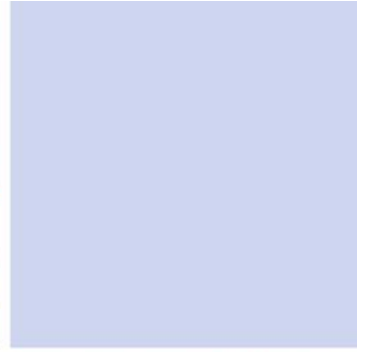




Freddie Mac
Working Paper



Reversion to the Mean Versus Sticking to Fundamentals: Looking to the Next Five Years of Housing Price Growth

Amy Crews Cutts
Frank E. Nothaft

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Abstract

The keen interest of the media, and by extension, the public, in the future of house price growth in the United States centers on the question of whether there is a house price bubble nationally or regionally. Even among those who concede that a bubble per se may not be present, many worry that they may experience a decline in home prices in their metro area due to the very high and unsustainable rise in values over recent years in some parts of the United States. We examine this potential by forecasting the likely change in prices under three models – one that asserts a mean reversion correction on regional markets to return the national average gain in prices to the 50-year annual growth rate of 5 percent over the period 1998-2010; the second and third base future regional and national home price growth on economic fundamentals.

We also discuss recent findings by Chang, Cutts and Green (2005) and perform a simple extension of their work applied to 22 major cities. In all cases, we find the predicted worst-case outcomes to be much less dire than the “doomsday” predictions reported in the mainstream press and elsewhere.

Reversion to the Mean Versus Sticking to Fundamentals: Looking to the Next Five Years of Housing Price Growth

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Introduction

The keen interest of the media, and by extension, the public in the future of house price growth in the United States centers on the question of whether there is a house price bubble nationally or regionally. Even among those who concede that a bubble per se may not be present, many worry that they may experience a decline in home prices in their metro area – or, more specifically, in their particular house.

The fast speculation-driven run-up in prices of technology company stocks in the late 1990s along with the fast democratization of the investor class through online \$9.95 stock trades meant that the bursting of the tech-stock bubble was both sharp and widely distributed. Since that time, the homeownership rate in the United States has climbed to an all-time high and home prices have shown remarkable resilience throughout the recession and recovery. Because equity in owner-occupied homes represents such a large share of household wealth (according to the 2001 Survey of Consumer Finances, home equity accounted for at least 50 percent of net wealth for one-half of all households¹), the fear that prices may fall sharply is both rational (based on what happened in the tech-stock decline) and irrational (homes are not tech stocks).

In the discussion that follows, we ask a series of “what if housing prices behaved in this way...” questions to get a feel for what we might expect to happen to house prices over the next five years. Specifically, we examine three different models of house price growth over the period 2005-2010 and one that questions whether the correction may already be underway. The first is a very simple model that asserts a mean reversion correction on regional markets to return the national average gain in prices to the 50-year annual growth rate of five percent over the period 1998-2010. This model essentially follows the “what goes up, must come down” theory of price growth. The second model relies on regional economic fundamentals to drive home price growth rates. Here we use forecasts of mortgage rates, population growth and income growth to predict regional growth in home prices. The third model is an extension of the work

¹ Nothaft and Chang (2005) citing their analysis data from the 2001 Survey of Consumer Finances.

presented by Chang, Cutts and Green (2005) to test mean reversion tendencies between rents and home price changes in 22 metropolitan areas over the period 1990-2005. We finish with a consideration of national macroeconomic fundamentals and what they suggest about home price appreciation through 2010.

In all cases, we find the predicted worst-case outcomes to be much less dire than the “doomsday” predictions reported in the mainstream press and elsewhere.² Past experience with significant home price declines such as those experienced in Southern California in the early 1990s and in the oil patch states in the mid and late 1980s were caused by large job losses – the subsequent fall in home values was not caused by the previous run-up in prices but rather by the inability of hundreds of thousands of families to meet their mortgage obligations when they were laid off.³ Absent such large job losses in a concentrated area, it is unlikely that the pure mean reversion in prices is likely to occur over such a short period; indeed we fall more toward the side of fundamentals in our regular monthly forecast and expect home prices to gradually slow towards the long-term trend of approximately 5 to 6 percent annual growth over the next several years.⁴

The average annual growth in home prices nationally over the past 50 years was 5 percent, and over the past 30 years was 6.1 percent.⁵ Some regions have trended well above this 30-year average: the Pacific region, encompassing Washington, Oregon, California, Hawaii, and Alaska, has seen annual home price growth of 8.6 percent. The West South Central States of

² See, for example, Shiller (200) who believes several markets are bubbly but does not predict declines per se – rather he only warns that there could be contagion effects from regional declines; Van Akkeren and Ogishi (2005) which estimates that as of the second quarter of 2005, 12 metro areas have a greater than 40% likelihood of a price decline in the next two years and 21 have a greater than 20% chance of a decline; and Cochrane (2005) who states, “Of the nation’s 379 metro areas or their component divisions, 96 display signs of serious real estate imbalance and an additional 78 metro areas are moderately imbalanced.”

³ According to the Bureau of Labor Statistics, the three metropolitan statistical areas of Los Angeles, Orange County and San Diego lost a total of 575,000 non-farm payroll jobs (equivalent to 3.3 percent of the population) during the period 1990-1993. The Houston MSA lost 175,000 jobs between 1985 and 1987 (3.6 percent of the population). Based on Freddie Mac’s Conventional Mortgage Home Price Index, Southern California home prices rose between 75 and 100 percent in the five years previous to the job losses and then fell between 10 and 21 percent from their peak; Houston saw home price gains of just 18.6 percent over the five years prior to the massive job losses and then witnessed average cumulative declines of 25 percent over three years.

⁴ This range includes about 1 percentage point per-year growth in home values that is attributable to additions and alterations to the existing housing stock.

⁵ 50-year average growth rate based on the U.S. Bureau of Labor Statistics CPI-Shelter index from 1954-1963, the U.S. Bureau of the Census New One-Family Houses Sold series for 1963-1970, and Freddie Mac’s Conventional Mortgage Home Price Index from 1970-2005. In Bordo (2005), using data compiled by Shiller (2005), the real rise in home values between 1890 and 2005 has been 86.3%, with roughly 75 percentage points of the increase occurring since 1995. Over the 115 years, this is an annual real appreciation rate of 0.54%, or approximately 3.25% per year nominally.

Arkansas, Louisiana, Oklahoma and Texas have seen the slowest average annual growth at 4.4 percent over this same time. The 30-year growth rates for these and the other 7 Census Divisions based on the Conventional Mortgage Home Price Index (CMHPI)⁶ are shown in Figure 1.

In Figure 2, we have plotted the annual growth rate of home prices nationally from 1954 through 2004 and include an annualized growth rate for 2005 based on data through June. Two things are worth highlighting in this chart. First, nominal home prices as measured by the data in the figure have not dipped into negative territory over the past 50 years. The second is that starting in 1998 home prices have been growing above the 50-year average growth rate rather substantially. We will use this date marker to guide our models below.

Experiment 1: A Model Of Pure Mean Reversion

If we believed that regional home prices should average the 5-percent nominal long-term national growth rate over the period 1998 through 2010 and that a correction will occur over the next five years to regain this average, what would regional home price growth look like?

In Figure 3 we illustrate the results of this thought experiment. For this very simple exercise we examine how fast home prices have grown over the period 1998 through the second quarter of 2005 in each region and then determine how fast they should grow over the next five years such that the 1998-2010 average growth rate in each region is equal to 5 percent.

Annual house price growth nationally would have to slow to just 0.9 percent, or 4.6 percent cumulatively over the next 5 years, to regain an average growth rate of five percent over the whole period 1998-2010. The New England and Pacific states would lose an average 3.3 and 3.9 percent per year respectively, or roughly 15 to 18 percent cumulatively, in average home values over five years. The East and West South Central states, which have performed below average over the past few years would be expected to grow at more than 5 percent per year.

This experiment is very simple and it assumes that every region will grow at the national average rate rather than at its own long-term average rate over the 12 years. This is not likely to be the case but it does provide a sense of what it might take to get back to “normal” over the next five years. Keeping in mind that the coastal areas also have more housing wealth than the interior states, if such a growth pattern in home prices were to occur and the total dollar losses in

⁶ The Conventional Mortgage Home Price Index was jointly developed by Freddie Mac and Fannie Mae in 1994 and is published quarterly by Freddie Mac. For the second quarter of 2005 release, the national index is computed using more than 28 million matched repeat transactions on one-unit detached and single-family townhome properties serving as collateral on loans purchased by Freddie Mac and Fannie Mae by July 31, 2005.

the housing assets were measured, the national average growth rate would be lower than our model predicts.⁷

Because this simple experiment does not take into account supply and demand factors that are well understood to impact home prices, we now turn to a simple model based on economic fundamentals.

Experiment 2: A Model Of Economic Fundamentals

Mortgage interest rates have been a big driver of housing demand. From the middle of 2000 through the middle of 2003, 30-year fixed mortgage rates fell 40 percent and from the middle of 2000 through the first quarter of 2004, 1-year adjustable mortgage rates fell by 53 percent.⁸ This dramatic fall in financing costs has kept housing affordability high even though household income growth has not kept pace with rising home prices – the impact of falling mortgage rates on affordability is illustrated in Figure 4. Even though home prices have risen by more than 50 percent nationwide over the past five years⁹, the National Association of Realtors Composite Housing Affordability Index remains well above 100 – the index represents the share of the median priced home that is affordable to the median-income household at prevailing mortgage rates with conventional, conforming financing with a 20 percent down payment.¹⁰

Almost all economists are expecting higher mortgage rates over the next two years.¹¹ Unless incomes rise substantially to compensate for the higher financing costs, affordability will diminish and we would expect home price growth rates to slow also. Housing demand is also affected by population growth into the local areas – areas that are growing quickly or that have limited land available for residential development will have more upward pressure on home prices than those with stable populations or a ready supply of buildable land. Certainly there are

⁷ Based on 2000 Census estimates of the value of the housing stock in each state, we estimate that dollar weighting the growth rates would produce only a 0.2 to 0.4 percent annual growth rate over the next five years. If the correction is deeper than just mean reversion suggests, we could see a net negative impact on U.S. housing wealth.

⁸ Primary Mortgage Market SurveySM. See www.freddiemac.com/pmms/pmms_archives.html [accessed October 3, 2005].

⁹ As measured by the CMHPI, second quarter 2005 release.

¹⁰ The NAR affordability index does not take into account the ability of potential homeowners to raise the 20-percent downpayment – a very real constraint in many high cost areas. See, for example, Wachter (2003) for a discussion of the impact of high housing costs on homeownership rates in California.

¹¹ As of September 2005, 30-year fixed rate mortgages are expected to average 5.8 percent for the year. In 2006, Freddie Mac is forecasting these rates to average at 6.2 percent, the Mortgage Bankers Association at 6.3 percent, Economy.com at 6.8 percent and Macroeconomic Advisors at 6.3 percent. In 2007, Freddie Mac is forecasting that these rates will average 6.5 percent, Economy.com 6.9 percent and Macroeconomic Advisors 6.4 percent.

other local supply and demand constraints that will influence home price growth¹², but they are hard to measure consistently and in most cases are simply not available. So we will limit our model of fundamental-based changes in regional home prices to three variables:

- Population growth reported by the U.S. Bureau of the Census;
- 30-year fixed conventional conforming contract mortgage rates from the Primary Mortgage Market SurveySM;
- Real Per Capita Disposable Personal Income from the Bureau of Economic Analysis deflated using the Consumer Price Index (CPI) – All Urban Consumers series. Regional values were obtained by using population to obtain a weighted average of the state values.

The dependent variables are the real annual regional growth rates in the CMHPI. Because all of our independent variables are annual values, the home price growth rate is computed by averaging the four quarters of the index level for each year and then calculating the change from the previous year. The CMHPI growth rate is deflated using the CPI – Less Shelter series for the U.S.¹³

The methodology we use to determine the coefficients for our regional real growth in homes prices is seemingly-unrelated-regression analysis to capture any correlated trends across the regions and we present the regression results in Table 1. In all cases but one we got the predicted sign on our coefficients and most are significant as well – usually interest rates or incomes are significant, although not always together. In the one case of the West North Central states, the population growth coefficient was significant and negative – this is due in part to the fact that these states are losing population consistently throughout the sample period, even though the major cities are showing modest growth. We elected to delete this variable from this one regression model.

To obtain the predicted home value growth rates from 2005 through 2010 we use forecasts of the three independent variables provided to us by Moody's Economy.com and their

¹² See, for example, Glaeser and Gyourko (2002), Glaeser, Gyourko and Saks (2004) and Gyourko, Mayer and Sinai (2004) for discussion of local environmental, political and amenity-driven impacts on home prices.

¹³ Technically we should use real mortgage rates in addition to real income and home prices, but for this we will need inflationary expectations rather than just the current rate of inflation. Unfortunately the inflationary expectations series does not cover the full period of our sample. A 3-year moving average of actual inflation is often used as a proxy for inflation expectations, but we found that when this variable is used instead, interest rates have no statistical impact on home prices and the coefficients were usually of the wrong sign.

prediction for the CPI – All Urban Consumers series. We did a simple regression to estimate the CPI – Less Shelter series from the Moody’s Economy.com inflation forecast and then turned our regional real home price growth estimates into nominal growth predictions. To obtain a national growth rate in home prices we weight the regional values by the distribution of one-unit detached, single-family structures in each Census division to get the national average growth rate.¹⁴ The results of this exercise are presented in Figure 5.

In this experiment, we see a pattern similar to the 25-year growth pattern, with stronger home price appreciation on the coasts than in the middle of the country and a national growth rate of 5.0 percent per year.¹⁵ Population has been migrating to the coasts over the past half century and land constraints are tighter there than in the central states – in short this is where we would expect to see stronger growth.

The Pacific states are expected to lead home price growth over the next five years, with an annualized growth rate of 6.5 percent or a total growth of 37.0 percent. The Middle Atlantic states are expected to follow close behind with annual growth of 6.4 percent and just over 36 percent cumulatively. The Mountain states and West South Central states are expected to have the weakest growth due to lower incomes and low population density. The model suggests they can expect annual home price growth of 3.1 percent, totaling 16.5 percent at the end of five years.

Experiment 3: A Consideration of Rents and Home Prices

In a paper presented by Chang, Cutts, and Green at a conference held by the Atlanta Federal Reserve Bank in May 2005, they suggested that the difference between rent growth and growth in home prices was due primarily to significant increases in the quality of the stock of owner-occupied homes over the past fifteen years that did not occur in the rental stock. Once the quality of the rental and owner-occupied housing units were controlled for, rents and home price increases were generally in alignment. Their analysis covered 27 metropolitan areas and was based on data from the American Housing Survey. Because the AHS only surveys metro areas

¹⁴ This is the same weighting scheme used to obtain the national series in the Conventional Mortgage Home Price Index.

¹⁵ Economy.com generally predicts somewhat higher long-term interest rates than many other forecasters – thus we might consider this to be near the lower bound of a fundamental-based prediction. For example, substituting Freddie Mac’s September 2005 forecast for mortgage rates raises the U.S. annual home price growth to 3.7 percent. We should note here that the error terms are heteroskedastic in these regressions – rather they become larger in the most recent periods and this pattern holds across all regions.

every 6-10 years on a rolling cycle, the Cutts, Green and Chang analysis ends in 1998 to 2002, missing much of the above trend growth in real estate prices and they have no way of verifying whether rents and home prices continue to diverge or reverse trend.

Based on their research and that of others,¹⁶ we pose the question: are rents and home price growth rates converging or diverging in a mean reverting sense over not just the recent hot market, but rather over the longer period of 1990-2005 – that is, from the period of below the 50-year trend home price growth (area A) to the current above trend growth period (area B) as shown in Figure 6. In the same figure we show one way in which the mean reversion in our first experiment might look nationally – in that experiment we forced area C to be equal to area B. Just on the basis of the national home price growth shown in the figure, area A is slightly smaller than area B – home prices grew about 1.75 percentage points slower than the long-term trend of 5 percent during the 1990-1999 period and grew about 2.75 percentage points faster than that trend between 1999 and 2005.

We use data on home prices from the CMHPI and use data on contract rents on units in professionally managed multifamily properties from REIS, Inc. for the 22 metropolitan areas that we could match to the Cutts, Chang and Green study.¹⁷ What we found is that when rents grew substantially faster than home prices in the earlier period, home prices grew substantially faster in the later period. The correlation between the early and late period rent-price growth rate differentials is -0.74 . This comparison of rent and price growth is shown as a scatter plot in Figure 7.

The CMHPI and REIS data do not control for improvements in the stock of either rental or owner-occupied units so we would not expect rents and home prices to grow at exactly the same rates. But it is a dramatic testament to the reversion process in prices.

A Final Experiment and Concluding Thoughts

We close with yet one more view of what might happen in home prices over the next five years by providing a forecast of national home price trends based on macro-level fundamentals. Specifically, we model U.S. home price growth as

¹⁶ See for example Hendershott and Shilling (1982), Meese and Wallace (1994) and Leamer (2002).

¹⁷The cities are: Baltimore, Birmingham, Boston, Columbus, Cincinnati, Houston, Kansas City, Miami, Milwaukee, Minneapolis, Norfolk-Virginia Beach, Oakland, Phoenix, Portland, Riverside, Salt Lake City, San Diego, San Francisco, San Jose, Tampa, and Washington.

$$\begin{aligned} \Delta\text{CMHPI}_t = & \beta_0 + \beta_1 * \Delta\text{CMHPI}_{t-1} + \beta_2 * \Delta\text{GDP}_t + \beta_3 * \Delta\text{GDP}_{t-1} + \beta_4 * \Delta\text{HousingStarts}_{t-1} + \\ & \beta_5 * \Delta\text{30YearFMR}_t + \beta_6 * \Delta\text{30YearFMR}_{t-1} + \beta_7 * \Delta\text{30YearFMR}_{t-2} + \beta_8 * \Delta\text{30YearFMR}_{t-3} + \\ & \beta_9 * \Delta\text{CPI}_t + \beta_{10} * \Delta\text{CPI}_{t-1} + \beta_{11} * \Delta\text{CPI}_{t-2} \\ & \beta_{12} * \text{30YearFMRspd}_t + \beta_{13} * \text{30YearFMRspd}_{t-1} + \beta_{14} * \text{30YearFMRspd}_{t-2} + \\ & \beta_{15} * \text{SpringQtrDummy}_t + \beta_{16} * \text{SummerQtrDummy}_t + \beta_{17} * \text{FallQtrDummy}_t \end{aligned}$$

where ΔCMHPI indicates the quarterly growth rate in home prices as recorded by the Conventional Mortgage Home Price Index, ΔGDP represents real GDP growth, $\Delta\text{HousingStarts}$ is the percent change in housing starts, $\Delta\text{30YearFMR}$ represents the change in the quarterly average of 30-year fixed mortgage rates plus points divided by 4 as recorded in the Primary Mortgage Market Survey, 30YearFMRspd represents the level of these rates less the 10-year constant maturity Treasury rate, and ΔCPI is the inflation rate as measured by the all-urban consumers series of the Consumer Price Index. Once again, we use forecasted values of the independent variables provided to us by Moody's Economy.com to obtain the predicted growth rates for 2005-2010.

We show this forecast in Figure 8 as a dark green dotted line. It is by far the most optimistic among our forecasts for the next two years. However, while it looks like we are forecasting a boom to continue in home prices because our forecast is everywhere above the 5 percent line, if we took as our benchmark the past 30 years of home price growth instead of the past 50, we would find our forecast to flatten out at the 30-year average – this average is marked at 6.1 percent in the figure. Our final forecast is predicated on no national recessions over the next 5 years, so GDP growth remains positive, and that 30-year fixed mortgage rates will remain below 8 percent. We do not rule out that there might be a regional recession or localized loss in home values.

The primary driver behind the continued interest in home prices and the bubble theory is simply that we have been in an above-trend market for some time and we “know” that we should soon enter a below-trend market. Several important concepts emerge from our three simple experiments. First, the choice of 5 percent as “the” benchmark to represent long-term home price growth is just as arbitrary as if we had picked the past 10 years or 20 – had we chosen these shorter horizons, the benchmark value would have been higher. Second, the choice of the next five years as the period of reconciliation of trends is also arbitrary – if we chose a longer period,

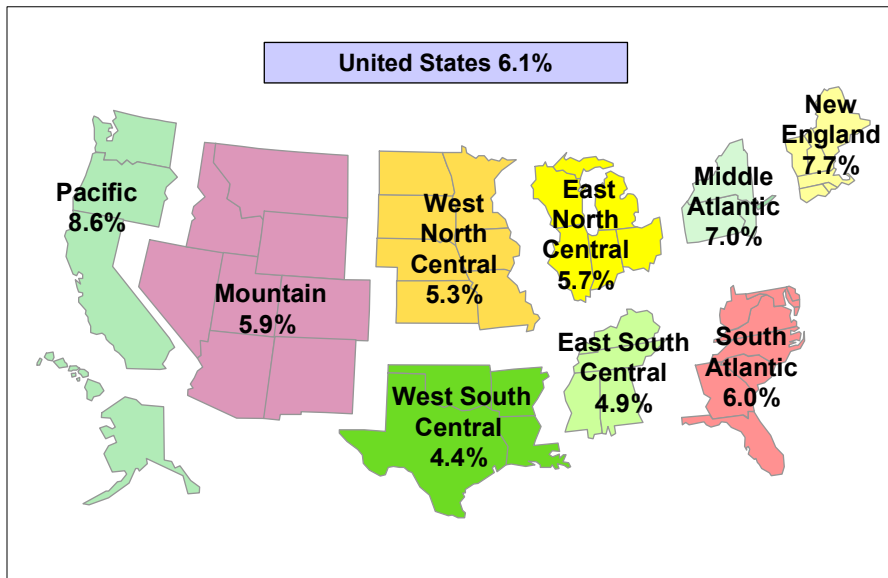
the steepness in the reversion paths would have been shallower and thus less alarming. Third, resources are scarce, meaning that real home prices can continue to rise as buildable land becomes scarcer in the areas where people most want to live, but it also means that we will change our use of the resource as it becomes relatively more expensive – hence we see smaller dwelling units in taller buildings in Manhattan than we see in Indianapolis. Lastly, housing price dynamics are complex – the national growth rates are the average of many thousands of micro-markets all influenced by macroeconomic trends such as interest rates as well as very specialized local constraints such as zoning and road congestion. We cannot hope to capture all of the nuances that affect these local markets across the United States in any one model. The experiments that we demonstrate here provide bounds on what might happen under different paradigms of macro or regional dynamics.



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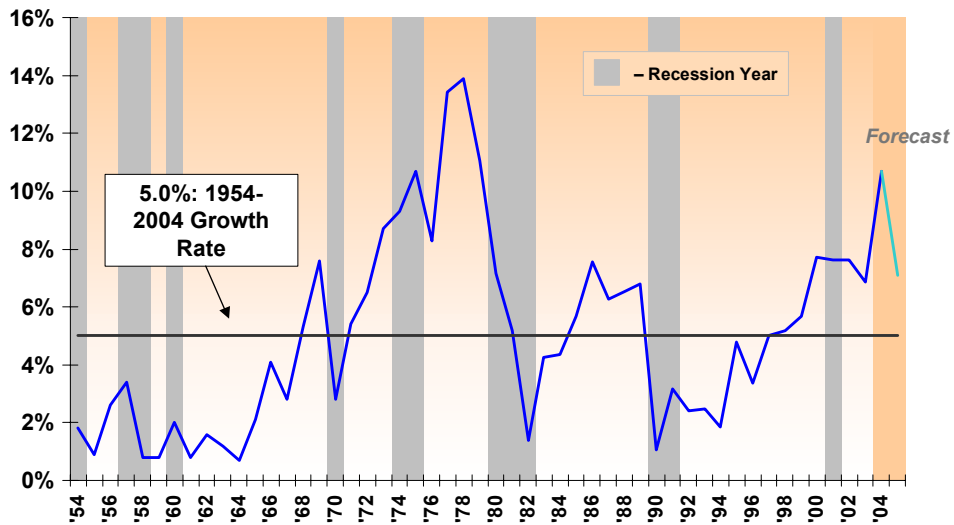
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Figure 1: Regional Annual House-Price Growth 1975-2005



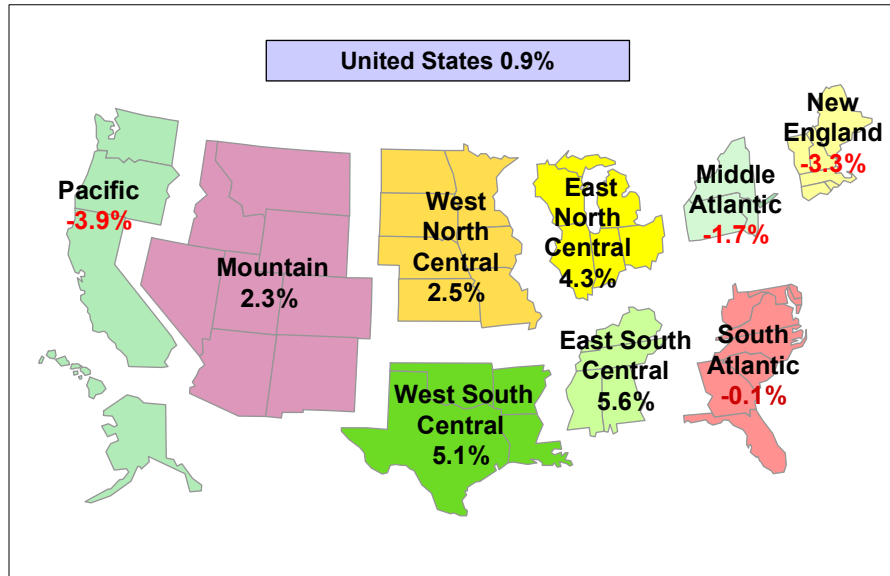
Source: Freddie Mac Conventional Mortgage Home Price Index 2Q2005 release for period 1Q1975 - 1Q2005.

Figure 2: Annual Growth Rate of Home Prices in the U.S. 1954-2005



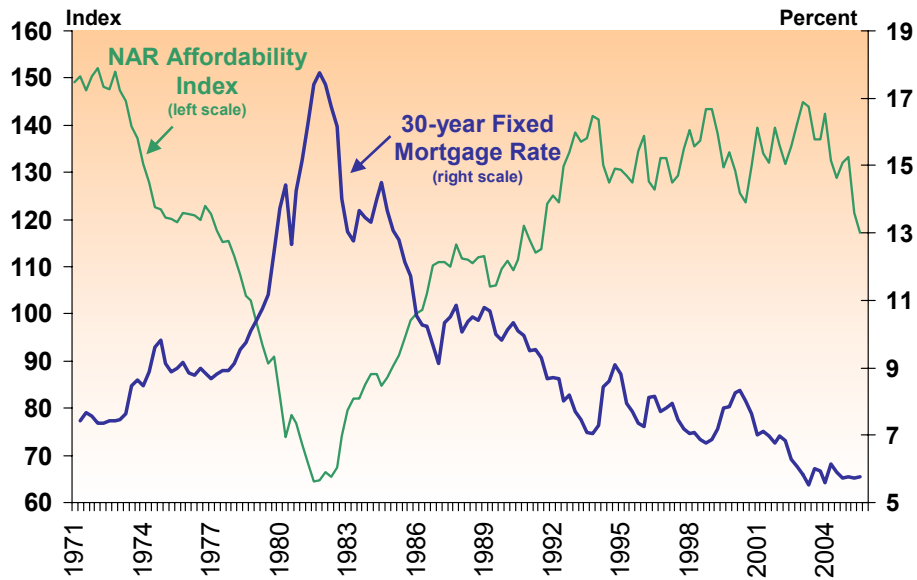
Source: U.S. Bureau of Labor Statistics - CPI-Shelter index (1954-1963), U.S. Bureau of the Census - New One-Family Houses Sold series (1963-1970), and Freddie Mac's Conventional Mortgage Home Price Index (1970-2005)

Figure 3: Pure Mean Reverting View of Annual House Price Growth 2005-2010



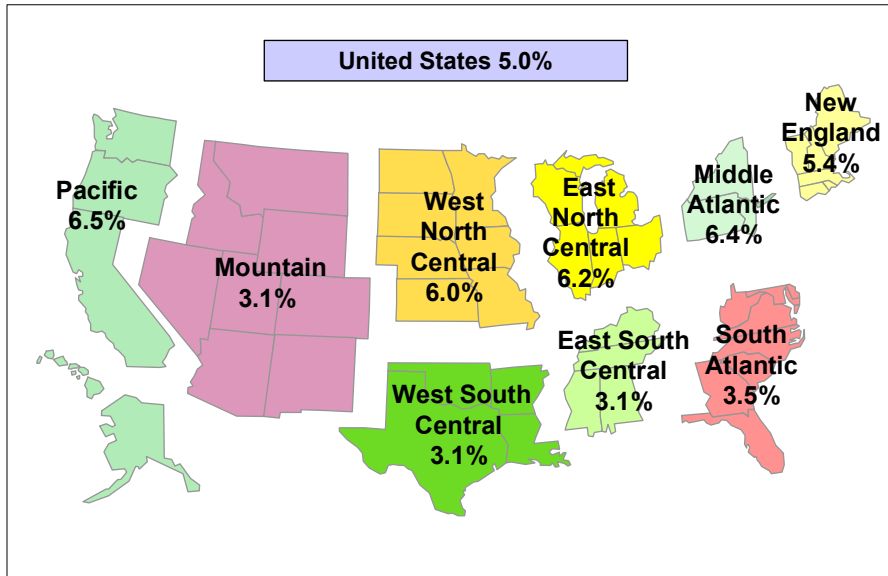
Source: Authors' calculations on Freddie Mac's Conventional Mortgage Home Price Index data.

Figure 4: Mortgage Rates and Affordability of Homes 1971-2005



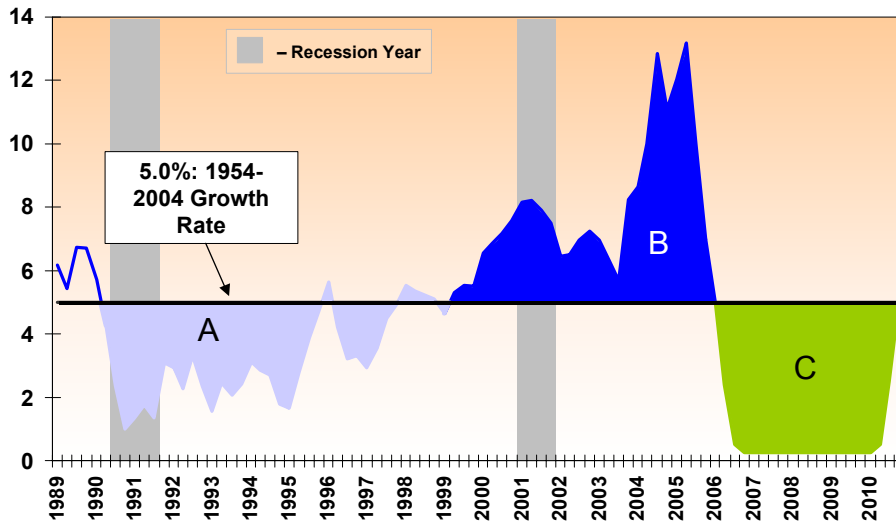
Source: National Association of Realtors Composite Housing Affordability Index – (% of median priced home affordable on median income with conventional financing 30-Year fixed-rate mortgage and 20% down); Freddie Mac Primary Mortgage Market SurveySM

Figure 5: Fundamental Economics View of Annual House Price Growth 2005-2010



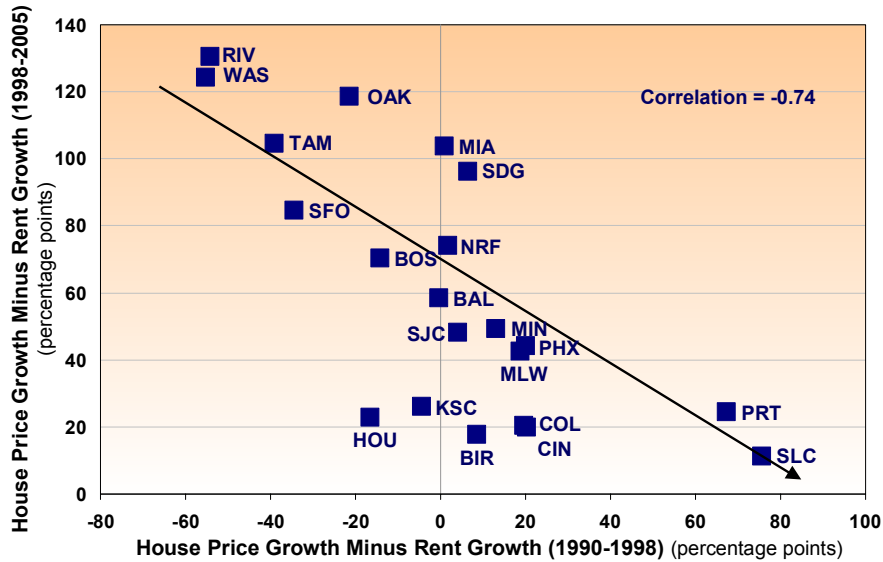
Source: Authors' calculations using Moody's Economy.com projections of regional real household income, population growth and 30-year fixed conventional and conforming mortgage rate projections.

Figure 6: Annual Growth Rate of Home Prices in the U.S. 1970-2005



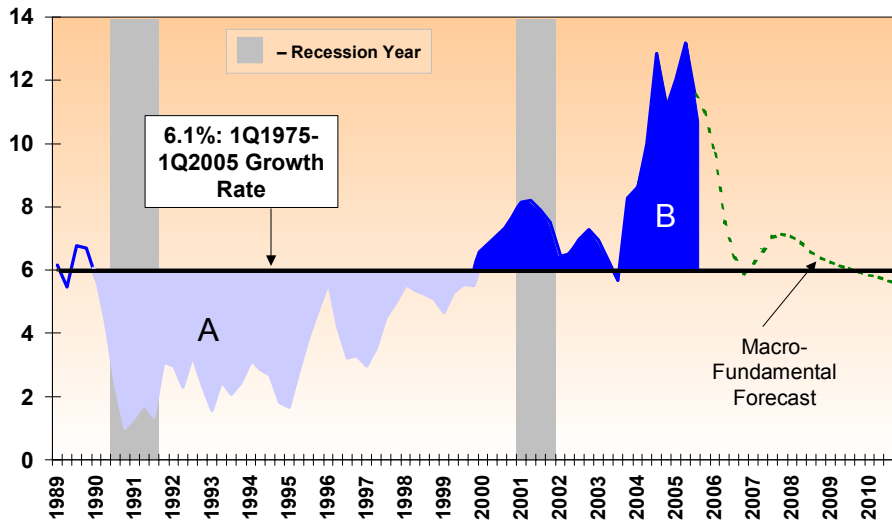
Source: Freddie Mac Conventional Mortgage Home Price Index (1971-2005), Authors' calculations

**Figure 7: Long-term Home Prices Versus Rents
Reversion to Mean: 1990-2005**



Source: Authors' calculations on data from Conventional Mortgage Home Price Index and REIS, Inc.

**Figure 8: 2005-2010 Forecast of Home Prices Based on
Macroeconomic Fundamentals**



Source: Conventional Mortgage Home Price Index and Authors' calculations using Moody's Economy.com projections of interest rates, CPI, GDP, and housing starts.

Table 1: Seemingly Unrelated Regression Results Predicting Regional Home Price Growth

Division	Intercept	Income Growth	Population Growth	30-Year Fixed Mortgage Rates
New England	-0.28 (-0.07)	1.13 (-3.13)	9.58 (-3.59)	-0.36 (-0.98)
Middle Atlantic	3.98 (-1.06)	1.03 (-2.48)	3.58 (-1.82)	-0.38 (-1.05)
East North Central	8.48 (-3.64)	0.43 (-2.64)	0.74 (-0.54)	-0.81 (-4.29)
West North Central	9.85 (-7.02)	0.24 (-20.4)	- -	-0.94 (-6.84)
South Atlantic	0.16 (-0.04)	0.31 (-1.45)	3.79 (-1.73)	-0.56 (-3.08)
East South Central	5.5 (-3.52)	0.39 (-3.02)	0.48 (-0.9)	-0.62 (-4.66)
West South Central	-0.41 (-0.31)	0.42 (-3.25)	4.44 (-14.37)	-0.7 (-5.36)
Mountain	-2.72 (-1.59)	0.23 (-1.60)	3.96 (-12.71)	-0.58 (-3.97)
Pacific	2.7 (-0.78)	0.77 (-1.96)	7.79 (-5.23)	-1.34 (-3.96)
System R²	0.75			
Observations per region	29			

Sources: Authors' calculations based on Bureau of Economic Analysis and Bureau of Labor Statistics: Real Per Capita Disposable Personal Income, U.S. Bureau of the Census: population, Freddie Mac: Primary Mortgage Market SurveySM contract interest rates for 30-year, fixed conventional and conforming mortgages. Regressions based on period 1976 to 2004. Values in parentheses are t-statistics.