Some Thoughts on Housing Markets Cycles

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ABSTRACT

The possibility of a "housing bubble" has become a topic of widespread interest in the financial press and elsewhere. A working definition of an asset bubble is "a period of time in which assets trade at prices substantially above their fundamental (or long-run) value." This paper examines the question of a housing bubble, looking at movements in various housing valuation indicators over the past 3 decades. It presents an econometric model of housing prices, showing that price changes are related to movements in mortgage rates and employment. The estimated housing price model is used to construct conditional housing price forecasts, and the implications of future housing price changes for residential mortgage default rates are examined in light of these forecasts. The forecasts suggest that while housing price appreciation seems certain to slow or even turn negative when mortgage rates turn up, it is not likely that a moderate rise in rates will produce a sharp collapse. As a result, mortgage defaults may move upward, but defaults are not likely to reach levels where serious concern is warranted. However, in some cities, where prices are substantially above historical trends, falling prices and rising defaults may be more probable.

I. Introduction

Housing prices in many parts of the country have been accelerating rapidly, leading to widespread speculation of a housing bubble.[1] Writing in the *Wall Street Journal* in October of last year, Ray Smith reported: "If you're considering selling your house, sooner rather than later might be the way to go, according to financial planners."[2] Later in the same month, *Fortune* warned that the residential housing market in the U.S. is overvalued by 5 to 10 percent, but "frothy" markets in major cities are 12 to 22 percent overpriced.[3] *Fortune* cited Boston, Miami, New York, Portland, and San Francisco as areas of particular concern.

In December 2002, Robert Shiller, writing in the *Wall Street Journal*, warned that while home prices increases in many cities have been in line with construction cost movements, prices in cities such as Boston, San Jose, Los Angeles, New York, San Diego, and San Francisco may be vulnerable to price drops of as much as 10 percent.[4] Following on Shiller's article, *Wall Street Journal* editorial writer, Jonathan Clements was more restrained. He suggested that home prices are not that pricey in most cities, and even in cities where prices are richly valued, low interest rates and high "dividend" (imputed rent) could make buying a home worth purchasing if the homeowner's time horizon is at least five years.[5]

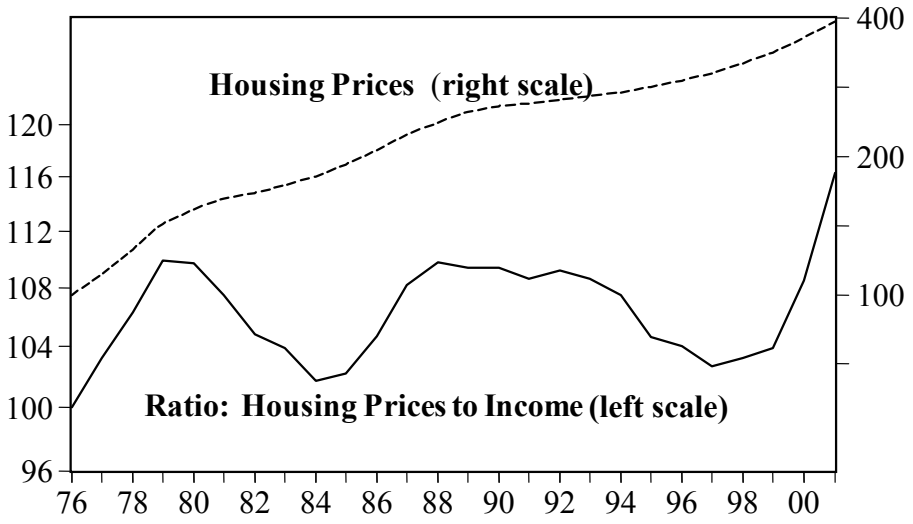
A working definition of an asset bubble is "a period of time in which assets trade at prices substantially above their fundamental (or long-run) value." This paper examines the question of a housing bubble, looking at movements in various housing valuation indicators over the past 3 decades. It presents an econometric model of housing prices, showing that price changes are related to movements in mortgage rates and employment.

The estimated housing price model is used to construct conditional housing price forecasts, and the implications of future housing price changes for residential mortgage default rates are examined in light of these forecasts.

II. Housing Prices and Income

One way to gauge the existence of a housing price bubble is to look at the relationship between housing prices and household income. Figure 1 shows the changes in the ratio of existing housing prices to median household income.[6]

Figure 1: Housing Prices and Household Income, 1976-2001
(index log scale)

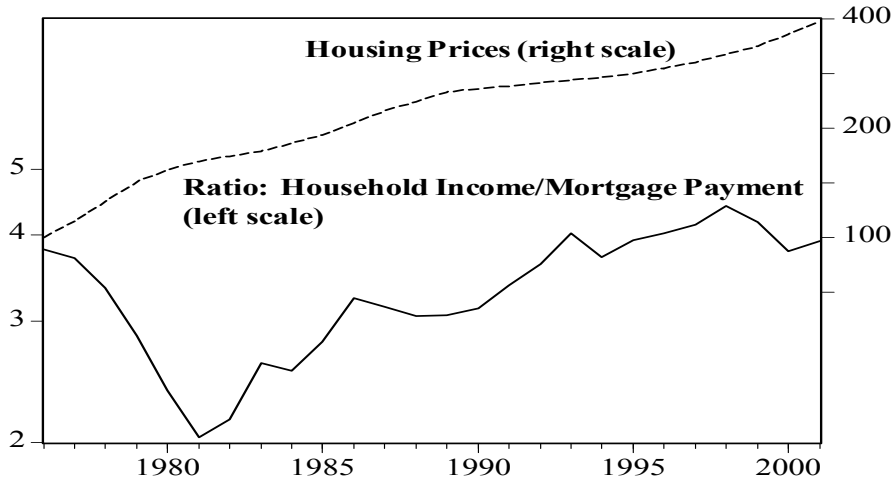


In 2001, the housing-price/income ratio was 16.1 percent higher than it was in 1976 and 7.2 percent higher than in 2000. The ratio is higher now than at any time in the past quarter century.

Housing prices are being stimulated by mortgage interest rates that are at lows not seen in decades. Low mortgage rates have made housing affordable despite its rising cost. Figure 2 plots the ratio of median household income to the mortgage payment

needed to purchase the average existing home.[7] It shows that housing affordability is as high now as almost any time over the past 30 years.[8]

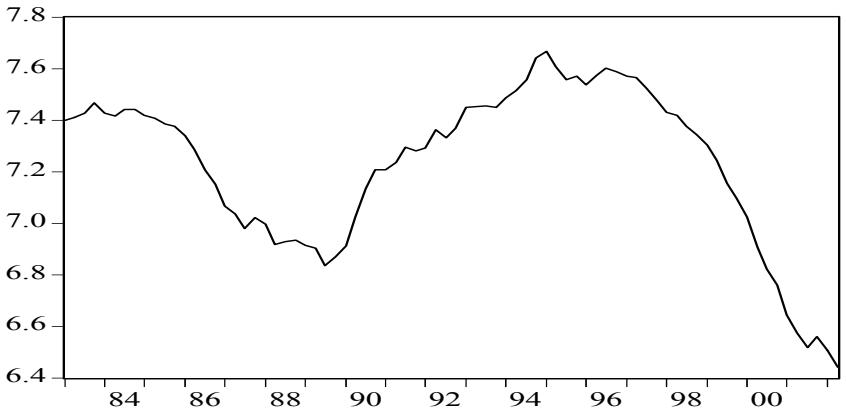
Figure 2: Housing Affordability and Housing Prices (dual log scale)



III. Housing Prices and Residential Rents

Another way to examine the relative valuation of housing is to look at housing prices relative to rents. The Bureau of Labor Statistics (BLS) compiles an index of implicit rent for owner-occupied housing as part of the larger Consumer Price Index. Figure 3 plots the implicit rental yield on owner-occupied housing (that is, the ratio of rent to housing value). This statistic is conceptually similar to the dividend yield on common stocks. Since 1995, the yield on owner-occupied housing has fallen from 7.7 percent to 6.4 percent, indicating that housing values have risen much faster than rents. The implicit rental yield is lower now than at any time since 1983. But compared to yields on other investments currently available in the market, it may still be very attractive.

Figure 3: Imputed Rental Yield on Owner-Occupied Housing



IV. Investment Returns to Homeownership

The growing demand for housing and the concomitant rise in housing prices has created very high returns to investments in owner-occupied housing.[9] Our recent working paper presents investment returns in a number of cities for recent three-, five-, and ten-year holding periods, assuming an 80-percent loan-to-value ratio, and a 28-percent marginal tax bracket. Table 1 shows the calculated returns for 20 cities.

Table 1: Returns for Recent Holding Periods Ending 2001:4
(30-year, fixed-rate loan, 80-percent L/V ratio, & 28-percent tax rate)

MSA	3-year	5-year	10-year
Atlanta, GA	33.9%	31.9%	23.0%
Boston, MA	37.1%	28.5%	14.6%
Charlotte, NC	20.8%	23.1%	19.6%
Chicago, IL	18.2%	14.5%	11.3%
Dallas, TX	27.0%	24.5%	16.0%
Denver, CO	38.7%	30.0%	23.9%
Houston, TX	31.9%	29.5%	18.1%
Kansas City, MO	31.6%	28.3%	22.0%
Los Angeles, CA	20.1%	20.6%	0.5%
Miami, FL	14.5%	18.0%	15.8%
Minneapolis, MN	37.4%	28.5%	19.1%
New York, NY	31.0%	22.6%	9.2%
Phoenix, AZ	30.9%	28.6%	22.2%

Riverside, CA	29.2%	27.0%	5.5%
San Diego, CA	35.5%	28.9%	9.2%
San Francisco, CA	37.8%	30.5%	11.3%
Seattle, WA	20.2%	22.2%	12.9%
St. Louis, MO	25.9%	22.9%	17.6%
Tampa, FL	43.6%	36.0%	24.3%
Washington, DC	29.2%	19.9%	9.2%
Mean	29.7%	25.8%	15.3%
Median	31.0%	27.7%	15.9%
Std. Deviation	7.8%	5.3%	6.6%
Minimum	14.5%	14.5%	0.5%
Maximum	43.6%	36.0%	24.3%

Source: Adapted from G. Donald Jud and Daniel T. Winkler, "Rates of Return to Owner-Occupied Single-Family Housing: An Empirical Study of National and Local Markets" University of North Carolina at Greensboro, Bryan School of Business & Economics, November 2002.

Acceleration in the recent level of returns clearly is evident in Table 1. The average annual return for a 10-year holding period in the 20 cities is 15.3 percent, while the average for a 3-year holding period is 29.7 percent. The level of investment returns recorded recently is much higher than historical norms, and it is reasonable to expect that this level cannot be maintained.[10]

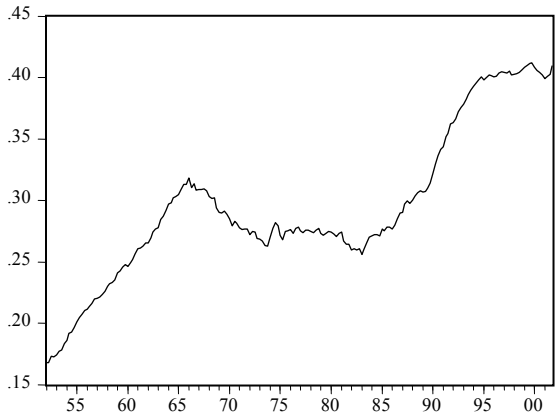
Of course, all housing markets are local, and Table 1 shows wide variation in the level of returns across the 20 cities. The highest annual returns for the 3-year holding period are recorded in Tampa and Denver at 43.6 and 38.7 percent respectively, while the lowest returns over the same period are in Miami and Chicago at 14.5 and 18.2 percent.

V. Trends in Mortgage Debt

Overheated asset markets traditionally are characterized by the increased use of debt, and this clearly has been true in the housing market over the past decade. Figure 4 plots the aggregate loan-to-value ratio for real estate investment in the household sector.

The data in Figure 4 are taken from the Federal Reserve's Flow of Funds Accounts. Between 1990 and 2001, the aggregate loan-to-value ratio for household real estate investment has risen from 33 to 41 percent.

Figure 4: Aggregate Loan-to-Value Ratio for the Household Sector



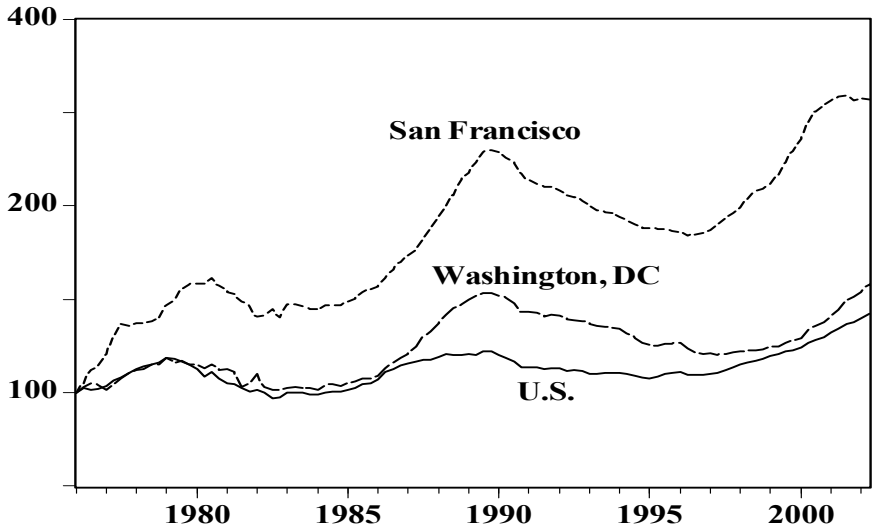
Nevertheless, in addition to raising the level of risk, higher mortgage debt has exerted a powerful force sustaining consumption and the economy by allowing households to withdraw their home equity capital for consumption or investment elsewhere. Alan Greenspan, in testimony to the Joint Economic Committee, describes the effect of mortgage borrowing as occurring through three channels: the turnover of the housing stock, home equity loans, and cash-outs associated with the refinancing of existing mortgages.[11]

VI. Tracking Housing Cycles

Looking over the past several decades, it is clear that long-term cycles are evident in real housing prices. The Office of Federal Housing Enterprise Oversight (OFHEO) publishes a quality-adjusted price index for existing homes in the United States and major

metropolitan areas. Deflating the OFHEO price index by the Consumer Price Index (CPI-U) yields the following series of real housing prices as shown in Figure 5.

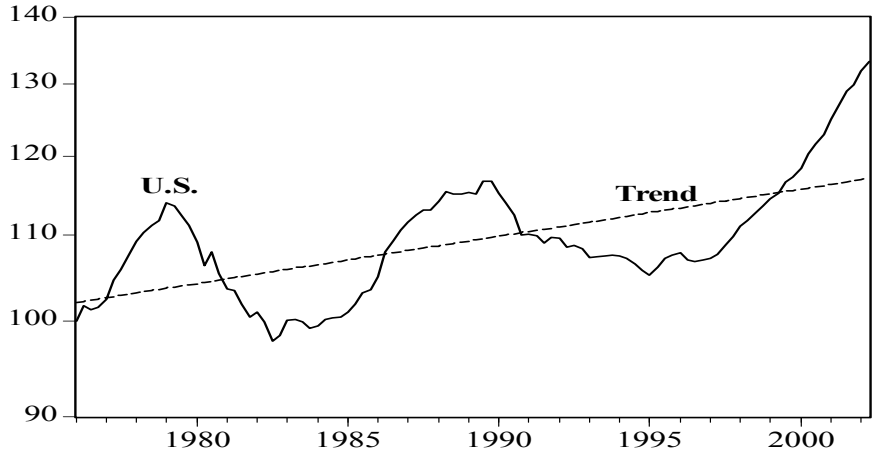
Figure 5: Real Housing Prices
(1976 =100)



The housing price cycles in the U.S. appear to have an average duration of about 5-6 years from peak to trough. San Francisco and Washington DC have a similar cyclical pattern, although the average price growth and cyclical oscillation is larger than for the nation at large. This trend might suggest that real housing prices will peak in 2003.

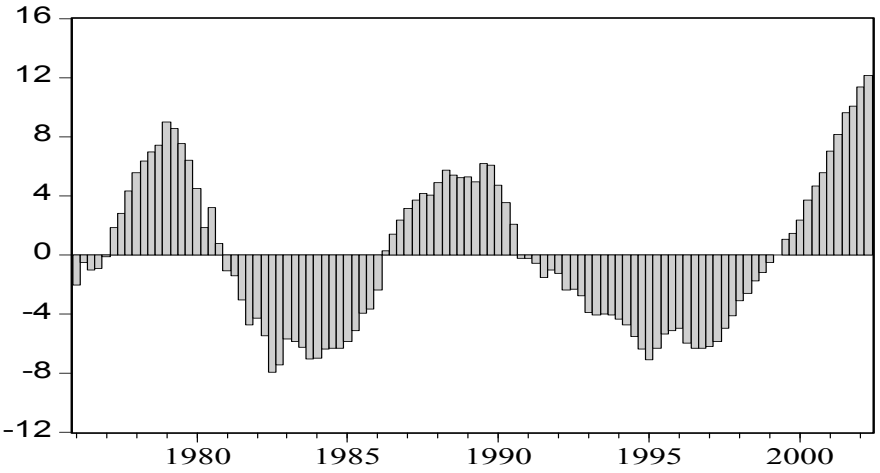
Fitting a log-linear trend line to the U.S. series suggests that real housing prices have grown about 0.5 percent annually since 1978. Figure 6 plots the trend in U.S. prices.

Figure 6: Real Housing Prices
(1976 =100, log scale)



As a first step in the identification of a housing bubble, it seems reasonable to measure the percentage deviation of real housing prices from their long-run trend value. Figure 7 plots a valuation index calculated as the percentage deviation of real housing prices from their long-run trend value.

Figure 7: U.S. Housing Valuation Index



The valuation index suggests that housing prices nationally are about 12 percent overvalued at present. This level of overvaluation is higher than at any time from 1976:1

to 2002:2. The next highest overvaluation occurred in 1979, when prices were 9 percent above their long-run trend value.

Table 2 reports the same trend line analysis for 25 large metropolitan areas across the county. The average level of overvaluation among the 25 cities is 12.4 percent using the trend line method. The highest levels of overvaluation are in Minneapolis (24.6%) and Denver (24.1%). The lowest levels are in New York (3.8%) and Raleigh (4.6%). Housing prices in Minneapolis and Denver exceed their long-run trend values more than at time during the past 25 years. In other areas, however, like Boston, Los Angeles, New York and San Francisco, the degree of overvaluation according to the trend method remains below levels of previous peaks. Robert Shiller suggests, however, that these areas may be particularly vulnerable because supply in these cities is very inelastic. Further analysis is needed to more clearly establish whether these and other markets may be overvalued.

Table 2: Current Housing Prices Relative to Long-Term Trends

MSA	Time Period	Current Overvaluation Level	Historical Maximum Overvaluation Level	Average Annual Appreciation Rate	Appreciation Rate Over the Past 2 Years
Atlanta	76.1 - 02.2	13.7%	13.7%	0.9%	4.2%
Boston	77.1 - 02.2	10.2%	32.8%	4.1%	9.0%
Charlotte	78.1 - 02.2	5.9%	9.6%	0.6%	1.8%
Chicago	77.1 - 02.2	10.4%	19.4%	0.6%	4.5%
Dallas	77.1 - 02.2	7.6%	8.3%	-0.4%	3.5%
Denver	77.1 - 02.2	24.1%	24.1%	1.6%	6.1%
Houston	77.1 - 02.2	9.3%	9.3%	-1.5%	3.3%
Kansas City	77.1 - 02.2	12.8%	16.0%	-0.3%	3.8%
Las Vegas	79.1 - 02.2	6.3%	6.3%	-0.5%	4.3%
Los Angeles	76.1 - 02.2	5.1%	30.1%	1.7%	7.7%
Miami	77.1 - 02.2	19.3%	19.3%	1.0%	9.4%

Minneapolis	77.1 - 02.2	24.6%	24.6%	0.9%	8.4%
New York	77.1 - 02.2	3.8%	33.9%	3.7%	8.8%
Oakland	76.1 - 02.2	16.5%	21.5%	2.8%	8.5%
Orange County	76.1 - 02.2	12.1%	25.8%	1.6%	8.1%
Phoenix	77.1 - 02.2	14.9%	17.7%	0.1%	4.0%
Raleigh	77.1 - 02.2	4.6%	10.8%	0.7%	1.6%
Riverside-San Bernardino	77.1 - 02.2	12.4%	20.8%	0.2%	7.7%
San Diego	76.1 - 02.2	18.1%	20.0%	1.5%	9.9%
San Francisco	76.1 - 02.2	11.1%	26.5%	3.3%	4.4%
San Jose	76.1 - 02.2	13.1%	25.8%	3.6%	3.5%
Seattle	76.1 - 02.2	9.7%	19.7%	1.8%	4.0%
St Louis	76.1 - 02.2	14.2%	16.8%	-0.2%	4.3%
Tampa-St Petersburg	77.1 - 02.2	18.7%	18.7%	0.3%	7.6%
Washington DC	76.1 - 02.2	12.1%	12.1%	0.7%	5.2%
Average		12.4%	19.3%	1.1%	5.7%

In addition to looking on at the deviation from the long-term price trend, the average annual appreciation rate and appreciation rate over the past two years also are useful indicators, especially when used in conjunction with the trend-line deviation. For example, although Boston's current overvaluation level is substantially below its historical maximum overvaluation level, its average annual appreciation rate and most-recent, two-year appreciation rate have been high, suggesting the strong possibility of substantial overvaluation. The high average annual appreciation rates in New York, San Francisco and San Diego and the moderately to high growth rates over the previous two years suggest possible overvaluation in these cities as well.

VII. Forecasting Housing Prices

The possibility of overvaluation in the housing market represents a reason for caution; however, it does not mean that a housing price collapse in imminent. A simple

model of housing prices provides some additional clues on the direction of prices over the next year. The model is expressed as follows:

$$\Delta P_t = a_0 + a_1 \Delta E_{t-2} - a_2 \Delta R_t - a_3 \Delta R_{t-1} + \varepsilon_t \quad (1)$$

where:

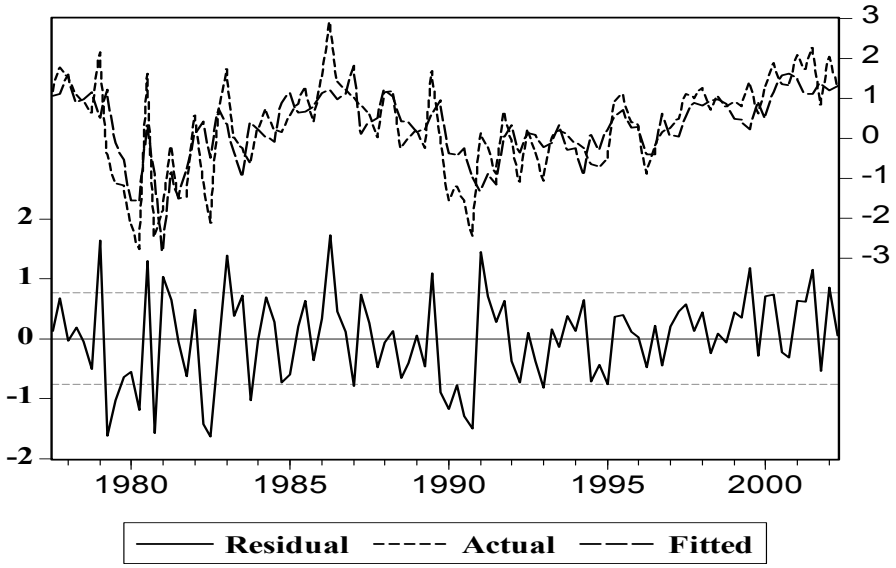
ΔP_t = the change in real housing prices in period t;

ΔE_{t-2} = the change in employment in period t-2;

ΔR_t = the change in mortgage rates in period t.

Figure 8 shows the projected (fitted) and actual changes in real housing prices nationwide, 1976.1 through 2002.2, using the model in equation (1). The model fits the data reasonably well and provides a useful tool for forecasting housing prices.[12]

Figure 8: Changes in Real Housing Prices, 1976.1 – 2002.2



The model in equation (1) suggests that housing prices are directly related to employment growth and negatively related to the change in interest rates. Over the course of the next two years, the consensus economic forecast calls for modestly higher

employment growth accompanied by modestly higher mortgage rates. Two possible economic scenarios for next two years are considered in Table 3, as follows:

Table 3: Possible Future Economic Scenarios: 2003-04

Scenario	Economic Outcome	Employment Growth	Mortgage Rates Rise To
1	Moderate Growth	1% annual	7.0%
2	Recession	-1% annual	8.0%

Scenario no. 1 is the most likely and is in line with the current consensus expectation of moderate growth. Scenario no. 2 is a worse-case expectation, calling for falling employment and rapidly rising mortgage rates. Figure 9 shows the projected changes in real housing prices given Scenario no. 1, and Figure 10 shows projected changes with Scenario no. 2. Both scenarios suggest that it is reasonable to expect a considerable slowdown in the rate of housing price appreciation, and in the extreme case of falling employment and rising mortgage rates, Scenario no. 2 (Figure 10) indicates falling prices.

Figure 9: Housing Price Percentage Changes: Moderate Growth

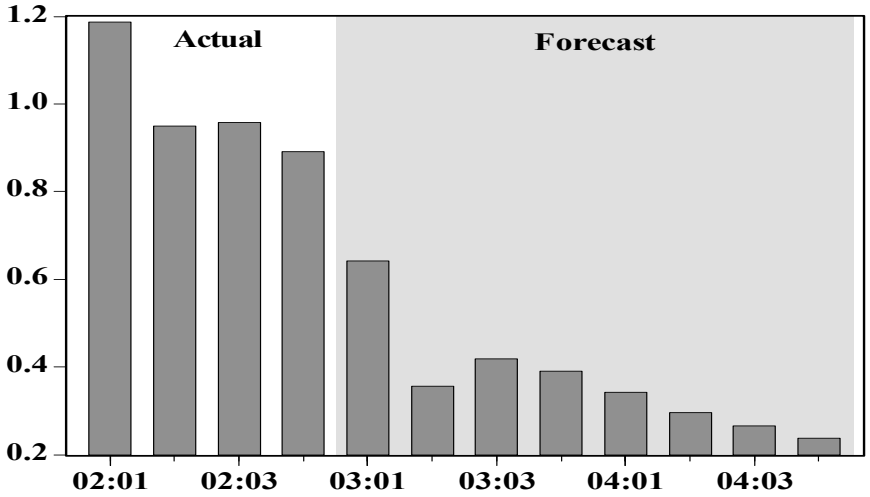
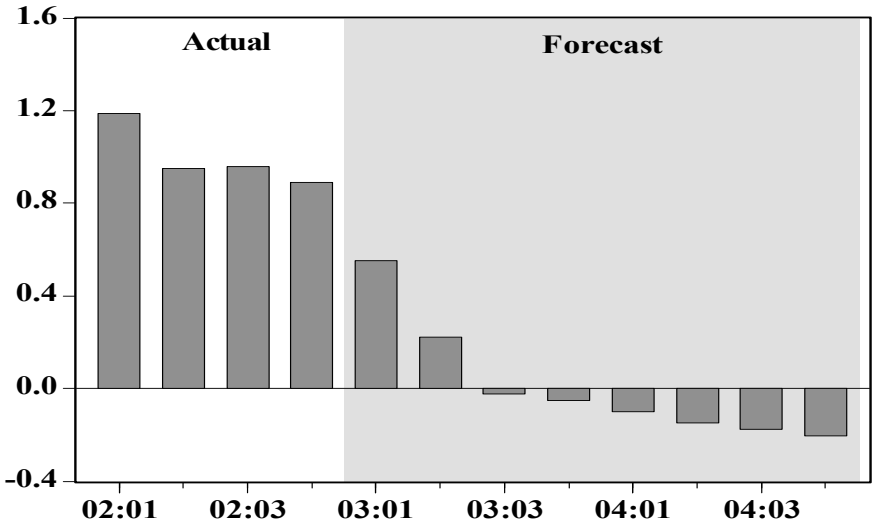


Figure 10: Housing Price Percentage Changes: Recession

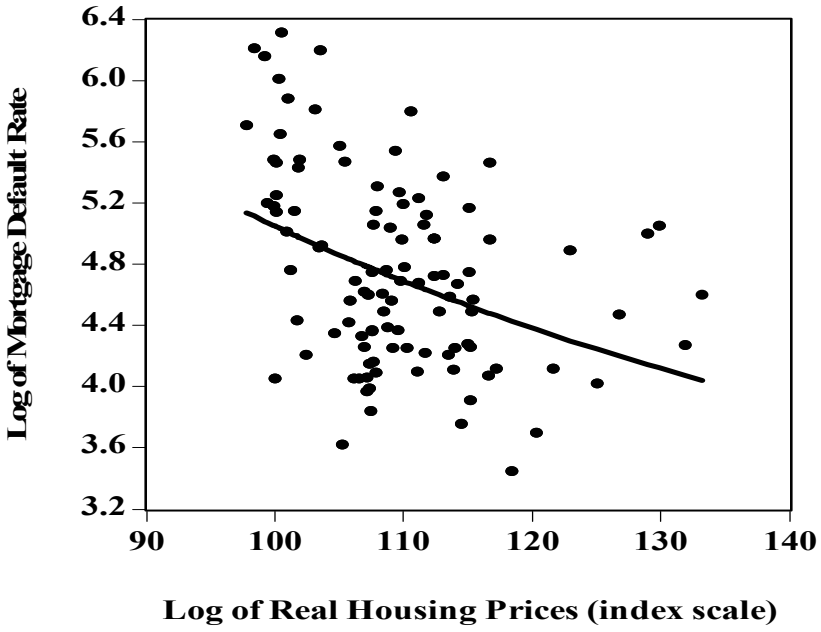


The most likely Scenario no. 1 (Figure 9) suggests that housing prices nationally can be expected to continue to increase, but at a much slower pace. Across the nation, Table 2 shows that prices in some cities are substantially above historical trends, and a slowdown in the rate of housing price appreciation nationally may well be associated with falling prices in those cities where valuations are very extended.

VIII. Housing Prices and Mortgage Defaults

Housing market research has established a strong relationship between housing prices and mortgage default rates. Falling housing prices consistently have been found to be the most important factor explaining mortgage defaults.[13] Figure 11 plots the percent of loans past due and real housing prices, using quarterly data from 1976.1 – 2002.2.[14] It is clear that there is a negative relationship between prices and the percent of past due mortgages, that is, falling prices generally are associated with rising delinquencies.[15] Given the relationship between home prices and mortgage delinquencies, it is reasonable to expect that any fall in real prices will prompt an increase in mortgage defaults.

Figure 11: Housing Prices and Mortgage Default Rates, 1976.1 – 2002.2 (quarterly data, log scale)



To further explore this issue, we obtained a special tabulation from RMIC files showing the percent of loans outstanding each quarter for which a claim for mortgage insurance was filed. The data were available for 25 metropolitan areas for 1981:4 – 2002:2.

Using the RMIC mortgage claim data, we estimated the following model using data for the 25 metropolitan areas:

$$MC_{i,t} = b_0 + b_1 (\log(P_{i,t}) - \log(P_{i,t-4})) + \varepsilon_{i,t} \quad (2)$$

where:

$MC_{i,t}$ = mortgage insurance claims as a percent of all loans in the *i*th MSA in period t;

$(\log(P_{i,t}) - \log(P_{i,t-4})$ = the percentage change in real housing prices in the *i*th MSA over the past 4 quarters.

The coefficient (b_1) in equation 2 shows the relationship between the percent of mortgage insurance claims ($MC_{i,t}$) and the percentage change in housing prices [($\log(P_{i,t}) - \log(P_{i,t-4})$]. If the coefficient is negative, as expected, then a drop in real housing prices is associated with a rise the mortgage insurance claims.

The results of estimating the model in equation 2 are shown in Table 4.[16]

Table 4: Mortgage Insurance Claims and Real Housing Prices, 1981:4 – 2002:2

(b_1)	**Mortgage insurance claims depend on:**	**t-statistic**
-0.730	- Percentage Change in Housing Prices	5.41
0.856	R^2	
2,075	Number of observations	

The estimated coefficient (b_1) is -0.730, and it has a t-statistic of 5.41. Since the t-statistic is greater than 2.0, we can say with statistical confidence that the percentage change in housing prices is an important determinant of the percent of mortgage insurance claims.

Across the 25 MSAs for the sample period, the average percent of mortgage insurance claims was 0.5, or 0.5 percent. The estimated coefficient (b_1) suggest that if real housing prices were to fall by 1 percent, the percent of mortgage insurance claims would rise by 0.73 percentage points (i.e., 0.01*0.73 = 0.0073).

IX. Summary and Overview

While the rapid rise in housing prices appears to be slowing somewhat,[17] it will take a strong upward turn in mortgage rates or a steep decline in employment to produce a marked fall in prices. Neither of these possibilities appears very likely in the near- to

medium-term (see, Figures 9 and 10). Accordingly, while housing price appreciation seems certain to slow or even turn negative when mortgage rates turn up, it is not likely that a moderate rise in rates will produce a sharp collapse. As a result, mortgage defaults may move upward, but defaults are not likely to reach levels where serious concern is warranted. However, in some cities, where prices are substantially above historical trends, falling prices and rising defaults may be more probable.

Notes

[1]Asset market bubbles are exceeding difficult to identify before a crash. A recent conference sponsored by the World Bank and the Chicago Fed identified wide differences among financial economists on how to identify price bubbles. See, Darrin R. Halcomb and Syed Shad Saeed Hussain, "Asset Price Bubbles: Implications for Monetary, Regulatory, and International Policies," *Chicago Fed Letter* (September 2002), number 181b.

[2]Ray A. Smith, Time to Cash Out of Real Estate, Too?" The Wall Street Journal, October 10, 2002, D1.

[3] Shawn Tully and Brian O'Keefe, "Is this House Worth $1.2 million?," *Fortune*, October 28, 2002, pp. 58-72.

[4]Robert J. Shiller, "Safe as Houses?,"The Wall Street Journal, December 17, 2002, pp. A16.

[5]Jonathan Clements, "Bubble? What Bubble? Housing Isn't That Pricey, So Go Ahead and Buy," *The Wall Street Journal*, February 5, 2003, D1.

[6] Existing housing prices are measured using the existing house price index published by the Office of Federal Housing Enterprise Oversight (OFHEO).

[7] The calculation of this ratio assumes a 30-year, fixed-rate mortgage with a 10-percent down payment. Mortgage rates are taken from data published by the Federal reserve and average existing housing prices are from OFHEO data.

[8] Note that the reciprocal of this ratio is typically calculated to determine if a homebuyer would qualify for a home loan.

[9] The returns to homeownership stem from two sources: 1) the implicit savings of out-of-pocket rental expenses and 2) capital gains arising from housing price appreciation. Homeowners incur expenses from (1) the payment of mortgage interest, (2) property taxes, and (3) insurance and maintenance. Additionally, high transaction costs in the housing market force homeowners to incur expenses both when they buy and when they sell.

[10] Jud and Winkler (2002) estimate that from 1978 through 2001, the average 3-year holding period return for homeownership was 10.6 percent assuming a 30-year fixed rate mortgage with an 80-percent loan-to-value ratio and a 28-percent marginal tax rate.

[11] Testimony of Chairman Alan Greenspan, *The Economic Outlook*, before the Joint Economic Committee, U.S. Congress, November 13, 2002

[12] The regression equation for the relationship shown in equation (1) is (t-values in parenthesis):

$$\Delta P_t = \underset{(0.07)}{0.025} + \underset{(2.05)}{0.468}\,\Delta E_{t-2} - \underset{(5.61)}{0.736}\,\Delta R_t - \underset{(2.92)}{0.402}\,\Delta R_{t-1} + \underset{(4.03)}{0.403}\,AR(1) + \underset{(0.15)}{0.017}\,AR(2) + \underset{(3.43)}{0.342}\,AR(3)$$

Adj. $R^2 = 0.56$, n = 100 (1977:3 – 2002:2), the null hypothesis of no autocorrelation is rejected by the Breusch-Godfrey Lagrange multiplier test with lags up to 4.

[13] See, for example, Karl E. Case, Robert J. Shiller, and Allan Weiss, "Mortgage Default Risk and Real Estate Prices," Yale University, Cowles Foundation Discussion Paper: 1098, April 1995.

[14] Data on the percent of all loans past due, were obtained from the Mortgage Bankers' Association.

[15] The regression equation for the relationship shown in Figure 11 is (t-values in parenthesis):

$$\log(MD_t) = \underset{(6.17)}{5.20} - \underset{(4.33)}{0.78}\log(P_t) \qquad R^2 = 0.15 \quad n = 106 \quad \text{time period} = 1976.1 - 2002.2$$

The coefficient on real prices (P_t) indicates that a 1-percent drop in prices is associated with a 0.78 percent increase in the percent of mortgages that are delinquent.

[16] The model was estimated using pooled time series, cross-section data for the 25 MSAs over the period 1981:4 – 2002:2. The estimation procedure included fixed MSA effects and econometric corrections for autocorrelation and heteroskedasticity.

[17] See, June Fletcher, "Did Your Town See Values Rise or Slow Down in 2002?" *Wall Street Journal*, January 31, 2003.