

Economic Review

Federal Reserve Bank of San Francisco

Summer 1990 Number 3

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Do Interest Rates Still Affect Housing?

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The author wishes to thank Rachel Long and Deborah Martin for their skilled and patient research assistance. Editorial committee members were Carolyn Sherwood-Call, Jonathan Neuberger, and Adrian Throop.

Activity in the housing market traditionally has been very sensitive to changes in interest rates. This sensitivity has had important implications both for participants in the housing industry and monetary policy. Theory suggests, however, that financial innovation and deregulation in recent years may have altered the link between housing and interest rates. In this paper, the theoretical linkages are discussed and studied empirically for the periods before and after 1983. A significant difference in the strength and nature of the linkages is revealed.

The housing market historically has displayed pronounced cycles in investment activity. In the last 30 years, for example, the variation in the volume of new housing starts has been 1½ times greater than the variation in GNP over the same period.¹ Economists and central bankers long have been interested in understanding these fluctuations for several reasons. First, the cycles in housing activity empirically have been useful leading indicators of the general business cycle. In most recessions, residential fixed investment appears to have led both declines in business investment and GNP.² Its perceived value as a leading indicator has made understanding housing cycles important to economic forecasters.

Second, understanding investment behavior in the economy is important for understanding aggregate economic volatility. Investment spending is the most volatile component of aggregate demand, and spending on new home and apartment construction (residential fixed investment) is the most volatile component of total investment spending.³ Thus, although residential investment is a smaller proportion of GNP than business fixed investment, its volatility has a particularly important influence on the volatility in national income over time.

Finally, because housing activity apparently has been sensitive to changes in interest rates, the housing sector historically has been an important channel through which monetary policy has influenced economic activity. In fact, there is some evidence that the economy may react more quickly to shocks that make their way through the housing component of aggregate demand than through the business fixed investment component.⁴ Thus, when monetary authorities have decided to slow the national economy to bring inflation down, they typically have used monetary restraint to raise interest rates, which tended to contract the housing sector, and in this way, they were able to effect the desired cooling of the overall economy.⁵

A key linkage in this process, of course, has been the relationship between housing activity and the level of interest rates. Historically there does appear, indeed, to have been a strong, inverse relationship between disturbances to interest rates and changes in housing starts. In

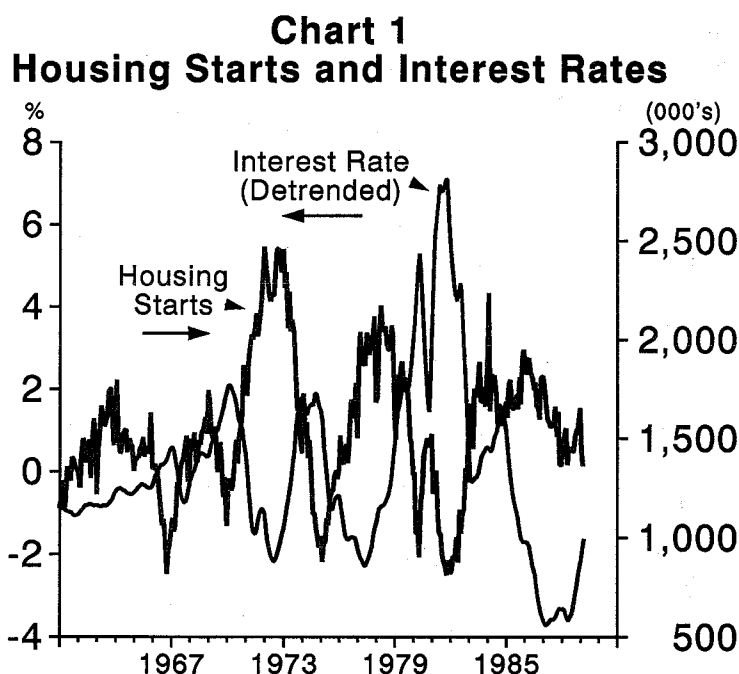
recent years, however, the relationship between housing and disturbances in interest rates appears to have become less regular. (See Chart 1.)

This article explores the changes in the relationship between interest rates and housing, and tries to examine the potential causes of this changed relationship. The extensive financial innovation and reform that occurred in banking and mortgage markets in the early 1980s changed the way in which housing lenders raised their funds, and changed the types of mortgage instruments that were made available to homeowners. The empirical evidence presented in this paper suggests that the relationship between housing starts and interest rates changed significantly in the period after deregulation.

The remainder of this paper is structured as follows.

In Section I, the various theoretical links between interest rates and housing are presented, and in Section II, the influence of financial reform on these links is hypothesized. As we shall see, there are numerous potential channels by which housing may have been affected by financial innovation and regulatory reform. In Section III, the relationships between interest rates and housing and between funds flows and interest rates are examined empirically. The data reveal that, in fact, a significant change in these relationships has occurred.

The article concludes (in Section IV) with a discussion of the policy implications of these findings. These implications relate both to the effects of the changes on monetary policy transmission and the likely effects on housing investment.



I. Interest Rates and Housing: Channels of Influence

Because of the intimacy of the relationship between housing and national income, it is important to understand the behavior of housing cycles, particularly as they relate to movements in interest rates, since the level of interest rates generally has been the control variable for monetary policy. In this section, I discuss the various linkages between housing investment demand and the interest rate that likely operated during the period prior to the recent financial reforms. To do so, I posit a simple model of housing investment.

A User Cost Model of Housing Investment

In this model, housing investment is a function of housing demand and a (lagged) supply process. Housing demand, or the desired stock of housing (H^*), is determined by the periodic costs of owning a unit of housing, that is, the user cost of housing, and demographic factors:

$$H^* = H^*(U, W, D) \quad (1)$$

where

U = user cost
 W = household wealth
 D = various demographic factors, such as population, household formation behavior, etc.

The user cost of housing capital (or, sometimes more ambiguously, the rental price) represents all current, out-of-pocket costs and net foregone income that are associated with owning a home. A major component of the user cost is the interest cost associated with an investment in housing. In addition, costs are affected by (economic) depreciation of the structure, maintenance expenditures, and expected changes in the market price of the housing unit. This latter component, of course, can reduce or increase user costs depending on whether inflation or deflation in the market price of the unit is expected. Tax policy also affects user costs through the treatment of both interest expenses and capital gains in the tax code.

The relationship between the user cost, U , of a unit of housing, the real interest rate, r , and the other components of the user cost can be stated more precisely as:

$$U = P[(1-t)(i) - (1-c)(h) + d] \quad (2)$$

where

P = market price of the housing unit
 t = marginal tax rate on normal income
 c = marginal tax rate on capital gains
 d = rate of economic depreciation of the unit per period
 i = the nominal interest rate = $(r + e)$
 h = expected house price inflation
 r = real interest rate
 e = rate of inflation expectations

or, equivalently, if expected house price inflation, h , equals the expected rate of general price inflation, e ,

$$\begin{aligned}
 U &= P[(1-t)(r+e) - (1-c)(e) + d] \\
 &= P[(1-t)r - (t-c)e + d].
 \end{aligned} \quad (3)$$

From Equation (3), it is clear that user costs increase with the after-tax real interest rate, $(1-t)r$, and the rate of depreciation, d . User costs decline with increases in inflation expectations, e , as long as the tax treatment of capital gains is favored (that is, as long as $c < t$).

If the desired stock of housing equals the actual existing stock at the prevailing user cost (that is, if $H^* = \underline{H}$), then no investment in housing will occur. More likely, however, the desired stock is less than or greater than the actual, and investment (I) will occur as:

$$I = s(H^* - \underline{H}), \quad (4)$$

where

s = an adjustment weight or function

and the actual housing stock will adjust toward the desired stock at a speed that depends upon the nature of the supply adjustment process, s . In markets in which the supply process is elastic, the adjustment in the housing stock will take place primarily through investment or disinvestment; less elastic supply conditions will result primarily in price adjustments to bring the desired and actual stocks into balance.

The Effects of Interest Rate Changes

We can now discuss the ways that interest rates affect housing investment. We begin first by discussing the channels of influence revealed by the simple user cost model described above. As we will see, however, in the period prior to recent financial market reforms, institutional factors created additional "channels" of influence.

Channel 1: Simple User Cost Effects

In the simple user cost model presented above, the interest rate is the key component of user costs, revealing a direct channel of influence of interest rates on housing. The precise effects of a change in interest rates depends, however, on whether the changes in interest changes occur because of changes in the underlying real rate or changes in inflation expectations.

Specifically, the effect on housing is unambiguous when a rise in the real interest rate occurs. As the rate, r , in Equation (3) rises, the user cost rises and depresses stock demand. This, in turn, results in depressed net new investment (manifested in reduced housing starts, for example), and possibly depressed real housing prices, depending on the elasticity of the housing supply response.

On the other hand, the effect of an increase in interest rates associated solely with an increase in inflation expectations is less clear. Equation (3) implies that if the tax rates on normal income and capital gains are the same, an equal increase in general and housing price inflation expectations would have no effect on housing demand. If, however, the capital gains tax rate is effectively lower than the normal tax rate (the case in the U.S.⁶), then an increase in inflation expectations can actually *lower* the user cost of housing capital because the higher interest costs are more than offset by the expected after-tax gain in the value of the housing assets. If the user cost is lower, then the demand for the housing stock increases, and with it, the price of housing and/or investment.

In summary, the demand for housing is a function of interest rates through their effect on the user cost of housing. The link between housing and interest rates is a negative one when the real interest rate changes and a positive one when inflation expectations change (assuming that capital gains receive preferential tax treatment, as is the case currently).

Channel 2: Credit Scoring and Affordability

A second channel by which interest rates potentially have influenced housing is the so-called affordability constraint, which arises out of the loan qualification process. This channel was a particular source of concern in the mid- to late-1970s. Because state laws limit lenders' ability to secure mortgage loans via the non-housing net worth and/or future income of households, the current home value and current income of the household play an important role in credit scoring or loan qualification standards. The standards usually are stated as limits on the ratio of mortgage payment size to household income, among other variables. To the extent that these standards do not change (because of constraints on mortgage design, or sluggish adjustment of the standard due to regulation or convention) they can become an additional source of influence for interest rate shocks. If interest rates rise abruptly, for example, the effective supply of mortgage credit to borrowers—under a fixed set of standards—can change abruptly as well.⁷

The affordability effect can be viewed in the context of the user cost model presented above as an additional factor that implicitly augments the interest rate component of user costs. To the extent that affordability constraints are binding, therefore, affordability constraints have the effect of depressing housing demand and lowering either housing investment activity or prices, or both.

To summarize, affordability considerations reinforce the depressing effect of higher real interest rates on housing investment and prices. Affordability considerations also will offset, at least partially, any stimulative effects of higher inflation expectations on housing investment. The extent to which affordability considerations depress housing investment and prices will depend upon the availability of ameliorative mortgage designs.

Channel 3: Interest Rates and Disintermediation

A third channel through which interest rates may have influenced housing investment is the phenomenon known as "disintermediation." Disintermediation refers to the tendency of funds to flow away from conventional housing

lenders (such as thrifts and banks) when interest rates rise suddenly. Disintermediation occurred historically because the conventional mortgage intermediaries faced restrictions on their ability to pay deposit rates that were competitive with open-market investment opportunities. Faced with higher-yield opportunities elsewhere, consumers are said to have moved their deposits out of financial intermediaries, thereby reducing the funding available to conventional housing lenders. To the extent that other sources of mortgage funding were imperfect substitutes for financial intermediaries, the result was an increase in the cost of mortgage funds.

It is unlikely that the effects of disintermediation could have persisted for long periods of time, however. After the initial effects of an increase in interest rates, investment in mortgage debt by other lenders should have provided an offsetting supply of mortgage credit. For example, lending by non-depository intermediaries (such as insurance companies), issuance and sale of mortgage-backed securities by banks and thrifts, and financing by home sellers most likely increased to offset the decline in traditional mortgage intermediation.

In addition, even if banks and thrifts have been restricted in their ability to compete via higher deposit rates, in the long run, they were able to attract funds by increasing the services offered their depositors. This non-pecuniary form of competition eventually would have drawn some funds back to the affected banks and thrifts.

This argument suggests that disintermediation, to the extent it was influential, had primarily transient effects related to sudden *changes* in the level of interest rates and not to the level itself. The extent to which disintermediation affected the supply of mortgage funds depends on a number of factors, including the breadth and sophistication of the mortgage-backed securities market and the speed with which the deposit rate regulations could be circumvented by banks and thrifts. Disintermediation is cited as a significant contributor to short-term housing cycles in the 1960s and 1970s not only because deposit regulations were binding at times during this period, but also because the mortgage-backed securities market was not yet highly developed.

From a user-cost perspective, the disintermediation phenomenon would be manifested in price- or non-price rationing of mortgage funds that effectively would raise the interest cost component of housing user costs. The expected effect of this channel of influence, therefore, would be for higher interest rates (transiently, at least) to depress housing demand, housing investment, and housing prices.

II. The Effects of Financial Change

In the early 1980s, major changes in the financial system occurred that may have affected the functioning of these various linkages. Legislative reforms and financial innovation affected mortgage instrumentation, mortgage intermediaries, and household mortgage demand.

A Changing Marketplace

There were both legislative and market changes in the early 1980s that may have influenced the interest rate/housing link. Two key pieces of legislation affecting mortgage markets that were enacted in the early 1980s were particularly important. The first, the Depository Institutions Deregulation and Monetary Control Act (DIDMCA), was passed in 1980. Title II of this Act provided for interest rate ceilings on time and saving deposits at banks and thrifts to be phased out over a six year period. Title III provided nationwide authorization of interest-bearing transactions accounts as of January 1, 1981. These accounts were negotiated order of withdrawal, or NOW, accounts with a regulated maximum rate.

Because depository institutions were believed to still be at a disadvantage vis à vis the continued, intense competition from (non depository) money market mutual funds, a second piece of legislation was passed in 1982. The Garn-St. Germain Depository Institutions Act of 1982 authorized (in its Title III) the money market deposit account (MMDA). The MMDA required a minimum balance and had restricted transactions capability, but offered an unregulated deposit rate. It was widely available by the end of 1982. On January 5, 1983, so-called Super Now accounts, with unregulated deposit rates, were permitted. Thus, effective deregulation of retail transactions deposit rates occurred sometime between 1980 and 1983, although full removal of rate ceilings and account minimums on all types of retail accounts did not occur until 1986.

These Acts had features that also affected the mortgage markets. Title V of DIDMCA, for example, authorized an override of state usury provisions on loans secured by liens on eligible residential real estate and made after March 31, 1980. Title II of the Garn-St. Germain Act, also preempted state-imposed restrictions on the execution of the due-on-sale clause in mortgage contracts.⁸

In addition to legislative changes, several important regulatory changes broadened the types of mortgage instruments that could be offered by banks and thrifts. First, in 1981 the Federal Home Loan Bank Board permitted thrifts to offer adjustable rate mortgages on a widespread basis.⁹ Since regulation and the conventions of the

secondary markets have strongly influenced the types of mortgages that lenders have issued ever since the 1930s, this change in regulation means that prior to 1981 it is likely that well over 95 percent of all residential mortgages issued were conventional, fixed-rate, self-amortizing instruments, although accurate statistics to support this observation unfortunately are not available.

In addition, the technology of the mortgage marketplace was changing during the period of the early 1980s. As a result of the continued development of the secondary mortgage market, in particular, newly-originated mortgages no longer needed to be funded within the bank or thrift portfolio. Instead, mortgages could be used to create mortgage-backed securities which could then be sold to a variety of institutional and private investors. This process, known as securitization, was facilitated by government-backed mortgage agencies which provided credit enhancement in the form of principal and interest guarantees to investors in the securities. Development of the secondary mortgage market was particularly rapid in the early 1980s. The volume of contracted mortgage commitments of the Federal Home Loan Mortgage Corporation (FHLMC), for example, grew from about \$7 billion in 1981 to almost \$33 billion in 1983.

Effects on the Housing Market

These legislative reforms and market developments had the effect of facilitating better matching of the needs of demanders and suppliers of mortgage credit over the interest rate cycle, and as a result, affected most of the interest rate/housing channels discussed earlier. First, the deregulation of deposit rates removed the primary cause of financial disintermediation. Deposit rate flexibility enabled banks and thrifts to price their deposits more competitively with non-deposit investments. Thus, when general interest rates rise in the current regulatory environment, there need be no tendency for depositor funds to flow out of financial intermediaries into investments in the primary securities markets.¹⁰ This presumably has had the effect of making mortgage supply less cyclically-sensitive.

Second, the continued development of secondary mortgage markets also helped to make mortgage supply less cyclical. A mortgage lender having difficulty attracting funds can now originate a qualified mortgage, and sell it into a very liquid secondary market.

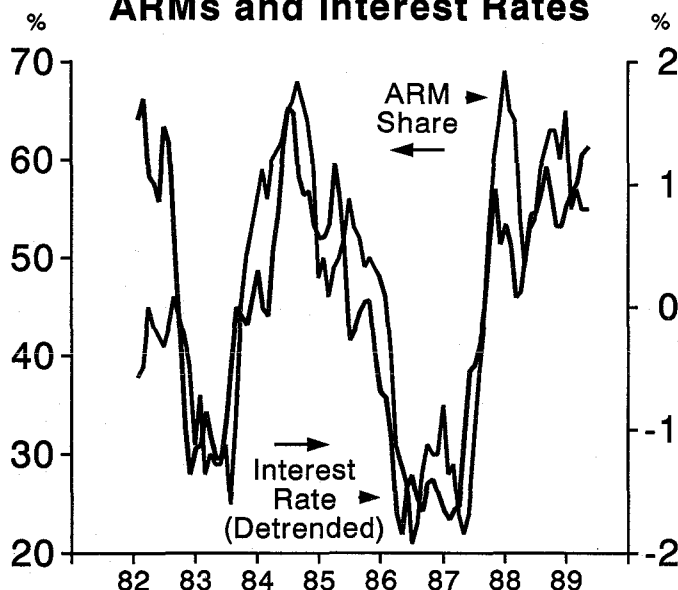
Third, the availability of the adjustable rate mortgage after April 1981 likely affected the channel relating to the affordability constraint. The ARM generally has initial

payments that are lower than those of fixed rate mortgages, making any given payment-to-income test less binding. In addition, the flexibility of the instrument's payment structure (allowing such things as low buy-in or "teaser" rates, negative amortization, and so on) can be used to tailor the instrument to borrower needs over the business cycle. This, too, should have the effect of better insulating mortgage supply conditions from interest rate cycles.

The adjustable rate mortgage may be influential in another way, as well. It can be shown that borrowers may prefer ARMs over fixed rate instruments when they believe that their own income is likely to fluctuate with future interest rate movements. Elimination in 1981 of restrictions on ARMs therefore likely made the mortgage market more "complete"; that is, it may now be better able to efficiently match borrowers' and lenders' needs as they vary over the business cycle, reducing the cyclical linkage among interest rates, mortgage credit, and housing investment.¹¹

As Chart 2 illustrates, the share of ARMs in new mortgages varies with the interest rate cycle. The chart plots the deviations in interest rates from a simple linear time trend, and the share of new mortgages issued as adjustable rate instruments. When interest rates rise above their trend, the ARM share also rises, consistent with the notion that the ARM instrument does, indeed, help to "buffer" somewhat the effects of interest rate spikes.

Chart 2
ARMs and Interest Rates



In summary, there are a number of reasons to expect a weakening of the linkage between interest rates and housing investment activity at some point in the early 1980s. The linkage likely has weakened along with the weakening of the secondary channels of influence—affordability and credit scoring constraints, financial disintermediation effects, and other mortgage instrumentation constraints.

III. The Interest Rate Link: The Empirical Record

In this section, the available data are examined to determine whether the changes in the early 1980s actually diminished the strength of the relationship between interest rates and housing. The empirical approach employs simple, time-series models estimated using data from the period from 1960 to 1989. In this section, I test for changes in the effect of interest rates on housing starts and for changes in the effect of interest rates on fund flows to institutional housing lenders (thrifts and banks). The model presented above permits analysis of the effect on housing of one-time disturbances or "shocks" to interest rates and comparison of the size of this effect in the pre- and post-deregulation periods. My interest in testing the effects on housing starts follows directly from the hypothesis that positive disturbances to interest rates typically have depressed housing demand and, thereby, housing investment. My interest in studying the effect of interest rates on

fund flows is to determine whether mortgage-supply phenomena were, in fact, a channel of influence.

The Basic Model

The models estimated in this section use simple, vector autoregression (VAR) systems. These VAR models employ generalized time-series equations to identify dynamic relationships among the variables of interest. Such models are particularly appropriate in this application because they permit exploration of shocks and other dynamic interactions among the variables. In addition, their atheoretical structure is desirable in this context because we are interested in changes in linkages across periods, rather than testing a particular model specification.

The estimated VAR equation systems involve the current value of each variable of interest regressed on lagged values of itself and every other variable in the system. In a

two variable (X and Y) system, for example, the estimated equations would be:

$$X_t = c_1 + \sum_{i=1}^n a_{1i} X_{t-i} + \sum_{i=1}^n b_{1i} Y_{t-i} + e_{1t} \quad (5)$$

$$Y_t = c_2 + \sum_{i=1}^n a_{2i} X_{t-i} + \sum_{i=1}^n b_{2i} Y_{t-i} + e_{2t} \quad (6)$$

where a , b , and c are estimated coefficients and n is the lag length employed.

In the empirical work below, equations similar to those in (5) and (6) are estimated using monthly data on interest rates and various housing-related variables. A comparison of the relationships estimated for the period prior to deregulation with those for the period afterward can detect changes in the interest rate/housing linkage. For the purposes of the analysis below, the pre-deregulation period is assumed to span from 1960 to 1982, and the post-deregulation period extends from 1983 to 1989.¹²

The linkages between the interest rate variables on the one hand, and housing starts or funds flows, on the other, are explored in a series of simple VARs, rather than in one large VAR system, which would take into account all the interrelationships among these variables. As a practical matter, the paucity of data in the post-deregulation period constrains the size of the VARs that may be employed. Thus, housing starts and funds flows are studied one at a time, paired with the interest rate variable(s).¹³

Several statistical tests are presented to demonstrate the changes in the interest rate/housing linkage. First, a Chow test is used to compare the VAR systems for the pre-deregulation period with those estimated over the subsequent period to determine whether the estimated equations differ significantly between the two estimation periods.¹⁴

Second, the share of the total observed variation in housing starts "explained" by interest rate variation is examined for the two periods. While such "variance decomposition" exercises cannot reveal changes in statistical "causality" with great precision, changes in the contribution of interest rates to the variance in starts between the two periods is suggestive of a change in the underlying structure of the housing market.¹⁵

Finally, impulse response functions are estimated and presented for both the pre- and post-deregulation periods. These relationships project the effects into future periods of an hypothetical, one standard deviation shock in interest rates. Unlike a simple comparison of coefficients, the impulse response functions incorporate all direct and feedback effects. They provide a graphical summary of interest rate effects before and after deregulation.

The Data

The models reported in this paper are all two- or three-variable VARs that use monthly data and a 12-period lag structure on all variables. The interest rate (TBILLS) variable employed is the short-term interest rate, measured by the 90-day Treasury bill yield. In addition, in some of the VARs reported below, the difference between the short- and long-term interest rate (LNGMSHRT) is also included as a proxy for the effects on the yield curve that would accompany a change in long-term inflation expectations. As discussed in Section II, whether an increase in interest rates is due to the real rate or inflation expectations may have different effects. The long rate used is the AAA corporate bond yield.¹⁶

Housing starts data (rather than data on housing investment) are employed in this study to permit a monthly time frame for analysis and to avoid the arbitrary valuation assumptions that must be made to calculate housing investment flows. The housing starts variable (STARTS) is seasonally adjusted. The aggregate of funds flows to thrifts and commercial banks (FUNDTOT) is measured as net changes in total share balances and total deposits.

Empirical Results

The results presented first shed light on the hypothesis that changes in mortgage instrumentation and other factors have relaxed the "affordability" constraint, thereby reducing the "direct" effect of interest rate cycles on housing starts.

Housing Starts and Interest Rates

Housing start relationships are studied using two simple VAR systems, compared over two periods. In the first VAR, the only interest rate variable is the Treasury bill rate. In the second, both the Treasury bill rate and the difference between the long rate and the short rate are used.

Chow tests suggest that in both VARs, the results from the two periods are significantly different at a confidence level of over 90 percent. In addition, the pattern of coefficients (for brevity, not shown here) in both models suggests that the relationship between interest rates and housing starts has changed significantly since 1983.

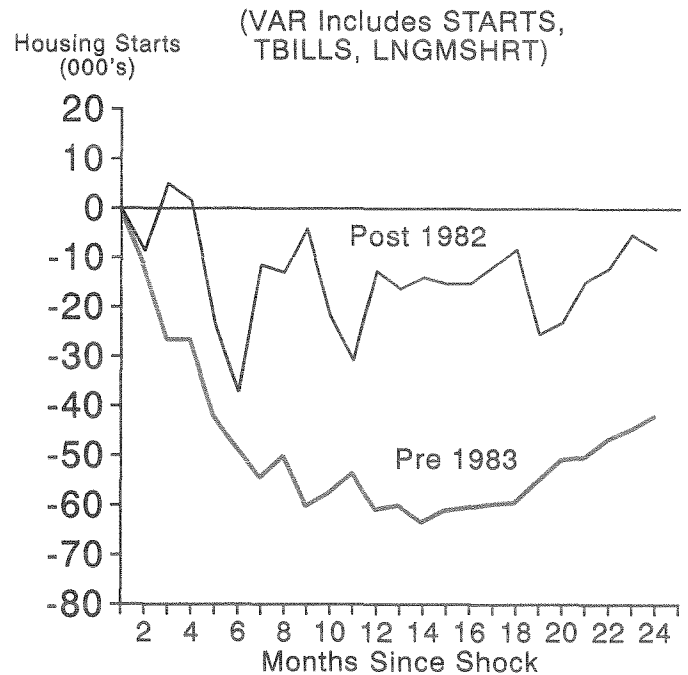
Table 1 presents the variance decomposition obtained from the two models for both time periods. As would be expected if the interest rate channel had weakened in the later period, the contribution of interest rates to the total variation in housing starts has declined.

Table 1**Interest Rate Variation and Housing Starts Variation***

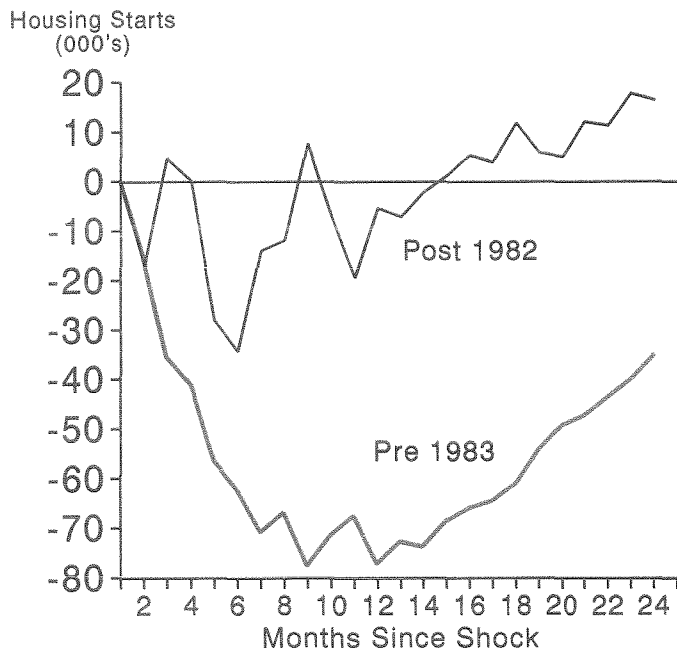
Percent of STARTS variance explained by:	VAR 1		VAR 2	
	Pre-83	Post-82	Pre-83	Post-82
STARTS	39.6	78.5	32.9	43.9
TBILLS	60.4	21.5	56.9	28.2
LNGMSHRT	—	—	10.2	27.8

*Variance decomposition of STARTS, from 12-lag VARs; in percent of variation explained, measured at 24 months

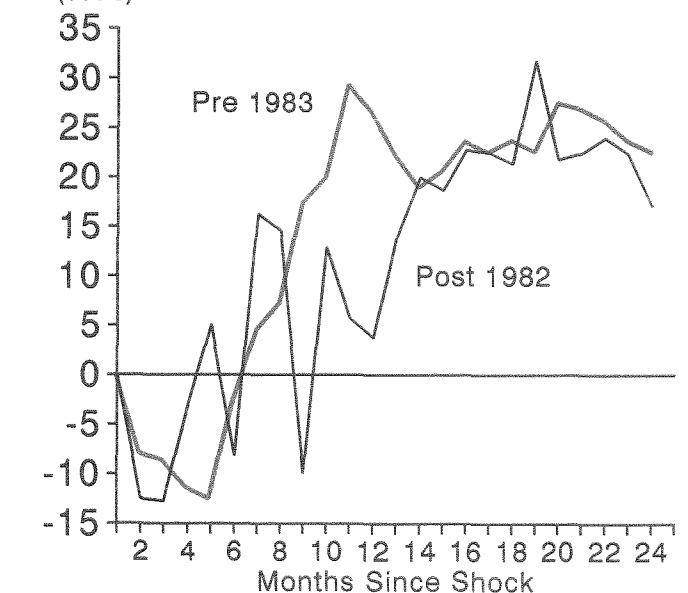
The impulse response functions in the three panels of Chart 3 reveal the extent of the changes in the relationship more graphically by tracing out the effects on housing starts of a positive, one standard deviation shock to the interest rate variables. Chart 3A presents the impulse response of housing starts to a one-standard deviation shock in the Treasury bill rate, as estimated from the first model. Panels B and C of Chart 3 display the same thing for the two variables of the second model. These graphs illustrate that whereas prior to deregulation, a one

**Chart 3B
Impulse Response of
Housing Starts to
Shock in Treasury Bills****Chart 3A
Impulse Response of
Housing Starts to
Shock in Treasury Bills**

(VAR Includes STARTS, TBILLS)

**Chart 3C
Impulse Response of
Housing Starts to Shock
in Yield Curve Tilt**

(VAR Includes STARTS, TBILLS, LNGMSHRT)



standard-deviation shock to interest rates would have depressed housing starts by up to 80 thousand units, such an effect is largely absent in the period after 1982.

The second formulation of the VAR can be used to assess whether there has been a change in the effect on starts of an upward tilt in the yield curve. Such an effect, which might be associated with increased long-term inflation expectations, is represented by LNGMSHRT.

As is apparent from the variance decomposition results in Table 1, in both periods, LNGMSHRT explains a sizable proportion of the variation in starts. From the graphs of the impulse response functions, it is apparent that in both periods, the effect of an upward tilt in the yield curve is to stimulate housing starts. This means that the capital gains effects of higher long-term inflation expectations apparently ultimately offset any affordability effects of higher long-term interest rates. Prior to 1983, however, the effect reached a peak only after 18 months; in the period afterward, the positive effects occur approximately six months earlier, and are larger on average. The contribution of LNGMSHRT to explaining the variance of starts also is larger in the later period. This is consistent with the notion that improved mortgage instrumentation in the later period resolves the affordability problems associated with higher rates more quickly and easily than was the case in the earlier period.

These results confirm that the relationship between housing starts and interest rates is different in the post-1982 period from the pre-deregulation period.

Funds Flows and Interest Rates

The fact that housing starts appear less sensitive to interest rates after 1982 than before does not establish which of the various channels of influence has changed to produce this effect. Thus, the second hypothesis I will test is that deregulation of deposit rates and continued development of alternative mortgage finance mechanisms have made housing less sensitive to the effects of "disintermediation." This hypothesis has two parts: (1) that funds flows into banks and thrifts are now less sensitive to interest rates, and (2) that the financing of housing starts has become generally less affected by patterns of funds flows to traditional lenders.

If deposit rate deregulation, and the subsequent decline of the disintermediation phenomenon are important, the funds flow variable should be sensitive to interest rates prior to 1983, but less so afterward. Additionally, if deregulation and growth of the secondary market has made housing investment less tied to funding from traditional intermediaries, any effect that fund flows have on housing

Table 2
**Interest Rate Variation,
Funds Flows and Housing***

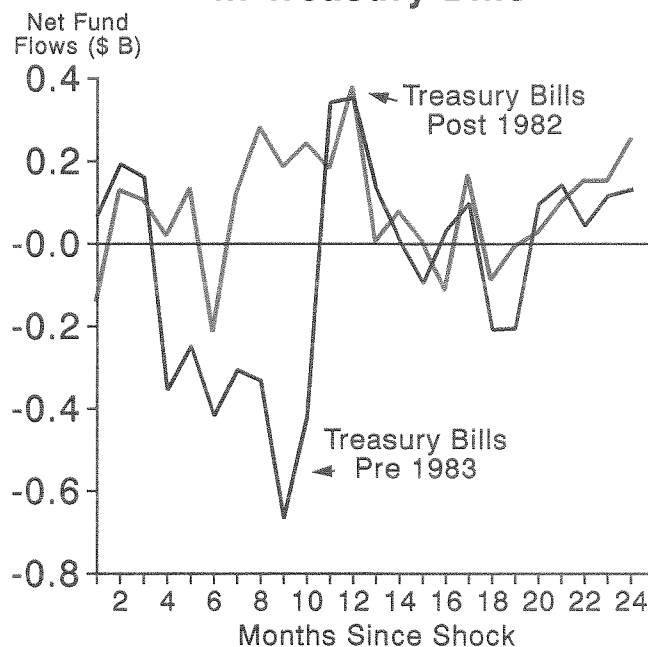
Percent of variance explained by variables below:	VAR 1		VAR 2	
	FUNDTOT Pre-83	FUNDTOT Post-82	STARTS Pre-83	STARTS Post-82
STARTS	—	—	34.1	65.8
TBILLS	88.8	69.1	64.6	25.8
FUNDTOT	16.2	30.9	1.3	8.4

*Variance decomposition from 12-lag VARs; in percent of variance explained, measured at 24 months

starts in the pre-1983 period should weaken in the period afterward. This is tested with VARs that include the total of funds flows to banks and thrifts (FUNDTOT). To test whether interest rate channels other than deregulation play a role, the interest rate variable is included in these VARs as well.

In Table 2, and Charts 4 and 5, the results are presented of VARs involving housing starts, fund flows, and the interest rate for the two sample periods. The variance decomposition results in the first two columns of Table 2

Chart 4
Impulse Response of Net Fund Flows to Shock in Treasury Bills



Note: Post 1983 normalized to pre 1983 levels for comparison purposes.

are consistent with the hypothesis that disintermediation has declined in the sense that fund flows are less sensitive to interest rate shocks in the post-82 period. This is confirmed more formally by a Chow test which finds the estimated relationship for the two periods to be significantly different at better than the 90 percent level.

The impulse response functions graphed in Chart 4 depict the effects of these changes. Prior to 1983, a one standard deviation increase in the Treasury bill rate resulted in a decline in net fund flows to banks and thrifts that began about three months after the shock, and extended for seven or eight months. In the period after 1982, an effect of this scale appears to be absent.

In the third and fourth columns of Table 2, the variance decomposition results from the VARs linking housing starts to fund flows and interest rates are reported. In this case, the impact on housing starts of a shock to interest rates declines as expected. The impact of fund flows increases, suggesting that traditional intermediaries, if anything, play a more important role in the post-82 period. However, this may simply be a result of higher variance in fund flows after 1982. For this reason, it is important to

inspect the impulse response function. The change in the coefficients estimated in the two periods is significant here as well, as confirmed by a Chow test.

In panels A and B of Chart 5, the effects of positive shocks to fund flows and Treasury bills are depicted for the pre-1983 and post-1982 periods, respectively. As in the simpler VARs discussed above, a depressing effect on housing starts of shocks to the Treasury bill rate is observed in the pre-1983 period. A one-standard deviation shock results in a 70 thousand unit decline in housing starts. In this model, the additional funds flow variable also has an effect on starts; a shock to fund flows does appear to stimulate starts, suggesting that during this period housing was linked to the funding capability of the traditional housing lenders.

Panel B of Chart 5 suggests that both effects are much less pronounced in the post-1983 period. This finding is consistent with the notion that not only is housing less sensitive to interest rates directly, but also that the supply of funds to housing from other sources (via the mortgage securities market, for example) has increased.

Chart 5A
Impulse Response of Housing Starts to Shocks in Treasury Bills & Net Fund Flows

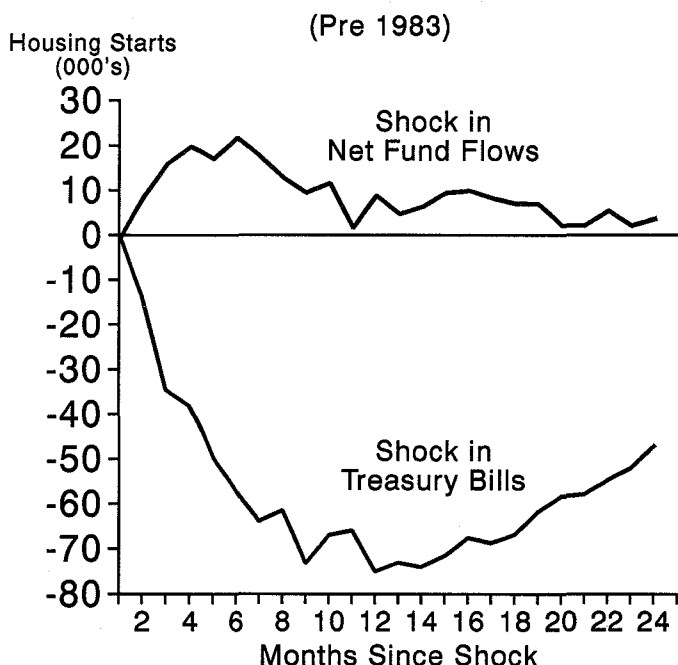
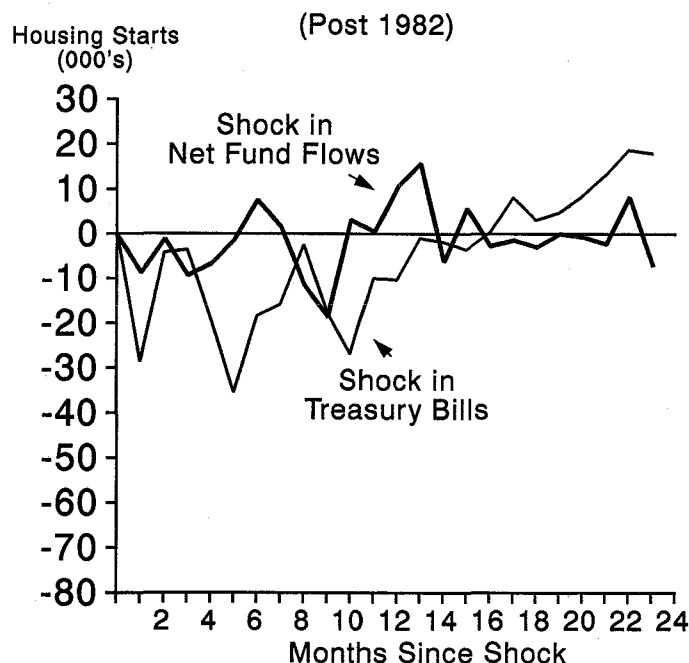


Chart 5B
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IV. Conclusions and Policy Implications

The potency of the interest rate/housing linkage appears to have changed significantly in the period following extensive financial deregulation in the early 1980s. In this paper, simple time series statistical models were used to measure the changes in the strength of this linkage, and to explore the possible causes of the changes.

The available data allow demonstration of a strong association in time between the changes in this linkage and changes in the regulation of mortgage lending institutions. The data also allow testing of the independent causal linkage between housing starts and fund flows into traditional mortgage lenders. The results, therefore, are consistent with linkages associated with disintermediation processes, affordability constraints, mortgage instrumentation restrictions, and growth of secondary markets.

Less important than the precise linkage, however, is the fact that the strength of the link appears to have weakened considerably in the post-82 period. This change has the greatest import for investors, builders and owners of housing in the United States, since it means that the housing sector is less likely to be buffeted severely during periods of economic policy manipulation.

The housing market appears to be functioning at a level of housing production of about 1.6 million units per year; this puts the market in a steadier environment that is below the peaks of earlier cycles, but is also well above the troughs. In such an environment, participants in the housing market can direct their resources to responding to other planning parameters, such as local economic and demographic conditions.

The weakening of the interest rate link to the housing cycle also may be important from the standpoint of the conduct of national economic policy. With a weaker link between interest rates and housing, national output levels become less sensitive to interest rate disturbances, at least on a cyclical basis. This is a desirable prospect, of course, to those economists who would prefer to see the economy buffered against most macroeconomic disturbances, which they view as originating from the mismanagement of monetary aggregates and interest rates. If, on the other hand, manipulation of aggregate real output levels is a key element of effective national economic policy, the increased insulation of the housing sector may make such management more difficult.

NOTES

1. For example, the standard deviation of housing starts from its trend from 1962 to the present has been one-fifth of its mean level, versus only one-twentieth for real GNP.
2. R. E. Hall and J. B. Taylor, *Macroeconomics* (New York: W. W. Norton & Company), 1986, p. 203.
3. The other two components are nonresidential fixed investment (purchases of new plant and equipment by businesses) and inventory investment (changes in stocks of goods produced but not yet purchased).
4. See P. K. Clark, "Investment in the 1970s: Theory, Performance and Prediction," *Brookings Papers on Economic Activity*, Washington, D.C., 1979, pp. 73-113.
5. The role of residential investment in business cycles is discussed along these lines in Dornbusch and Fischer, *Macroeconomics*, New York: McGraw-Hill, 1987, pp. 317-326.
6. There are several aspects of U.S. tax policy that make the capital gains tax rate less than the tax rate on "ordinary" income. First, the statutory rate on realized, long-term capital gains historically has been lower than the rate on ordinary income. Thus, although the tax reforms of 1986 made these rates the same, over most of the period covered in this paper, there was a significantly lower long-term capital gains rate. Second, capital gains generally have been taxed in the U.S. only as they are realized (rather than on an "accrual" basis). This ability to time and delay capital gains tax burdens (but not ordinary income tax burdens) is an additional source of preferential treatment of capital gains. Finally, housing capital gains have enjoyed an additional advantage in that the tax burden can be sheltered beyond the date of realization if the proceeds from the sale of one primary residence are rolled over into another home within a specified time (presently, 2 years).
7. The size and significance of the disintermediation phenomenon was the subject of considerable discussion. See, for example, F. Arcelus and A. Meltzer, "The Markets for Housing and Housing Services," *Journal of Money, Credit and Banking* (1973), pp. 78-99, and D. Jaffee and K. Rosen, "Estimates of the Effectiveness of Stabilization Policies for the Mortgage and Housing Markets," *Journal of Finance* (1978), pp. 933-46.
8. The "due-on-sale" clause gives the lender the option to terminate the loan secured by a home when the home is sold.
9. The Federal Home Loan Bank Board in April 1981 allowed thrifts under its supervision to offer ARMs. This power was extended to other institutions as the result of a provision of the Garn-St. Germain Depository Institutions Act, passed in 1982.
10. Whether the relationship between interest rates and deposit flows disappears altogether, however, is less certain. Depending upon the deposit pricing strategy of banks and thrifts, and how rapidly and completely open-market rates are matched, there still may be some reaction of deposit flows to interest rate changes. See M. J. Flannery, "Retail Bank Deposits as Quasi-Fixed Factors of Production," *American Economic Review*, June 1982, pp. 527-536, for a discussion of the process that might cause banks to make less-than-complete adjustments to open-market rates.
11. See, for example, H. R. Varian, "Divergence of Opinion in Complete Markets: A Note," *Journal of Finance* (1985), pp. 309-317.
12. The selection of the date that constitutes the break between the pre- and post-deregulation periods necessarily is somewhat arbitrary. Conceptually, it should be possible to find a breakpoint that maximizes the differences between the pre- and post-period VAR estimates. As a practical matter, the results are relatively insensitive to a range of breakpoints a year or so on either side of the chosen date.
13. The alternative of estimating the VARs with exogenous period dummy variables, and interactions of those dummies with the interest rate variable(s), also was explored. This permits a much larger model, but that structure complicates testing of the significance of changes in the model's coefficients. In addition, sample size limitations do not permit incorporating the full number of interaction terms in the larger model. Qualitatively, however, the findings are the same in either modelling context. The simpler methodology facilitates presentation of the findings.
14. The Chow test employs residual sum of squares (RSS) information from a regression spanning the entire data sample ($RSS1$), the first subperiod ($RSS2$), and the second subperiod ($RSS3$). An F test is then constructed as:

$$F = [(RSS1 - RSS2 - RSS3)/k] / [(RSS2 + RSS3)/(N1 + N2 - 2k)]$$
with degrees of freedom = $\{k, N1 + N2 - 2k\}$ where $N1$ is the sample size of the first subperiod, $N2$ is the sample size of the second subperiod, and k is the number of estimated parameters.
15. The use of the variance decomposition in this manner has two potential problems. First, a problem in interpretation of the variance decomposition can occur if the variance of interest rates changes significantly between the two periods. In such a case, the contribution of interest rates to the variance of housing starts may appear to have changed, but the measured effect is caused simply by the change in the variance of interest rates. Second, the "ordering" of the variables (which affects the precedence of shocks) can affect the results. In our case, however, we are interested only in comparisons across periods (not the levels of variance contributions per se). This is less affected by ordering considerations.
16. The mortgage rate is not used specifically because of the potential problems interpreting this series, as mortgage instrumentation and other features of the mortgage market change over the time frame of the analysis.