The Outlook for Housing: The Role of Demographic and Cyclical Factors

By Andrew J. Filardo

With the current U.S. economic expansion now in its sixth year, the economy appears to be on a path of stable growth. Such a development would be beneficial because it would foster steady gains in employment, income, and investment, all of which would help boost the overall standard of living. To maintain such a healthy course, most sectors of the economy need to be solid performers. The housing sector is an especially important component of the economy, having generated $1.5 trillion in output in 1995, or one-fifth of the nation's gross domestic product (GDP).[1]

Whether housing activity will continue to perform well in the 1990s will depend in part on two key factors. First, will demographic factors, such as the aging "baby-boom" generation and the smaller "baby-bust" generation, lessen the demand for housing and thereby imperil the health of housing activity? And second, will cyclical factors enable housing activity to sustain its solid performance as the economy moderates to a *stable* growth path?

This article explores whether housing will continue to perform well in the rest of the decade. The first section shows that demographic trends are moving in a healthy direction. Recently revised population projections from the U.S. Bureau of the Census point to a relatively sanguine picture for housing activity in the late 1990s, with demand for residential housing and housing-related goods continuing to trend upward. The second section examines how moderate income growth, which is likely to be associated with a stable expansionary period, will help foster continued strength in the housing sector. The article concludes that favorable demographic trends and stable cyclical forces will lay the foundation for healthy housing activity for the rest of the decade.

## DEMOGRAPHIC FACTORS AFFECTING HOUSING ACTIVITY IN THE LATTER HALF OF THE 1990s

Some analysts are concerned about housing activity in the second half of the 1990s because the smaller "baby-bust" generation is replacing

Andrew J. Filardo is a senior economist at the Federal Reserve Bank of Kansas City. Paul N. Cooper, a research associate at the bank, helped prepare this article.

Chart 1

TOTAL U.S. RESIDENT POPULATION GROWTH PROJECTION

Millions of people
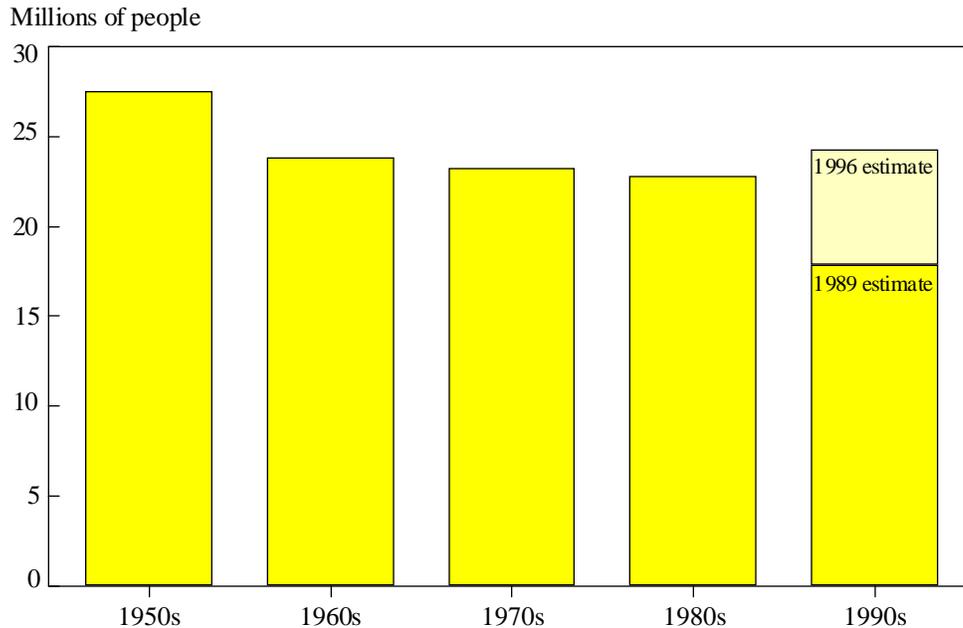
Sources: U.S. Census Bureau Reports P25-1018, P25-1130, and author's calculations.

the "baby-boom" generation in the pool of first-time house buyers. The baby-boom generation usually refers to persons born in the mid-1940s to the mid-1960s, while the baby-bust generation refers to those born in the late 1960s to the early 1970s. This ongoing demographic shift could decrease the demand for housing, but other emerging demographic developments could bolster housing activity. In assessing the outlook, therefore, three key demographic trends need to be considered: population growth, household formation rates, and the age structure of the population.
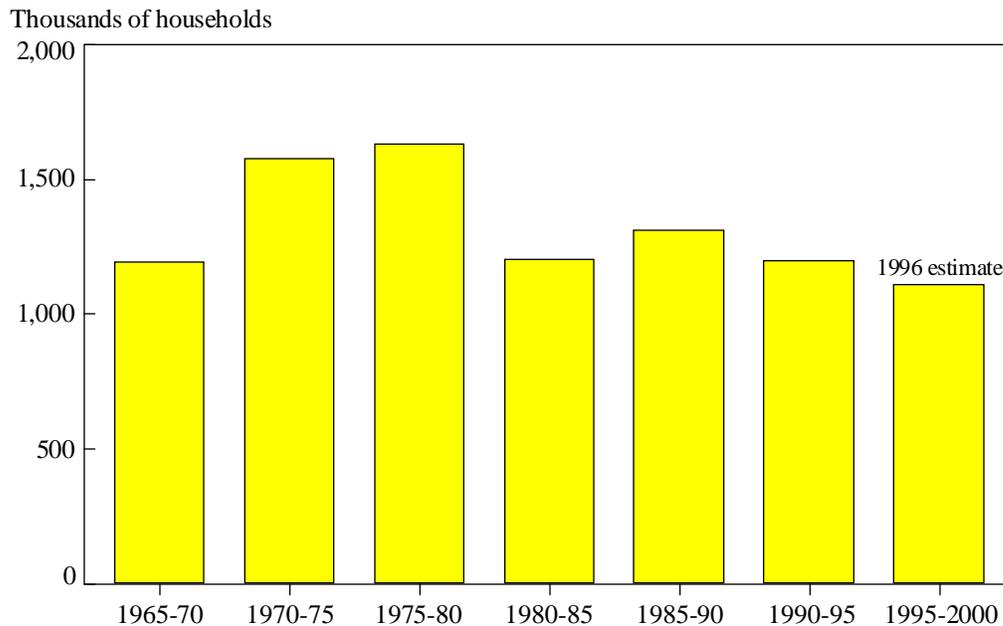
Solid population growth

Population growth provides the fuel for increases in housing demand. Not surprisingly, roughly one-third of all consumer spending is on housing.[2] Earlier projections of slower population growth in the 1990s had led some analysts to forecast a dramatic slowdown in housing demand in the second half of the decade. The declining population trend of the postwar era was expected to continue to slow housing demand through the end of the century because most baby-boomers had already bought their first house.

Recently, however, an upward revision of population growth since the beginning of the decade has significantly improved housing's prospects (Chart 1). According to Census Department projections released in March 1996, the country is expected to add roughly 24 million people in the 1990s, an increase of nearly

Chart 2

ANNUAL INCREASE IN THE NUMBER OF HOUSEHOLDS: 1965-2000

Thousands of households

Sources: U.S. Bureau of the Census; Joint Center for Housing Studies; and Apgar, Masnick, and McArdle.

6.4 million over projections made in the late 1980s—the first uptrend in population growth in four decades. Such an increase would clearly contribute to an increase in housing demand.

Steady rate of household formation

As a complement to strong population growth, the rate of household formation, defined as the number of new households per year, is expected to remain steady in the late 1990s. While population growth is the fuel for housing demand, the rate of household formation is the tinder, providing the immediate demand for housing. Just as population projections have been revised upward, so has the rate of household formation.[3] Chart 2 shows the rate of household formation since 1965. After the baby-boom generation

boosted the rate of household formation to 1.68 million households per year in the 1970s, the rate slipped 24 percent in the 1980s and since then has remained steady, adding roughly 1.25 million new households annually. Earlier projections called for a slight decline to 1.16 million new households per year in the 1990s, but revised projections based on the latest census report now indicate 1.25 million per year.[4] These rates of household formation suggest that housing activity has a solid foundation for the last half of the decade (Hirsch).

Favorable changes in the age structure of the population

A third factor expected to help boost housing activity in the late 1990s is the changing age

Table 1

RECENT DEMOGRAPHIC PROJECTIONS FOR 1995 TO 2000

Age group	Average annual population growth (thousands)	Average annual household growth (thousands)
< 25	674	20
25-34	-728	-319
35-44	438	193
45-54	1,190	670
55-64	566	375
65+	235	161
Total	2,375	1,106

Source: U.S. Bureau of the Census Reports P25-1018 and P25-1130; Apgar, Masnick, and McArdle.

structure of the population. Table 1 shows the average annual population growth and the rate of household formation by age group. The influence of the baby-bust generation on the demographic projections is evident. The baby-bust generation (represented by the 25-34 age group) is expected to contract annually on average by 728,000 people and 319,000 households from 1995 to 2000. The smaller population and fewer households of this age group will drag down overall housing activity.

This drag on housing activity, however, will be more than offset by increases in housing demand from other age groups. The population of youth (25 years old) is expected to increase sizably, adding roughly 674,000 people and 20,000 households per year. This increase is due to a greater number of children from baby-boom parents—sometimes referred to as the "echo baby-boom"—and to a growing number of children of immigrants. Housing activity will benefit from the demand for both a greater number and bigger size of homes to house the growing youth cohort.[5]

The middle-aged groups will contribute to housing activity by purchasing a greater number of new houses. The 35-44 and 45-54 year-old groups are expected to grow substantially as many new households form in the latter half of the 1990s, reflecting strong immigration trends and baby-boomers settling down. The annual increase of 1.5 million people and 868,000 households will support demand for new homes, with the middle-aged groups offsetting the drag from the baby-bust generation.[6]

Existing home owners in the middle-aged groups and older age groups will also spur housing activity by maintaining and upgrading their existing housing stock to meet their changing needs. Such spending can be just as important to future housing activity as the number of new houses constructed and may become a more important source of housing activity over time as the population ages (Apgar and Masnick).[7] For example, the 35-54 year old population will boost housing demand for renovations, improvements, and trade-ups.[8] The 55-64 year old cohorts who have had an increase in their standard of

Table 2

CONTRIBUTION OF HOUSING ACTIVITY TO GDP, 1995

	Level (billions of 1992 dollars)	Share of GDP (percent)
Total housing activity	1,507.1	22.4
Residential housing:	262.8	3.9
Single-family	127.7	1.9
Renovations and improvements	110.9	1.6
Other residential housing	24.6	.4
Housing-related spending:	256.0	3.8
Furniture and equipment	251.8	3.7
Inventory investment	4.2	.1
Other housing activity:	988.3	14.7
House service and operation	958.8	14.2
Other	29.5	.5

Note: Residential housing is National Income and Product Account (NIPA) residential investment. Other residential investment includes multifamily residential investment and producers' durable equipment. Inventory investment largely includes construction supplies. The other component of other housing activity includes semidurable house furnishings and government new residential buildings.

living will spur housing activity through second-home demand and alternative housing needs for their changing lifestyles. Finally, the elderly (65+) will contribute to housing activity as demand for retirement housing stimulates construction and furnishing demand. Thus, from the young to the old, the changing age structure will help fortify demand for housing activity.

In sum, demographics projections for the late 1990s reveal solid population growth, a steady rate of household formation, and a favorable change in the population age structure. These demographics developments imply strong housing demand for the rest of the century, especially for improvements and renovations of the existing housing stock.

CYCLICAL FACTORS AFFECTING HOUSING ACTIVITY IN THE LATER HALF OF THE 1990s

In addition to demographic factors, housing activity is also affected by the various stages of the business cycle. Historically, housing activity has responded strongly when the economy enters a business expansion and has fallen dramatically during business contractions. Now, as the economy appears to be settling into a stable expansion, analysts wonder whether housing will continue to be a strong performer.

The rest of this section examines the behavior of housing in *stable* expansionary periods. The evidence suggests that cyclical factors will help

Table 3

SENSITIVITY OF HOUSING ACTIVITY TO THE BUSINESS CYCLE

	Cyclical phases (percent of change in GDP)		
	Stable expansion	Less stable expansion	Contraction
Total housing activity (share of GDP)	38	40	37
Residential housing:	15	21	43
Single-family	8	12	26
Renovations and improvements	4	4	9
Other residential housing	3	4	9
Housing-related spending:	7	6	10
Furniture and equipment	5	3	1
Inventory investment	2	3	8
Other housing activity:	16	13	-15
House service and operation	16	13	-15
Other	–	–	–

Note: All comparisons are made on a quarterly basis. The category other (of other housing activity) is not available at quarterly frequencies. Also, see notes at bottom of Table 2. The subperiods—stable expansion, less stable expansion, and contraction—are described in Appendix A.

contribute to a healthy housing sector throughout the decade.

Housing activity in stable expansions: historical record

To examine the cyclicality of the housing sector, it is useful to observe that total housing activity can be divided into three broad categories. First, *residential housing*, considered one of the most cyclical sectors of the economy, primarily includes purchases of new single-family homes and spending on renovations and improvements to existing homes. Table 2 indicates that expenditures on residential housing accounted for about 3.9 percent of GDP in 1995.[9] The second category of total housing activity, *housing-related spending*, includes goods bought to furnish new homes and housing additions. This category, dominated by spending on furniture and appliances, added 3.8 percent to GDP in 1995.[10] The third category, *other housing activity,* makes up the rest of total housing activity and represents the day-to-day costs of living in the existing stock of homes.[11] This category, which includes such items as household utilities and implicit rent on the existing housing stock, accounted for 14.7 percent of GDP in 1995.[12] While representing the biggest share of total housing activity last year, this category of housing

activity plays only a secondary role in cyclical developments because it trends upward smoothly over time and shows no cyclical swings.

The sensitivity of swings in the two cyclical components of total housing activity—residential housing and housing-related spending—to economywide activity depends on the stage of the business cycle. Broadly speaking, there are three basic stages of the business cycle. First, *stable* expansionary periods occur when GDP grows near its long-run trend for at least a year (Appendix A). Second, *less stable* expansionary periods include all other expansionary periods. For example, during the beginning of a recovery when the economy's growth rate is well above its sustainable long-run trend, the economy may experience erratic growth. And third, periods of *contraction* occur when GDP growth falls well below its long-run trend.

The residential housing and housing-related spending components swing sharply over the course of the business cycle (Table 3). Since 1959, residential housing, especially new single-family housing purchases, has accounted for 15 percent of GDP growth in stable expansionary periods, 21 percent of GDP growth in less stable expansionary periods, and 43 percent of GDP declines in contractions. Housing-related spending also moves with the overall economy, adding another 7 percent, 6 percent, and 10 percent in each of the three subperiods. Together, these two categories of housing activity have accounted for a relatively large share of cyclical swings, 22 percent in stable expansions, 27 percent in less stable expansions, and 53 percent in contractions. Such swings show how dependent housing activity is on the economy's health.

With the economy apparently having entered a stable expansionary period, analysts naturally wonder if housing activity will remain solid, similar to its performance in previous stable

expansions. The rest of the section examines this issue by focusing on the role played by pent-up demand.

The influence of pent-up demand on housing activity

The sensitivity of residential housing and housing-related spending to the business cycle depends in large part on the level of pent-up demand.[13] Demand for housing activity generally becomes pent up, or temporarily deferred, when potential home owners decide to postpone their purchases or when existing home owners decide to delay major renovations. When this demand is realized, the economy typically experiences a large increase in housing activity.

Changes in pent-up demand will influence overall housing activity by affecting both residential housing activity and housing-related spending. Changes in pent-up demand directly cause swings in residential housing spending by affecting the number of new home sales and improvements to existing homes. For example, as potential home owners and existing home owners defer their residential purchases, residential housing activity slows. In extreme cases, the slowdown can precipitate a recession. When the pent-up demand is subsequently released, housing activity tends to accelerate quickly and perform well above its sustainable long-run trend.

Changes in aggregate pent-up demand will also affect overall housing activity indirectly through housing-related spending. For example, after a house is purchased or renovated, the home owner often makes major purchases to furnish it. But if a house purchase or renovation is deferred, then housing-related spending is also deferred. Similarly, as the level of pent-up demand for residential housing diminishes, so does the subsequent release of housing-related purchases.[14]

A good part of housing activity's sensitivity to the stage of the business cycle is attributable to movements in pent-up demand. During contractions, such as the one in the early 1980s, income can drop sharply. Facing such income conditions, consumers are likely to postpone residential housing purchases, causing pent-up demand to build and housing-related purchases to be deferred.[15] As the economy recovers and enters a less stable expansionary period, employment and incomes rise, releasing pent-up demand and causing a surge in new home sales. During stable phases of the expansions, however, income and employment tend to rise more moderately. As a result, pent-up demand plays only a limited role, and wide swings in residential housing and housing-related spending are muted.

Measuring housing activity in stable expansionary periods

The theoretical considerations in the previous section suggest that housing activity will react differently to a given income change in stable expansionary periods than in less stable periods, reflecting the differing impact of pent-up demand. Empirically assessing this difference is important for the economic outlook. If the difference is sizable, housing activity should be expected to grow more stably than it had earlier in this expansion, and similar to other historical stable expansionary periods. This section uses new empirical estimates to measure the effect of income changes on housing activity in both stable and less stable expansionary periods.

Estimating the relationships among income, residential housing, and housing-related spending calls for a regression procedure that uses a system of equations. Housing activity, as measured by residential housing and housing-related spending, enters the small-scale macroeconomic model in two separate equations. The residential housing equation is regressed on its own lags, and lags of income, interest rates, consumer confidence, and housing-related spending. The housing-related equation is regressed on its own lags, and lags of income, interest rates, consumer confidence, and residential housing spending (Appendix A). Because this model can measure the influence of changing income conditions on housing activity, it can be used to investigate how housing activity may differ in stable and less stable expansions. This section focuses on the response of housing activity to a given income change in stable and less stable expansions, while taking into account the interactions of the other variables in the model. The specific relationships among housing activity and the other variables in the model are discussed in Appendix A and Appendix B.

The statistical response over time of residential housing activity to an increase in income in both stable expansions (black line) and less stable expansions (blue line) is shown in Chart 3. The chart shows the more muted response of residential housing to an increase in income in stable expansions. Starting at the left side of the chart, an increase in income sets in motion a response by residential housing. Initially, residential housing rises substantially in less stable periods and reacts modestly in stable periods. Then, residential housing falls off substantially in less stable expansions, while it moderates in stable expansions.[16] After four quarters, the response patterns for both stable and less stable periods roughly track each other before the effect of the income increase finally dissipates. In short, the response in stable expansions is initially more muted and subsequently a bit more drawn out. Moreover, the response of housing activity in stable expansions provides evidence that pent-up demand is relatively low as housing activity responds modestly to a given change in income.

In the current stage of the business cycle, these results for residential housing suggest that housing

Chart 3
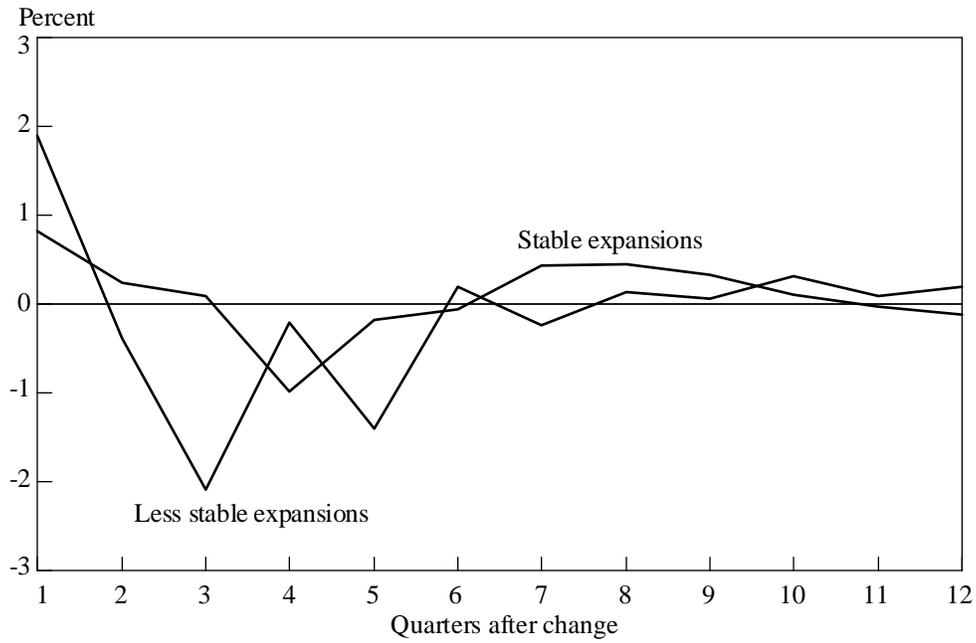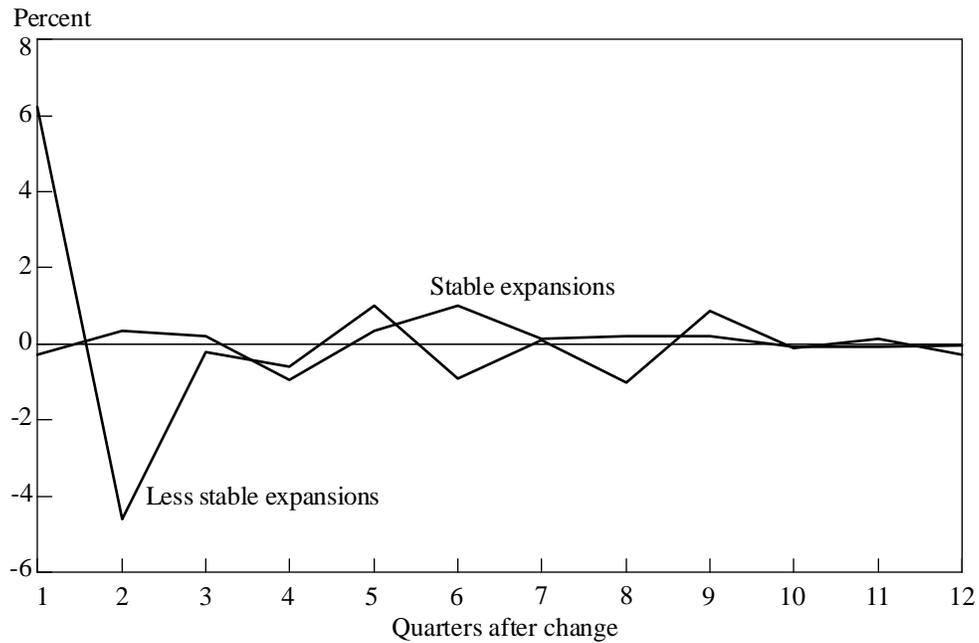
RESPONSE OF RESIDENTIAL HOUSING TO INCOME

Percent

Stable expansions

Less stable expansions

Quarters after change

Chart 4

RESPONSE OF HOUSING-RELATED SPENDING TO INCOME

Percent

Stable expansions

Less stable expansions

Quarters after change

Source: Author's calculations.

activity will remain healthy. Moderate income growth in a stable expansion will provide financial resources for potential home owners to purchase houses and for existing home owners to renovate. Together with a relatively low level of pent-up demand, the housing sector can maintain steady growth, avoiding the costly boom and bust cycles of the past.

The behavior of housing-related spending in stable expansions reinforces the healthy prognosis for overall housing activity. Chart 4 depicts the response of housing-related spending to an increase in income in stable expansions (black line) and less stable expansions (blue line). Starting on the left side of the chart, housing activity initially rises substantially in less stable periods, followed by an immediate and large slowdown. The zig-zag pattern in the first two quarters suggests that housing-related spending tends to fluctuate widely in less stable periods. In stable periods, however, housing-related spending reacts minimally to a given increase in income. Housing-related spending's subsequent response is also small, thereby painting a smooth response of home owners to income increases as they furnish their new homes and renovations.

Thus, both residential housing and housing-related spending fluctuate less in stable expansions than in less stable expansions. These results suggest that the current stable expansion will lead to a favorable environment for housing activity for two reasons.[17] First, stable expansions cause the income of existing and potential home owners to grow, increasing their demands for housing and housing-related goods. Second, the lower levels of pent-up demand for housing indicate that housing activity is less likely to experience the upward or downward swings which cause housing activity to be volatile. In such an environment, cyclical housing activity is likely to grow stably for years to come.

SUMMARY

The outlook for housing activity during the rest of the 1990s appears to be healthy. Demographic factors provide a good foundation for growth in housing demand for the rest of the 1990s. Solid population growth, steady household formation rates, and favorable changes in the age structure of the population all contribute to this outlook. Cyclical factors will also contribute to the health of the housing sector. Lower pent-up demand in the current stable expansion will help housing activity to grow solidly over time. Taken together, the demographic and cyclical factors both point to a bright future for housing activity through the end of the century.

APPENDIX A

MODEL DESCRIPTION AND ESTIMATION

This appendix describes the statistical analysis used in the article to estimate the sensitivity of housing activity to income, interest rates, and other variables during stable expansionary periods. The first subsection lays out the methodology to identify stable expansionary periods, less stable expansionary periods, and contractions. The second subsection describes the statistical model which is estimated over each subperiod using a dummy variable procedure. The third subsection reports results for variables not discussed in the text (income) or in Appendix B (interest rates).

Identifying stable expansionary periods

The post-1959 data were split into three periods: stable expansionary periods, less stable expansionary periods, and contractions. Since no official or unofficial source splits expansionary periods into periods of stable and less stable expansions, this paper uses a split based on deviations of economywide activity from its long-term trend. A stable expansionary period is one in which economywide activity, as measured by real gross domestic product, grows smoothly near its long-run trend for at least one year. To identify these periods, a smooth trend in GDP is removed, yielding the difference between the smooth trend and the actual data.[18] The four-quarter moving average of the squared gap is used to distinguish periods of relative stability and periods of relative turbulence.

Intuitively, this distinction yields plausible results. The periods of stability were generally found in the mid-1960s and the mid-1980s. These periods also happen to correspond to the longest expansion and longest peacetime expansion on record, respectively.[19]

Statistical method and impulse responses

The statistical method uses a five-equation system. The system incorporates five variables that either influence housing activity or measure housing activity: the growth rate of residential housing, the growth rate of housing-related spending, the growth of real income excluding these housing activity measures, the percent change in the 10-year U.S. Treasury bond rate, and the growth in consumer confidence as measured by the University of Michigan's Index of Consumer Sentiment. The dependent variables of the system are the contemporaneous values of each of these variables. The explanatory variables include the lags of these variables. Because the data sample, which spans 1959:Q3 to 1995:Q4, is split into subsamples which correspond to contractions,

stable expansionary periods, and less stable expansionary periods, the lags of the explanatory variables were restricted more than is standard practice. In a standard vector autoregression (VAR), the lag length of the explanatory variables is usually similar across equations and runs from the first lag to the maximum significant lag. For example, a four-lag VAR includes the first four lags of the dependent variables for each equation. In the near-VAR of this paper, all lags that are statistically insignificant are restricted to have a zero coefficient.[20] The validity of the more parsimonious parameterization was verified using standard F-tests of significance.

The near-VAR of this article is different from a usual VAR in that the means and slopes of each equation are allowed to be phase dependent.[21] The phase structure allows comparisons of the model between the stable phases and the turbulent phases.

The estimation strategy is also a bit more involved than the usual VAR structure. The near-VAR falls into the category of a seemingly unrelated regression estimation (Zellner). As such, estimation requires more than equation-by-equation ordinary least square methods. A two-step procedure is employed. The model is first estimated and the variance-covariance matrix of the residuals is calculated, subperiod by subperiod. Then the model in the first step is adjusted (by the Cholesky decomposition of the variance-covariance matrix) and the final estimates are obtained.[22] These estimates are reported in Table A1.

The tests of the sensitivity of housing activity to the other variables exploit the impulse responses of the near-VAR. Impulse responses measure the quarter-by-quarter effect of an unexpected development in the economy on each of the variables in the equation system. To isolate the impulse responses in stable and less stable expansionary periods, the parameter estimates of the system of equations are separated into two sets—one corresponding to stable expansionary periods and the other corresponding to less stable expansionary periods. Then, given these two sets of estimates and their corresponding variance-covariance matrices, the response of housing activity to hypothetical, unexpected changes in income (less residential housing and housing-related spending), interest rates, consumer confidence for both the stable expansionary period and the less stable expansionary period are simulated.[23]

Results

The two housing activity equations in the model capture housing's sensitivity to changing economic conditions. In particular, the model uses separate equations for residential housing and housing-related spending. The residential housing equation includes lags of income (Y), interest rates (R), consumer confidence (CC), housing-related spending (HS), and residential housing (RH). Estimated regression coefficients on the variables reported in Table A1 measure the sensitivity of residential housing to these economic factors. The housing-related spending equation includes

Table A1

REGRESSION COEFFICIENTS FROM FIVE-EQUATION MODEL

Residential Housing (RH_t) Equation

	Stable expansions	Less stable expansions	Contractions
Regressors:			
Y_{t-1}	.00 (.00)	.00 (.00)	.00 (.00)
Y_{t-2}	-.24 (.55)	-1.14 (.44)	-.95 (.75)
Y_{t-3}	-1.28 (.47)	-.05 (.41)	-.97 (.69)
Y_{t-4}	.00 (.00)	.00 (.00)	.00 (.00)
RH_{t-1}	.42 (.13)	.24 (.09)	.29 (.10)
RH_{t-2}	.00 (.00)	.37 (.10)	.00 (.00)
RH_{t-3}	-.08 (.13)	.00 (.00)	.00 (.00)
RH_{t-4}	.00 (.00)	.00 (.00)	.00 (.00)
HS_{t-1}	-.10 (.10)	-.08 (.07)	.00 (.00)
HS_{t-2}	.00 (.00)	-.22 (.07)	.00 (.00)
HS_{t-3}	-.06 (.09)	-.10 (.08)	.00 (.00)
HS_{t-4}	.00 (.00)	-.11 (.07)	.00 (.00)
R_{t-1}	-.27 (.07)	.00 (.00)	-.54 (.09)
R_{t-2}	.00 (.00)	-.13 (.07)	-.29 (.10)
R_{t-3}	.06 (.07)	.10 (.07)	.00 (.00)
R_{t-4}	.00 (.00)	-.08 (.08)	.00 (.00)
CC_{t-1}	.14 (.09)	.00 (.00)	.07 (.07)
CC_{t-2}	.00 (.00)	.00 (.00)	.00 (.00)
CC_{t-3}	.01 (.09)	.07 (.05)	.00 (.00)
CC_{t-4}	.00 (.00)	.00 (.00)	.00 (.00)

Table A1 (continued)

REGRESSION COEFFICIENTS FROM FIVE-EQUATION MODEL

Housing-Related Spending (HS_t) Equation

	Stable expansions	Less stable expansions	Contractions
Regressors:			
Y_{t-1}	.00 (.00)	.00 (.00)	.00 (.00)
Y_{t-2}	.00 (.00)	.00 (.00)	.00 (.00)
Y_{t-3}	.00 (.00)	.00 (.00)	.00 (.00)
Y_{t-4}	.00 (.00)	.00 (.00)	.00 (.00)
RH_{t-1}	.24 (.21)	.00 (.00)	.00 (.00)
RH_{t-2}	-.21 (.20)	.00 (.00)	.00 (.00)
RH_{t-3}	-.24 (.19)	.00 (.00)	-.06 (.14)
RH_{t-4}	.00 (.00)	.00 (.00)	.00 (.00)
HS_{t-1}	-.57 (.16)	-.47 (.11)	-.49 (.17)
HS_{t-2}	-.31 (.15)	-.29 (.11)	.00 (.00)
HS_{t-3}	.00 (.00)	-.28 (.11)	.00 (.00)
HS_{t-4}	.00 (.00)	.01 (.11)	.00 (.00)
R_{t-1}	.00 (.00)	-.02 (.11)	-.33 (.14)
R_{t-2}	.00 (.00)	.00 (.00)	.00 (.00)
R_{t-3}	-.17 (.12)	.00 (.00)	.00 (.00)
R_{t-4}	.00 (.00)	-.21 (.12)	.00 (.00)
CC_{t-1}	.00 (.00)	.00 (.00)	.23 (.10)
CC_{t-2}	.13 (.14)	.00 (.00)	.00 (.00)
CC_{t-3}	.00 (.00)	.00 (.00)	.00 (.00)
CC_{t-4}	.00 (.00)	.08 (.08)	.00 (.00)

Note: Standard errors of the regression coefficients are in parentheses. Regression coefficients for the output (Y_t), interest rate (R_t), and consumer confidence (CC_t) equations are available from the author on request.

lags of income, interest rates, consumer confidence, residential housing, and housing-related spending. The interpretation of the estimated regression coefficients in this equation is similar to the one in the residential housing equation (Table A1).

In addition to the residential housing and housing-related spending equations, the five-equation model includes equations for output, interest rates, and consumer confidence. The estimated regression coefficients for these equations are available from the author on request.

The empirical results for the income and interest rate variables are generally as expected. Broadly speaking, when output increases, so does housing activity, and when interest rates rise, housing activity slows. The text and Appendix B, respectively, of this article fully discuss the income and interest rate sensitivity of housing activity in stable and less stable expansionary periods.

There are three main results for the remaining variables. First, residential housing and housing-related spending generally react positively to an increase in consumer confidence. In stable and less stable expansions, there are some slight differences in housing activity's sensitivity, but the differences are not statistically significant. Second, housing-related spending reacts less to an increase in residential housing in stable expansions than in less stable expansions. Third, the persistence of residential housing and housing-related spending changes (measured by each variable's own lag coefficients in the regressions) are similar in stable and less stable expansionary periods.[24]

APPENDIX B

INTEREST RATE SENSITIVITY OF HOUSING ACTIVITY IN STABLE EXPANSIONARY PERIODS

Financial developments over the last two decades (for example, adjustable-rate mortgages, relaxation of Regulation Q, proliferation of alternative ways for banks to attract funds) raise the possibility that the interest sensitivity of housing in stable expansionary periods has fallen over time. This appendix reports new evidence on the interest sensitivity of housing in stable expansions. The results generally indicate that housing activity is more interest sensitive in stable expansions than in less stable expansions. This greater interest sensitivity, however, has shown no evidence of a decline since 1959. Moreover, the evidence demonstrates that housing activity responds symmetrically to increases and decreases in interest rates and to declines in interests rates in stable expansionary periods.

Interest sensitivity in stable and less stable expansionary periods

According to the small-scale macroeconomic model in the article, the measured response of residential housing to changes in interest rates depends on the stage of the business cycle. The evidence shows that residential housing is more interest sensitive in stable expansions than in less stable expansions. Chart B1 exhibits the responses of residential housing to an increase in interest rates. The response of residential housing is

substantial in stable growth periods. While the estimation method forces the first quarter response to be zero, the subsequent response for stable expansionary periods shows that residential housing falls sharply for two quarters and then slowly shrugs off the negative impulse. In comparison, residential housing is relatively insensitive to interest rate increases (although with a slight negative bias) during less stable expansionary periods. The dramatic difference between the stable and less stable periods indicates that interest rate changes play a much more important role in stable periods than in less stable periods. In particular, interest rate increases tend to slow housing activity considerably, and interest declines tend to speed up housing activity.

No decline in interest sensitivity since 1959

Earlier research in the late 1980s and early 1990s led some analysts to argue that regulatory reform, tax changes, and financial innovations may have caused housing activity—especially residential housing— to become less sensitive to interest rates.[25] With access to more years of data, however, this article finds little evidence that housing activity's interest sensitivity in stable expansionary periods has fallen since 1980.

Chart B1

RESPONSE OF RESIDENTIAL HOUSING TO INTEREST RATES

Percent
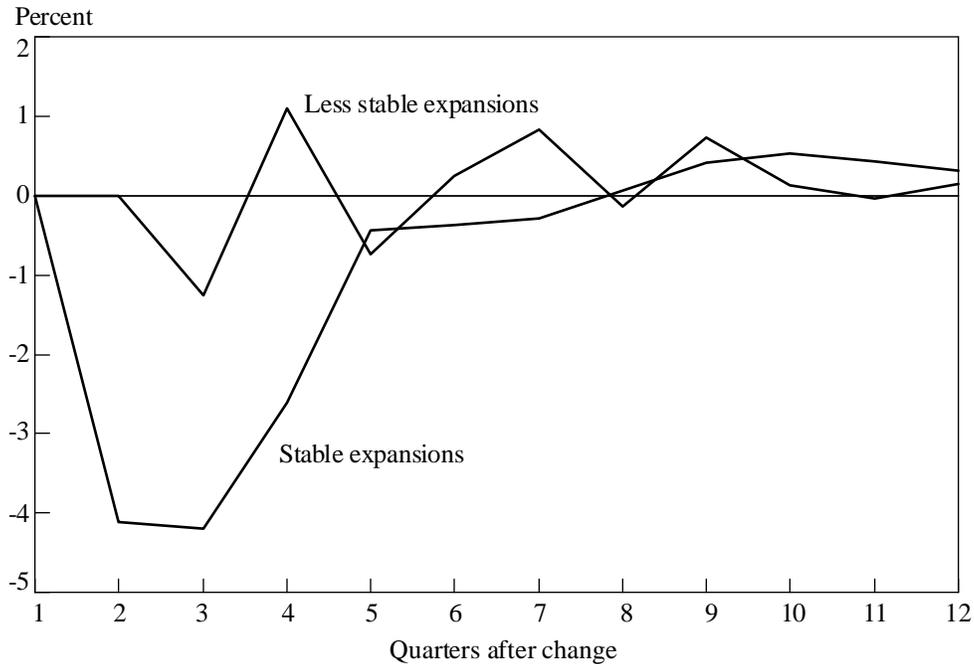
Source: Author's calculations.

Two separate tests confirm little statistical evidence of a secular decline in the interest sensitivity of housing activity. First, the empirical model was augmented to detect a change in interest rate sensitivity before and after 1980. Technically, the regression model includes an interest sensitivity dummy variable for the pre-1980 and post-1980 periods. Using this version of the model, the test of changing interest sensitivity was statistically rejected.[26] Despite the statistical insignificance, however, the estimates of the regression model suggest a hint of lower interest rate sensitivity. Second, to further examine the statistical significance of this hint of lower interest sensitivity, the regression model was then augmented with a dummy variable identifying credit constrained periods.[27] This specification was motivated by the results of Mauskopf.[28] In this credit-constrained version of the model, the rejection of the statistical test was pronounced, suggesting that the hint of lower interest rate sensitivity was due to a few credit-constrained episodes. Thus, these two tests resolve the issue. The financial, regulatory,

and tax changes do not appear to have muted the interest sensitivity of housing activity in stable expansionary periods.

No evidence of asymmetries

Given the finding that housing activity is more interest sensitive in stable expansions than in less stable ones, there might be some question about whether interest rate increases have a different impact than interest rate decreases in stable expansionary periods.

Some analysts have recently begun to focus on asymmetric responses in the economy. To test for the possibility of asymmetries, the interest rate data were split into positive and negative changes and were then added to the regression model.[29] The results find little statistical evidence of interest rate asymmetries in stable expansionary periods. Both increases and decreases in interest rates have statistically similar effects on the economy. The empirical results indicate that interest rate asymmetries are small, at best.

ENDNOTES

[1] Many economists believe that housing activity adds to output primarily through single-family housing purchases, but housing activity also comprises consumption, investment, and government.

[2] In 1990, the Consumer Expenditure Survey of the U.S. Bureau of the Census indicates that 31 percent of expenditures were for housing.

[3] The upward population and household formation revisions largely reflect stronger net immigration into the United States. In revised population projections released this year, the Census Bureau now assumes that immigration will be 820,000 per year for the rest of the decade, up from projections of 600,000 just six years ago (U.S. Bureau of the Census 1989, 1996). At this rate, net immigration will account for one-third of the population growth for the rest of the century. In addition, further upward projections may be warranted given recent patterns of illegal immigration. The Immigration and Naturalization Service estimated that illegal immigration grew by roughly 100,000 per year more than projected by the Census Department earlier in the decade. INS estimates illegal immigration was about 300,000. The immigration translates into at least 310,000 new households per year out of a total of 1.15-1.27 million new households. New immigrants generally have different

housing preferences such as larger households, but the addition to the household formation is quite important (McArdle and Mikelson).

[4] The range of estimates from other sources show a household formation rate a bit higher or slightly lower. The National Association of Home Builders estimates 1.27 million per year, and Apgar, Masnick, and McArdle estimate 1.15 million per year.

[5] This youth projection was revised upward significantly from earlier Census Bureau projections. Earlier in the decade, the Census Bureau expected nearly 100,000 additions to the youth population annually. Table 1 shows that the Census Bureau now expects 674,000 youths per year from 1995 to 2000. This revision reflects stronger immigration and a stronger echo baby-boom generation than previously expected. The increase in youths per household is also projected to rise, thus causing the demand for bigger houses.

[6] The 35-44 and 45-54 age groups account for 16.2 percent and 11.8 percent of the total population in 1995. Combined this age group will account for two percentage points more by the year 2000. This growth reflects the aging of the baby-boom generation and strong immigration.

[7] In the 1991 American Housing Survey, the Bureau of the Census estimated that renovations and improvements spending peaks at about $350 annually for home owners aged 35-54. While it is true that housing activity certainly depends on new house construction, over 40 percent of activity depends on renovations and improvements of existing dwellings. In addition, in the Consumer Expenditures Survey for the years 1984-89, Peng (1992) finds 35-64 year old households are most likely to spend on renovations and improvements. Spending on capital improvements increased until the 35-44 year range, while spending on maintenance and repairs continues to climb until the 55-64 year range.

[8] The need for improvements and renovations should continue to rise in the near future. The U.S. Census Bureau reports that in 1993, the average age of U.S. housing units was up six years from 1973 (U.S. Bureau of the Census 1996).

[9] Residential housing includes single-family houses, renovations and improvements, and other residential housing. The other residential housing includes a relatively small share of multifamily housing and producer durable equipment such as bulldozers.

[10] Furniture and household equipment include mattresses and bedsprings, kitchen and other household appliances (consists of refrigerators and freezers, cooking ranges, dishwashers, laundry equipment, stoves, air conditioners, sewing machines, vacuum cleaners, and other appliances), china, glassware, tableware and utensils, other durable housing furnishings (includes such house furnishings as floor coverings, comforters, quilts, blankets, pillows, picture frames, mirrors, art products, portable lamps, and clocks, as well as writing equipment and hand, power, and garden tools.) Housing-related spending also includes other inventory investment which largely comprises construction material supplies.

[11] Housing services include owner-occupied nonfarm dwellings—space rent, tenant-occupied nonfarm dwellings—rent, rental value of farm dwellings, and other. Rent space consists of rent for space and for heating and plumbing facilities, water heaters, lighting fixtures, kitchen cabinets, linoleum, storm windows and doors, window screens, and screen doors, but excludes rent for appliances, furniture, fuel, and electricity. Rent consists of space rent and rent for appliances, furnishings, and furniture. Other consists of transient hotels, motels, clubs, schools, and other group housing.

Housing operations include household utilities (electricity, gas, water, and other sanitary services), telephone and telegraph, domestic service, and other (includes maintenance services for appliances and house furnishings, moving and warehouse services, postage and express charges, premiums for fire and theft insurance on personal property less claims paid, and miscellaneous household operations services).

Other housing activity includes government purchases of residential housing and the purchase of semi-nondurable goods. Government residential structures (excluding military) includes only state and local government spending. Data on federal spending levels are not available. Semidurable house furnishings consists largely of textile house furnishings including piece goods allocated to house furnishing use, lamp shades, brooms, and brushes.

[12] Bureau of Economic Analysis (BEA) includes in GDP the implicit rental value of the existing housing stock. They treat the housing stock as if it were rented by home owners to the residents of the house, who generally are the home owners. In other words, the implicit rental value is supposed to measure the service flow of housing to its residents. The housing stock is roughly $4 trillion.

[13] Of course, housing activity also depends on other factors including interest rates (Appendix B).

[14] Economists typically call the indirect influence on housing-related spending the *housing multiplier effect*.

[15] Income conditions are especially important for housing activity because first-time home buyers must raise relatively large down payments and existing home owners require relatively large collateral (or equity in an existing home) to trade up to a more expensive home or a major renovation. Several studies find that liquidity constraints in the form of collateral, down payments, and refinancing are quite important for housing decisions (Dynarski and Sheffrin). Caplin, Freeman, and Tracy argue that regional economic shocks which drive down house prices aggravate regional business cycles; the reduction in housing prices reduces the collateral value of the mortgage, which makes it difficult for existing homeowners to refinance and reap the benefits of lower interest rates. Jones finds that first-time home buyers typically face significant borrowing constraints. Down payments imposed by lenders are significant enough to distort lifetime consumption profiles, thus violating predictions of perfect capital models of housing tenure transition models. Engelhardt and Mayer also find that down payment constraints are key to consumption profiles. Using data on gifts and bequests, they find that about 85 percent of the transfers are used to pay for the down payment. These transfers also decrease the time to save for down payments by 22 percent.

[16] The response of housing-related spending to income in less stable expansionary periods shows a dramatic flip-flop. The initial surge in housing-related spending is reversed in the subsequent periods. Such behavior reflects what is technically referred to as intertemporal substitution.

[17] Some of the smoothness of housing-related spending to an income shock is due to the fact that housing-related spending reacts more smoothly to a change in residential housing in stable expansions. In stable expansions, housing-related spending initially increases in response to a given residential housing increase, with the increase being smaller than the one in less stable expansions. After the initial response, housing-related spending in stable expansions slows for about a year before dissipating. In contrast, during less stable expansions most of the housing-related spending response occurs during the first two quarters. The response patterns demonstrate that the timing of housing-related purchases is spread out more in stable expansions than in less stable expansions.

[18] To remove the trend, the standard Hodrick-Prescott filter was used to estimate the trend in GDP. For details on the filter, see Hodrick and Prescott.

[19] The dates of the stable and less stable expansionary periods from 1959 to 1995 which are at least four quarters long are: stable periods, 1961:Q3-1965-Q2, 1966:Q3-1969:Q2, 1984:Q4-1985:Q4, 1986:Q4-1987:Q4, 1988:Q3-1990:Q1; less stable periods, 1970:Q4-1973:Q3, 1975:Q1-1976:Q3, 1977:Q1-1978:Q4, 1980:Q2-1981:Q2, 1982:Q4-1984:Q3.

[20] Erring on the less parsimonious side, lags for variables that were quite statistically insignificant were dropped from the estimation. A reasonable rule is to drop those lags with t-statistics less that 1.

[21] A more standard VAR treatment is found in Daniell. A variant of the near-VAR is used by Gordon and King, and Keating.

[22] This two-step estimator (TSE) has the same asymptotic distribution as the maximum likelihood estimator (MLE). In practice, however, the small sample estimates can differ. For this housing experiment, both the TSE and MLE estimates are quite "close." They are "close" in the sense that the implied impulse responses do not substantively differ.

[23] The shocks used in the simulation are the orthogonalized innovations from a Cholesky decomposition of the variance-covariance matrices from both the stable subperiod and the turbulent subperiod. The ordering of the decomposition was: GDP (less residential housing and housing-related spending), residential housing, housing-related spending, interest rates, and consumer confidence.

[24] In addition, tests on the parameters that determine the cyclical persistence confirm the graphical evidence. Residential housing and housing-related spending, tests that the sum of the autoregressive lags which help determine the shape of the dynamic responses cannot be rejected at traditional significance levels (P-value of 0.71 for residential housing and 0.14 for housing-related spending).

[25] Previous research has suggested that financial, regulatory, and tax developments over the past few decades may have changed the sensitivity of housing to interest rates, especially since the early 1980s. Financial market innovations in the 1970s and 1980s may have caused housing demand to be less interest sensitive to interest rates. Adjustable-rate mortgages (ARMs) have smoothed out mortgage credit demand when conventional fixed-rate mortgage interest rates temporarily rise (Kahn, Ryding, Goodman, Hendershott). However, Romer has argued that ARMs are not very different from fixed rates. Some evidence supports this view (Goodman, Gabriel and Rosenthal).

Over the decades, regulatory reforms have alleviated bank intermediation pressures. Banks have offered more flexible terms on deposits and have paid interest rates more closely tied to market rates, thus reducing the risk of disintermediation and a restriction on mortgage lending (Kahn, Ryding).

Tax changes in the 1980s may have muted the swings in the interest costs of owning a house because marginal tax rates fell and the standard deduction was raised (Poterba).

The cyclical implications for these developments are not clear. While these factors may all help to smooth out housing activity in less stable expansionary periods, it is unclear whether they should have a significant impact in stable times.

[26] I take the break dates from Kahn of 1979:Q3 and 1983:Q1. The equation estimated was:

$$RH_t = \sum a_{y,i} Y_{t-i} + \sum a_{rh1,i} RH_{t-i} + \sum a_{rh2,i} RH_{t-i}$$
$$\times DUM_{post-80,i} + \sum a_{hs,i} HS_{t-i} + \sum a_{r,i} R_{t-i}$$
$$+ \sum a_{cc,i} CC_{t-i} + e_t,$$

where RH, Y, HS, R, and CC are the growth rates of residential housing, GDP less RH and HS, housing-related spending, interest rate, and consumer confidence, respectively. The a's are the estimators and $DUM_{post-80}$ is a variable defined with zeros before 1983:Q1 and ones thereafter. The p-values that each coefficient was zero for the DUM variable ranged from 0.30 to 0.80 for the stable periods and 0.38 to 0.94 from the relatively turbulent periods. The p-value of the test that all the coefficients on DUM are zero was 0.89.

[27] Credit rationing and crunches are no more likely to fall in stable expansionary phases than in other phases of the business cycle. Credit rationing by banks, or the leftward shift in the supply of loanable funds, can have an immediate and lasting effect on housing activity because more than two-thirds of all real estate loans originate from banks. When bank lending dries up, many borrowers have few convenient alternatives to bank mortgage loans, and thus must postpone their housing purchase (Dokko, Edelstein, and Urdang). A more severe form of credit rationing is often called a credit crunch. A credit crunch, however, has less to do with the stage of the business cycle than with political and regulatory factors (Owen and Schreft).

Despite the lack of theoretical association among credit rationing, credit crunches and the stage of the business cycle, credit rationing and credit crunches can influence empirical studies. In particular, studies that do not account for credit rationing may mistakenly find a change in interest sensitivity when no change has occurred. Credit rationing and credit crunches may, by chance, occur more often in certain phases of the cycle. The prevalence of these types of episodes may cause measures of interest sensitivity to be statistically significant because credit rationing causes interest rates to rise and housing activity to slow together, making housing activity appear more interest sensitive than it really is (Stiglitz and Weiss).

[28] Mauskopf concludes that there has not been a decline in the interest sensitivity of housing. She conjectures that earlier research had not properly accounted for the infrequent but economically influential credit constrained periods. Credit constraints could cause a spuriously high interest sensitivity of housing because credit constraints are correlated with interest rate fluctuations. When Mauskopf

controls for credit constraints, the interest sensitivity does not decline. When she leaves out the credit control periods she finds some evidence of a decline. The credit constrained periods she accounts for are 1966:Q3-1966:Q4, 1969:Q3-1970:Q3, and 1974:Q1-1975:Q1.

Following up and extending the observation by Mauskopf, this paper adds in the data up to 1995:Q4 and includes a credit constrained period in early 1990. The results generally confirm her conclusion. When the credit constrained periods are included the size and statistical significance are quite small. This is true when these periods are allowed to influence the slope and intercept parameters. If the credit constrained periods are not included, the statistical significance is small but the parameters on the interest variable falls from -0.44 to -0.14. These results and conclusions are similar to those when using the Owen and Schreft credit crunch dates.

[29] Several studies have shown that the economy responds differently to positive shocks than to negative shocks (Cover, Morgan). It is also possible that interest rates may affect housing activity, especially residential housing, in stable expansionary periods differently than in less stable expansionary periods. In stable expansionary periods, economic fundamentals such as interest rates play a more central and predictable role in determining housing activity, and thus interest rate increases may influence the housing activity more than a similarly sized decrease. An increase in the interest rate will surely raise borrowing costs, but such an increase might also cause the economy to fall into recession. In comparison, a decrease in the interest rate could help boost interest-sensitive sectors, but the initial increase is less likely to set off a vigorous expansion because fundamental demand and supply conditions are well-balanced. In such a situation, the housing activity is less likely to experience waves of pent-up demand and a boom in demand.

Impulse response standard error bands verify that the difference between the positive interest rate impulse response and the negative impulse response is statistically insignificant. The bands were generated using a Monte Carlo procedure which takes into account the SUR variance-covariance matrix.

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