The Role of Interest Rates in Influencing Long-Run Homeownership Rates

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Abstract

As a stated policy objective, the U.S. Department of Housing and Urban Development seeks to boost the national homeownership rate to 70 percent by 2006. To accomplish this goal, they estimate that 3.8 million additional families be added to the ranks of U.S. homeowners. Furthermore, HUD estimates that the homeownership gap between minority and nonminority families must be reduced by a full 15 percent. Many policy instruments – both targeted and otherwise – have been suggested to increase homeownership. These range from low downpayment loans, greater access to credit in underserved areas, and interest rates subsidies. However, little is know about the efficacy of these measures to raise long-term homeownership rates.

In this analysis, we focus on the role of interest rates on homeownership rates and the housing stock. In particular, we provide a critical review of the literature on the relationship between housing and interest rates in contrast to other determinants of homeownership and changes in housing supply. We then present our own estimates of the influence of interest rates on homeownership and housing starts. We find that interest rates play little direct role in changing homeownership rates. While changes in interest rates may affect the timing of changes in tenure status from renter to owner, the long-run ownership rate appears independent of interest rates.

We find housing starts are, however, sensitive to changes in the interest rate. This implies that housing supply, or at least the timing of changes in housing supply, is sensitive to interest rates. It is though this mechanism that the stock of owner-occupied housing expands, though household formation and immigration may leave the ownership rate unchanged. We conclude by discussing whether other instruments, such as low down payment loans and improved technology for assessment of credit risk, may potentially be better suited to increasing long-term homeownership rates.

Introduction

In recent years, substantial academic research and policy debate has been undertaken examining the access to, and importance of, homeownership. This is appropriate given residential real estate's significance within a portfolio of household assets and its importance to national accounts. A dwelling is the single largest purchase that most households will make and plays a starring role in the "American Dream." It has been reported that, relative to renting, homeownership generates neighborhood benefits related to property upkeep, public safety, school quality, and the like (see, for example, Green and White [1997]). From a macroeconomic perspective, owner-occupied housing represents an enormous store of national wealth (until recently exceeding the capitalized value of the American equities markets) and a source of continued strength in a flagging economy.

The U.S. Department of Housing and Urban Development recently announced a goal of raising the national homeownership rate to 70 percent by 2006 (Gabriel, 2000). HUD's homeownership goal will require that 3.8 million families be added to the ranks of U.S. homeowners. Clearly, achieving HUD's goal will require disproportionate upward movement in homeownership rates among low-income households and among racial and ethnic minorities; HUD estimates that the homeownership gap between minority and nonminority families must be reduced by 15 percent. A number of possible policy instruments have been used or discussed to increase homeownership rates among underserved populations. In general, these interventions have focused on lowering the relative cost of ownership through credit mechanisms – specifically on the cost of and access to mortgage credit. These policies range from the provision of low down-payment loans, greater access to credit in underserved areas, and interest rate

discounts on mortgages conforming to the government sponsored enterprises (GSE) loan limit. However, even while combinations of these interventions have been in place, the disparity in the attainment of homeownership between white and minority household has continued to grow (Painter, Gabriel, and Myers, 2001).[1] This suggests that credit policies alone may not be sufficient to meet HUD's 70% homeownership rate goal.

Policies aimed at influencing outcomes in housing markets require a clear understanding of their mechanics, whether their goal is to close the large and persistent difference in the rates of homeownership across racial and ethnic groups, to promote homeownership to maximize public externalities, or to stimulate construction activity. In this paper we focus on a particular outcome and policy lever: homeownership rates and the influence of interest rates on their level. Our goal is to estimate the impact of interest rates on tenure choice and to evaluate its potential as a primary tool for increasing homeownership.

The relevant question for policy makers is the extent to which interest rates drive homeownership relative to its other fundamentals. Holding all else constant, lower interest rates must raise aggregate demand for owner-occupied housing. However, as shown in Figures 1 and 2, homeownership rates have almost doubled since WWII, and have increased during periods both of rising and falling interest rates. Homeownership rates in different regions within the United States have exhibited large independent movements despite facing essentially symmetric interest rates and federal tax treatment. Moreover, the evolution of homeownership rates of minority, poorly educated, and single households have differed substantially over the last 30 years (Green, 1996; Gyourko and

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[1] There is some evidence in Bostic and Surette (2001) that the widening racial disparity over the past three decades has appeared to slightly reverse itself in the past few years for a broad segment of households. They show the racial disparity of 28 percent points in 1990 falling to about 26 percentage points by 1998 for household headed by 22-60 year olds.

Linnemann, 1997), and yet all of these households faced similar macroeconomic conditions. This anecdotal evidence suggests that interest rate changes may have first-order effects only for a small margin of households for whom financing costs are the determining factor of tenure choice. Much smaller effects are likely for households on either side of the margin, especially relative to the influence of other economic and demographic fundamentals of homeownership.

Our results indicate that interest rates play no discernable role in increasing homeownership rates in the short- or long-run. In preliminary cross-sectional analyses, we find that homeownership is largely determined by income and demographics. In more appropriate time-series models, however, the role for interest rates in influencing homeownership is reduced to changing the timing of housing starts. That homeownership rates are not responsive to short-run changes in fundamental variables is no surprise, as in the short run the supply of housing is essentially fixed. This feature of housing markets would lead to interest rate changes simply being capitalized into housing prices, leaving effective housing demand unchanged.[2] Conversely, we find that housing starts, in the short term, increase with a fall in the interest rate. This implies that interest rates can influence the aggregate supply of housing, or at least the timing of increases in housing supply, though the effect of new supply on ownership rates may be offset by increased family formation or immigration.

The paper proceeds in three parts. First, a simple model of homeownership is introduced to highlight the influence of interest rates on homeownership. We also compare the insights from the model with evidence from the existing literature addressing

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[2] Effective demand could also remain unchanged if rental rates and house prices moved together with interest rates, as a referee pointed out. The two markets are not perfect substitutes, however, and don't necessarily move in lock step. Meese and Wallace [1994] test the present value relation and find the markets are cointegrated in the long run, but experience significant idiosyncratic movement in the short term. The relative price of the two tenures is crucial and is discussed below.

homeownership and housing supply. Second, we analyze the determinants of homeownership and housing starts using regional data taken at quarterly intervals over the past 35 years. We conclude with a discussion of directions for future research to determine what policy instruments are most likely to influence homeownership rates.

The Mechanics of Homeownership and Relevant Academic Research

The decision to purchase a home is similar to the purchase of any economic good, with the exception of its large expense. In a simple model of housing markets, this expense, and requisite financing, implies two channels through which interest rates influence outcomes. First, interest rates directly impact the borrowing costs of the buyer, and, in turn, the overall price of owner-occupied housing relative to other goods. Second, to the extent that builders borrow money in order to build housing, interest is part of the cost of construction. In a competitive construction industry, the cost of funds is embedded in the price of housing. In this simple model, lower interest rates work for higher homeownership through both supply and demand.

Several caveats of this "model" warrant discussion. First, interest rates can influence ownership rates only to the extent that supply is price elastic and change the perceived advantage of one form of tenure over another. Lower rates spur demand and increase prices above construction costs; the supply response yields more dwellings for owner-occupation and homeownership rates rise. An inelastic supply would result in aggregate demand changes manifested in price movements rather than changes in the supply of owner-occupied housing or in the composition of tenure within the housing stock. Policies aimed at increasing homeownership must consider the extent of supply

response; failure to do so may result in a simple transfer of wealth to owners of the existing stock.

We focus on the potential use of interest rate subsidies to increase the long-run rate of homeownership. At the margin of the new demand will be first-time homeowners who were previously unable to afford housing due to the borrowing costs. Of course, homeownership rates cannot increase for those already owning a home; for these households, the lower cost of capital will increase the consumption of housing.[3] Clearly, this kind of broad shift in aggregate demand can arise from changes in any of the demand fundamentals: income, wealth, and tax treatment of owner-occupied housing: family structure, tastes for ownership, etc. Aggregate (negative) shocks to construction costs could have the same effect of increasing the consumption of owner-occupied housing by lowering its price relative to other goods. Policies aimed at raising homeownership rates need to be differentiated from those that raise aggregate demand for housing.[4] The effectiveness of any of these fundamentals as a policy lever may be inferred by brief reviews of several stylized facts relating homeownership and its fundamentals, as well as the relevant existing literature on homeownership and housing supply.

The most striking feature of homeownership in the United States is the upward march of homeownership rates since World War II. Figure 1, drawn from U.S. Census data, shows flat ownership rates prior to the War and the sharp rise in the years following the War. Overall homeownership rose from 55.0% in 1950 to 61.9% in 1960. Subsequent growth was milder, reaching 62.9% in 1970, 64.4% in 1980, falling slightly

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[3] Substantial transaction costs will dampen the effect of interest rate changes in housing consumption and in homeownership rates relative to changes in their absence.

[4] Furthermore, policies aimed at increasing homeownership by reducing interest rates broadly subsidize marginal ownership, but also inframarginal housing consumption. In other words, they subsidize greater consumption of owner-occupied housing across the spectrum of owner-occupiers, including those who are already owners or those who would have been even without the subsidy. Measured by dollars per additional change in housing tenure, broad subsidy programs may be exceedingly costly.

during the 1980s, before accelerating again to reach 66.9% by the end of the century. Regional homeownership rates within the U.S. underscore the role of local factors in housing markets and preview our inability to find a significant role for interest rates in influencing homeownership rates. The West experienced a steady *decline* in ownership rates from 1967 through the early 1990s as New England's rate marched *upwards*. The Midwest and South regions experienced extended stagnation in ownership rates, punctuated by infrequent but significant changes. All of this intra-regional variation occurred under generally uniform interest rate and federal tax regimes.

Hidden in the aggregate statistics are several important patterns. First is the well-understood lifecycle pattern of ownership. As illustrated in Chevan (1989) and supported in Gyourko (1998), the propensity to own housing is positively related to age, marital status, and the presence of dependent children. That is, the shape of the propensity-to-own curve rises from early adulthood – through the years in which family formation and expansion occur – until adult children leave home, and thereafter flattens before declining into old age. The important finding of Chevan is that, for the years 1940-1980, the relative location of this curve has moved upward for each cohort of adults. In other words, the average propensity to own is higher for every age group in 1980 than in 1970, and higher for every age in 1970 than in 1960, and so on. In his review of the causes of this sustained growth, Chevan lists the tax treatment of owner-occupied housing, federal programs to finance ownership, income growth, and changing demographics as potential candidates to explain this phenomenon. However, he closes his review agreeing with Struyk and Marshall's (1974) finding that "only income [is] found consistently related to tenure…"

Gyourko (1998) disaggregates Chevan's cohorts and finds that within the relatively slow growth in aggregate ownership from 1960 to 1990 there was substantial diversity of ownership experiences within particular socioeconomic and demographic groups. In particular, he finds that among young households (especially young, minority households) the propensity to own a home fell, perhaps foreshadowing a drop in the aggregate rate as these groups worked their way through life. He also finds that households with relatively low levels of education suffered a similar decline in ownership rates. In his review of the existing research, he concludes that "recent research convincingly demonstrates that [mortgage subsidy] policies are insufficient to deal with the affordability problems currently facing many households."

Disentangling the factors that influence the desire and ability to purchase housing is a daunting empirical task. To date, there is little evidence of a significant, independent, role for interest rates despite their clear marginal effects. Green (1996) and Yates (2000) both attempt to separate the influence of changing demographics and preference from changing economic conditions. Yates surmises in her study of Australian ownership rates between 1975 and 1994 that the observed stability in aggregate rates belies "a change homeownership propensities which is neither uniform across age groups, nor uniform for different household types with both the same and with different levels of income." Green finds similarly that improving affordability conditions offset changes in ownership by households headed by single people. In his study, he finds that the user cost of capital invested in owner-occupied housing (which are substantially determined by mortgage and marginal tax rates) exercises a negative influence on ownership rates. These estimates, however, are not statistically significant.

Two influences on the tenure choice between owning and renting that are extremely difficult to capture are mobility and credit rationing. With regards to mobility, the most significant barriers to homeownership may be the large entry and exit fees associated with buying and selling residential real estate. As mobility rises, the population for whom an anticipated stay is long enough to justify paying these fees shrinks (Kan, 2000; Painter, 2000). This may be particularly important for certain segments of the population such as immigrant groups (Painter, Gabriel, and Myers, 2000). There is also growing evidence that mortgage credit has been allocated using price and non-price mechanisms (Munell et al. 1996, Dokko et al 1990, Ambrose et al. 1998). In these cases, homeownership assistance programs should focus on identifying the non-price mechanisms such as racism, wealth and down payment constraints, and credit-worthiness assessment. Bourassa (1995) finds that down payment constraints are the single most important factor in keeping those at the margin of homeownership from changing tenure. Galster, et al (1999) suggests that there is a large pool of households for whom homeownership would be possible if the underwriting standards used for suburban whites were applied elsewhere. Bostic and Surette (2001) suggest that improved techniques for identifying credit-worthiness may have played a role in the recent (modest) increase in homeownership rates of minorities.

These studies suggest a more nuanced model of housing markets than the simple one presented above. Certainly, holding all else constant, lower interest rates – combined with an elastic supply response – will result in higher aggregate demand for housing and higher homeownership at the margin. These studies clearly indicate that "all else" is not constant and is, rather, constantly evolving. The long, secular, rise in homeownership rates is more consistent with rising real incomes than with sustained reduction in interest

rates. The varied homeownership experiences of the less-educated and minority groups speaks to lower permanent income, less wealth, and uneven access to credit – not directly to its cost. Meen (1998) addresses the role of interest rates in sustainable ownership rates: "Low interest rates are not necessarily consistent with either sustainable owner-occupancy or sustained growth…"

One area of particular relevance to homeownership is the effect of interest rates on the supply of housing. Most of the research reviewed above examines the demand side of housing markets. The classic work on the supply, or investment, side of the U.S. housing market is by Topel and Rosen (1988). In this research, the authors find that a large elastic response to changes in interest rates. They find that a one-percent increase in the real interest rate, or in inflation expectations (two components of nominal interest rates), causes an eight-percent decline in new construction. The authors find this number too large to be a result simply of changes in borrowing costs. The explanation for this large response may be found in Kenny (1999). He employs cointegration techniques to discover the long-run relationships among the housing fundamentals. One central result is that interest rates are significant in both cointegrating vectors, *and of opposite signs*. He interprets the negative coefficient in the traditional manner: higher interest rates raise the cost of owner-occupied housing through the costs of financing the purchase. His explanation of the positive effect is that if owner-occupied housing is viewed as a hedge against inflation, then high nominal rates that signal inflation concerns can lead to higher demand. The magnitude of the two effects is ambiguous theoretically, but Kenny argues that the net effect of increases in interest rates is an *increase* in the aggregate demand for owner-occupied housing.

Ultimately, the influence of interest rates on homeownership rates will be limited to size of a small portion of households for whom borrowing costs are the barrier to owning a home. This segment of the population lies between those who already own homes and those whose incomes are simply not great enough to afford the substantial costs of ownership regardless of financing costs. Goodman and Nichols (1997), in their study of the role of the FHA lending programs, find that the pool of households who take out FHA mortgages is much larger than the pool of those who are forced to these mortgages because they fail to qualify elsewhere. That is, many of the households that take FHA mortgages do so in order to raise their level of owner-occupied housing consumption; the FHA subsidy in this case promotes housing demand beyond the margin of new ownership. Furthermore, Goodman and Nichols find that this pool of applicants, those who can receive mortgage credit through FHA only, is small and highly transitory: they tend to become eligible for other conventional lending sources within a short period of time. Their finding is that the FHA program does not change the long-run level of homeownership, but simply changes the timing of first purchase.

Results

i.   Univariate Comparisons

The analysis we present below largely confirms the findings of the literature surveyed above. The analysis is conducted by using regional economic data taken at quarterly intervals from 1965-1999. Table 1 presents the variable means and the data sources. The analysis includes interest rates, house prices, household income, and other demographic and economic factors that may explain changes in homeownership and housing starts.

Initial evidence on the relationship between homeownership rates and interest rates is presented in Figure 2. The first striking observation is that homeownership rates are relatively flat for the period 1965 to 1990 (moving from 63 to 64 percent). Contrary to expectations of an inverse relationship between interest rates and homeownership, it appears that homeownership rates and interests rates move together for most of the period. This demonstrates graphically the findings in Kenny (1999) that interest rates are positively related to homeownership rates.[5] In the 1990s, interest rates were relatively flat, as homeownership rates rose from 64 to 67 percent. As shown in Figure 3, homeownership rates appear to rise because of the increase in income over the 1990s. In sum, the trend evidenced in Figures 2 and 3 seem to imply that interest rates do not play a role in homeownership rates, rather median household income can best explain the increase in homeownership rates in the 1990s.

The relationship between housing starts and interest rates is very different from the relationship between homeownership and interest rates. In both Figures 4 and 5, which differ only in the interest rate series compared, it appears that housing starts and interest rates vary inversely with each other. This relationship is particularly pronounced in the early 1970s and early 1980s when there were large changes in both housing starts and interest rates. This evidence is only based on trends. Next we turn to the econometric models that enable us better to isolate the impact of interest rates while controlling for other factors that may impact homeownership and housing starts.

ii.   Co-integration and Vector Error Correction Models

Beginning with Granger's (1983; see also Engle and Granger, 1987) work, it is well appreciated that many macroeconomic times series may be cointegrated. In our

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[5] Again, Kenny (1999) explains this counter-intuitive finding that housing acts as a good hedge against inflation: as inflation and nominal interest rates rise, the cost of ownership relative to renting falls and the demand for owner-occupied housing rises.

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data, it may be the case that while homeownership and housing starts are non-stationary, a linear combination of those variables may be stationary after controlling for the presence of a cointegrating vector. In our specification, we also include the variables interest rates and house prices because there is reason to believe that they all may be cointegrated. Since housing demand and housing supply jointly determine house prices, it is easy to understand that homeownership and housing starts series may be cointegrated. At the same time, interest rates are a component of housing demand and may be capitalized into housing prices.[6]

We first test for co-integration in all four regions using the methodology developed by Johansen (1991). The results of these tests are presented in the Appendix 1. In all of the regions, we found to be at least one co-integrating vector that would make the estimation of the four series stationary. This leads to a vector error correction model specification (also called vector error equilibrium model) of the form:

$$\Delta Y_{it} = \text{"}_i (\text{*}_{it-1} Y_{it-1} + \text{*}_{it-2} Y_{it-2}) + \$_{it} X_{it} + \text{,}_{it} + \text{,}_{it-i},$$

where i represents the four endogenous variables, and the error term ,_{it-i} adjusts for the presence of the cointegrating vector.[7] The advantage of this approach over the simple autoregressive approach is that it allows the four endogenous variables to affect each other through lagged values and innovations in each equation's error term.

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[6] Dickey-Fuller tests for both house prices and mortgage interest rates fail to reject the presence of a unit root at the 1 percent level, but can reject at the 5 percent level. This suggests that the series may not be stationary and therefore it may be appropriate to model the system of equations in the vector error correction (VEC) framework. On the other hand, the tests are not conclusive that the VEC model is the appropriate one, and therefore the results in the previous section may be more appropriate.

[7] The estimation is conducted using E-views 3.1. They models are assumed to have a cointegrating vector if one is found at the 1 percent level. The results are not substantively changed if we use the 5 % threshold.

The analysis demonstrates the presence of cointegration in all of the regions.[8] Neither the endogenous nor the exogenous variables show much predictive power in explaining variations in homeownership rates. Two-period lagged housing starts are a statistically significant influence on homeownership rates in two regions, but the impact is quite small. Lagged homeownership rates appear to lower homeownership rates in the West; however, after taking into account the impact of homeownership rates on all of the other endogenous variables, the realized impact of a rise in interest rates is actually positive, but insignificant.[9] On the other hand, both the endogenous and exogenous variables are significant in explaining variation in housing starts. We find that increases in lagged interest rates lower housing starts; we also find weak evidence that increases in house prices lead to more housing starts. One would expect that higher housing prices would spur home building motivated by higher prices; however, we do not control for construction costs and cannot differentiate between price changes driven by demand shocks (which would raise profits) and supply shocks (which would not).

With respect to the exogenous variables, population and median income (only in the Midwest) are found to be positively related to housing starts, while unemployment rates are not statistically different from zero. This suggests the long-run importance of household demographic factors.

To get a picture of the long run impact of interest rates and house prices on homeownership rates and housing starts, we simulated the impact of a one standard deviation increase in interest rates (2.65 percentage points) and in housing prices (varying from $27,000 in the Midwest to $60,000 in the Northeast). Both of the simulated shocks are quite large (in the case of interest rates, the shock is approximately five times the

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[8] The results are largely consistent with cross-sectional analyses, which are not presented. Results are available upon request.

estimated difference between loans conforming to the GSE loan limit and those that do not). Although neither of these variables are statistically significant for homeownership, the simulations still prove to be illustrative.

Beginning with the Midwest region (Figure 6), one observes that while there is a short-term response of homeownership and housing starts to changes in interest rates and house prices, there is no lasting impact in the longer term. In the Northeast, homeownership rates initially increase with an increase in interest rates, and then fall about 2 percentage points in the long run. In the South and the West, homeownership actually ends up higher in the long run after an increase in interest rates. These results demonstrate the complex relationship between house prices and interest rates. However, one relationship is consistent and as expected: higher house prices lead to permanently lower homeownership rates in all regions.

One surprising result regarding housing starts is that there appears to be a long run increase in housing starts after short-run declines in the Northeast and South following an increase in interest rates. But, the increases are small – both less than 2 percent. These results suggest that interest rate changes may only alter the timing of housing starts, and not the long-run level of housing starts. A one standard deviation change in housing prices significantly increases housing starts in some regions (West and South), but even these changes are never greater than 2 percent in the long run. Overall, this suggests that the long-run relationship is more dependent upon the exogenous variables in the analysis.

iii. Other tests

Although the models presented above are appropriately specified in a time-series framework, we also estimated naïve cross-sectional models of both homeownership and housing starts in order to provide a descriptive picture of the influences of economic and

demographic on those two series. As expected, higher income is associated with higher homeownership rates, holding everything else constant. However, nominal house prices and interest rates positively impact homeownership rates, although neither are consistently significantly different from zero.

The relationships between housing starts and the economic and demographic factors are as expected: mortgage interest rates, house prices, and population all negatively impacted housing starts, and increases in incomes positively impacted housing starts. It should be stressed that simple cross-sectional regressions can be misleading because of the influence of lagged values of homeownership rates and housing starts, and therefore should be viewed cautiously. Our main econometric specification is a result of these concerns.

We next estimated a variety of standard time series models in which we included moving average and autoregressive terms. Since Dickey-Fuller tests suggest that the homeownership series is a random walk, we modeled homeownership rates in first differenced form. The results suggest that changes in homeownership are not significantly impacted by the changes in interest rates, prices, or other economic characteristics. The impact of changes in interest rates is positive in two regions and negative in the other two. The only important feature of the model that proves significant is the correlation in the error term of the model. Overall, the one period lagged error term is negatively related to current changes in homeownership levels, and the seasonal component or the four-period lagged term is positively related to current changes in homeownership rates.

We modeled housing starts in both first differenced form and as an autoregressive process with two lags based on the inconclusive Dickey-Fuller tests and on the

correlogram. In both models, there is a distinct relationship between housing starts and interest rates. In all but the South, the coefficient on 30-year mortgage interest rates is negative and statistically significant. For example, in the West, the estimates imply that a one percentage point increase in interest rates will lower housing starts in the current period by 7 percent. This estimate is very close to the results of Topel and Rosen (1988) discussed earlier. Our main results are different from their findings due to the controls for cointegration used above.

Finally, we included two other variables in the primary analysis that have the potential to impact homeownership rates. The first is the ratio of median housing prices to the GSE conforming loan limit, to capture the extent of the market for subsidized mortgage debt. This GSE market share variable shows no clear relationship between access to subsidized mortgages and homeownership. In two of the four regions the variable is significant and positive, while negative and significant in the other two. In no case is the magnitude large. This may not be surprising since the loan limit is set in conjunction with price growth, and therefore there is little possibility that this could be the driving factor in ownership levels.

The second variable was a categorical variable capturing the tax changes associated with TRA86. If the number of households that can itemize deductions falls, then homeownership may become less attractive. The evidence is inconsistent across regions. Two regions (Midwest and South) show positive impacts, and one (Northeast) shows a negative impact. Therefore we conclude that these tax policy regime shifts probably do not likely influence homeownership rates in the long term, and for purposes of this analysis do not impact the relationship between interest rates and homeownership

rates. Further, in Figure 7, we observe no discernable relationship between the number of itemizers and homeownership rates.

Discussion

In this paper we have examined the role of interest rates in determining homeownership rates and housing starts. We first outline a simple economic model that indicates that while lower interest rates increase the demand for homeownership, unless there is an aggregate supply response, lower interest rates will simply increase the price of housing. In our review of the relevant literature, we find little evidence of a direct impact interest rates on the aggregate propensity to own homes. In studies that do find an effect, it is either small negative effect (Green, 1997) or even slightly positive (Kenny, 1999). Other research has found a large supply side impact (Topel and Rosen, 1988) in the long run.

Both the trend analysis and the econometric models undertaken in this paper confirm most of the results in the literature. We find that in the short run, changes in economic variables like interest rates or incomes do not impact change homeownership rates. We also find that interest rates influence housing starts in the short run, but that this impact fades over a longer horizon.

Overall, we find that interest rates do not appear to have a long-run impact on homeownership rates, rather our results indicate that rising incomes and changing demographics are the most important factors in explaining changing homeownership rates over time. Interpreting these results is straightforward. Because conversion from one tenure type to another is costly, it is only through new construction of owner-occupied housing that ownership rates can change. As previewed in Figures 2-5 and supported in our regressions, income alone was significant; in this view ownership is a

normal good and more is demanded as aggregate income rises. The role of interest rates in determining long-term ownership rates is minimal, potentially affecting the timing of first purchase, but not long-term affordability.

While this paper has shed some light on the relationship between interest rates and aggregate homeownership, the mechanics of individual homeownership remain indeterminate. In particular, understanding who are the households at the margin and their behavior in response to intervention is central. It is this group on which most of the policy discussion should be focused, but most existing research examines overall or average relationships, and therefore has been ill suited to answer the question about those households on the margin. None of the interest rate studies, including this one, is sufficiently disaggregated to isolate the effect of changes in the interest rate component of affordability on this population of potential homebuyers. The only study that did was Goodman and Nichols (1997), who found that FHA low down-payment programs likely only accelerated homeownership for the targeted groups, but do not increase long-term home ownership rates.

This is of particular interest because groups on the margin of home buying are typically minority households living in neighborhoods with small populations of homeowners. Evidence over the past twenty years has shown that the gap in homeownership rates between white households and minority households has widened. Neighborhoods in which these households reside are also areas that lack many social amenities (good schools, low crime rates, etc.) that households desire. Among minority groups, Painter, Gabriel, and Myers (2001) have shown that income differentials, immigrant status, and household mobility can explain all of the gap in homeownership between Latinos, Asians, and white households, but that it can not fully explain the gap in

homeownership rates between African American and white households. This implies that appropriate intervention on behalf of Latinos or Asian should be more focused on human capital and affordability than on credit policies. However, Gabriel and Painter (2001) show that location choice and location characteristics can further explain part of the remaining gap for African-Americans, but that more remains that is not well understood.
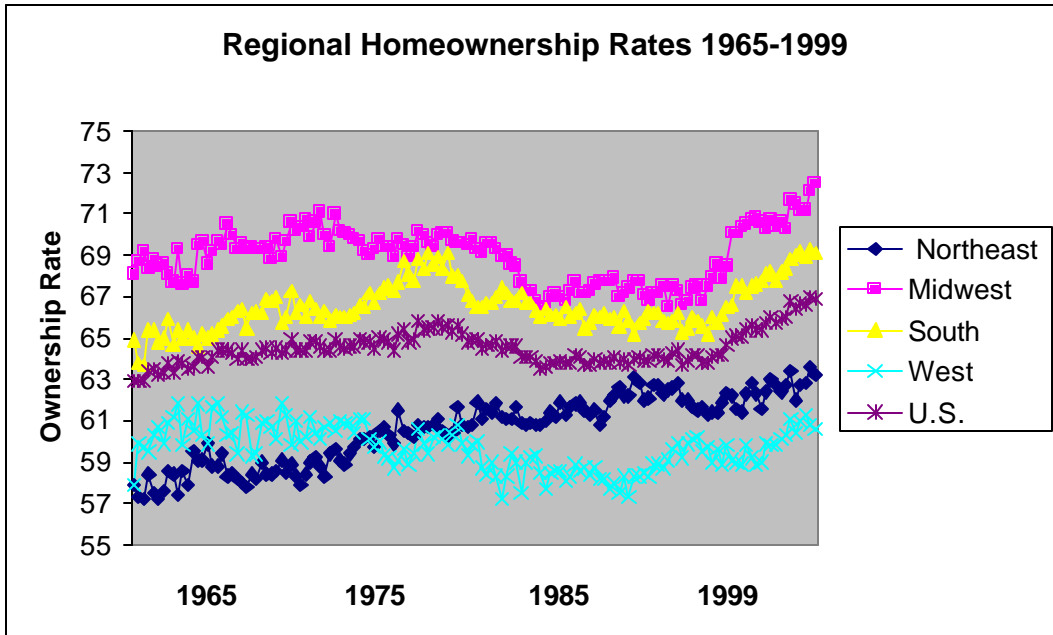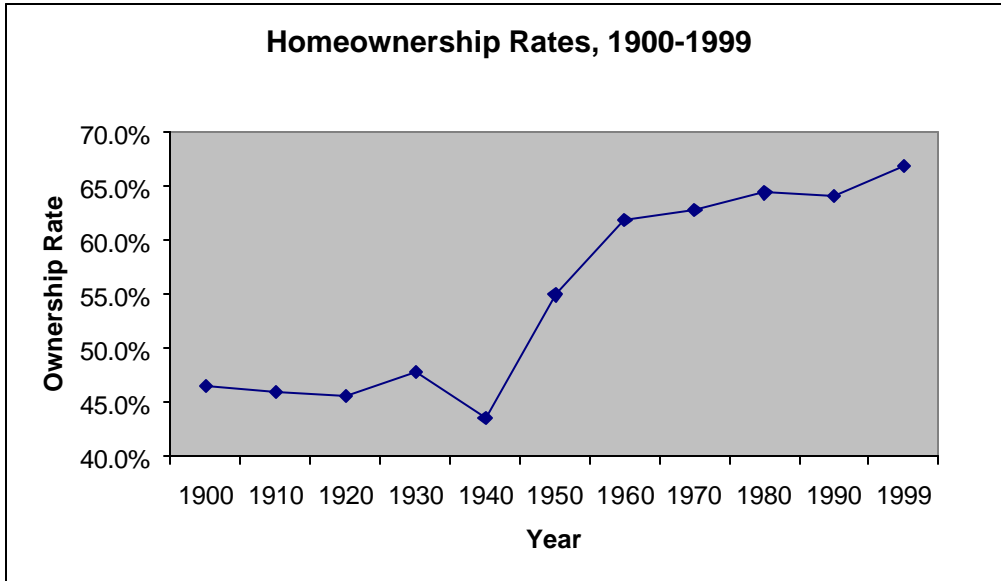
Figure 1

Homeownership Rates, 1900-1999

Regional Homeownership Rates 1965-1999

Figure 2
Homeownership and Interest Rates 1965-1999

Quarterly Rates: 1965 - 1999

Homeownership rates   10 yr Treasury Bill rates
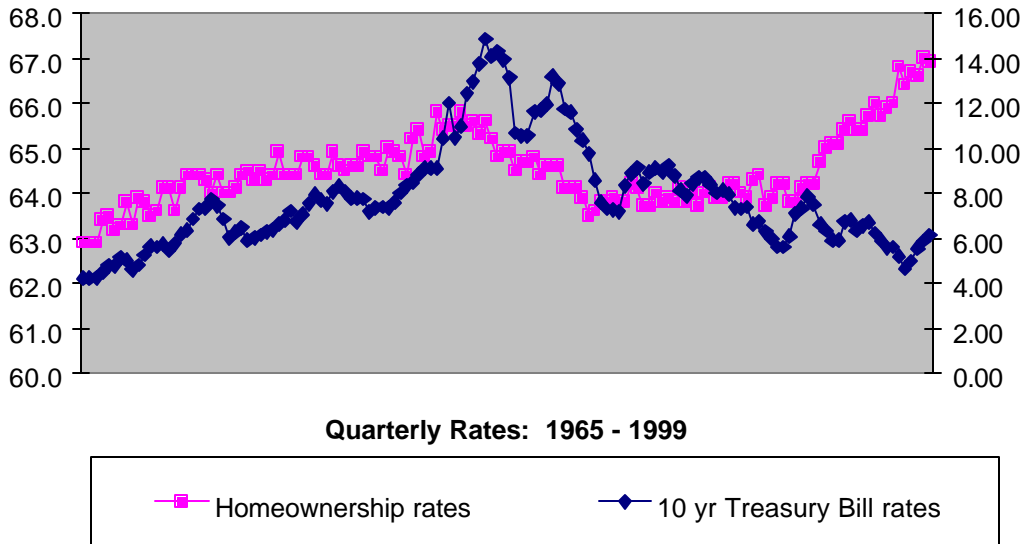
Figure 3
Homeownership and Median Household Income 1975-1999

Quarterly Rates: 1975 - 1999

Homeownership rates   Median Income

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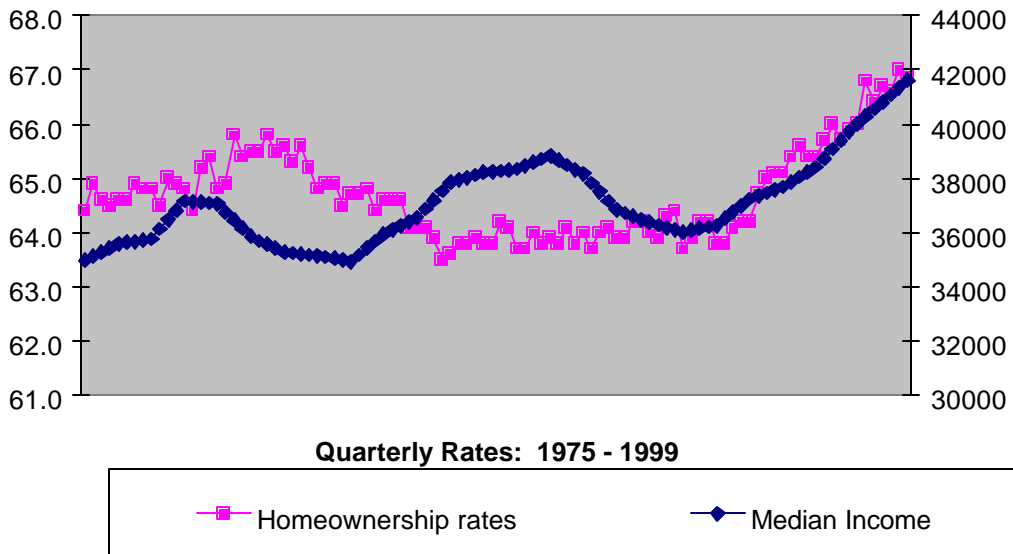
Figure 4
Housing Starts and Interest Rates 1965-1999

Quarterly Rates: 1965 - 1999

Housing Starts   10 yr Treasury Bill rates
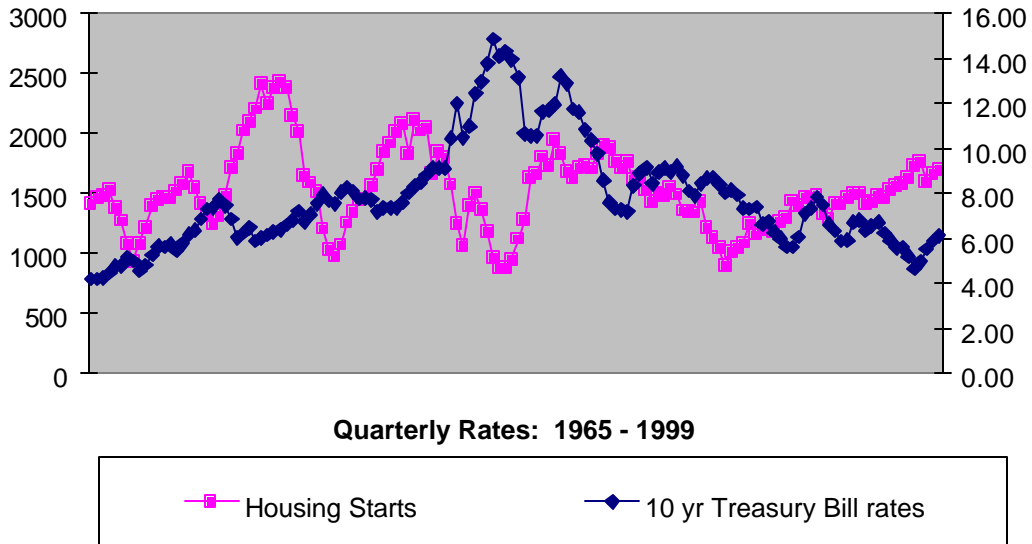
Figure 5
Housing Starts and Interest Rates 1971-1999

Quarterly Rates: 1971 - 1999

Housing Starts   30 yr mortgage rates
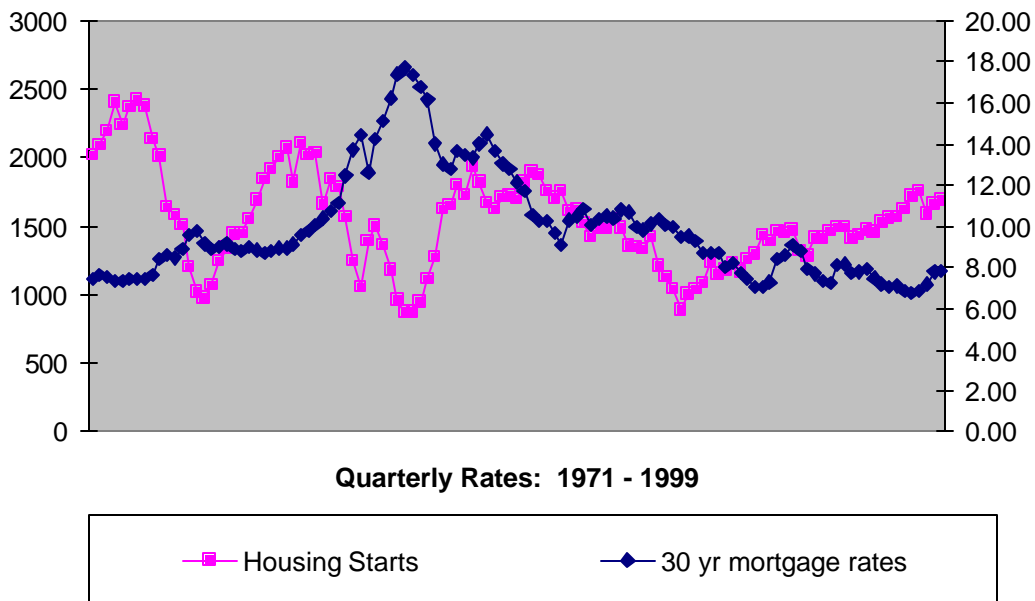
Table 1

Summary of Data Files

Data Series	Time Range	Periodicity (Original Format)	Geography	Source	Variable Means
Homeownership Rate	01/65—04/99	Quarterly	Regional	Census Bureau	63.94
Housing Start	01/65—12/99	Monthly	Regional	Census Bureau	380,183
30-year Fixed Mortgage Rate	04/71—12/99	Monthly	National	Federal Reserve System	9.95
10-year T-Note Rate	01/65—12/99	Monthly	National	Federal Reserve System	7.83
Divisional Housing Price Index	01/80—04/99	Quarterly	Divisional	N/A	167,988
Household Median Income	1975—1999	Annual	Regional	CPS	37,646
Household by Age	1960—1998	Annual	National	CPS	43.41
Population by State	1970—1999	Annual	State	Census Bureau	61,312,354
Unemployment rate by state	01/78—12/99	Monthly	State	Bureau of Labor Statistics	6.46%

Notes: Monthly data are aggregated to Quarterly by simple averages. Annual data are converted into quarterly annualized values by interpolating year-to-year changes in the trend. State and Divisional data are aggregated to the regional level using population-weighted averages.

Figure 6
Forecasted Response of Homeowne rship and Housing Starts
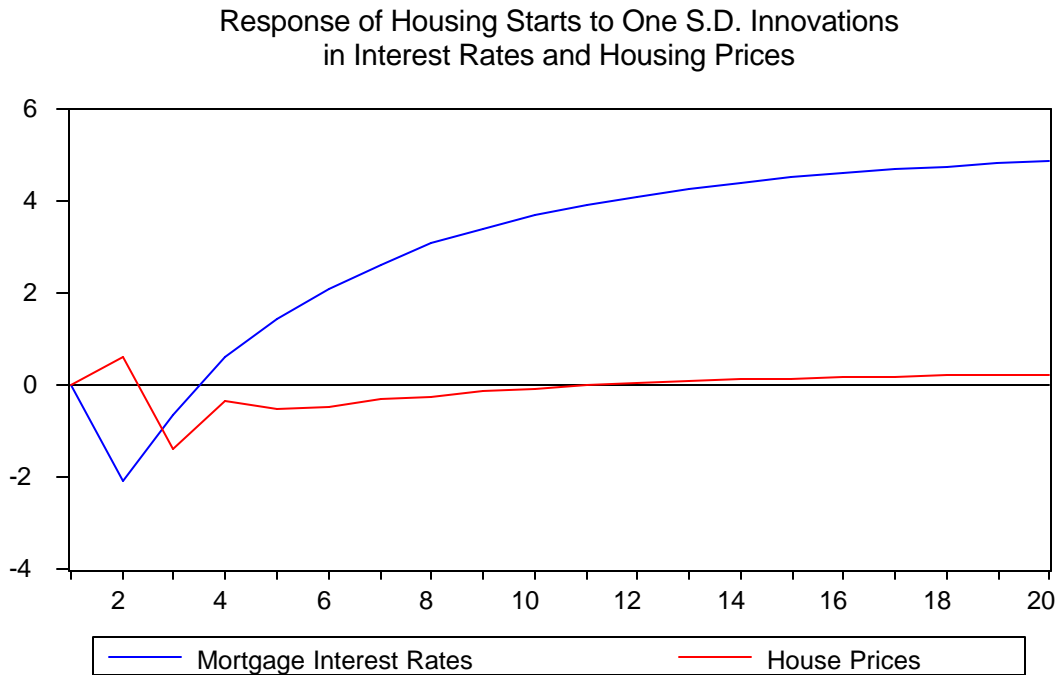**To Changes in Mortgage Interest Rates and House Prices**

Northeast

Response of Homeownership Rates to One S.D. Innovations
in Interest Rates and Housing Prices

Response of Housing Starts to One S.D. Innovations
in Interest Rates and Housing Prices

Figure 6 (Continued)
Forecasted Response of Homeownership and Housing Starts
To Changes in Mortgage Interest Rates and House Prices

Midwest

Response of Homeownership Rates to One S.D. Innovations
in Interest Rates and Housing Prices

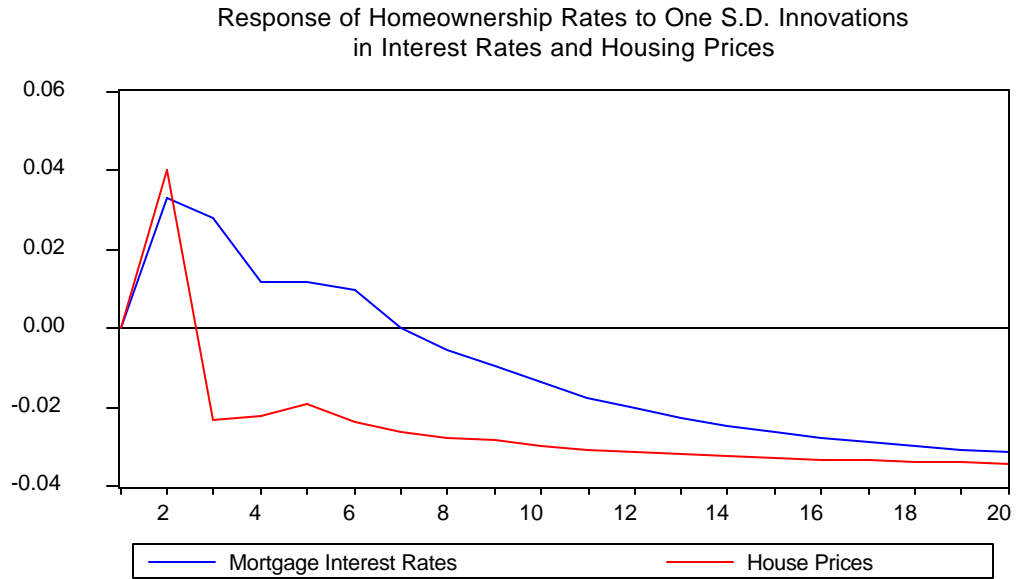Response of Housing Starts to One S.D. Innovations
in Interest Rates and Housing Prices

Figure 6 (Continued)
Forecasted Response of Homeownership and Housing Starts
To Changes in Mortgage Interest Rates and House Prices

South

Response of Homeownership Rates to One S.D. Innovations
in Interest Rates and Housing Prices

| Mortgage Interest Rates | House Prices |

Response of Housing Starts to One S.D. Innovations
in Interest Rates and Housing Prices
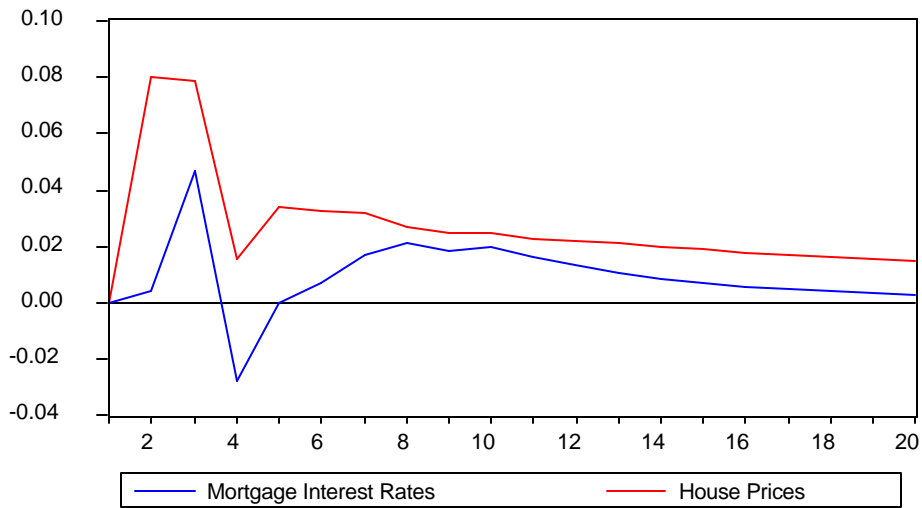

| Mortgage Interest Rates | House Prices |

Figure 6 (Continued)
Forecasted Response of Homeownership and Housing Starts
To Changes in Mortgage Interest Rates and House Prices

West

Response of Homeownership rates to One S.D. Innovations
in Interest Rates and Housing Prices

Response of Housing Starts to One S.D. Innovations
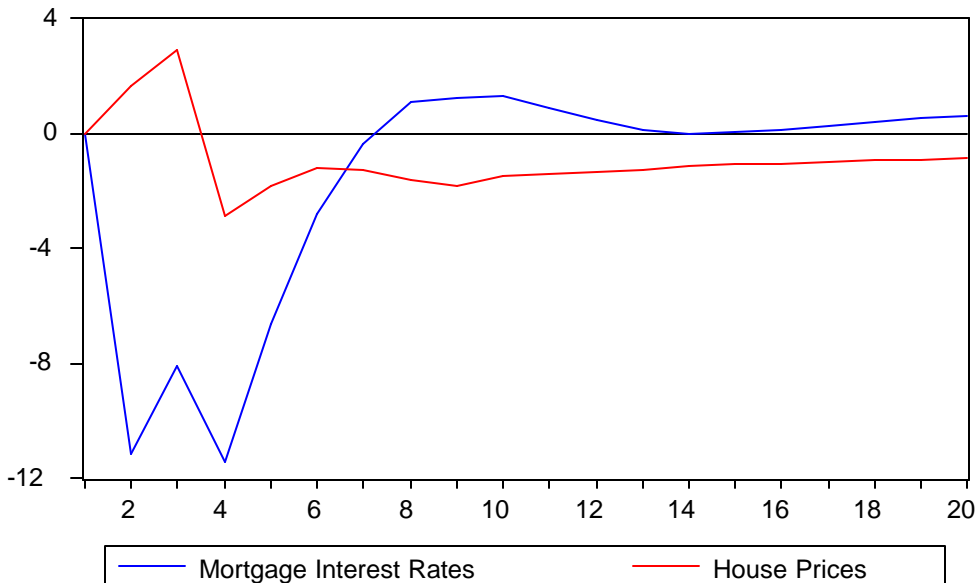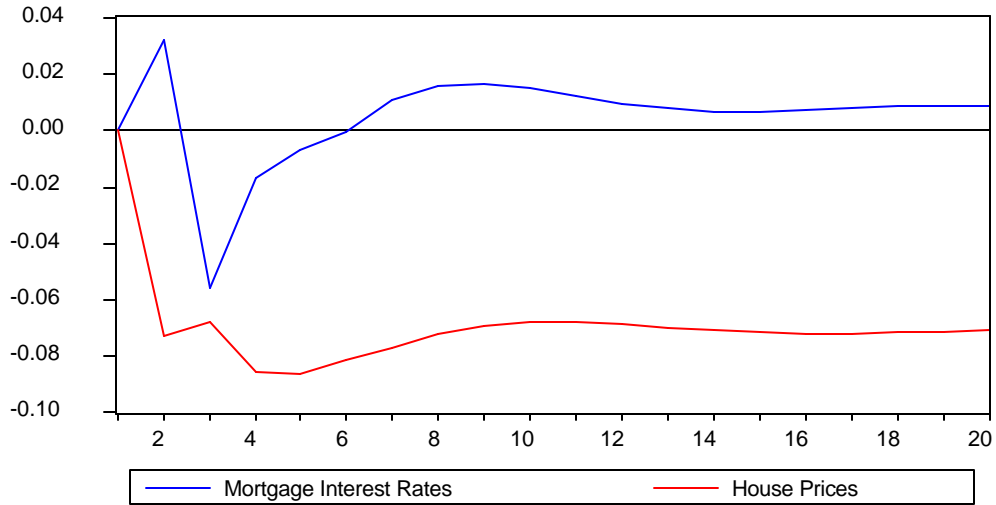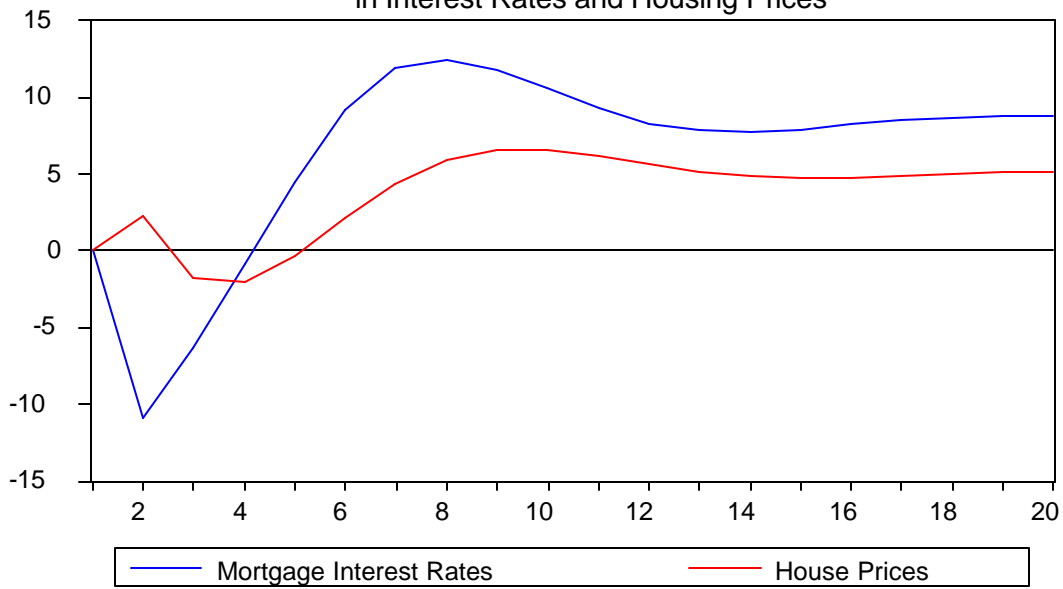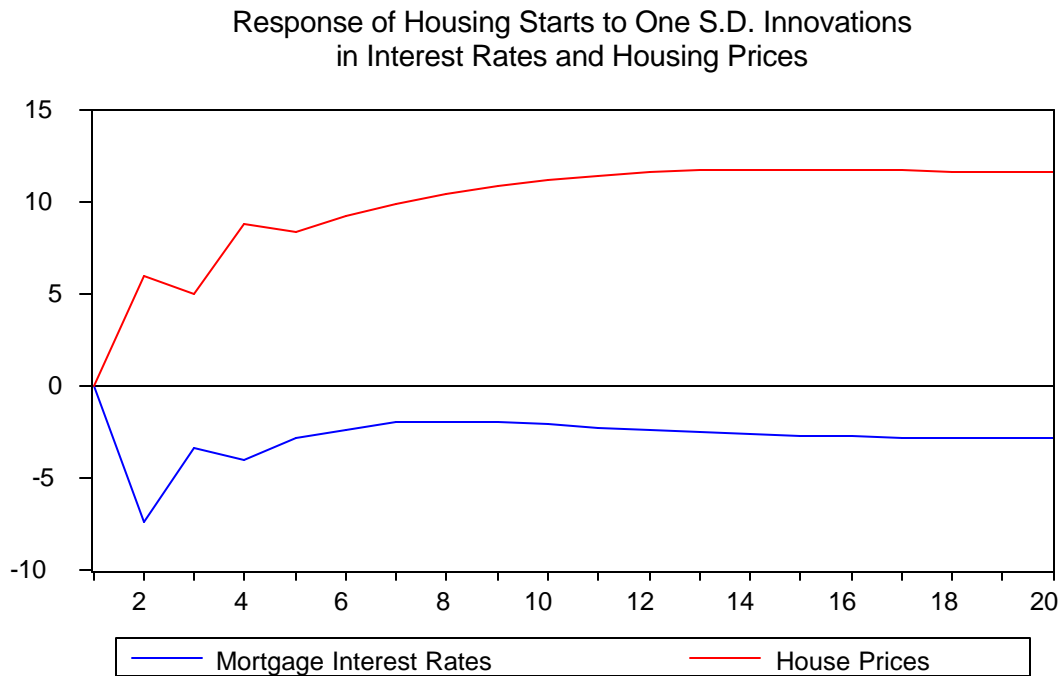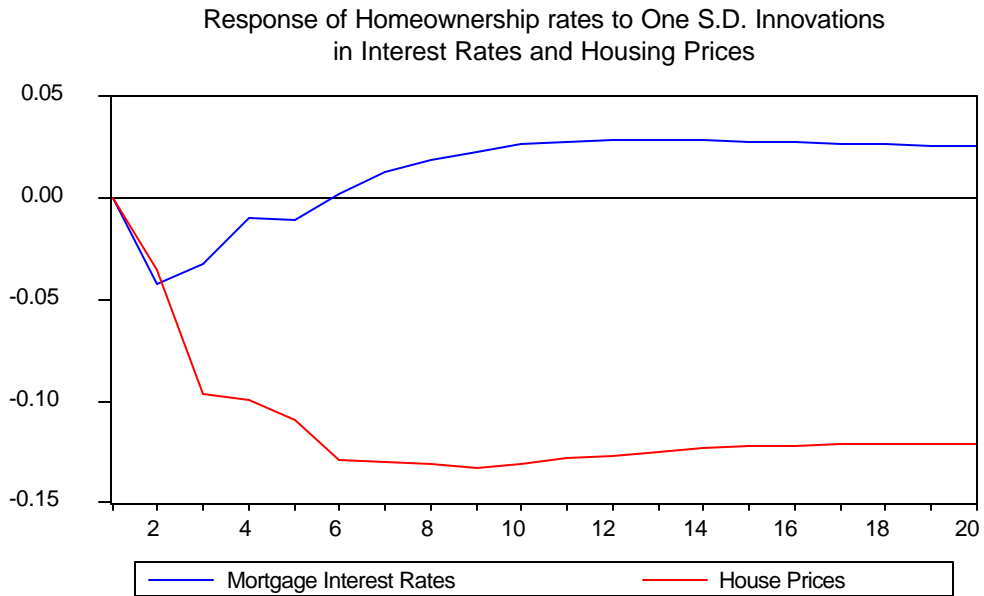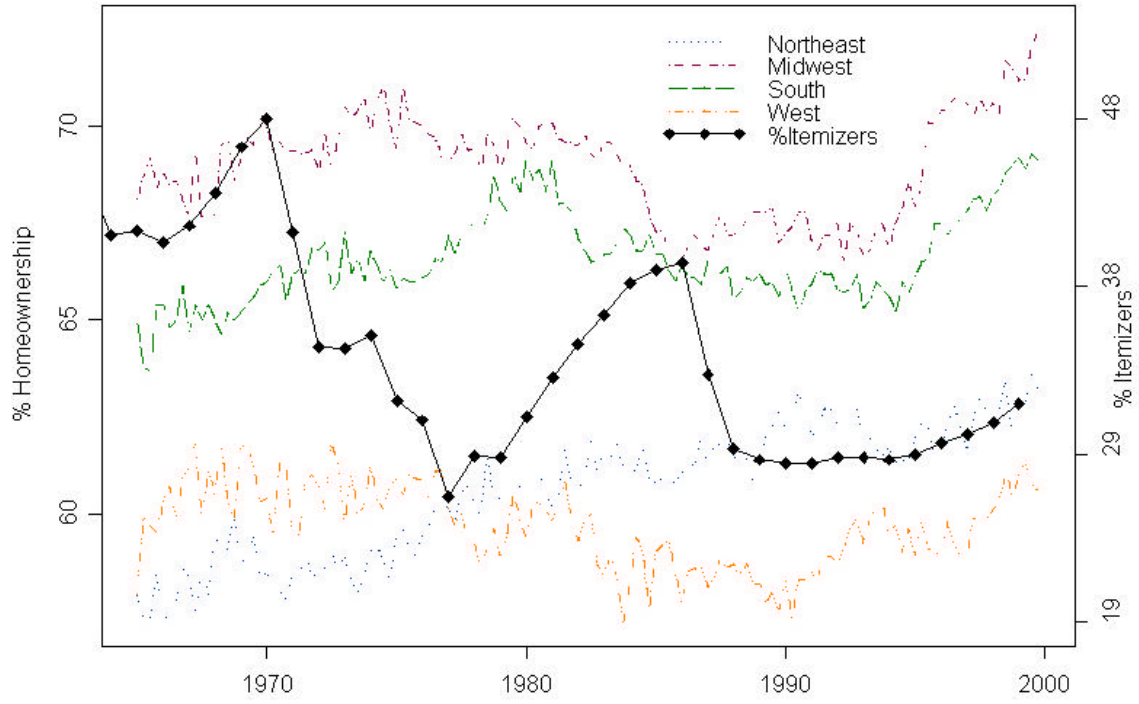in Interest Rates and Housing Prices

Figure 7 - Homeownership Rates & Percent Itemizers

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Appendix 1
Cointegration Tests for each of the Four Geographic Regions

Northeast

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.543712	109.2521	47.21	54.46	None **
0.326227	48.83543	29.68	35.65	At most 1 **
0.182337	18.43106	15.41	20.04	At most 2 *
0.037344	2.930545	3.76	6.65	At most 3

*(**) denotes rejection of the hypothesis at 5%(1%) significance level

Midwest

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.400178	94.75829	47.21	54.46	None **
0.364462	55.91300	29.68	35.65	At most 1 **
0.204578	21.46341	15.41	20.04	At most 2 **
0.052124	4.068361	3.76	6.65	At most 3 *

*(**) denotes rejection of the hypothesis at 5%(1%) significance level

South

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.490793	98.86873	62.99	70.05	None **
0.310059	46.90133	42.44	48.45	At most 1 *
0.187261	18.32280	25.32	30.45	At most 2
0.030150	2.357238	12.25	16.26	At most 3

*(**) denotes rejection of the hypothesis at 5%(1%) significance level

West

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.394797	65.58647	47.21	54.46	None **
0.273508	26.91774	29.68	35.65	At most 1
0.028461	2.314152	15.41	20.04	At most 2
0.001179	0.090835	3.76	6.65	At most 3

*(**) denotes rejection of the hypothesis at 5%(1%) significance level

Appendix 2

Vector Error Correction Model for Homeownership Rates and Housing Starts (Northeast Region)

Dependent Variable	Homeownership Rates	Housing Starts
Homeownership Rates [-1]	-0.166	-5.687
	(0.129)	(5.245)
Homeownership Rates [-2]	-0.198	-2.612
	(0.121)	(4.930)
Housing Starts [-1]	0.003	-0.065 **
	(0.004)	(0.158)
Housing Starts [-2]	0.008 *	-0.198
	(0.004)	(0.158)
30 year mortgage rates -1]	0.001	-8.937
	(0.117)	(4.782)
30 year mortgage rates [-2]	-0.057	-1.078
	(0.108)	(4.400)
House Prices [-1]	0.052	0.429
	(0.029)	(1.178)
House Prices [-2]	-0.027	-0.071
	(0.029)	(1.181)
Median Household Income	-0.001	-4.321
(1,000s)	(0.001)	(3.330)
Population (1,000,000s)	0.009	3.330 *
	(0.037)	(1.600)
Unemployment rates	-4.680	161.46
	(10.432)	(424.76)
Constant	6.879	-1610.53
	(20.361)	(829.01)
Cointegration Vector (1)	-0.321 **	4.594
	(0.112)	(4.637)
Cointegration Vector (2)	-0.002	0.150
	(0.002)	(0.081)
R^2	0.335	0.324

The estimated Cointegration vectors are

Homeownership	Housing Starts	Mortgage Interest Rates	House prices	Constant
1.000000	0.000000	-0.766861 **	-0.030672	-47.34459
		(0.26176)	(0.02289)	
0.000000	1.000000	40.91927 **	-1.168787	-341.8892
		(10.7536)	(0.94017)	

Notes: The notation [-1] represents a one period lagged value of the variable.

 ** represents statistically different from zero at the 1 percent level.
 * represents statistically different from zero at the 5 percent level.

Appendix 2 (continued)
Vector Error Correction Model for Homeownership
Rates and Housing Starts (Midwest Region)

Dependent Variable	Homeownership Rates	Housing Starts
Homeownership Rates [-1]	-0.099	-2.870
	(0.126)	(6.435)
Homeownership Rates [-2]	-0.228	-4.528
	(0.126)	(6.132)
Housing Starts [-1]	0.001	0.060
	(0.003)	(0.151)
Housing Starts [-2]	0.005 *	0.165
	(0.002)	(0.115)
30 year mortgage rates -1]	-0.001	-6.128
	(0.137)	(6.770)
30 year mortgage rates [-2]	0.056	5.227
	(0.117)	(5.708)
House Prices [-1]	0.134	5.406
	(0.071)	(3.451)
House Prices [-2]	0.071	7.075 *
	(0.072)	(3.506)
Median Household Income	0.105	12.792 **
(1,000s)	(0.094)	(4.590)
Population (1,000,000s)	0.023	3.340 **
	(0.014)	(0.686)
Unemployment rates	5.640	-102.47
	(9.907)	(482.28)
Constant	-19.632	-2652.51 **
	(11.939)	(581.23)
Cointegration Vector (1)	-0.126	1.411
	(0.075)	(3.672)
Cointegration Vector (2)	-0.005	-0.939 **
	(0.004)	(0.183)
Cointegration Vector (3)	-0.011	-20.114 **
	(0.114)	(3.600)
R^2	0.331	0.616

The estimated Cointegration vectors are

Homeownership	Housing Starts	Mortgage Interest Rates	House prices	Constant
1.000000	0.000000	0.000000	-0.012459	-66.70382
			(0.03584)	
0.000000	1.000000	0.000000	1.350520	-465.2857
			(0.72965)	
0.000000	0.000000	1.000000	0.075035 **	-21.27223
			(0.03471)	

Notes: The notation [-1] represents a one period lagged value of the variable.
** represents statistically different from zero at the 1 percent level.
* represents statistically different from zero at the 5 percent level.

Vector Error Correction Model for Homeownership
Rates and Housing Starts (South Region)

Dependent Variable	Homeownership Rates	Housing Starts
Homeownership Rates [-1]	-0.410	-1.952
	(0.130)	(16.392)
Homeownership Rates [-2]	-0.185	3.543
	(0.123)	(15.521)
Housing Starts [-1]	0.001	0.124
	(0.001)	(0.117)
Housing Starts [-2]	0.000	0.104
	(0.001)	(0.115)
30 year mortgage rates -1]	0.030	-37.046 **
	(0.086)	(10.794)
30 year mortgage rates [-2]	-0.237	2.321
	(0.092)	(11.600)
House Prices [-1]	-0.065	3.101
	(0.037)	(4.716)
House Prices [-2]	-0.044	1.667
	(0.039)	(4.944)
Median Household Income	0.020	5.053
(1,000s)	(0.059)	(7.400)
Population (1,000,000s)	0.022	1.080 **
	(0.036)	(0.450)
Unemployment rates	-4.026	1251.98
	(7.961)	(1004.41)
Constant	-2.166	-1194.08 *
	(4.396)	(554.59)
Cointegration Vector (1)	-0.002	7.847
	(0.040)	(5.083)
R^2	0.326	0.381

The estimated Cointegration vector is

Homeownership	Housing Starts	Mortgage Interest Rates	House prices	Constant
1.000000	0.005596 *	-1.054339 **	0.144128	-80.60702
	(0.00249)	(0.19399)	(0.07555)	

Notes: The notation [-1] represents a one period lagged value of the variable.

** represents statistically different from zero at the 1 percent level.
* represents statistically different from zero at the 5 percent level.

**Vector Error Correction Model for Homeownership
Rates and Housing Starts (West Region)**

Dependent Variable	Homeownership Rates	Housing Starts
Homeownership Rates [-1]	-0.353 **	-15.591 *
	(0.129)	(6.357)
Homeownership Rates [-2]	-0.300 *	-9.800
	(0.127)	(6.291)
Housing Starts [-1]	0.001	-0.265
	(0.002)	(0.114)
Housing Starts [-2]	0.001	-0.142
	(0.002)	(0.114)
30 year mortgage rates -1]	-0.175	-22.643 **
	(0.145)	(7.183)
30 year mortgage rates [-2]	-0.111	6.431
	(0.151)	(7.437)
House Prices [-1]	-0.049	1.239
	(0.052)	(2.639)
House Prices [-2]	-0.045	1.331
	(0.052)	(2.548)
Median Household Income	-0.005	6.540
(1,000s)	(0.009)	(4.490)
Population (1,000,000s)	0.024	0.839
	(0.041)	(2.000)
Unemployment rates	-20.990	1629.33
	(12.933)	(638.60)
Constant	2.357	-422.38
	(4.627)	(228.47)
Cointegration Vector (1)	-0.126	1.411
	(0.075)	(3.672)
Cointegration Vector (2)	-0.005	-0.939 **
	(0.004)	(0.183)
Cointegration Vector (3)	-0.054	1.781
	(0.084)	(4.127)
R^2	0.271	0.440

The estimated Cointegration vector is

Homeownership	Housing Starts	Mortgage Interest Rates	House prices	Constant
1.000000	-0.002713	0.001726	-0.716193 **	-51.04379
	(0.00419)	(0.01773)	(0.17618)	

Notes: The notation [-1] represents a one period lagged value of the variable.

** represents statistically different from zero at the 1 percent level.
* represents statistically different from zero at the 5 percent level.