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]

*James Kearl is Assistant Professor of Economics, Brigham Young University; Kenneth Rosen is Assistant Professor of Economics and Public Affairs, Princeton University; and Craig Swan is Associate Professor of Economics, University of Minnesota.

[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

*Senior Staff, The Urban Institute.

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.

*Senior Staff Economist, Council of Economic Advisers.

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.