, the research should explore not only how this would be related to the tax world but also how accountants who still live in a nominal world

would also treat these matters and how they would treat indexed mortgages. Now this does take us to a somewhat new twist because the accounting profession may soon go to an indexed world. The Financial Accounting Standards Board has a proposal that public corporations must offer two sets of accounts — one nominal and one indexed. The question would be, and I think it would be a useful aspect of research here, to see what, if any, would be the problems of accounting in this indexed mortgage area on both sides — both the borrower and the lender — and especially if the accounting itself becomes indexed which might well occur within a couple of years.

I haven't said much here about the tax problems of the lenders and my guess is that they can be solved once the lawyers for these institutions simply get to work and know what it is that they have to work on. I gather from talking to a few of the people here who work for these institutions, that none of their lawyers have thought about these problems at all. This is too far off in the future to really get down to the complex questions of what's ordinary gain and what's capital gain and when do you accrue and so forth. I repeat, if the economic and institutional solutions to the problem are rational, then I think rational tax treatment will follow in one way or another — whether you get the answer from the Internal Revenue Service giving an overall ruling on various types of indexed mortgages, whether you get it through regulations or whether you get it through legislation if it turns out that legislation is necessary. But obviously if institutions come to the conclusion that an indexed mortgage is necessary and useful in the United States, then the tax system is going to adjust and make sure it is a useful instrument. So that I don't think taxes are a constraint.

Another aspect to research, however, in this regard is how the indexed mortgage would look in a tax-indexed world. I spoke of an accounting indexed world, but one might have to think about a tax-indexed world especially if indexing is initiated as to capital assets. Obviously our tax system is still based on nominal dollars, but that is a matter that is being debated now and certain groups are seeking to index the tax system itself largely where it will help them. These are principally the investment houses and the Stock Exchange in respect to capital gains on the sale of securities. Here they would like to index the cost of these assets because it would reduce the capital gains. They forget about indexing the liabilities on the money borrowed to carry the securities. But in any event they are drifting to a consideration of the indexing of capital assets in the tax system, and consequently I think the research here should see whether there are any interrelationships if the tax system starts to index capital assets.

Consequently, all I can say is that it is desirable to continue to research the tax, accounting, and regulatory aspects, but it is easier and wiser to do so in the light of whatever the definitive mechanics and details are for the range of instruments that are deemed desirable. It would also probably be useful to look at the foreign tax and accounting experience

just to see how all of the various instruments that we described this morning are handled under the foreign tax systems and under foreign accounting systems. Certainly insofar as the lenders are concerned, the tax and accounting rules don't differ from one country to another. They are pretty standard. As far as the borrowers are concerned, some countries obviously do not give a deduction for consumer borrowing and therefore there is not a deduction for interest. On the other hand, it seems to me in some of these countries the borrowers must be commercial people and business people where they do get a deduction for interest, so therefore you would be able to research the foreign accounting and tax treatment on the borrowing side as well as on the lending side. I think that would be useful to do and I gather it apparently has not been done as a part of looking at the foreign experience.

Let me just say one non-tax word. I would hope there would be a study as to how an indexed mortgage with a rise in payment fits with all the other household expenses. In other words, if all other payments are rising, such as those with respect to children, education and other consumption desires, then what is the effect of changing the housing payment stream so that it also rises. I guess this really involves the relationship of these other expenses to inflation, and in the end may simply be an aspect of the clear articulation of just what choices are being offered to the consumer through the various mortgage instruments, so he can fit it in to whatever life pattern he thinks he will have with respect to his expenses and his income. But this as I said is a non-tax subject and my contract really doesn't commit me to raise non-tax subjects at this time.

Overview

Rudy Penner*

I would like to begin by saying that one has to be very appreciative of the enormous amount of work that went into this contract and the high quality level that was maintained, given the fantastic time constraints that we imposed on our contractors. However, Harris Friedman and I won't really know whether we spent the taxpayers' money wisely until we go back and run it through the Office of Management and Budget's management-by-objective system and count the number of good ideas per dollar. But, I suspect that the outcome will be somewhere in the range of Dwight Jaffee's Alpha.

One thing that we know for certain is that we have many unresolved issues per dollar. But better to have unresolved issues than to be unaware of their existence.

One thing that was said a number of times is that if capital markets were perfect, we wouldn't be here at all. Various mortgage forms would have already evolved and the issue would be moot. *And,* in fact, markets aren't so imperfect that we aren't already getting these new mortgage instruments. They have already started: we see the development of the short-run balloon note; we saw the California developments with variable rate mortgages in the last few days and these may be only the first of a flood of new kinds of instruments. Of course, I may be wrong; economists (especially housing economists) have been wrong a great deal this year. At a minimum we're guaranteed an experiment to see if American consumers like these new mortgage forms, either because they're relatively smart, as Franco suspects, or because they're relatively dumb, as Saul Klaman seemed to suggest yesterday. But the real policy issue is not whether we'll have them or not, but whether the various levels of government should alter their laws, regulations, and subsidy programs, to favor them or at least be neutral towards them. I don't think there's anyone here who claims that we should bar such innovations by fiat; nor do I think there's anyone here who would suggest that we should bias our regulations in favor of them. Rather, we should make those changes which would allow them to develop in a neutral context.

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One of the problems we face in a policy framework is whether any particular new instrument would add to the efficiency of the marketplace. Again, I think there's pretty firm agreement here that the efficiency of markets will be enhanced by giving the consumer a choice between more mortgage instruments. Much of the discussion, however, involves endogenous political responses that arise when you have different mortgage forms. For example, there has been considerable discussion about the political response in various countries whenever a particular type of mortgage has created serious problems for consumers. On the other hand, there hasn't been too much discussion of the political responses within the United States over the last year, when our markets have been in trouble for reasons which include, but are clearly not limited to, the level payment mortgage. I don't think there's been widespread realization of the extent of Federal Government intervention last year. One can say that the mortgage market for new houses in the $40,000 range and under has effectively been nationalized, since we created an inventory of commitments that would finance the present level of sales twice over.

Political responses are hard to predict, but let's admit for the sake of argument that when you consider political factors as endogenous, we still come to the conclusion that new mortgage forms will result in a higher level of efficiency. We still must face the problem that changes which increase the efficiency of the economy also have distributional implications. If the new mortgage is a good thing for certain types of borrowers, and commands more resources, say, to the home building sector, there will be fewer resources left elsewhere in the system for consumption or investment.

One thing we know about policy-making in Washington is that when you work with the Hill, it's much easier to stop an idea than to initiate one. One could go further to say that in a political environment it isn't important who actually loses, but rather who perceives that they will lose. This conference has brought to the surface some of the people who think that they would lose from the new mortgage form. When you talk about the losers, I think you have to differentiate between the long-run losers and those who would lose in this very difficult transition phase. Looking at the long run, Steve Rhode perceives that the losers would be the non-upwardly mobile poor, especially the minorities and the elderly. I have serious doubts about this; but I think the uncertainties are great enough that no one can reach any conclusion with certainty. In regard to the truly disadvantaged, the topic is essentially irrelevant. These groups are not in the home-buying market and they are not to any great extent savers. Of course, this view oversimplifies the problem, because it doesn't consider the full range of changes that take place in an economy in response to a change in technology or institutions.

However, I'm starting to sound too much like an academic economist. I want to stress a more fundamental point, that it would be a great tragedy to avoid change just because of the low probability that it might have some adverse distributional effect.

Turning from the long-run distributional effect, I think the transitional distributional effects are quantitatively more important and somewhat troublesome. If tomorrow we remove Regulation Q and create all sorts of new mortgage forms, it's likely that Saul Klaman and Ken Thygerson could not afford to come to the next conference where we would study the results of the policy change. The discussion last night clearly delineated the Reg Q dilemma, a dilemma that affects many things, in particular the whole issue of financial reform. To go cold turkey on Reg Q would lead to many adjustment problems, a euphemism for many people going broke. On the other hand, if we opt for a five-year or ten-year phase-out, I'm very concerned that at the end of that time, there would be a request for just one more fix, to save us from what is generally called ruinous competition. Obviously, we're not going to resolve this issue here; both the Treasury and HUD have been working very hard with the interested parties on this question in connection with the whole issue of financial reform.

Let me turn to a very different issue concerning the results of the study. I suppose that some of the most dangerous and most useful results came from the simulations that Dwight Jaffee ran. I'm in accord with Professor Duesenberry that one of the most important reasons for running simulations is to uncover interrelationships that you would not think of offhand, and when these are uncovered, you can think of them, or about them, more profoundly. Unfortunately, simulations also yield hard numbers, often specified to two decimal points, and quite frankly, I am concerned about potential misuse of these results by persons unfamiliar with the underlying assumptions. Perhaps a label should be affixed saying "The use of these numbers may be dangerous to your health."

In summary, I think that we've learned enormous amounts from this exercise, and I think there's plenty more to learn. However, I think what we do in the near future very probably will be overwhelmed by the marketplace. I think there are, certainly, new mortgage forms in our future.

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