IX. House Price Dynamics

As Malpezzi (1999) pointed out in his research on regulatory constraints, house prices can be studied in either levels or changes. The next two chapters are devoted to the extensive literature on house price changes or dynamics. Chapter IX focuses on the determinants of metropolitan house price changes, with a review of the relative efficiency of housing markets. We also consider the way in which the financial accelerator impacts the sensitivity of house prices to income shocks and credit constraints. Chapter X examines house price bubbles, how they build and collapse, and reviews the current evidence for house price bubbles. Economists often associate bubbles with irrational behavior, and, in fact, most strict tests of housing market efficiency fail. Chapter XI on behavioral finance considers how buyers and sellers form price expectations in an uncertain, dynamic housing market.

In a fine review of the earlier dynamics literature, Cho (1996) defines the three forms of informational efficiency identified by Fama (1970). The strong form of efficiency assumes that investors cannot consistently earn above-normal, risk-adjusted returns using either public or private information. A semi-strong form of efficiency assumes that above-normal returns are possible only with private information, not public information. The weak form of efficiency assumes that above-normal returns are not possible using only past public information on prices and returns. It is actually the weak form of efficiency that has been tested extensively, because it is possible to avoid the endogeneity of current information and test the significance of lagged prices and lagged returns. For example, Case and Shiller (1989) found that both house prices and after-tax excess returns are positively serially correlated which violates the weak form of efficiency assumption. From an overview of the literature, Cho concludes that both house prices and excess returns exhibit a positive serial correlation in the short run. Although the housing market does not appear to be efficient, the deviations are not large enough for investors to systematically profit from them given the high transaction costs.[53]

Abraham and Hendershott (1993) use Freddie Mac repeat-sales data for 29 cities to estimate a house price change equation from 1977 to 1991. Following Case and Shiller (1989), the best model specification includes lagged real house price appreciation. Showing the sign in parentheses, the specification also contains real construction cost inflation (+), employment growth (+), real income growth (+), and change in real after-tax interest rate (-). A deviation variable, calculated as the difference between national prices and local prices ($P_{National}$-P_{Local}), is not significant when lagged price changes are in the model. The idea is that some cities have temporary shocks, but they tend to revert back to the national average house price growth. The driving force comes from the growth variables for employment and income. In a comment, Wilcox recommends including an error correction mechanism, and Apgar suggests adding controls for demographics and growth controls.

Similar findings are presented by Jud and Winkler (2002), who estimate the percentage price change as reported by OFHEO for 130 metropolitan areas from 1984 to 1998. The independent variables (shown in Exhibit 20) are in percentage change form, so the coefficients are elasticities. For example,

[53] See also Clayton (1996) for a rational expectations model that works well on Vancouver, BC data from 1979-1991 during less volatile times, but misses the boom periods. The conclusion is that house prices deviate from market fundamentals during the extremes of real estate cycles when the market is less efficient and expectations are less rational.

a 1 percent increase in income is associated with a house price increase of 0.17 percent. Surprisingly, after including the lagged effect, a 1 percent increase in the stock market index is associated with a 0.16 percent increase in house prices, nearly as large as for a similar change in real per capita income. As expected, income, stock market wealth, population and construction costs also have a positive effect on house prices. The unexpected finding is that changes in after-tax real mortgage interest rates have a *positive* effect, especially given that interest rates fell throughout most of the estimation period. Fixed-effect dummies for the MSAs are included in the specification and nearly all are negative. The authors show a positive correlation between those fixed effects and other measures of regulatory constraints. Thus, they conclude the fixed effects represent "the magnitude of restrictions on housing growth attributable to specific metropolitan areas" (p. 40). The top four positive fixed effects are for: San Francisco, Los Angeles, Honolulu and San Jose.

Exhibit 20. Determinants of House Price Percentage Changes for 130 MSAs from 1984-1998

Independent Variables (%Δ)	Coefficient	t-Statistic
Real Income per capita	0.168	6.43
S&P 500 Stock Index	0.099	21.00
S&P 500 lagged 1 year	0.063	18.93
After-tax Mortgage Interest Rate	0.024	13.01
Population of MSA	1.089	11.19
Construction Cost (lagged 1 year)	0.122	12.00
R^2 =0.65 with a full set of MSA fixed effects (n=1,690)		

Source: Jud and Winkler (2002), p. 34.

One disadvantage of inter-metropolitan models is the wide diversity of local economic effects, which make it difficult to tell a unified story. Case and Mayer (1995b) analyze the house price appreciation for 168 towns in the Boston metropolitan area from 1982 to 1994. Each town has its own repeat-sales index from a subset of the total 135,000 pairs of sales. Despite some mixed results, they manage to draw out a compelling story. The underlying idea is that towns compete with one another, offering a mix of amenities, taxes, and land for development. The housing price in any particular town is a function of the amenities, taxes, and developable land for all the towns. Shifts in employment affected demand for housing as manufacturing towns like Lawrence and Lowell lost jobs, while financial service industries downtown and in certain western suburbs gained jobs. Accessibility was also important, as towns close to the business district had faster house price appreciation. Towns that allowed more rapid development enjoyed slower price growth. The baby boomers reached middle age during this time, and they pushed up house prices, as Mankiw and Weil (1989) described elsewhere. However, as fewer families had children in school, the premium fell for houses in towns with good schools. Schools are a good example of an amenity that cannot be replicated easily to meet the demand of house buyers and mitigate any relative price changes.

Another way to look at house price changes is to decompose the current change into a serial correlation component, a mean reversion component, and a change in fundamental price component. Capozza, Hendershott, Mack and Mayer (2002) start with the following model.

$$P_t - P_{t-1} = \alpha(P_{t-1} - P_{t-2}) + \beta(P^*_{t-1} - P_{t-1}) + \gamma(P^*_t - P^*_{t-1})$$

The first term on the right is the serial correlation component, and α drives the amplitude and persistence from past prices. Mean reversion is captured in the second term, with P^* representing the fundamental value for a city that equalizes supply and demand on average. The coefficient β measures the speed of adjustment back to the mean. The third term shows the degree of change in the fundamental value. The fundamental value, P^*, is not observed, so the researchers estimate a steady state house price levels equation as the first stage. Predicted values from this first stage model can then be used in the second stage house price changes regression.

Capozza et al. test hypotheses on information dissemination (assuming there is more information from active markets), on supply constraints (assuming government regulation hampers new construction and market adjustment) and on expectation formation (assuming there are more backward-looking expectations and serial correlation in hot growth markets). The data is a panel of 62 MSAs from 1979 to 1995. The authors find that serial correlation is higher in MSAs with higher real incomes, population growth and real construction costs. Reversion to the mean is higher in MSAs with larger size, faster population growth and lower construction costs. Substantial overshooting of prices occurs in areas with high real construction cost, with high serial correlation, and with low mean reversion (such as coastal cities like Boston, New York, San Francisco, Los Angeles and San Diego). To the extent that government regulation drives up real construction costs and weakens mean reversion, this model suggests that regulation could also result in house prices overshooting their fundamental value.

Metropolitan housing markets can be influenced by regional effects and national effects, though the correlations can vary over time. Calem, Case, and Fetter (2003) study house price changes in 137 MSAs from 1982 to 2000. In four of nine regions (including the West and Northeast), they found short-term (one-year) positive serial correlation coupled with a strong five-year mean reversion. Although the timing of the cycles was quite different, the authors conclude that the correlations in house prices are high enough among MSAs that geographic diversification would be difficult. Another curious finding is that income shocks to the West coast and Northeast appear to take much longer to be absorbed, despite the strong mean reversion. A standard deviation income change or shock is milder and more quickly absorbed in the Southeast, Central and Plains districts where serial correlation is weaker and cycles less pronounced.

Recent work by Glaeser and Gyourko (2004) focuses on the asymmetric growth patterns of cities linked to the durability of housing. Cities typically grow more quickly than they decline because population growth is readily accommodated by new construction, but population decline does not lead to a commensurate removal of housing units. Positive shocks, stemming from increased productivity, may lead to house price increases in the short run depending on the elasticity of supply. But in the longer run, new construction will satisfy demand and house prices will represent the price of land/regulation and construction costs. Negative shocks tend to decrease housing prices more than they decrease population such that house prices fall below construction costs and the existing structures gradually decline from under-maintenance. The asymmetric pattern described by Glaeser and Gyourko is rapid growth versus protracted decline. The decline is exacerbated by the movement of skilled labor toward growth cities, while unskilled labor is attracted to cheap housing. Declining cities are trapped in low growth by a surplus of low quality housing and workers.[54]

Financial Accelerator Model

One explanation for why some cities react differently than others to income shocks is that some cities have a higher proportion of highly leveraged homeowners. These highly leveraged homeowners, often in starter homes, rely heavily on an increase in their house value to provide the equity necessary for moving up to a nicer home. A favorable income shock in a city may increase the number of new homeowners, but it can have an even bigger impact by providing the equity, and thus down payment, for many existing homeowners to buy a bigger home. Stein (1995) divides families into three groups:

- unconstrained movers,
- constrained movers, and
- constrained non-movers.

The first group is wealthy enough that its members do not have to rely on house prices to make their optimal housing choice. It is the second group of constrained movers that plays a destabilizing role in the model, because their net demand for housing is an increasing function of price. As house prices increase, this relaxes the wealth constraint and allows these movers to choose their preferred level of housing. If a large fraction of owners have high LTV ratios, then a small increase in price can trigger a wave of moving and house buying that compounds the initial price increase. The amplifying effect, sometimes called the financial accelerator (Almeida, Campello and Liu, 2002; Bernanke and Gertler, 1989; Kiyotaki and Moore, 1997), can also compound a fall in house prices. With so many homeowners highly leveraged, a small decrease in house price can put many homeowners into a situation of negative equity. With no ownership stake and a large mortgage, some homeowners are more likely to default or sell their house in a surplus market. The excess supply of houses on the market drives down prices further in a downward spiral.

Lamont and Stein (1999) use the 44 metropolitan areas in the AHS from 1984-1994 to verify Stein's theoretical model. A one percent shock in per capita income causes house prices in a highly leveraged city to increase by 0.64 percent in the first year, growing to 1.23 percent in the third year. In contrast, the same income shock in a low-leverage city causes a smaller increase (0.19 percent) in the first year and only 0.68 percent by the third year. House prices are nearly twice as responsive in a high-leverage city as in a low-leverage one. The empirical challenge is that leverage is endogenous and, as often is the case, the instruments used in the instrumental variable estimation are weak. Buyers might be more willing to enter into high-LTV loans when they expect house prices to rise, and certainly lenders would be more willing to lend in those circumstances. Once again, how people form their expectations is key to the responsiveness of house prices and the likelihood of overshooting.

Ortalo-Magné and Rady (2002a) study housing market fluctuations through a life-cycle model, with households varying in income and preferences. The underlying assumption is that there is a property

[54] Glaeser, Gyourko and Saks (2004a) also claim that differences in regulation among MSAs account for differences in house prices (more regulation causing higher house prices) and how the MSA house prices respond to increases in productivity (more regulation generally reduces supply elasticity so that increases in productivity lead to larger increases in house prices rather than more housing).

ladder that households are trying to ascend. Young households want to become homeowners, but they do not have the necessary down payment for their ideal house. Instead, they buy a low-cost, starter-home and then use the equity from that leveraged investment to trade up. One of the important assumptions is that supply is relatively inelastic. Otherwise, a small increase in prices would lead to expanded supply, and homeowner equity would not increase. Another assumption is that the non-starter homes are higher quality and have a positive spread relative to the price of starter homes. A hierarchy of house qualities is matched by a hierarchy of homeowner wealth such that existing homeowners can outbid new homeowners by using the capital gains from their houses.

As in the Stein model, Ortalo-Magné and Rady find that housing prices can over-react to income shocks. Moreover, a relaxation of the down payment constraint can initiate a boom-bust cycle. Liberal underwriting may exacerbate house price overshooting, but the model also shows faster correction because adjustments are made at the lowest quality level. Essentially a big wave of new homeowners gets stuck on the bottom rung of the property ladder. A less sanguine possibility is many new homeowners fall off the bottom of the ladder, and their accumulated defaults can harm whole neighborhoods. The proliferation of low-down payment loan products has made it possible for wealth-constrained households to become homeowners. The government has promoted this trend, but Ortalo-Magné and Rady point out an increased vulnerability to greater cyclical fluctuations.

Another finding of the model is that housing prices and the number of housing transactions are positively correlated. Some researchers, Follain and Velz (1995) and Hort (2000), have found a negative correlation and claim the relationship is sensitive to time period and specification. Berkovec and Goodman (1996) explained the positive correlation between prices and sales in the context of a search model, in which buyers are more sensitive to house prices than sellers. One reason for this asymmetry is that buyers are more directly affected by income shocks, i.e., they rely more heavily on income than on their wealth to qualify for the mortgage. (Of course, this explanation works better for first-time homebuyers.) Another reason for buyers to be more sensitive to the market is that they spend so much time searching in that market, whereas the sellers may be focused as buyers on a higher quality market or a different location. A third explanation suggested by Case and Shiller (1988, 1990) is that sellers form their expectation about the appropriate selling price in reference to the price they paid. As a consequence, sellers are reluctant to lower their asking price below their purchase price. This makes house prices sticky downward, and thus sales drop along with prices. Potential sellers, who have flexibility, may wait for “up” markets.

In the Berkovec and Goodman model, the sellers are under time pressure, although price discounts remain very small for a long time. Eventually the sellers have to sell in order to get the money for their own purchase or to avoid a bridge loan. Both buyers and sellers have backward-looking, adaptive expectations, in which the price expectations for the next period are a weighted average of the current price and the current market-clearing price. The market-clearing price isn’t revealed until market participants see how many buyers enter relative to the number of new and continuing sellers. Once the participants see fewer buyers coming into the market, then they adjust their price expectations. The lag in adjustment means that sales react more quickly than prices to a demand shock. Over the longer run, prices and sales move together, but in the short-run adjustment period sales can run counter to prices. In fact, Berkovec and Goodman found a closer relationship between sales and prices in annual observations than in monthly or quarterly observations. This suggests one reason that house price indexes have difficulty tracking short-term changes is that they need to control for sales transactions.[55] Some of the initial response to demand changes occurs in the sales transactions before getting transmitted to price.

In a separate theoretical model on homeownership, Ortalo-Magné and Rady (2002b) consider how heterogeneous households[56] make the joint decisions of location and tenure mode. The dynamic stochastic equilibrium model[57] with homeownership is compared to a rental-only version in their response to a labor shock. One of the findings common to both of their models is that homeownership adds to the price volatility of a housing market.

The more disturbing finding is that households that consume the most housing gain the most from the ability to own their own home. Existing owners not only benefit from the capital gains when strong demand causes their house to appreciate, but also they can use that cumulated equity to sustain them if their income drops. And, in a down market, the owners do not have to sell. Particularly in up markets, the presence of owners means fewer houses on the market, and wider price swings. Newcomers suffer from higher housing cost fluctuations and fewer housing choices. Ironically, homeownership alleviates the risk of fluctuating prices for the existing owners, but can exacerbate the costs and fluctuations for renters and potential new homeowners.

Summary for House Price Dynamics

Housing markets are not informationally efficient, as shown by the significance of lagged prices, but excess returns are generally not large enough to be profit opportunities because transaction costs are high for housing. Abraham and Hendershott estimated a house price change equation and found positive effects for employment growth, income growth, construction cost, and lagged price appreciation, and (as expected) a negative effect from interest rates. Jud and Winkler also found positive effects from stock market wealth, population growth, and, surprisingly, real interest rates. Focusing on one metropolitan area (Boston), Case and Mayer found positive price effects from the baby boom cohort, but negative effects for manufacturing towns and towns that allowed more rapid development.

Trying to understand the circumstances behind serial correlation of prices and reversion of prices to the mean, Capozza et al. found serial correlation is higher in MSAs with higher real incomes, population growth, and construction costs, while mean reversion is higher in MSAs with larger size, faster population growth, and lower construction costs. Regulatory constraints increase construction

---

55 Clapp and Giaccotto (1992; 1994) posit that starter homes are over-represented in repeat sales price indexes because these properties are more likely to be sold repeatedly. This “starter home effect” means that repeat sales indexes contain more homes that are smaller and less expensive than the entire housing stock. As a result, repeat sales indexes are more sensitive to unemployment and interest rates than the assessed value (AV) method that is more representative of the complete cross-section of owners.

56 Heterogeneous households, in this context, means the characteristics of the households vary over a multi-dimensional distribution. The alternative would be homogeneous households which all share the same set of characteristics. As an example of heterogeneous households, households with high income tend to be owners, but not all rich households are owners and not all low-income households are renters.

57 A stochastic model allows for variables drawn from a random distribution. A non-stochastic model would be a deterministic model that does not allow for random variation. In a stochastic equilibrium model, there is an underlying equilibrium condition, but the model is not necessarily in equilibrium due to random error in the variables. A dynamic stochastic equilibrium model allows for changes over time in the stochastic variables, which would converge back to equilibrium, but for the random shocks.

costs, so regulatory constraints can contribute to higher serial correlation and weaker mean reversion. Substantial “overshooting” is most likely to occur when MSAs have high construction cost, high serial correlation, and low mean reversion. This pattern can be found in Boston, New York, San Francisco, Los Angeles and San Diego. Calem, Case and Fetter found that shocks take longer to be absorbed in the West and Northeast, despite the apparent strong mean reversion there.

Lamont and Stein found that income shocks can be compounded by a financial accelerator. In metropolitan areas where many owners are highly leveraged, those owners increase their housing demand when capital gains on their current houses make it possible for them to move up the property ladder. However, the high leverage can lead to overshooting and collapse. Ortalo-Magné and Rady associate the positive correlation of prices and sales transactions with the financial accelerator, but Berkovec and Goodman associate it with buyers being more sensitive than sellers to income shocks and market prices. Both buyers and sellers are assumed to have backward-looking expectations, but the faster realization and response to changing prices by buyers lead to a change in sales that precedes the change in prices. Usually rising sales precede rising prices and falling sales come before falling prices. In a different model, Ortalo-Magné and Rady find that homeownership can facilitate mixed income neighborhoods, but homeownership can also increase housing costs and price fluctuations, which are detrimental to renters and new homebuyers.

X. Bubbles

The thrilling rise and abrupt fall of the stock market in recent years has led many homeowners and a few analysts to wonder if housing markets could follow the same path (Schulte, 2002; Shiller, 2002a; Laing, 2002). Despite the evidence in the last section that positive serial correlation and high construction costs can lead to overshooting, housing economists, including Federal Reserve Chairman Greenspan,[58] do not foresee housing prices falling in more than a few metro areas. In this section we consider the positions expressed by housing experts in the popular media, as well as studies published in the academic literature.

Michael Carliner (2002), Chief Economist for the National Association of Home Builders, disparages what he calls "house price bubble babble" by showing that the rapid increase in house prices is in line with income and rents at the national level. There has been a dramatic increase in the ratio of house prices to owner's rent[59] since 1995, however, that followed a nearly equal drop from 1989 to 1995, so that the ratio in 2001 was only 5 percent higher than in 1989. Falling interest rates during this period have made homeownership more affordable generally. Carliner concedes that house prices are high relative to incomes in metropolitan areas with physical barriers to growth or regulatory constraints. The analogy to the stock market may be misleading, according to Carliner, because corporate earnings are much less stable than household income. The price-to-earnings ratio (P/E) is really analogous to the price-to-rent ratio in the housing market, and that ratio has remained within the historical range.

Even if house prices have not soared above rents, they have been growing at unsustainable *rates* in a number of cities. According to David Levy, chairman of the Jerome Levy Forecasting Center, the 6-8 percent national growth rate is unsustainable (Bernasek, 2002). Douglas Duncan of the Mortgage Bankers Association agrees that house price growth is more likely to be in the 2-4 percent range in coming years. In this scenario, bubbles will not necessarily burst, but will stop expanding. However, Robert Shiller of Yale claims that the San Francisco bubble began bursting in the fall of 2001, as house prices dropped 7 percent in the fourth quarter (Bernasek, 2002). Shiller warns that Seattle, Denver, New York City, and Portland, Oregon, have the highest risk of a bubble burst in the near future.

According to Bernasek (2002), a bubble bursts for a variety of reasons. First, interest rates will eventually rise, which will make housing less affordable. As affordability decreases, demand decreases. This causes prices to stagnate or drop. If house prices drop, current homeowners who are well off may begin to decrease their spending, including maintenance, because they feel a drop in their real wealth. Current homeowners who are not well off may find themselves in a negative equity situation as their mortgage debt exceeds the home's current value. This will lead to increased defaults.

---

58 "'Clearly, after their very substantial run-up in recent years, home prices could recede,' Greenspan said. 'A sharp decline, the consequences of a bursting bubble, however, seems most unlikely.'" From a speech to the Independent Community Bankers as reported in The Record, "Greenspan Expects Housing Market to Cool; Consumer Spending Could Slow," (Bergen County, NJ), March 5, 2003.

59 Owners do not pay rent, but the concept is how much the owner would have to pay as a renter for the same quality housing unit.

However, for a bubble to burst, there must be one or more precipitating events. Among the possibilities are affordability reduced by rising interest rates or a lack of consumer confidence caused by some other action (war, oil crisis, weakening dollar). Optimistic analysts claim that demand does not appear to be slowing and, therefore, the bubble (if indeed there is one) will not burst in the near future (Bernasek, 2002). These same analysts claim that the current housing supply does not support the idea of a bubble, either. In previous housing price run-ups, there was a glut of new construction that caused supply to exceed demand. In the current market, however, new construction is at a 30-year low. Optimistic analysts point to the fact that, although house prices have increased dramatically in some areas (California and the Northeast) in the last several years, the increases are still much lower than the increases during the mid- to late-1980s. These analysts also argue that interest rates will not rise as long as inflation stays in check.

According to Mark Zandi, chief economist at Economy.com, “[t]here’s no widespread bubble, but there are bubble-ettes across the country.” Zandi cites several of the top bubble contenders, including San Diego, San Francisco, Denver, and Boston.

Analyst Ingo Winzer, who has published the Local Market Monitor for 12 years, claims that there are more overpriced regional markets in 2002 than he has ever recorded. Winzer’s formula for determining equilibrium home prices requires that the ratio of the local equilibrium home price to the national home price should equal the ratio of the average local income to the average national income multiplied by a constant factor that varies by market. That multiplicative factor is lower in the Midwest and South and higher in many California markets. Winzer claims that most markets become unbalanced – deviated from their equilibrium price – when there is a sudden surge of demand, such as when technology and Internet firm employees experienced a large jump in personal wealth in the late 1990s. According to Winzer, when the market prices of homes rise well above the equilibrium price for that area, either the equilibrium price will rise or a local recession will force actual prices down closer to the equilibrium level. Winzer places Salinas, CA at the top of his list of overpriced housing markets (prices are 45 percent above equilibrium levels) followed by Boston and Orange County, CA (36 percent).

Shifting to more academic arguments, Joseph Stiglitz (1990, p. 13) defines bubbles this way: “if the reason that the price is high today is *only* because investors believe that the selling price will be high tomorrow-- when ‘fundamental’ factors do not seem to justify such a price—then a bubble exists.” While it may not be rational to believe that a bubble can persist forever, there can be enough uncertainty about when it will break that bubbles can build temporarily. Information is costly and information about housing markets is not complete. In particular, unlike stocks, housing cannot be sold “short,” so even if it would be rational to bet against an exuberant housing market, the market lacks a suitable vehicle.

Flood and Hodrick (1990) point out an indeterminacy in the pricing of durable assets, which allows bubbles to be “rational,” at least in the short run. The current price is the discounted sum of future dividends (or rents) and the future price. Given that the current price depends on the expectation of the future price and the expectation of the future price depends on the current price, there appear to be an infinite set of possible combinations. The current price can include a bubble component in addition to the discounted dividends, as long as the bubble is expected to continue into the future, at least until the sale. A problem with testing for bubbles is that future dividends are truncated at the point of future sale. Ideally the test would isolate the bubble component as being an additional amount beyond the present value of future dividends, but there appears no feasible way to make that separation with actual prices. A further difficulty for housing is that “dividends” are rents the owner pays to himself for the use of the house, which are unobserved. Risk aversion is also unmeasured, yet the discount factor for future rents depends on risk aversion. Uncertain information about future rents can lead to changes in the discount factor and volatile prices. Neither the investor nor the researcher may be able to disentangle the speculative bubble from poorly measured rents or changes in the discount factor.

Undaunted, Cutler, Poterba and Summers (1991) attempted to estimate the speculative dynamics of returns on stocks, bonds, foreign exchange, collectibles, and real estate. The study covered 13 countries from 1960-1988 and used the Case and Shiller (1989) constant quality house price index. One common feature across assets is that returns tend to be positively serially correlated in the short run (less than 1 year) and weakly negatively correlated in the long run. Another feature is that deviations of asset values from proxies for the fundamental value have predictive power in explaining returns (Malpezzi, 1999).

Such common results for different assets suggest they are underlying characteristics of speculative dynamics. One plausible explanation is that the market is a mix of rational traders and feedback traders. Rational traders base their demand on expected future returns, while feedback traders focus on realized past returns (i.e., backward-looking or adaptive expectations). In the conventional view, approaching market peaks are times of low risk so investors lower their required returns and pay a higher price for the asset. Under feedback trading, peaks are caused by over-optimism by some investors who drive prices too high. As the market rises, there are more and more feedback traders. The transaction data appears to be additional information that reduces uncertainty, but, in fact, the traders are feeding off of one another. Ultimately the rational traders realize the market price is disconnected from the fundamental price. Once the rational traders begin selling, the tide turns quickly and prices fall rapidly. Owner-occupied house prices may not collapse so quickly, because owners need a place to live and owners usually have the option to take their house off the market. Nevertheless, the idea of feedback trading seems to fit real estate markets because houses are so difficult to price in a market with few similar transactions.

Building on the idea that prices can be decomposed into a fundamental component and a bubble component, Abraham and Hendershott (1996) estimate a house price appreciation model on 30 MSAs from 1977 to 1992. The model for the equilibrium or fundamental price changes includes growth in real income, growth in real construction costs, and changes in the real after-tax interest rate. The bubble component has two drivers, a bubble builder and a bubble buster. The bubble builder is the positive serial correlation with lagged house price changes. In effect, this term captures the tendency of the market to be backward-looking and tend to extend past trends. The bubble buster is the difference between last period’s equilibrium price and the actual price. If the actual price falls below the equilibrium price, the positive coefficient on the difference will work toward eliminating the difference and bringing the market back into equilibrium.

The model is estimated in two passes, so that the first pass can focus on the equilibrium equation without the deviation term. The second pass predicts the equilibrium value for prices and includes the deviation term or bubble buster. In the econometric results, the deviation term has a small effect, but it is twice as big for the 14 coastal cities as it is for the inland cities. The bubble builder or serial correlation is significant for all cities, but it is also bigger for the coastal cities.[60] A model *without* lagged appreciation or the deviation term (just the other control variables) can explain 40 percent of price changes, nearly the same as the model with *only* lagged appreciation and the deviation term (and no other control variables). Put together, the model with lagged appreciation, deviation term and other control variables explains 60 percent. From the model simulations, the authors show that the most intense bubble busting of house prices occurs 3 to 6 years after the boom ends, with a potentially long adjustment period unless offset by strong economic growth. On net, the model estimates a 15 percent premium or bubble for the coastal cities in 1994. The California housing market was in a slump in 1994, so we might expect a much larger premium in 1999 or 2003.

Summary of Bubbles Literature

Distinguishing a bubble from a price increase is a matter of judging whether fundamental demand supports the rise or speculative forces have separated prices from supply and demand. Carliner looks at the national house price picture and finds no broad evidence for a house price bubble. Even though house prices rose rapidly at the end of the 1990s, so did household income. And the price-to-rent ratio, which is analogous to a stock's price-to-earnings ratio, is only 5 percent higher than in 1989. Nevertheless, as Zandi and Winzer point out, it is hard to deny bubble-like price hikes in California and Northeastern MSAs. So far, relatively stable wages, modest new construction, and extremely low interest rates have prevented house prices from falling.

A perfectly rational economic agent would price an asset today based on expected dividends and the future resale value. But a reasonable future price depends on the current price. Moreover, the bubble component could inflate both the current price and the resale value, especially if the future is not very far off. Cutler, Poterba, and Summers compare a number of assets, including real estate, to find some other distinguishing features besides high prices. Speculative dynamics feature positively serially correlated returns in the short run. Also, deviations in prices from the estimated fundamental values help predict future changes in the asset returns. One explanation for these features is that the market has a mix of rational traders and feedback traders. Toward the end of a rising trend, the feedback traders look at past prices and expect continued increases. Once a significant number of rational traders see the "disconnect" between prices and fundamental values, selling begins and the feedback traders rush to leave the market.

Abraham and Hendershott estimated a dynamic house price model, with measures for past prices (bubble builder) and the deviation of lagged prices from lagged fundamental values (bubble buster). The results showed that coastal cities were more likely to have both a bigger bubble builder and a bigger bubble buster. As of 1994, the coastal cities had a 15 percent price premium. At their peak, the premium was almost surely higher.

[60] A similar study of New Zealand house price dynamics by Bourassa, Hendershott and Murphy (2001) shows that the US has a larger bubble builder component (lagged prices) and a smaller bubble buster (error correction).

XI. Behavioral Finance and the Formation of Price Expectations

Given the evidence that housing markets are not perfectly efficient, can we learn more about how non-rational or backward-looking traders form price expectations? Often it appears that market participants do not know the degree of balance between supply and demand forces. Rather, they focus on a combination of newspaper reports and their own personal experience to determine a "fair" price. For sellers, real estate agents and appraisers should offer reliable guidance, but they are biased toward high turnover. This section considers survey data and a few alternative models about how people respond to the market, given so much uncertainty about the fundamentals.[61]

Case and Shiller (1988) sent out questionnaires to recent buyers in four markets: two booming markets in California, one post-boom market (Boston) and one stable market (Milwaukee). The response was not large (886), but there were thought-provoking themes. Few showed much knowledge of market fundamentals or the underlying causes for price movements. Curiously, interest rates were blamed for the price changes even though the price changes were quite different in each market, while the interest rates were the same. Apparently, people form expectations from observed price movements and then look for a logical explanation to justify their beliefs.

The researchers found evidence that during market booms the news media exaggerated stories about prices paid over the asking price, yet ignored the same phenomenon at other times. The news articles seemed to be successful in spreading panic among households about being priced out of the market if they did not buy soon. In booming California, 75 percent agreed with the statement "Housing prices are booming. Unless I buy now, I won't be able to afford a home later." This fear may help explain why sales speed up with rising prices. Another explanation for a speed-up in sales is upward rigidity in asking prices. Real estate agents make more money from many listings and quick sales. Therefore, rather than advising sellers to price the home for sale at the new, higher market-clearing price, agents suggest a below-market price, which leads to many offers (some above asking).

The survey also presented evidence of downward rigidity in asking prices during a slow market. One explanation from prospect theory is that traders have a psychological preference to sell winners and hold losers (Kahneman and Tversky, 1979). By not realizing the loss with a sale, the owner can avoid the pain of regret and hope the market will come back in his favor. Market participants want to believe in the notion of the fair price or intrinsic worth. They use past history to gauge the intrinsic worth, and they are most aware of the past price they paid to buy the house. The owner assumes the purchase was at a fair price and is thus reluctant to sell below that fair price.

Survey respondents tend to deny the role of mob psychology, particularly in their own price expectations. Yet, the researchers conclude that the suddenness of booms and busts has to be based on investors reacting to one another (feedback trading) and recent price changes. However, respondents could not cite a trigger event for the booms, and there appeared to be no fundamental change to start the boom. Ironically, offer prices above asking prices may do more to feed a speculative bubble than a quick jump in prices. The high offers serve to increase demand (panic

[61] The field of behavioral finance is growing rapidly. To do it justice, see Richard Thaler (2003).

buying) and the appearance of excess demand also serves to increase demand in a vicious circle. The spiral is triggered by the illusion of a shortage (Shiller, 1990).

Genesove and Mayer (2001) analyze the Boston condominium market from 1982 to 1998. During that time, nominal prices rose by 170 percent (1982-89) before falling 40 percent (1989-93) and then booming to new heights (1995-98). Condo owners facing nominal losses set higher asking prices by 25 percent to 35 percent of the difference between the property's expected selling price and the original purchase price. In part by being patient, these same condo owners eventually received higher selling prices that were 3 percent to 18 percent of the difference between expected selling price and the original purchase price.

These findings are consistent with prospect theory, which posits that sellers have a reference point (in this case their original purchase price). The value function around that reference point is asymmetric, with gains favored less than losses are regretted. Condo sellers try to avoid a loss by setting a high reservation price. The high asking price extends the time to sale and the transactions price, but the ultimate sale price is above the reference point.

These findings are also consistent with the positive price-transaction volume correlation noted by Berkovec and Goodman (1996). The loss aversion by sellers results in lower transaction volume in markets with falling prices. One implication from this research is that prices are determined by seller characteristics (own price history) as well as unit attributes. Once again this provides evidence that the housing market is less than a perfect asset market.

The final paper on expectations formation is by Capozza and Sequin (1996). They use Census data from 1960 to 1990 to examine 10-year price changes for a cross-section of 64 MSAs. If markets were competitive, the total risk-adjusted expected returns should be equal across urban areas. In simplified terms:

$$E[TR_{it}] = \frac{R_{it}}{P_{it}} + \frac{E[\Delta P_{it}]}{P_{it}}$$

where TR_{it} is the total return, R_{it} is the rent and P_{it} is the house price for city *i* at time *t*. To avoid problems with measurement error, the first stage is an instrumental variable equation of R/P regressed on log income, change in log income, log population, change in log population, tax rate, utility rate, median number of bathrooms, conditional land supply and census year dummies. The first stage model acts like an equilibrium equation. The predicted rent-to-price ratio is the equilibrium rate given those market conditions, and the residual is the deviation from the equilibrium value. In the second stage, the 10-year change in log house prices ($\ln P_{10} - \ln P_1$) is regressed on the predicted R_1/P_1 from the first stage, change in log population, change in log real income, and the lagged residuals from the first stage.

The equilibrium rent-to-price ratio does predict future price growth. Cities with low equilibrium rent-to-price ratios (4 percent) appreciate by 27 to 40 percent more price growth per decade than cities with high ratios (8 percent).

Another finding is that the residuals or disequilibrium components from the first stage have significant predictive power. The residuals may be picking up an omitted variable, such as for risk, or capturing a mean reversion (error correction) effect. The authors interpret the significance of the residuals as an indication that the housing markets are not efficient. A third finding is that lagged income growth has a negative and significant effect on house price growth. In places with high-income growth, house price growth slows in the next decade. This finding may reflect mean reversion in incomes and house prices, or, as the authors suggest, represent euphoria in expectations, in which rents are set too high relative to house prices. The strong income and house price growth of the past decade is carried forth into the next decade by backward-looking expectations, but it is disappointed on average.

Summary of Behavioral Finance

From survey evidence, Case and Shiller determine most buyers have little understanding of housing market fundamentals. Rather, buyers focus on recent news about house prices. It is simply too difficult to get all the relevant information needed to determine the theoretical market-clearing price. Most buyers, once committed to the market, feel compelled to choose from the possibilities of houses on the market. If the supply were perfectly elastic, then the market would stay close to equilibrium and market prices would be a sufficient statistic, i.e., all the market participants would need to know about past or present prices. But supply is not that elastic, particularly in highly regulated markets. Moreover, buyers are susceptible to panic buying, especially on news of offers above the asking price. Nervous about missing their chance to buy before prices go up, panic buying can quickly lead to self-fulfilling expectations of faster sales and higher prices.

Sellers are averse to losses and expect a sales price that is at least what they paid for the property. Consistent with prospect theory, sellers use their own purchase price as a reference point for setting their expectations of a “fair” selling price. This tends to make prices “sticky” downward and slows sales.

As further evidence of backward-looking expectations, Capozza and Sequin provide evidence that income growth from the past decade can help predict the current decade’s price changes. Apparently strong income growth in the past leads to euphoric expectations about future price gains, which, on average, are not fulfilled. In short, clear information is hard to obtain and the supply response is sluggish, so that prices can become disconnected from the underlying fundamentals.

XII. Summary

This report summarizes the literature on house price trends and homeownership affordability and provides some new estimates derived from the American Housing survey. Our goal is not to draw firm conclusions about the direction of house prices or the possibility of a sudden collapse in house prices. Rather, our purpose is to understand what is happening and why, from the best research available. In addition to the findings of researchers on house prices and affordability, this chapter makes some recommendations on further research.

House prices have been rising rapidly in the past few years. The median price of existing homes sold in 2004 was up 8.3 percent from 2003, and in 2003 the gain was nearly as strong at 7.5 percent. The latest report (May 2005) shows median house prices have increased by 15 percent in the last year. These house price increases are much larger than the economy-wide inflation as measured by the CPI. The ratio of average house prices to disposable income has been gradually increasing from 6.75 in 1995 to 7.5 in 2002, with house prices outpacing income. Interest rates have been trending downward for 20 years and have reached a 40-year low in 2003. These low interest rates have kept monthly payments affordable for existing owners, but at the same time help fuel price increases. Homeownership rates rose during the 1990s and early this decade, and have been in the 68 to 69 percent range for the past several years. The aging of the large baby boomer cohort has certainly helped push the ownership rate this high, but there were also large gains for low-income households and minority households. For the bottom income quintile, the homeownership rate increased from 42.5 percent in 1985 to 48.5 percent in 1999. Although single-family housing starts set a record high in 2004, sales too have been strong and new home inventories remain relatively lean, at about a 5 month supply as of early 2005. The short-term projection is for lower house price growth and gradually rising interest rates, but there is considerable uncertainty. Mortgage rates have remained low despite repeated increases in short term rates. What is clear is that high house prices pose the largest challenge for new homebuyers trying to save for a down payment.

House Price Indexes

The most widely available house price index is the National Association of Realtors (NAR) median house price index. Comparisons over time can be somewhat misleading, because there are no controls for changes in quality or for how representative the sales transactions are. Nevertheless, it is transparent and available for a broad cross-section of metropolitan areas. Hedonic indexes do control for house quality. The most common data source is the American Housing Survey (AHS) data, which is limited to about 44 MSAs. The house values are self-reported, but studies confirm that those valuations are close to correct (about 5 percent high) and seem to track the market over time. The Census C27 series is another common price index controlling for constant quality.

Repeat-sales indexes, such as the Freddie Mac-Conventional Mortgage Home Price Index or the Office of Federal Housing Enterprise Oversight (OFHEO) House Price Index, control for quality changes by taking the difference in sales prices for the same house. This limitation to repeat sales reduces the sample size, but that has been offset by a comprehensive data collection effort from the mortgage purchases that funnel through Freddie Mac and Fannie Mae. The indexes are designed to track price changes, rather than levels, so they are often anchored by house prices from the decennial

Census. Repeat-sales indexes can be biased if the repeat sales are not representative of the entire housing stock. Hybrid approaches have been suggested to broaden the repeat-sales with tax assessor data or controls for remodeling with additional data. The challenge remains to collect such data for a broad cross-section of houses over time.

New Hedonic Indexes from the American Housing Survey

Another widely used technique for house price index construction is hedonic regression analysis. By this method house prices are related to the physical and locational attributes of the property. The regression-estimated influence of those attributes on property prices define implicit prices for those housing features. The attribute prices can then be aggregated for different bundles of housing features to determine estimated prices for houses with those features. These bundles can be re-priced at different locations or at different times to generate cross-sectional estimates of house price differences from place to place and time series estimates of house price inflation.

The American Housing Survey is well-suited for estimation of hedonic indexes of house prices and has been used extensively for this purpose. This report builds on previous research in this area and uses the AHS to estimate house price indexes for different locations and submarkets over the period 1985 through 2003. We find that:

- The typical house nationwide rose 32 percent in real terms between 1985 and 2003, as measured by a hedonic index and deflated by the CPI less its shelter component.
- New home owners – those buying for the first time -- are of interest because they show conditions in the starter house market. The AHS shows that they buy less house, but the typical bundle purchased rose in real price by 31 percent between 1985 and 2003, almost matching the increase in the market overall.
- These two AHS hedonic indexes rose less than did house prices as measured by the OFHEO repeat sales index between 1985 and 2003 – up 41 percent. Possible reasons for the difference include the treatment of quality changes arising from remodeling and the possibility that houses that sell at least twice and thus are in the OFHEO index are not representative of the broader market.
- Manufactured housing has lower values per property than does site-built housing, and shifts over time in the manufactured share of all single-family housing may account for some of the differences between house price inflation by different measures.
- Price increases were greatest between 1985 and 2003 for houses occupied by higher income homeowners, and least among houses typically occupied by those in the bottom third of the homeowner income distribution. This same pattern by income held among the subset of first time home buyers.
- The AHS hedonic index estimates for regions and large metro areas are generally consistent with estimates from other sources in showing the West and Northeast to have posted the biggest house price increases between the late 1990s and 2003.

Affordability Indexes

Affordability indexes range from the simple to the very complex, but nearly all relate the cost of housing to some measure of income. Goodman (2001) uses AHS data to show that the ratio of house cost to income for all homeowners has increased from 2.08 in 1985 to 2.17 in 1999, while for the lowest income quintile of homeowners the ratio has increased from 2.50 in 1985 to 2.93 in 1999. The NAR Home Affordability Index calculates affordability as the median family income relative to the cash flow needed to afford the median priced house in the local market. This index is highly correlated (-0.94) to mortgage rates, so the gradual decline in rates has essentially offset the increase in house prices to keep affordability level. A more sophisticated indicator of affordability is produced for *The State of the Nation's Housing* (2002), and controls for tax effects. Mortgage interest and property taxes are deductible. This index shows that the share of income going to housing for all owners has fluctuated around 18 percent for the last ten years.

A number of proprietary affordability indexes calculate the risk of house price changes. There is an underlying assumption of mean reversion, so the indexes look for house prices at the extreme of their historical range. Selected cities are high cost by this measure, especially in California and the Northeast, and the producers of proprietary indexes claim that there is considerable risk for declines in these markets.

New Affordability Estimates from the AHS

The AHS-based hedonic price indexes presented earlier can be combined with information about household income and mortgage interest rates to develop several measures of house price burdens and affordability. Using the AHS data files for the period 1985-2003, we find that:

- As measured by the price index for the typical owner-occupied house, house prices rose at about the same rate as average household income over the period 1985 to 1997 and consequently the ratio of the price of this constant-quality house to income held at about 1.6. Subsequently, income gains outpaced house price increases until 2001 and the ratio dipped to 1.5. Between 2001 and 2003, however, sharp increases in house prices boosted the ratio back up to 1.7.
- Among new home owners, the price to income ratio was flat at a level slightly below that of all homeowners up through 1999, but the ratio subsequently rose rapidly and in 2003 was 1.8, exceeding the ratio for all owners.
- By income group, the ratio of constant quality house price (for houses occupied by that income group) to income since 1985 has been highest among those households in the bottom third of the income distribution. In addition, since 1995 the ratio has risen the most among low-income owners. These patterns by income hold among all owners and among the subset of new home owners.
- Owing to substantial declines in mortgage interest rates, the cash costs of mortgage payments on constant quality houses, as a ratio to household income, did not increase appreciably between 2001 and 2003, despite the sharp rise in the ratio of house prices to incomes over this period. Indeed, the payment-to-income ratio by this measure in 2003 was near its lowest point since at least the mid-1980's. This pattern holds among all owners and also among new home owners.

- Housing demand has been fueled not only by the mortgage rate reductions but also by consumers' expectations of future capital gains from continued house price appreciation, according to findings of previous research. Illustrative calculations of our AHS data, under the assumption that future house price expectations are based on the experience of the past eight years, show that a simplified measure of "user costs" (mortgage payments less expected capital gains) of constant quality houses fell sharply between 1997 and 2003 in a diverse set of large metro housing markets nationwide.

Determinants of House Prices

The traditional stock-flow model is represented by DiPasquale and Wheaton (1994) in two equations. The first is an equilibrium equation matching supply to demand. The second is a flow equation showing the change in stock as a function of new construction and depreciation of existing stock. In a steady state, new construction just offsets demolition and conversion. Designating the sign of the effect in parentheses, we can describe the basic factors of demand and supply. Housing demand is a function of demographics (+), income (+), price relative to rent (-) and user cost (-), which is the interest rate adjusted for taxes and capital gains. Housing supply is a function of construction costs (-), financing costs (-), government intervention (+/-) and price relative to rent (+).

The housing market is not perfectly efficient, in part because supply, demand, and price data are not so readily available. The inefficiency means that the market is slow to respond to disequilibrium between supply and demand and that lagged prices help predict future prices. Construction prices are particularly difficult to measure when they include land prices, because of the uncertainties associated with regulatory approval for development. A common modification of the traditional stock-flow model is to include a disequilibrium term. In a regression model, the coefficient on the disequilibrium term gives the speed at which a disequilibrium gap closes.

Malpezzi, Chun and Green (1998) augment a single-equation form of the stock-adjustment model with topographical constraints and regulatory constraints. House prices are predicted in a first stage hedonic model to control for quality. A separate instrumental variable equation is estimated for regulatory constraints, because they could be endogenous. Regulation can boost demand and restrict supply causing prices to increase, or regulations can be put into effect as a result of higher prices. Some measures of regulatory constraints are: large lot zoning, delay in approvals, amount of impact fees and the number of sources of regulation. The study finding is that regulatory constraints have a significant positive effect on prices.

Demand Factors

Considering the demand factors in detail, we start with *demographics*. The most distinctive demographic feature in the post-WWII era is the baby boom. This large cohort of households increased the demand and prices for housing. As they have aged, they have increased the homeownership rate. What is less clear is how fast baby boomers will leave their suburban homes after they retire. In-migration is a less predictable source of housing demand for cities, but, in combination with foreign immigration, another powerful upward force on prices. It is predicted that the minority share of homeowners will increase from 18 percent in 2000 to 25 percent in 2020 (Masnick, 2001).

Although everyone needs a place to live, it is *income* that enables a household to demand housing on the market. In the late 1990s, there was a strong gain in income at nearly all levels as the economy flourished, but also growing income dispersion as the top quintile grew twice as fast as lower quintiles. *Wealth* is another demand factor and often seen as a measure of permanent income or defense against default risk. One of the big differences between new homebuyers and existing homeowners is usually the degree of wealth. For prospective homebuyers, it is unclear whether higher prices motivate the prospective buyer to save more or discourage the renter who thinks homeownership is now out of reach. For existing owners, however, house prices are positively related to wealth through home equity. For minority households, home equity is the majority of their wealth (57 percent for African Americans and 71 percent for Hispanics, compared to 40 percent for whites). Homeownership can act as a hedge against rent risk (Sinai and Souleles, 2003). People are willing to pay more to buy a house in order to avoid high variance in rent.

Taxes affect the user cost of homeownership. The standard formula for user cost starts with real interest rates and adjusts for the marginal tax rate. Theoretically, the size of the mortgage interest deduction and the property tax deduction depends on the marginal tax rate of the homeowner. Practically, there might not be much effect, because most of the households in the upper tax brackets are homeowners. Historically the homeownership rate has been relatively stable despite tax rate changes. The other important tax break is that capital gains are tax free up to $500,000. The justification for these tax breaks is often stated in terms of supporting homeownership and strong communities. An unintended side effect may be overinvestment in housing, especially luxury housing, which does not improve the productivity of the economy. Through more stringent regulation (e.g., exclusionary zoning), the high-quality housing might even crowd out the development of affordable housing.

More liberal mortgage financing has contributed to the increase in demand for housing. During the 1990s, lenders have been encouraged by HUD and banking regulators to increase lending to low-income and minority households. The Community Reinvestment Act (CRA), Home Mortgage Disclosure Act (HMDA), government-sponsored enterprises (GSE) housing goals and fair lending laws have strongly encouraged mortgage brokers and lenders to market to low-income and minority borrowers. Sometimes these borrowers are higher risk, with blemished credit histories and high debt or simply little savings for a down payment. Lenders have responded with low down payment loan products and automated underwriting, which has allowed them to more carefully determine the risk of the loan. Other factors that have facilitated liberal financing include low and falling interest rates, low default rates, rising house prices, competition from subprime lenders and strong investor demand for mortgage-backed securities (MBS). The net effect has been a booming mortgage market that has generated strong demand for housing, which, in turn, has boosted house prices.

Supply Factors

We know less about supply decisions, which are made by builders, not households, and there are few publicly available surveys of builders. Also, construction and supply are location specific and have a complex interaction with local land use constraints. Despite these caveats, we do know that population grew faster in the 1990s than in previous decades while housing supply grew slower. The major difference has been in the construction of multifamily housing, which declined by nearly half, especially on the Coasts. Housing ranges widely in quality, and new housing tends to be high quality. According to the filtering model, as housing gets older it declines in quality and value, though high quality units are often cheaper to maintain at a high level rather than to under-maintain and then replace.

Unfortunately, there is no simple way to distinguish the market segments. One way is to divide the housing stock into quartiles by house price. Using AHS data, Collins, Crowe and Carliner (2001) report that the bottom quartile has a high concentration of manufactured houses (particularly in the South) and a disproportionate share of retirees. Adjusting for local costs and assuming an income of 80 percent of median income, the affordable owner-occupied stock shrank from 47.3 percent in 1997 to 44.2 percent in 1999. The biggest drop in affordable housing was in the West region. While there was movement in both directions, upward filtering dominated, with 1.4 value increases for each unit decrease, so that 1.7 million units became unaffordable due to price increases.

Renovation and remodeling are closely connected to filtering up. In the Northeastern cities, home improvement spending is larger than new construction. The older and larger cities, in particular, have a lot of replacement of systems, whereas high-cost cities and suburbs are active in discretionary remodeling. Rising prices build equity, which homeowners often tap to do renovation projects, through either home equity loans or cash-out refinancing.

The sensitivity of supply to prices is measured by the price elasticity of supply. An increase in demand would not necessarily boost prices, even if unexpected, as long as new supply could be created to offset the increased demand. However, if there were little change in supply, the increased demand chasing the same amount of housing would force up the price of housing. Unfortunately, there is little agreement about the elasticity of supply, and that seems to be because it varies over time and place. Malpezzi and Maclennan (2001) have done the most exhaustive research at the national level and found wide ranges with variation over time. Using a flow model (assumes the adjustment takes place in one year), the elasticity is between 6 and 13 whereas for a stock-adjustment model (assumes an adjustment of 0.3 per year) the elasticity is between 1 and 6. The standard assumption is that supply becomes more elastic in the long run. A major factor in the delayed response is obtaining land and approval for new development. Some empirical analysis shows that developers respond faster out of their existing inventory of land, and the response slows down when new land has to be approved for development. Mayer and Somerville (2000b) estimate that a one standard deviation increase in delay causes a 20 to 25 percent decline in permits, whereas the impact of fees is insignificant. The main point is that supply is less elastic in highly regulated environments.

Regulatory Constraints

The purpose of regulation is to shift from the private market equilibrium to the socially optimal equilibrium. The main difference between the two is externalities, which the private market tends to ignore. Local planners and politicians design regulations to reduce negative effects or channel positive effects. The influence of regulation on land use is so strong that it is not simple to distinguish whether house prices are higher because of increased demand or decreased supply. For example, large-lot zoning makes the neighborhood more spacious and desirable, but at the same time it reduces the number of dwelling units. Also, there are many layers of regulations so that density restrictions may be offset by environmental requirements. In empirical work, it is ideal to control for both supply and demand effects, but there are very few data sets with cross-sectional measures for regulatory constraints. Most of the studies reviewed use the data collected for the Wharton Urban Decentralization Project. There is a great need for new data to stimulate empirical analysis. Ideally there would be a time-series component to the data collection, so researchers could see how much both regulations and their implementation vary over time.

Fischel (1999) claims that growth controls are a major factor in suburban sprawl and the shortage of affordable housing for low-income households. Suburban governments, especially in high-income communities, have more restrictive zoning regulations that cater to the home-owning median voter. The zoning boards in those towns judge any project in terms of cost to the town and impact on property values. Low-income projects have to be relatively high density to spread the fixed cost of development over the low cost units and still keep the per-unit cost affordable. The high density increases the infrastructure cost and burden on the town. In addition, local zoning boards are concerned about the impact of the project on the neighboring house values. A common presumption is that a high-density, low-income development will lower neighboring property values. Those homeowners most affected may become highly motivated to challenge the project at the ballot box and, if necessary, in court.

Fischel's solution is to protect the landowner/farmer whose land is about to be subdivided for development. Large-lot zoning makes that land less valuable. Suburban governments could still require large lots, but they would have to compensate the seller for the loss caused by large-lot zoning relative to "normal" lot sizes. This financial burden would be enough to discourage most towns from insisting on large-lot zoning and open the way for more affordable housing.

An alternative solution is offered by Anthony Downs, who proposes metropolitan government control of land use decisions. His expectation is that metropolitan governments would balance the need for affordable housing with the interests of suburban homeowners.

"Smart Growth" advocates go further in advocating limits on suburban sprawl so as to promote infill development. More compact cities are better environmentally and socially, with more mixed-income neighborhoods. Not only do these cities make better use of the existing infrastructure, but they also provide affordable housing closer to employment opportunities and avoid the concentration of poverty in hollowed-out central cities. Smart Growth opponents blame the regulations associated with Smart Growth for raising the cost of construction and reducing the supply, particularly of affordable housing.

Empirical evidence shows a consistent connection between higher house price levels and regulatory constraints. The evidence is less clear about the impact of regulations on price changes, and it appears that regulation slows down the dynamic adjustment process of demand shocks back to equilibrium.

House Price Dynamics

Another important strain in the literature on house prices is the study of house price changes over time and housing market efficiency. Housing markets are not informationally efficient, meaning the current house price does not reflect all of the information available in the market. Rather, prices gradually adjust to new information, so that past prices have predictive power. This suggests that the market does not adjust fully to equilibrium each period and that measures of disequilibrium have explanatory power. However the market is rarely so inefficient that arbitrage opportunities develop, because transaction costs are high and there is no short selling.

Generally, the same factors that cause high prices also cause price increases, i.e., population growth, income growth, employment growth and construction costs. The effect of interest rates is less clear, because increased rates slow both construction and demand. Higher real incomes, population growth and construction costs seem to increase the correlation of current prices to lagged prices, while larger city size, faster population growth and lower construction costs increase mean reversion (the tendency of prices to return to a long run average). Substantial overshooting tends to occur in MSAs with high serial correlation and low mean reversion. The empirical evidence shows that serial correlation dominates mean reversion in the large MSAs in California and the Northeast.

A demand-side explanation for price overshooting is the financial accelerator or the process by which small price increases compound to large increases as homeowners move up the quality scale. Many homeowners are highly leveraged. These homeowners want a better house, but they are wealth-constrained. As soon as prices increase enough to create equity, the owners use that equity to trade up to a better house. An income shock, which lifts prices a small amount, can be compounded by the financial accelerator process. As owners trade up the property ladder, they increase demand, sales volume and house prices. Relaxed underwriting can trigger the same response. The self-reinforcing loop of prices, equity, demand and sales can convert small price increases in one part of the housing market into widespread price increases throughout the housing market.

The financial accelerator can also explain the positive correlation between house prices and sales. When prices are increasing, the market is very active with a lot of trading up, whereas when prices are sagging the re-sale market dries up. An alternative explanation for the positive correlation of prices and transaction volume is that buyers are more sensitive than sellers to income shocks and price increases. A leading indicator of strong demand is quick sales. Once sellers discover that houses are selling quickly, they adjust their asking prices upward.

Another aspect of the financial accelerator model is that higher homeownership rates can raise both housing costs and the degree of price fluctuations. Existing owners are largely shielded from price fluctuations with fixed-rate mortgages, but renters and new homebuyers are more vulnerable. The market tries to resolve the disequilibrium between supply and demand by changing the prices on the units turning over. If turnover slows down in a housing recession, there is greater pressure on the prices of the few units passing through the market to equilibrate supply and demand. Ironically, higher turnover in an up-market often means more demand is coming into the market from trade-up sellers who are also buyers. Rather than dissipating the demand pressure over more units selling in the market, the additional transactions bring more demand pressure to the market and push prices even higher. These house price dynamics occasionally lead to extreme price increases and then collapse, as occurs in price bubbles.

Bubbles

Following the telecom, technology and stock market collapses in 2000-01, there was concern that housing might be the next industry to have its bubble burst. However, distinguishing a bubble from a fundamental price increase is a matter of judgment, and experts differed. Carliner and Greenspan did not see a bubble, because they believe fundamental demand has continued strong relative to supply. Zandi and Winzer pointed to unsustainable price hikes in California and the Northeast. At this point in 2003, projected rising interest rates and slowing income growth will likely slow the markets without a real drop in prices.

Rational economic agents value assets as the present value of a future stream of dividends followed by a resale value. But the future price depends on the current price, and the current price depends on the future resale value. A speculative or bubble component to the price may be difficult to discern if it appears in both the current price and the future price. In fact, that is what sustains a bubble – the expectation that whatever the bubble component is now, it will be the same or greater when the owner goes to sell. If the owner expects the bubble to burst during ownership, she is far less likely to buy the asset, and the speculative component disappears from both the future and current values.

Cutler, Poterba and Summers (1991) find similar speculative dynamics in a range of assets, including real estate. In addition to positive serial correlation in the short run, they note that deviations in prices from the estimated fundamental values help predict future changes in asset returns. When house prices soar above the fundamental values justified by supply and demand, then they are subsequently likely to fall back to the fundamental value. One explanation of the market mechanism is that there is a mix of rational (fundamental) traders and feedback (speculative) traders in the market. As prices trend upward, more and more feedback traders jump into the market. They do not necessarily recognize the fundamentals under the market, but rather focus on recent price trends, which they expect to continue into the future – or at least until they sell. As prices ascend to dizzying heights, rational traders recognize that fundamental demand cannot support those prices relative to supply, so the rational traders exit the market. The savvy feedback traders start getting worried when price growth stalls and may decide to leave too. Sooner or later, the other feedback traders catch on, and there develops a full-scale stampede to sell before prices fall further. Of course, this drives prices lower, and probably too low, before fundamental traders re-enter the market and prices gradually return to a fundamental equilibrium.

Abraham and Hendershott (1996) estimate a dynamic house price model, which captures these features in terms of a bubble builder (lagged prices) and a bubble buster (deviation from fundamental values). Their findings show that coastal cities were more likely to have both a larger bubble builder and bubble buster components. As of 1994, the coastal cities had a 15 percent price premium and it almost certainly would be larger for conditions in 1999 or today.

Behavioral Finance and the Formation of Price Expectations

Experimental work and surveys in the behavioral finance field have helped us better understand how market participants collect information and form price expectations. In particular, the work by Case and Shiller (1989) shows that most buyers have little understanding of the market fundamentals. Instead of carefully collecting information on supply and demand, they see the news about recent price trends and project them forward. If prices are rising, and especially if houses are moving quickly through the market, buyers seem prone to panic buying. Anxious not to miss their chance to buy before prices go higher, buyers make offers over the asking price.

Sellers suffer a different fear. Sellers are afraid of realizing a loss relative to what they paid for the property. They may not be much better informed than buyers about the general market, but sellers do know what they paid for the property and expect to be able to sell it for at least that much. If there are no buyers willing to pay that price, sellers are more likely to wait rather than lower the price and take a loss. This behavior makes prices "sticky" downward and accounts for slower sales preceding price decreases.

Another study demonstrating backward-looking expectations is by Capozza and Sequin (1996). Using Census data to look at 10-year changes in metropolitan prices, the study shows that income growth from the past decade can help predict the current decade's price changes. This seems a remarkably long time for the market to adjust for old information. The authors claim that past strong income growth creates "euphoria" about future price gains that do not materialize on average. Much more study is needed to understand how people perceive market fundamentals and prices. The evidence to date suggests that homebuyers act like feedback traders without realizing how far current market prices are from fundamental values.

Implications for the Current Housing Market

By way of summary, how does this research help us understand the current housing market?

First, median house prices provide a quick measure of level and trends, but do not control for changes in quality, types of units being sold or inflation. Repeat-sales indexes and hedonic indexes provide better measures for comparisons over time and place, if sufficient data is available to control for quality.

Second, affordability indexes measure housing costs relative to incomes, but there are many ways to measure both housing costs and incomes. A simple ratio of house prices to income misses the fact that homebuyers finance their house purchase and the tax code reduces house costs through the deductibility of mortgage interest and local property taxes. A further complication is that an owner is at the same time part consumer and part investor. The expected capital gain from eventual house sale can offset the current cash costs of mortgage payment and maintenance. But, the sale price is uncertain and the sale date may be many years away. In most cases, it is too difficult to customize an affordability index for expectations about capital gains, so a simpler version of current house costs relative to current income is used. In the late 1990s, income gains outpaced house price increases to improve affordability. Falling interest rates lowered mortgage payments throughout the 1990s to 2004. However, the Federal Reserve has been increasing short term rates and the economic forecasts predict gradually rising mortgage rates. Assuming house prices continue to rise faster than household incomes, the increase in interest rates will cause affordability problems for prospective homebuyers and many existing owners with adjustable rate mortgages.

House prices are determined by demand and supply. Increasing house prices reflect demand exceeding supply. Certainly population, immigration and income are the fundamental sources of demand, but the availability of mortgage credit is also important in demand. In particular, active buying by investors in mortgage-backed securities (MBS) provides the secondary market for mortgages that makes funds available to primary lenders and keeps interest rates low. Relatively low mortgage default rates make the MBS investments profitable despite the historically low interest rates. Rising house prices help to maintain low default rates by giving the owner refinancing options. A stall in house prices could increase defaults forcing investors and lenders to demand higher interest rates. The key point is that housing demand is closely tied to financing and interest rates.

Housing supply is also sensitive to interest rates. Both the purchase of existing property and the construction of new property are done through financing. An important difference, however, is that construction requires permit approval by zoning boards and code inspectors. Throughout the country there has been an increase in the number and stringency of land use regulations that affect supply, primarily, but can also affect demand. Regulations tend to decrease supply, while increasing demand. The net effect is to increase house prices. Ironically, one reason that house prices are not expected to fall substantially is that regulations constrain overbuilding.

When supply and demand are out of equilibrium, house prices change and often in complicated ways. To simplify, most theories of house price dynamics start with a market in equilibrium. A shock is imposed on the market, which creates a disequilibrium between supply and demand and prices adjust as the market returns to equilibrium. Information about house prices is usually a key factor in the rate of adjustment. Markets with rapid growth, low construction costs and short approval times can adjust quickly. Sometimes a disequilibrium can increase before it returns to equilibrium. For example, in the financial accelerator model an income boost (more demand) can push up house prices, which provide owners with enough equity for the down payment of a nicer house. The chain reaction of higher prices causing more demand for more expensive houses can drive up prices much higher than the original increase. This pattern of trading up and price increases may explain why prices rise much higher in some cities and not others despite the same interest rates and credit availability.

In extreme cases, price increases may be labeled as bubbles. The implication of the “bubbles” label is that the price increase will abruptly reverse when the bubble bursts. The sign of a bubble is when many investors are speculating on the continued upward trend in house prices. Although they are buying rental properties, the profit from the transaction relies heavily on the capital gain at resale not the monthly rents. Demand from owner-occupiers may be augmented when they buy a vacation home or remodel their existing home, but if house prices fall the owners are likely to remain in their primary residence. Speculators assume they can sell their investments before all the capital gain disappears. Even if they take a loss on the current transaction, they expect to retain their profits from earlier deals.

Unfortunately, it is difficult to identify speculators from sales records, but the popular press offers accounts of condos bought and sold before its first occupant moves in (Leonhardt,2005). A weak stock market may contribute to investor interest in real estate and house prices have been increasing long enough that buyers assume prices will keep going up. Even Federal Reserve Chairman Greenspan notes the froth in certain markets, especially in California, Florida and the Northeast. As long as the demand by owner-occupiers exceeds the supply, then an increase in interest rates might not deflate house prices drastically. The signs of speculative buying may be a warning of future price declines in select markets.

Market fundamentals are hard to measure and most households rely on news reports about house price trends to form their price expectations. The literature shows that buyers are prone to panic when house prices are trending upward for fear of missing out on an opportunity to become owners. These buyers are not necessarily, or even usually, speculators. The buyers are not real estate mavens who can distinguish inflated house prices. More likely, the buyers have little experience in real estate transactions and are reacting to news reports of rapid sales and offers over the asking price.

Sellers in a down market suffer from the opposite problem. When the market prices start going down, sellers hesitate to reduce their asking price especially if it forces them to realize a loss relative to what the seller originally paid for the house. In other words, prices are "sticky" downward. Both phenomena, panic buying and reluctant selling, make it more difficult for the market to adjust prices back to equilibrium. Researchers have had difficulty determining how people form price expectations, but it is clear that price data is much more commonly available than measures of fundamental supply and demand. In the current market with rapidly increasing prices, a tendency of buyers to focus on recent trends serves to boost demand and propel prices even higher. Eventually, house prices will get high enough that there are not enough buyers with income or credit to afford the high asking prices. Prices need not collapse at that point, but double-digit increases cannot be sustained indefinitely.

Recommendations for Future Research

Research on house prices to date has been more successful in answering some questions than others.

While better data and analytic techniques are always possible, house price research in the U.S. is in relatively good shape with regard to the key outcome measure – house prices. From the decennial Census, American Housing Survey, industry surveys, and other sources, many data are available on the sales prices of single-family homes and the market value of houses that do not transact. These data are available for a wide range of geographies and time periods. Hedonic indexes, repeat sales indexes, and other analytic tools have been developed to adjust house prices for differences in quality and location. Researchers, policy makers, the business community, and consumers are all able to compare house prices across markets and to track price changes over time.

Similarly, there are both data and understanding of some of the determinants of housing prices, notably the key tangible determinants of housing demand. How housing demand and house prices depend on income, demographics, interest rates, and tax laws have been the subjects of extensive theoretical work that has been tested in a large number of econometric studies over the past fifty years.

But research has been less successful in answering other questions about the determinants of house prices. Beginning with the demand side of the market, the intangible determinants of consumer choices are a fruitful field for future research. As described in this report, research on consumers' decision making process has been expanding lately, but more work is needed both on the theoretical/conceptual side and also regarding collection of data that will allow those theories to be tested. How consumers form their house price expectations and their assessments of the total costs of home ownership are not yet adequately understood. More generally, how consumers gather and process information about market conditions and determine the "right" time to buy or sell a house are key to understanding housing demand and short-run price dynamics.

The supply side of the housing market continues to be less researched and less well understood than the demand side, although there does seem to be growing recognition of the importance of supply conditions for house prices. Perhaps the biggest limitation has been the lack of data about supply conditions. Construction cost indexes are available, but these cover only labor and materials. Land costs are becoming a larger part of total development costs in many markets, and for the most part only anecdotal and case study information is available on the prices of buildable lots. More data on land costs, preferably comparable across markets and over time, are needed before major progress can be made on calibrating supply influences on house prices.

Government actions are major drivers of housing supply. Government regulation of land use and building design affects the cost of land, what can be built on it, and ultimately house prices. Some data are available and have been researched to estimate the effects of building codes on construction costs, but how land use regulation affects the supply and cost of housing remains a large question mark. Beyond the data sources on land use regulation described in this report, much more is needed to allow these land use controls and how they affect housing prices to be well understood. The data task is formidable, given the multidimensionality of land use controls and the importance not just of the regulations but also their enforcement, but these controls are unquestionably a major driver of housing supply, its elasticity, and house prices.

Another area of needed supply side research is on the decision making of developers, renovators, and their financiers. Even less is known here than about the decision making of consumers. What, for example, causes the time lags in suppliers' responses to changing demand and the common overshooting of supply when the response does come? Both of these features of the supply side, which have implications for house price dynamics, are observed in the aggregate but are the result of the decisions of many individuals working with imperfect information and varying incentives.

A last area of needed house price research investigates the interaction of demand and supply as it affects house prices. How do the peculiarities of housing as a durable heterogeneous good, trading infrequently in markets with imperfect information and often inelastic supply, affect house prices over time and across markets? What are the causes and consequences, especially those pertaining to house prices, of the transactions volume or turnover rate of housing in a local market? What are the unique features of extreme markets? For example, what triggers panic buying in rapidly inflating markets? And in softening markets, what determines how firmly sellers hold on to their reference selling prices? One goal would be to understand the tipping point at which fear of large price increases, or decreases, converts an orderly market into a disorderly one.

References

Abraham, Jesse M. and Patric H. Hendershott (1996) "Bubbles in Metropolitan Housing Markets." *Journal of Housing Research,* 7(2): 191-207.

Abraham, Jesse M.; Hendershott, Patric H. (1993) "Patterns and Determinants of Metropolitan House Prices, 1977-91." In *Real Estate and the Credit Crunch*, ed. Lynne E. Browne and Eric S. Rosengren, 18-42. Boston: Federal Reserve Bank of Boston.

Ackert, Lucy F., Narat Charupat, Bryan K. Church and Richard Deaves (2002) "Bubbles in Experimental Asset Markets: Irrational Exuberance No More," Federal Reserve Bank of Atlanta, Working Paper 2002-24, December.

Allen, Katherine and Maria Kirby (2000) Unfinished Business: Why Cities Matter to Welfare Reform, Brookings Institution Center on Urban and Metropolitan Policy, Washington, D.C.

Almeida, Heitor, Murillo Campello and Crocker Liu (2002) "The Financial Accelerator in Household Spending: Evidence from International Housing Markets," Working Paper, Nov. 4, 2002.

Apgar, William, Allegra Calder, Michael Collins and Mark Duda (2002) "An Examination of Manufactured Housing as a Community- and Asset-Building Strategy," Report to the Ford Foundation by Neighborhood Reinvestment Corporation in collaboration with the Joint Center for Housing Studies of Harvard University.

Bailey, M.J., R.F. Muth and H.O. Nourse (1963) "A Regression Method for Real Estate Price Index Construction," *J. of the American Statistical Association*, 58, 933-942.

Berkovec, James A. and John L. Goodman, Jr. (1996) "Turnover as a Measure of Demand for Existing Homes," *Real Estate Economics*, 24(4): 421-440.

Bernanke, Ben and Mark Gertler (1989) "Agency Costs, Net Worth, and Business Fluctuations," *American Economic Review*, 79(1): 14-31.

Bernasek, Anna (2002) "Is Housing the Next Bubble?" *Fortune*, April 1, 2002.

Berube, Alan (2002) "Gaining, But Losing Ground: Population in Large Cities and Their Suburbs in the 1990s," Brookings Institution Center on Urban and Metropolitan Policy, Washington, D.C.

Bhattacharya, Anand K., Frank J. Fabozzi and S. Esther Chang (2001) "Overview of the Mortgage Market," in Fabozzi (ed.) *The Handbook of Mortgage-Backed Securities,* 5th Ed., New York: McGraw-Hill.

Bier, Thomas (2001) "Moving Up, Filtering Down: Metropolitan Housing Dynamics and Public Policy," The Brookings Institution Discussion Paper, September.

Blackley, D.M. (1999) "The Long-Run Elasticity of New Housing Supply in the United States: Empirical Evidence for 1950 to 1994," *Journal of Real Estate Finance and Economics*, 18: 25-42.

Bogdon, Amy S.; Can, Ayse (1997) "Indicators of Local Housing Affordability: Comparative and Spatial Approaches." *Real Estate Economics*, 25(1): 43-80.

Bourassa, Stephen C. (1996) "Measuring the Affordability of Home-ownership." *Urban Studies*, 33(10): 1867-77.

Bourassa, Stephen, Patric H. Hendershott and James L. Murphy (2001) "Further Evidence on the Existence of Housing Market Bubbles." *Journal of Property Research*, 18: 1-20.

Braden, Brett M. and Don L. Coursey (1999) "Effects of Impact Fees on the Suburban Chicago Housing Market," Heartland Policy Study #93, (Chicago, Heartland Institute).

Bratt, Rachel G. (2002) "Housing and Family Well-Being," *Housing Studies*, 17:13-26.

Burns, John (2002) "The Housing Cycle Barometer." Housing Zone. June 26, 2002. http://www.housingzone.com/topics/hz/economics/hz02fa606.asp#

Calem, Paul, Bradford Case and Daniel Fetter (2003) "Persistence, Mean Reversion and Regional Correlation in U.S. Metropolitan Area House Prices," Board of Governors, January.

Campbell, John Y., Andew W. Lo and A. Craig MacKinlay (1997) *The Econometrics of Financial Markets*, (Princeton, NJ: Princeton University Press).

Can, Ayse (1992) "Specification and Estimation of Hedonic Housing Pricing Models," *Regional Science and Urban Economics*, 22:453-474.

Can, Ayse and Isaac Megbolugbe (1997) "Spatial Dependence and House Price Index Construction," *Journal of Real Estate Finance and Economics*, 14:203-222.

Capozza, Dennis R. and Paul J. Sequin (1996) "Expectations, Efficiency, and Euphoria in the Housing Market." *Regional Science and Urban Economics*, 26: 369-386.

Capozza, Dennis R., Patric H. Hendershott, Charlotte Mack, Christopher J. Mayer (2002) "Determinants of Real House Price Dynamics," NBER Working Paper Series, No. w9262, October 2002.

Carliner, Michael (2002) "Housing Price Bubble Babble." *Housing Economics*. April.

Case, Bradford and Edward J. Szymanoski (1995) "Precision in House Price Indices: Findings of a Comparative Study of House Price Index Methods," *J. of Housing Research*, 6(3): 483-496.

Case, Karl E.; Mayer, Christopher J. (1995a) "Housing Price Dynamics within a Metropolitan Area." NBER Working Paper Series, No 5182.

Case, Karl E.; Mayer, Christopher J. (1995b) "The Housing Cycle in Eastern Massachusetts: Variations among Cities and Towns." *New England Economic Review*,(March-April 1995): 24-40.

Case, Karl E. and Robert J. Shiller (1987) "Prices of Single-Family Homes since 1970: New Indexes for Four Cities." *New England Economic Review*, September-October, pp. 45-56.

Case, Karl E. and Robert J. Shiller (1988) "The Behavior of Home Buyers in Boom and Post-Boom Markets," *New England Economic Review*, November/December, 29-46.

Case, Karl E. and Robert J. Shiller (1989) "The Efficiency of the Market for Single Family Homes," *American Economic Review*, 79(1): 125-137.

Case, Karl E.; Shiller, Robert J. (1990) "Forecasting Prices and Excess Returns in the Housing Market." *AREUEA Journal*, 18: 253-73.

Case, Karl E.; Shiller, Robert J. (1994) "A Decade of Boom and Bust in the Prices of Single-Family Homes: Boston and Los Angeles, 1983 to 1993." *New England Economic Review*, (March 1994): 40.

Case, Karl E., John M. Quigley and Robert J. Shiller (2001) "Comparing Wealth Effects: The Stock Market Versus the Housing Market," NBER Working Paper 8606, November.

Cho, Man (1996) "House Price Dynamics: A Survey of Theoretical and Empirical Issues." *Journal of Housing Research*, 7(2): 145-72.

Clapp, John M. and Carmelo Giaccotto (1992) "Estimating Price Indexes for Residential Property: A Comparison of Repeat Sales and Assessed Value Methods," *Journal of the American Statistical Association*, 87: 300-306.

Clapp, John M. and Carmelo Giaccotto (1994) "The Influence of Economic Variables on Local House Price Dynamics." *Journal of Urban Economics*, 36(2): 161-83.

Clayton, Jim (1996) "Rational Expectations, Market Fundamentals and Housing Price Volatility," *Real Estate Economics*, 24(4): 441-470.

Collins, Michael (1998) "How to Build a Neighborhood Price Index," http://pages.prodigy.net/michael_collins/Indices.pdf.

Collins, Michael, David Crowe and Michael Carliner (2001) "Examining Supply-Side Constraints to Low-Income Homeownership," Low-Income Homeownership Working Paper Series (LIHO-01.5), Joint Center for Housing Studies of Harvard University, August.

Corporation for Enterprise Development (2002) State Asset Development Report Card: Benchmarking Asset Development in Fighting Poverty.

Cutler, David M., James M. Poterba and Lawrence H. Summers (1991) "Speculative Dynamics," *Review of Economic Studies*, 58: 529-546.

DiPasquale, Denise, (1999) "Why Don't We Know More About Housing Supply?" *Journal of Real Estate Finance and Economics*, 18(1):9-23.

DiPasquale, Denise and C. Tsuriel Somerville (1995) “Do Housing Price Indexes Based on All Transacting Units Represent the Entire Stock? Evidence from the American Housing Survey,” *J. of Housing Economics*, 4(3):195-229.

DiPasquale, Denise, and William C. Wheaton (1994) “Housing Market Dynamics and the Future of Housing Prices,” *Journal of Urban Economics*, 35:1-27.

Dombrow, J., J.R. Knight and C.F. Sirmans (1997) “Aggregation Bias in Repeat-Sales Indices,” *J. of Real Estate Finance and Economics*, 14, 75-88.

Downs, Anthony (1994) *New Visions for Metropolitan America*, Washington, DC: Brookings Institution.

Downs, Anthony (2001a) “Attacking the Housing Affordability Problem.” Report to the Millennial Housing Commission, November.

Downs, Anthony (2001b) “What Does 'Smart Growth' Really Mean?” *Planning*, April.

Duda, Mark (2001) “Federally-Sponsored Rehabilitation Activity,” Joint Center for Housing Studies of Harvard University, W01-8, July.

Englund, Peter, and Yannis M. Ioannides (1997) “House Price Dynamics: An International Empirical Perspective,” *Journal of Housing Economics*, 6: 119-136.

Euchner, Charles C. (2003) “Getting Home: Overcoming Barriers to Housing in Greater Boston,” Rappaport Institute for Greater Boston, January.

Fama, Eugene F. (1970) “Efficient Capital Markets: A Review of Theory and Empirical Work,” *Journal of Finance*, 25:383-420.

Fannie Mae Foundation (2002) “Results of the Fannie Mae Foundation Affordable Housing Survey.” Conducted by Hard/Teeter. May/June.

Fergus, James T.; Goodman, John L.(1992) “House Prices: Trends, Causes, and Consequences.” Unpublished. April.

Fischel, William A. (1999) “Does the American Way of Zoning Cause the Suburbs of Metropolitan Areas to Be Too Spread Out?” *Governance and Opportunity in Metropolitan America*, The National Academy Press, p. 151-191.

Flood, Robert P.; Hodrick, Robert J. (1990) “On Testing for Speculative Bubbles.” *Journal of Economic Perspectives*, 4(2): 85-101.

Follain, James R. (1979) “The Price Elasticity of the Long Run Supply of New Housing Construction,” *Land Economics*, 55: 190-199.

Follain, James R. and O.T. Velz (1995) “Incorporating the Number of Existing Home Sales into a Structural Model of the Market for Owner-Occupied Housing,” *Journal of Housing Economics*, 4:93-117.

Franses, Philip Hans (1998) *Time Series Models for Business and Economic Forecasting*, Cambridge: Cambridge University Press.

Gabriel, Stuart A.; Mattey, Joe P.; Wascher, William L. (1999) "House Price Differentials and Dynamics: Evidence from the Los Angeles and San Francisco Metropolitan Areas." Federal Reserve Bank of San Francisco, n1: 3-22.

Gabriel, Stuart A. and Frank E. Nothaft (2001) "Rental Housing Markets, The Incidence and Duration of Vacancy, and the Natural Vacancy Rate," *J. of Urban Economics*, 49(1): 121-149.

Galster, George C. (1996) "William Grigsby and the Analysis of Housing Sub-markets and Filtering," *Urban Studies*, 33(10).

Gatzlaff, Dean H. and Donald R. Haurin (1997) "Sample Selection Bias and Repeat-Sales Index Estimates," *J. of Real Estate Finance and Economics*, 14, 33-50.

Gatzlaff, Dean H. and David L. Ling, (1994) "Measuring Changes in Local House Prices: An Empirical Investigation of Alternative Methodologies," *J. of Urban Economics*, 35:221-44.

Genesove, David, and Christopher J. Mayer (2001) "Loss Aversion and Seller Behavior: Evidence from the Housing Market." *Quarterly Journal of Economics*, 116 (2001): 1233-1260.

Glaeser, Edward L. and Matthew Kahn (2001) "Job Sprawl: Employment Location in U.S. Metropolitan Areas," Brookings Institution Center on Urban and Metropolitan Policy, Washington, D.C.

Glaeser, Edward L. and Jesse M. Shapiro (2002) "The benefits of the Home Mortgage Interest Deduction." Harvard Institute of Economic Research Discussion Paper: 1979. October.

Glaeser, Edward L.and Joseph Gyourko, (2002) "The Impact of Zoning on Housing Affordability." Harvard Institute of Economic Research Discussion Paper: 1948. March.

Glaeser, Edward L. and Joseph Gyourko (2004) "Urban Decline and Durable Housing," Working Paper, August 3.

Glaeser, Edward L., Joseph Gyourko and Raven Saks (2004a) "Urban Growth and Housing Supply," mimeo, July 29.

Glaeser, Edward L., Joseph Gyourko and Raven Saks (2004b) "Why is Manhattan So Expensive? Regulation and the Rise in House Prices," mimeo, August 30.

Glascock, John L. and V. Carlos Slawson, Jr., "Using the Housing Affordability Index to Assess Housing Opportunities." Presented at the AREUEA Midyear 1996 Conference, April 1996.

Goodman, Jack (2001) "Housing Affordability in the United States: Trends, Interpretations, and Outlook." Report to the Millennial Housing Commission. November 21, 2001.

Goodman, John L. and John B. Ittner (1992) "The Accuracy of Home Owners' Estimates of House Value." *Journal of Housing Economics*, 2: 339-357.

Granger, C.W.J. and P. Newbold (1974) "Spurious Regressions in Econometrics," *Journal of Econometrics*, 2:111-120.

Rick Grant (2002) "New Index Ranks Risk in MSAs," *National Mortgage News*, August 12, 2002.

Green, Richard K. (1999) "Land Use Regulation and the Price of Housing in a Suburban Wisconsin County," *Journal of Housing Economics*, 8(2): 144-159.

Green, Richard, and Patric H. Hendershott, "Age, Housing Demand, and Real House Prices." *Regional Science and Urban Economics*, 26 (1996): 465-480.

Green, Richard K. and Michelle J. White (1996) "Measuring the Benefits of Home Owning: Effects on Children," *Journal of Urban Economics*, 41: 441-461.

Green, Richard K. and Stephen Malpezzi (2003) *A Primer on U.S. Housing Markets and Housing Policy*, Washington, D.C.: Urban Institute Press.

Grigsby, William (1963) *Housing Markets and Public Policy*, Philadelphia: Univ. of Pennsylvania Press.

Gyourko, Joseph and Peter Linneman (1993) "The Affordability of the American Dream: An Examination of the Last 30 Years." *Journal of Housing Research*, 4(1): 39-72.

Gyourko, Joseph; Tracy, Joseph (1999) "A Look at Real Housing Prices and Incomes: Some Implications for Housing Affordability and Quality." *Federal Reserve Bank of New York. Economic Policy Review*, September 1999: 63-77.

Gyourko, Joseph and Richard Voith (1992) "Local Market and National Components in House Price Appreciation," *Journal of Urban Economics*, 32: 52-69.

Gyourko, Joseph and Richard Voith (2001) "Capitalization of Federal Taxes, the Relative Price of Housing and Urban Form: Density and Sorting Effects," The Wharton School, University of Pennsylvania Working Paper 00-12.

Haurin, Donald; Hendershott, Patric; Wachter, Susan (1996) "Expected Home Ownership and Real Wealth Accumulation of Youth." National Bureau of Economics Research Working Paper: 5629.

Hendershott, Patric H. and Thomas Thibodeau (1993) "The Relationship Between Median and Constant Quality House Prices: Implications for Setting FHA Loan Limits." *Journal of the American Real Estate and Urban Economics Association*, 18: 323-334.

Homeownership Alliance, *America's Home Forecast: The Next Decade for Housing and Mortgage Finance*, 2004.

Hort, Katinka (2000) "Prices and Turnover in the Market for Owner-Occupied Homes." *Regional Science and Urban Economics*, 30: 99-119.

Hwang, Min and John M. Quigley (2004) "Economic Fundamentals in Local Housing Markets: Evidence from U.S. Metropolitan Regions," Institute of Business and Economic Research, Working Paper No. W03-005.

Jargowsky, Paul (2003) "Stunning Progress, Hidden Problems: The Dramatic Decline of Concentrated Poverty in the 1990s," The Brookings Institution, Nov. 29.

Johnes, Geraint; Hyclak, Thomas (1999) "House Prices and Regional Labor Markets." *Annals of Regional Science*, 33(1): 33-49.

Joint Center for Housing Studies of Harvard University (2003) *Measuring the Benefits of Home Remodeling*, Cambridge, MA: Harvard University.

Joint Center for Housing Studies of Harvard University (2002) *The State of the Nation's Housing*, Cambridge, MA: Harvard University.

Jonas, Michael (2002) "Anti-Family Values." *CommonWealth,* 7(3): 62-71.

Jud, G. Donald and Daniel T. Winkler (2002) "The Dynamics of Metropolitan Housing Prices," J. of Real Estate Research, 23(1/2): 29-45.

Katz, Bruce (2002) "Smart Growth: The Future of the American Metropolis?" London School of Economics and Political Science CASE Paper, July.

Katz, Lawrence and Kenneth T. Rosen (1987) "The Interjurisdictional Effects of Growth Controls on Housing Prices," *Journal of Law and Economics*, 30: 149-160.

Kahneman, Daniel and Amos Tversky (1979) "Prospect Theory: An Analysis of Decision Under Risk," *Econometrica*, 47: 263-292.

Kiel, Katherine and Jeffrey E. Zabel (1997) "Evaluating the Usefulness of the American Housing Survey for Creating House Price Indices" *J. of Real Estate Finance and Economics*, 14:189-202.

Kiel, Katherine and Jeffrey E. Zabel (1999) "The Accuracy of Owners-Provided House Values: The 1978-1991 American Housing Survey," *Real Estate Economics*, 27(2):263-298.

Kiyotaki, Nobuhiro, and John Moore (1997) "Credit Cycles." *Journal of Political Economy*, 105: 211-248.

Laing, Jonathon R. (2002) "Home Groan," *Barrons*, April 15.

Lamont, Owen; Stein, Jeremy C. (1999) "Leverage and house-price dynamics in U.S. cities." *RAND Journal of Economics*, 30(3): 498-514.

Landis, John, Michael Larice, Deva Dawson and Lan Deng (2001) *Pay to Play: Residential Development Fees in California Cities and Counties, 1999* (Sacramento: State of California Business, Transportation and Housing Agency), August.

Leonhardt, David (2005) “Steep Rise in Prices for Homes Adds to Worry About a Bubble,” The *New York Times* (online edition), May 25.

Lerman, Donald L. and William J. Reeder (1987) “The Affordability of Adequate Housing,” *The Journal of the American Real Estate and Urban Economics Association*, 15(4): 389-404.

Levine, Ned (1999) “The Effects of Local Growth Controls on Regional Housing Production and Population Redistribution in California,” *Urban Studies*, 36:2047.

Linneman, P., A. Summers, N. Brooks and H. Buist (1990) “The State of Local Growth Management,” Working Paper No. 81, Wharton: Philadelphia, PA.

Linneman, Peter and Susan Wachter (1989) “The Impacts of Borrowing Constraints on Homeownership,” *AREUEA Journal*. 17(4): 389-402.

Lipman, Barbara J. (2002) “America's Working Families and the Housing Landscape: 1997-2001,” *New Century Housing*, 3(2).

Lowry, I.S. (1960) “Filtering and Housing Standards,” *Land Economics*, 35: 362-370.

Ludmilla Salvacion and Rebecca Wood (2003) “Analysis for the Housing Market”, The Meyers Group.

Luger, Michael I. and Kenneth Temkin (2000) Red Tape and Housing Costs: How Regulation Affects New Residential Development, (New Brunswick, NJ: CUPR Press).

Malpezzi, Stephen (1990) “Urban Housing and Financial Markets: Some International Comparisons,” *Urban Studies*, 27(6):971-1022.

Malpezzi, Stephen (1999) “A Simple Error Correction Model of Housing Prices.” *Journal of Housing Economics*, 8: 27-62.

Malpezzi, Stephen (1996) “Housing Prices, Externalities, and Regulation in U.S. Metropolitan Areas.” *Journal of Housing Research*, 7(2): 143-83.

Malpezzi, Stephen; Chun, Gregory H.; Green, Richard K. (1998) “New Place-to-Place Housing Price Indexes for U.S. Metropolitan Areas, and Their Determinants.” *Real Estate Economics*, 26(2): 235-74.

Malpezzi, Stephen; Green, Richard K. (1996) “What’s Happened to the Bottom of the Housing Market?” *Urban Studies*, 33(10): 1807-1820.

Malpezzi, Stephen and Duncan Maclennan (2001) “The Long-Run Price Elasticity of Supply of New Residential Construction in the United States and the United Kingdom,” *Journal of Housing Economics*, 10: 278-306.

Malpezzi, Stephen; Mayo, Stephen K. (1997) “Housing and Urban Development Indicators: A Good Idea Whose Time Has Returned.” *Real Estate Economics*, 25(1): 1-12.

Maki, Dean (2001) “Household Debt and the Tax Reform Act of 1986,” *The American Economic Review*, 91(1): 305-319.

Mankiw, N.G. and D.N. Weil (1989) “The Baby Boom, The Baby Bust, and the Housing Market,” *Regional Science and Urban Economics*, 19: 235-258.

Marschoun, Michael (2000) “Availability of Mortgage Loans in Volatile Real Estate Markets.” *Journal of Urban Economics*, 47(3): 443-69.

Masnick, George S. “A Demographer’s Perspective on Housing Affordability in the United States at the End of the 20th Century.” Report to the Millennial Housing Commission. December 2001.

Mayer, Christopher J. and Tsuriel C. Somerville (2000a) “Residential Construction: Using the Urban Growth Model to Estimate Housing Supply,” *Journal of Urban Economics*, 48: 85-109.

Mayer, Christopher J. and Tsuriel C. Somerville (2000b) “Land Use Regulation and New Construction” *Regional Science and Urban Economics*, 30: 639-662.

Mayer, Christopher J.; Somerville, Tsuriel C. “Unifying Empirical and Theoretical Models of Housing Supply.” Federal Reserve Bank of Boston Working Paper: 96/12.

Mayo, Stephen and Stephen Sheppard (2001) “Housing Supply and the Effects of Stochastic Development Control,” *Journal of Housing Economics*, 10: 109-128.

Meese, R. and N. Wallace (1994) “Testing the Present Value Relation for House Prices: Should I Leave My House in San Francisco?” *Journal of Urban Economics*, 35: 245-266.

Meese, Richard A. and Nancy E. Wallace (1997) “The Construction of Residential Housing Price Indices: A Comparison of Repeat-Sales, Hedonic Regression, and Hybrid Approaches,” J. of Real Estate Finance and Economics, 14(1/2): 51-73.

Millennial Housing Commission. “Meeting Our Nation’s Housing Challenges.” A Report of the Bipartisan Millennial Housing Commission Appointed by the Congress of the United States. May 30, 2002.

Muth, R.F. (1960) “The Demand for Non-Farm Housing,” in *The Demand for Durable Goods* (Arnold Harberger, Ed.), Chicago: University of Chicago Press.

National Association of Home Builders (2001) “Housing’s Impact on the Economy.” Report to the Millennial Housing Commission, November.

National Association of Home Builders (1999) The Truth About Regulatory Barriers to Housing Affordability, NAHB.

National Mortgage News (2002) “Index Finds Risk of Home Price Bubble Growing,” October 21, 2002, p. 11.

Nelson, Arthur C., Rolf Pendall, Casey J. Dawkins and Gerrit J. Knaap (2002) "The Link Between Growth Management and Housing Affordability: The Academic Evidence," The Brookings Institution Center on Urban and Metropolitan Policy, February.

Newman, Sandra J. and Joseph Harkness (2002) "Homeownership for the Poor in Distressed Neighborhoods: Does this Make Sense?" *Housing Policy Debate*, 13(3): 597-630.

O'Flaherty, Brendan. (1996) *Making Room: The Economics of Homelessness*. (Cambridge, MA: Harvard University Press).

Olsen, E.O. (1969) "A Competitive Theory of the Housing Market," *American Economic Review*, 59(4): 612-622.

Olsen, E.O. (1987) "The Demand and Supply of Housing Services: A Critical Review of the Empirical Literature," in *Handbook of Regional and Urban Economics,* (E.S.Mills, Ed.), Vol. 2, Amsterdam: Elsevier.

Oliver, M. and T. Shapiro (1997) *Black Wealth/ White Wealth: A New Perspective on Racial Inequality*, New York: Routledge.

Ortalo-Magne, Francois, and Sven Rady (2002a) "Housing Market Dynamics: On the Contribution of Income Shocks and Credit Constraints." mimeo, February 2002.

Ortalo-Magne, Francois, and Sven Rady (2002b) "Homeownership: Low Household Mobility, Volatile Housing Prices, High Income Dispersion," mimeo, September 2002.

Phillips, Justin and Eban Goodstein (2000) "Growth Management and Housing Prices: The Case of Portland, Oregon," *Contemporary Economic Policy*, 18(3): 334-344.

Pierce, Neal R. (2003) "Smart Growth Still a Movement with Legs," *The Seattle Times*, March 3.

Pollakowski, Henry O. (1995) "Data Sources for Measuring House Price Changes," *J. of Housing Research*, 6(3): 377-387.

Popper, Margaret, ed. (2002) "Real Estate's Bubble Cities: Certain Markets are Full of Hot Air." *BusinessWeek*. Aug 12, 2002.

Poterba, James M. "House Price Dynamics: The Role of Tax Policy and Demography." *Brookings Papers on Economic Activity* v0, n2 (1991): 143-83.

Quigley, John M. and Steven Raphael (2003) "Is Housing Unaffordable? Why Isn't It More Affordable," Institute of Business and Economic Research, Working Paper No. W03-002, September.

R.S. Means (2002) *Building Construction Cost Data*, 60th Annual Edition, R.S. Means Company.

R.S. Means (2000) *Residential Cost Data*, 19th Annual Edition, R.S. Means Company.

R.S. Means (2000) *Square Foot Costs*, 21st Annual Edition, R.S. Means Company.

Reade, Julia (2001) “Remodeling Spending in Major Metropolitan Areas,” Joint Center for Housing Studies of Harvard University, N01-4, September.

Redfearn, Christopher. “Think Globally, Aggregate Locally: Index Consistency in the Presence of Assymetric Appreciation.” Paper given at the AREUEA Conference, January 2003.

Retsinas, Nicolas and Eric Belsky (2000) Towards a Targeted Homeownership Tax Credit, Discussion Paper, Brookings Institution Center on Urban and Metropolitan Policy, Washington, D.C.

Rich, Motoko (2005) “Speculators Seeing Gold in a Boom in the Prices for Homes,” New York Times, March 1.

Rose, Louis A. (1989a) “Topographical Constraints and Urban Land Supply Indexes,” *Journal of Urban Economics*, 26(3): 335-347.

Rose, Louis A. (1989b) “Urban Land Supply: Natural and Contrived Restrictions,” *Journal of Urban Economics*, 25(3): 325-345.

Rosen, Sherwin (1974) “Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition,” *Journal of Political Economy*, 82: 35-55.

Rosenthal, Stuart S. (1999) “Residential Buildings and the Cost of Construction: New Evidence on the Efficiency of the Housing Market,” *Review of Economics and Statistics*, 81: 288-302.

Schill, Michael H. (2001) “Regulatory Barriers to Housing Development in the United States.” Report to the Millennial Housing Commission. November 11, 2001.

Scheutz, Mary Kay and Sammis White (1992) “Identifying and Mitigating Local Regulatory Barriers to Affordable Housing in Waukesha County, Wisconsin,” Urban Research Center, University of Wisconsin-Milwaukee.

Schulte, Erin (2002) “Housing's Strength Raises Another Bubble Concern,” *Wall Street Journal*, March 29.

Segal, David and Philip Srinivasan (1985) “The Impact of Suburban Growth Restrictions on U.S. Housing Price Inflation, 1975-1978,” *Urban Geography*, 6(1): 14-26.

Shiller, Robert J. (1990) “Speculative Prices and Popular Models.” *Journal of Economic Perspectives*, (Spring 1990): 55-65

Shiller, Robert J. (2002a) “Safe as Houses?” *Wall Street Journal*, Dec. 17, 2002, p. A16.

Shiller, Robert J. (2002b) “From Efficient Market Theory to Behavioral Finance.” Cowles Foundation Discussion Paper No. 1385, October 2002.

Sichelman, Lew (2005) “Freddie Introduces New Lineup of Low Downpayment Loans,” National Mortgage News, February 21, p. 23.

Patrick A. Simmons (2001) "A Coast-to-Coast Expansion: Geographic Patterns of U.S. Homeownership Gains During the 1990s," Fannie Mae Foundation Census Note 05 (June).

Sinai, Todd and Nicholas S. Souleles (2003) "Owner-Occupied Housing as a Hedge Against Rent Risk," NBER Working Paper 9462, January.

Singell, Larry D. and Jane H. Lillydahl (1990) "An Empirical Examination of the Effect of Impact Fees on the Housing Market," *Land Economics*, 66:84.

Singer, Audrey, Samantha Friedman, Ivan Cheung and Marie Price (2001) The World in a Zip Code: Greater Washington, D.C. as a New Region of Immigration, Brookings Institution Center on Urban and Metropolitan Policy, Washington, D.C.

Somerville, Tsuriel.; Holmes, Cynthia (2001) "Dynamics of the Affordable Housing Stock: Microdata Analysis of Filtering." *Journal of Housing Research*, 12: 115-40.

Stein, Jeremy C. (1995) "Prices and Trading Volume in the Housing Market: A Model with Down-Payment Effects." *Quarterly Journal of Economics*, 110: 379-406.

Stiglitz, Joseph (1990) "Symposium on Bubbles." *Journal of Economic Perspectives*. 4(2): 13-18.

Stone, M.E. (1993) *Shelter Poverty: New Ideas on Housing Affordability*, Temple University Press: Philadelphia, PA.

Thaler, Richard (2003) *Advances in Behavioral Finance II*, (New York: Russell Sage).

Thibodeau, Thomas G. (1995) "House Price Indices from the 1984-1992 MSA American Housing Surveys," *Journal of Housing Research*, 6(3):439-481.

Tobin, J. (1969) "A General Equilibrium Approach to Monetary Theory," *Journal of Money, Credit, and Banking*, 1:15-29.

Topel, R. and S. Rosen (1988) "Housing Investment in the United States," *Journal of Political Economy*, 96: 718-740.

Triplett, J.E. (1983) "Concepts of Quality in Input and Output Price Measures: A Resolution of the User Value-Resource Cost Debate." In M.F. Foss, ed., *The U.S. National Income and Product Accounts: Selected Topics (NBER Studies in Income and Wealth).* Chicago: University of Chicago Press, Vol. 47: 269-311.

U.S. Bureau of the Census (1991) Price Index of New One Family Homes Sold. Current Construction Reports Series C-27.

Winzer, Ingo (1992) "The Dynamics of Overpriced Markets." *Mortgage Banking*, 53(1): 16-22.

Zorn, Peter (1989) "Mobility-Tenure Decisions and Financial Credit: Do Mortgage Qualification Requirements Constrain Homeownership?" *AREUEA Journal*. 17(1): 1-16.

Appendix

Appendix A1. Hedonic Regressions on All Owners by AHS Survey Year: 1985, 1987

1985				
Number of obs = 21224				
F(31, 21192) = 480.57				
Prob > F = 0.0000				
R-squared = 0.4128				
Adj R-squared = 0.4119				
Root MSE = .71688				
lnvalue	Coef.	Std. Err.	t	P>|t|
suburb	0.066	0.013	5.090	0.000
nonmet	-0.320	0.015	-20.910	0.000
baths10	-0.274	0.012	-22.690	0.000
bdrms0	-0.409	0.187	-2.180	0.029
bdrms1	-0.218	0.032	-6.780	0.000
bdrms2	-0.068	0.013	-5.210	0.000
bdrms4p	0.101	0.014	7.330	0.000
attached	-0.080	0.030	-2.640	0.008
twoto4	-0.043	0.034	-1.270	0.205
fiveto9	0.116	0.074	1.560	0.118
tento19	-0.060	0.089	-0.670	0.502
twentyp	-0.012	0.051	-0.240	0.814
mobile	-1.511	0.023	-66.720	0.000
unitage	-0.006	0.000	-19.830	0.000
hsys2	0.243	0.017	14.210	0.000
hsys3	0.032	0.026	1.210	0.225
hsys4	0.061	0.018	3.420	0.001
hsys5	-0.208	0.028	-7.470	0.000
hsys6	-0.018	0.018	-0.990	0.323
acsys2	-0.074	0.013	-5.830	0.000
acsys3	0.030	0.014	2.210	0.027
sewer	0.052	0.012	4.300	0.000
adequate	0.229	0.026	8.810	0.000
agehead	0.000	0.000	-0.200	0.841
goodnbhd	-0.065	0.010	-6.310	0.000
fairpoor	-0.225	0.033	-6.920	0.000
black	-0.324	0.021	-15.510	0.000
hispanic	0.012	0.027	0.460	0.646
crowds	-0.146	0.023	-6.320	0.000
sqft	0.000	0.000	22.980	0.000
yearsin	-0.001	0.001	-1.400	0.162
_cons	11.550	0.044	265.350	0.000

1987				
Number of obs = 25412				
F(31, 25380) = 660.67				
Prob > F = 0.0000				
R-squared = 0.4466				
Adj R-squared = 0.4459				
Root MSE = .76983				
lnvalue	Coef.	Std. Err.	t	P>|t|
suburb	0.050	0.013	3.730	0.000
nonmet	-0.372	0.015	-24.060	0.000
baths10	-0.282	0.012	-23.870	0.000
bdrms0	-0.199	0.166	-1.200	0.231
bdrms1	-0.233	0.032	-7.320	0.000
bdrms2	-0.092	0.013	-7.160	0.000
bdrms4p	0.102	0.014	7.500	0.000
attached	-0.026	0.029	-0.900	0.367
twoto4	0.051	0.037	1.380	0.169
fiveto9	0.085	0.077	1.110	0.269
tento19	-0.031	0.085	-0.370	0.711
twentyp	0.245	0.053	4.600	0.000
mobile	-1.674	0.020	-81.900	0.000
unitage	-0.006	0.000	-20.810	0.000
hsys2	0.349	0.017	20.410	0.000
hsys3	0.014	0.023	0.590	0.558
hsys4	0.014	0.018	0.810	0.417
hsys5	-0.174	0.027	-6.330	0.000
hsys6	-0.084	0.018	-4.690	0.000
acsys2	-0.070	0.013	-5.510	0.000
acsys3	-0.021	0.013	-1.610	0.107
sewer	0.009	0.011	0.740	0.458
adequate	0.288	0.027	10.760	0.000
agehead	0.001	0.000	1.640	0.101
goodnbhd	-0.095	0.010	-9.460	0.000
fairpoor	-0.232	0.033	-7.010	0.000
black	-0.312	0.021	-14.720	0.000
hispanic	0.006	0.027	0.230	0.821
crowds	-0.175	0.023	-7.580	0.000
sqft	0.000	0.000	23.820	0.000
yearsin	-0.002	0.001	-3.880	0.000
_cons	11.610	0.044	265.480	0.000

Appendix A1. Hedonic Regressions on All Owners by AHS Survey Year: 1989, 1991

1989

Number of obs = 22511
F(31, 22479) = 520.77
Prob > F = 0.0000
R-squared = 0.4180
Adj R-squared = 0.4172
Root MSE = .80975

lnvalue	Coef.	Std. Err.	t	P>|t|
suburb	0.105	0.014	7.340	0.000
nonmet	-0.387	0.017	-22.610	0.000
baths10	-0.276	0.013	-21.000	0.000
bdrms0	0.061	0.200	0.300	0.761
bdrms1	-0.297	0.036	-8.160	0.000
bdrms2	-0.106	0.015	-7.260	0.000
bdrms4p	0.126	0.015	8.390	0.000
attached	0.046	0.031	1.460	0.145
twoto4	0.067	0.041	1.630	0.103
fiveto9	0.031	0.073	0.420	0.673
tento19	-0.249	0.095	-2.630	0.009
twentyp	0.229	0.056	4.110	0.000
mobile	-1.714	0.024	-71.140	0.000
unitage	-0.006	0.000	-16.430	0.000
hsys2	0.375	0.019	19.310	0.000
hsys3	-0.003	0.021	-0.150	0.882
hsys4	0.089	0.021	4.300	0.000
hsys5	-0.195	0.029	-6.600	0.000
hsys6	-0.054	0.022	-2.470	0.013
acsys2	-0.107	0.015	-7.240	0.000
acsys3	-0.051	0.015	-3.350	0.001
sewer	0.008	0.013	0.630	0.528
adequate	0.176	0.025	6.950	0.000
agehead	0.002	0.000	4.610	0.000
goodnbhd	-0.100	0.011	-8.850	0.000
fairpoor	-0.335	0.038	-8.840	0.000
black	-0.282	0.023	-12.370	0.000
hispanic	-0.008	0.029	-0.270	0.789
crowds	-0.144	0.026	-5.600	0.000
sqft	0.000	0.000	21.890	0.000
yearsin	-0.003	0.001	-4.930	0.000
_cons	11.618	0.046	250.030	0.000

1991

Number of obs = 25742
F(31, 25710) = 629.72
Prob > F = 0.0000
R-squared = 0.4316
Adj R-squared = 0.4309
Root MSE = .80604

lnvalue	Coef.	Std. Err.	t	P>|t|
suburb	0.081	0.014	5.820	0.000
nonmet	-0.363	0.016	-22.340	0.000
baths10	-0.286	0.012	-23.400	0.000
bdrms0	-1.025	0.170	-6.020	0.000
bdrms1	-0.166	0.034	-4.860	0.000
bdrms2	-0.075	0.014	-5.540	0.000
bdrms4p	0.120	0.014	8.700	0.000
attached	0.028	0.029	0.950	0.340
twoto4	0.057	0.039	1.490	0.137
fiveto9	-0.005	0.074	-0.060	0.948
tento19	-0.061	0.083	-0.740	0.461
twentyp	-0.043	0.054	-0.790	0.427
mobile	-1.782	0.022	-81.380	0.000
unitage	-0.006	0.000	-19.640	0.000
hsys2	0.351	0.018	19.770	0.000
hsys3	0.009	0.019	0.450	0.649
hsys4	0.088	0.020	4.490	0.000
hsys5	-0.212	0.028	-7.480	0.000
hsys6	0.037	0.020	1.860	0.063
acsys2	-0.166	0.014	-11.830	0.000
acsys3	-0.088	0.014	-6.260	0.000
sewer	0.028	0.012	2.340	0.019
adequate	0.125	0.023	5.390	0.000
agehead	0.003	0.000	6.060	0.000
goodnbhd	-0.063	0.010	-6.000	0.000
fairpoor	-0.351	0.037	-9.610	0.000
black	-0.302	0.022	-13.820	0.000
hispanic	0.018	0.027	0.670	0.503
crowds	-0.146	0.024	-6.020	0.000
sqft	0.000	0.000	23.950	0.000
yearsin	-0.003	0.001	-5.200	0.000
_cons	11.604	0.043	267.430	0.000

Appendix A1. Hedonic Regressions on All Owners by AHS Survey Year: 1993, 1995

1993

Number of obs = 23180
F(31, 23148) = 618.49
Prob > F = 0.0000
R-squared = 0.4530
Adj R-squared = 0.4523
Root MSE = .75088

lnvalue	Coef.	Std. Err.	t	P>|t|
suburb	0.094	0.013	7.150	0.000
nonmet	-0.323	0.016	-20.430	0.000
baths10	-0.301	0.012	-25.120	0.000
bdrms0	-0.223	0.212	-1.050	0.292
bdrms1	-0.191	0.035	-5.470	0.000
bdrms2	-0.086	0.013	-6.350	0.000
bdrms4p	0.103	0.013	7.680	0.000
attached	0.030	0.027	1.100	0.272
twoto4	0.029	0.038	0.760	0.445
fiveto9	-0.003	0.069	-0.050	0.964
tento19	-0.100	0.073	-1.370	0.170
twentyp	0.079	0.050	1.570	0.116
mobile	-1.803	0.022	-81.140	0.000
unitage	-0.005	0.000	-17.590	0.000
hsys2	0.310	0.018	17.710	0.000
hsys3	-0.021	0.018	-1.160	0.246
hsys4	0.065	0.020	3.330	0.001
hsys5	-0.123	0.032	-3.790	0.000
hsys6	-0.058	0.021	-2.810	0.005
acsys2	-0.174	0.014	-12.210	0.000
acsys3	-0.113	0.014	-8.220	0.000
sewer	-0.011	0.012	-0.900	0.371
adequate	0.333	0.026	12.950	0.000
agehead	0.002	0.000	4.410	0.000
goodnbhd	-0.083	0.010	-8.040	0.000
fairpoor	-0.300	0.035	-8.500	0.000
black	-0.307	0.021	-14.810	0.000
hispanic	-0.003	0.025	-0.130	0.898
crowds	-0.172	0.024	-7.100	0.000
sqft	0.000	0.000	25.000	0.000
yearsin	-0.002	0.001	-4.480	0.000
_cons	11.473	0.044	260.620	0.000

1995

Number of obs = 25159
F(31, 25127) = 547.18
Prob > F = 0.0000
R-squared = 0.4030
Adj R-squared = 0.4023
Root MSE = .80066

lnvalue	Coef.	Std. Err.	t	P>|t|
suburb	0.092	0.013	6.850	0.000
nonmet	-0.319	0.017	-19.340	0.000
baths10	-0.306	0.012	-24.850	0.000
bdrms0	-0.015	0.197	-0.070	0.941
bdrms1	-0.223	0.035	-6.300	0.000
bdrms2	-0.101	0.014	-7.250	0.000
bdrms4p	0.108	0.014	7.880	0.000
attached	-0.024	0.027	-0.900	0.368
twoto4	-0.045	0.038	-1.180	0.237
fiveto9	0.008	0.060	0.130	0.894
tento19	-0.161	0.074	-2.170	0.030
twentyp	0.077	0.048	1.610	0.107
mobile	-1.812	0.023	-77.530	0.000
unitage	-0.004	0.000	-13.650	0.000
hsys2	0.237	0.018	13.100	0.000
hsys3	-0.047	0.018	-2.620	0.009
hsys4	0.085	0.020	4.270	0.000
hsys5	-0.122	0.035	-3.510	0.000
hsys6	-0.035	0.023	-1.560	0.119
acsys2	-0.214	0.015	-13.990	0.000
acsys3	-0.125	0.015	-8.620	0.000
sewer	0.007	0.013	0.520	0.602
adequate	0.160	0.026	6.180	0.000
agehead	0.002	0.000	4.180	0.000
goodnbhd	-0.087	0.011	-8.220	0.000
fairpoor	-0.297	0.037	-7.960	0.000
black	-0.363	0.021	-17.530	0.000
hispanic	-0.032	0.024	-1.350	0.178
crowds	-0.111	0.025	-4.490	0.000
sqft	0.000	0.000	22.990	0.000
yearsin	-0.003	0.001	-4.770	0.000
_cons	11.667	0.045	257.520	0.000

Appendix A1. Hedonic Regressions on All Owners by AHS Survey Year: 1997, 1999

1997				
Number of obs = 21141				
F(31, 21109) = 488.67				
Prob > F = 0.0000				
R-squared = 0.4178				
Adj R-squared = 0.4170				
Root MSE = .79342				
lnvalue	Coef.	Std. Err.	t	P>|t|
suburb	0.084	0.015	5.590	0.000
nonmet	-0.242	0.018	-13.770	0.000
baths10	-0.270	0.013	-20.380	0.000
bdrms0	0.234	0.281	0.830	0.406
bdrms1	-0.367	0.042	-8.790	0.000
bdrms2	-0.158	0.015	-10.180	0.000
bdrms4p	0.167	0.014	11.790	0.000
attached	0.126	0.079	1.600	0.110
twoto4	-0.202	0.137	-1.470	0.142
fiveto9	0.160	0.240	0.670	0.505
tento19	-0.035	0.301	-0.120	0.908
twentyp	0.210	0.230	0.910	0.360
mobile	-1.713	0.023	-73.860	0.000
unitage	-0.004	0.000	-12.410	0.000
hsys2	0.171	0.020	8.390	0.000
hsys3	-0.017	0.019	-0.930	0.352
hsys4	0.035	0.022	1.580	0.115
hsys5	-0.230	0.038	-6.120	0.000
hsys6	-0.042	0.032	-1.290	0.197
acsys2	-0.173	0.017	-10.180	0.000
acsys3	-0.106	0.016	-6.750	0.000
sewer	-0.030	0.013	-2.330	0.020
adequate	0.206	0.031	6.550	0.000
agehead	0.002	0.000	4.160	0.000
goodnbhd	-0.075	0.011	-6.610	0.000
fairpoor	-0.362	0.042	-8.600	0.000
black	-0.250	0.022	-11.310	0.000
hispanic	-0.133	0.025	-5.280	0.000
crowds	-0.139	0.026	-5.290	0.000
sqft	0.000	0.000	21.060	0.000
yearsin	-0.004	0.001	-5.940	0.000
_cons	11.620	0.051	227.930	0.000

1999				
Number of obs = 26519				
F(31, 26487) = 646.11				
Prob > F = 0.0000				
R-squared = 0.4306				
Adj R-squared = 0.4299				
Root MSE = .7977				
lnvalue	Coef.	Std. Err.	t	P>|t|
suburb	0.060	0.013	4.540	0.000
nonmet	-0.296	0.016	-18.250	0.000
baths10	-0.309	0.012	-25.870	0.000
bdrms0	-1.616	0.207	-7.810	0.000
bdrms1	-0.278	0.036	-7.750	0.000
bdrms2	-0.152	0.014	-10.920	0.000
bdrms4p	0.215	0.013	17.030	0.000
attached	-0.126	0.025	-5.100	0.000
twoto4	-0.169	0.042	-4.010	0.000
fiveto9	-0.037	0.064	-0.580	0.561
tento19	-0.146	0.077	-1.890	0.058
twentyp	0.037	0.051	0.730	0.464
mobile	-2.020	0.022	-91.720	0.000
unitage	-0.003	0.000	-11.700	0.000
hsys2	0.205	0.018	11.410	0.000
hsys3	-0.087	0.017	-5.150	0.000
hsys4	0.060	0.021	2.900	0.004
hsys5	-0.205	0.035	-5.910	0.000
hsys6	-0.053	0.033	-1.620	0.106
acsys2	-0.245	0.016	-15.020	0.000
acsys3	-0.141	0.015	-9.430	0.000
sewer	-0.022	0.012	-1.820	0.069
adequate	0.205	0.028	7.270	0.000
agehead	0.000	0.000	0.350	0.728
goodnbhd	-0.106	0.010	-10.460	0.000
fairpoor	-0.427	0.041	-10.530	0.000
black	-0.294	0.019	-15.080	0.000
hispanic	-0.096	0.021	-4.470	0.000
crowds	-0.210	0.024	-8.810	0.000
sqft	0.000	0.000	17.830	0.000
yearsin	-0.003	0.001	-4.970	0.000
_cons	12.062	0.045	270.420	0.000

Appendix A1. Hedonic Regressions on All Owners by AHS Survey Year: 2001, 2003

2001

Number of obs = 25796
F(31, 25764) = 557.26
Prob > F = 0.0000
R-squared = 0.4014
Adj R-squared = 0.4007
Root MSE = .82502

lnvalue	Coef.	Std. Err.	t	P>|t|
suburb	0.067	0.014	4.840	0.000
nonmet	-0.319	0.017	-19.000	0.000
baths10	-0.330	0.013	-25.950	0.000
bdrms0	0.147	0.251	0.580	0.560
bdrms1	-0.465	0.038	-12.400	0.000
bdrms2	-0.174	0.015	-11.730	0.000
bdrms4p	0.229	0.013	17.370	0.000
attached	-0.018	0.026	-0.720	0.472
twoto4	-0.154	0.045	-3.440	0.001
fiveto9	-0.150	0.067	-2.230	0.026
tento19	0.126	0.073	1.740	0.082
twentyp	0.208	0.050	4.180	0.000
mobile	-1.737	0.022	-77.530	0.000
unitage	-0.003	0.000	-10.000	0.000
hsys2	0.214	0.019	11.180	0.000
hsys3	-0.111	0.017	-6.500	0.000
hsys4	0.034	0.022	1.490	0.135
hsys5	-0.217	0.038	-5.770	0.000
hsys6	-0.114	0.034	-3.350	0.001
acsys2	-0.293	0.018	-16.390	0.000
acsys3	-0.212	0.016	-13.140	0.000
sewer	-0.030	0.013	-2.310	0.021
adequate	0.208	0.030	6.970	0.000
agehead	0.001	0.000	1.540	0.122
goodnbhd	-0.116	0.011	-10.910	0.000
fairpoor	-0.410	0.042	-9.800	0.000
black	-0.249	0.020	-12.330	0.000
hispanic	-0.102	0.022	-4.730	0.000
crowds	-0.158	0.025	-6.360	0.000
sqft	0.000	0.000	21.190	0.000
yearsin	-0.003	0.001	-6.530	0.000
_cons	12.126	0.047	259.510	0.000

2003

Number of obs = 28837
F(31, 28805) = 509.40
Prob > F = 0.0000
R-squared = 0.3541
Adj R-squared = 0.3534
Root MSE = .92374

lnvalue	Coef.	Std. Err.	t	P>|t|
suburb	0.036	0.015	2.490	0.013
nonmet	-0.416	0.018	-22.960	0.000
baths10	-0.338	0.013	-25.190	0.000
bdrms0	-0.467	0.281	-1.660	0.096
bdrms1	-0.218	0.040	-5.400	0.000
bdrms2	-0.150	0.016	-9.440	0.000
bdrms4p	0.246	0.014	17.930	0.000
attached	-0.005	0.025	-0.210	0.837
twoto4	-0.057	0.043	-1.330	0.182
fiveto9	0.107	0.064	1.680	0.093
tento19	-0.107	0.072	-1.500	0.134
twentyp	0.196	0.050	3.930	0.000
mobile	-1.879	0.025	-74.470	0.000
unitage	-0.002	0.000	-8.600	0.000
hsys2	0.279	0.020	13.710	0.000
hsys3	-0.094	0.018	-5.070	0.000
hsys4	0.091	0.024	3.830	0.000
hsys5	-0.256	0.041	-6.190	0.000
hsys6	-0.118	0.038	-3.130	0.002
acsys2	-0.288	0.020	-14.590	0.000
acsys3	-0.207	0.018	-11.700	0.000
sewer	0.069	0.014	4.860	0.000
adequate	0.232	0.033	7.020	0.000
agehead	0.001	0.000	2.650	0.008
goodnbhd	-0.105	0.011	-9.340	0.000
fairpoor	-0.448	0.046	-9.660	0.000
black	-0.323	0.021	-15.140	0.000
hispanic	-0.080	0.022	-3.690	0.000
crowds	-0.080	0.026	-3.080	0.002
sqft	0.000	0.000	17.200	0.000
yearsin	-0.004	0.001	-6.430	0.000
_cons	12.086	0.051	237.590	0.000

Appendix A2. Effect of Expected Capital Gains on Owner Costs by CMSA, Boston

					Calculating monthly mortgage payment for Step 3							
	all owners		**new owners**		after 5% downpaid		Current yearly interest rates		Real Monthly interest rates		Monthly mortgage pmt after 5% downpaid	
	pred val	exp(pred val)	pred val	exp(pred val)	**all owners**	**new owners**	**all owners**	**new owners**	**all owners**	**new owners**	**all owners**	**new owners**
1985	12.134	186,126	11.998	162,467	176,820	154,344	9.91%	11.52%	0.53%	0.66%	1,100	1,128
1987	12.423	248,396	12.340	228,721	235,976	217,285	9.41%	9.59%	0.48%	0.50%	1,379	1,295
1989	12.400	242,853	12.313	222,671	230,710	211,537	9.66%	9.93%	0.40%	0.43%	1,216	1,150
1991	12.161	191,123	12.003	163,265	181,566	155,102	9.58%	9.60%	0.45%	0.45%	1,017	870
1993	12.019	165,917	11.867	142,505	157,621	135,379	8.52%	7.89%	0.46%	0.41%	898	718
1995	12.026	167,029	11.888	145,445	158,677	138,172	8.37%	8.27%	0.46%	0.45%	904	779
1997	12.011	164,522	11.917	149,786	156,296	142,296	8.12%	8.03%	0.49%	0.48%	919	829
1999	12.038	169,121	11.936	152,595	160,665	144,965	7.68%	7.44%	0.46%	0.44%	909	799
2001	12.254	209,762	12.180	194,833	199,274	185,092	7.60%	7.64%	0.40%	0.40%	1,040	971
2003	12.545	280,593	12.455	256,478	266,563	243,655	6.60%	6.28%	0.36%	0.33%	1,322	1,164

			Step 1		**Step 2**		**Step 3**				**Step 4**	
	Future capital gain applying the same growth rate to the next 8 years		Current value of future gain (discounted by 10 year treasury note)		Expected Capital Gain per month		User cost of Capital = (monthly mortg pmt - expected K gain per month)		monthly household income		**User Cost to Income Ratio**	
	all owners	**new owners**	**all owners**	**new owners**	**all owners**	**new owners**	**all owners**	**new owners**	**all owners**	**new owners**	**all owners**	**new owners**
1985	142,938	124,769	83,349	72,754	868	758	231	370	6,299	7,161	3.7%	5.2%
1987	272,491	250,908	187,799	172,924	1,956	1,801	(578)	(506)	6,254	6,187	-9.2%	-8.2%
1989	231,191	211,979	173,758	159,318	1,810	1,660	(594)	(510)	6,587	6,990	-9.0%	-7.3%
1991	94,611	80,821	71,400	60,993	744	635	273	235	6,490	7,666	4.2%	3.1%
1993	-	-	-	-	-	-	898	718	5,677	6,078	15.8%	11.8%
1995	-	-	-	-	-	-	904	779	6,125	5,588	14.8%	13.9%
1997	-	-	-	-	-	-	919	829	6,003	8,129	15.3%	10.2%
1999	20,988	18,937	15,960	14,401	166	150	743	649	6,840	6,391	10.9%	10.2%
2001	96,391	89,530	81,491	75,691	849	788	191	182	8,705	8,082	2.2%	2.3%
2003	214,187	195,779	186,893	170,832	1,947	1,779	(625)	(616)	7,020	7,877	-8.9%	-7.8%

Appendix A2. Effect of Expected Capital Gains on Owner Costs by CMSA, Buffalo

	all owners		new owners		Calculating monthly mortgage payment for Step 3: after 5% downpaid		Current yearly interest rates		Real Monthly interest rates		Monthly mortgage pmt after 5% downpaid	
	pred val	exp(pred val)	pred val	exp(pred val)	all owners	new owners	all owners	new owners	all owners	new owners	all owners	new owners
1985	11.3048	81,206	11.1688	70,884	77,146	67,340	9.91%	11.52%	0.53%	0.66%	480	492
1987	11.8607	141,587	11.77816	130,374	134,508	123,855	9.41%	9.59%	0.48%	0.50%	786	738
1989	11.7038	121,025	11.61698	110,966	114,973	105,418	9.66%	9.93%	0.40%	0.43%	606	573
1991	11.438	92,779	11.28044	79,256	88,140	75,293	9.58%	9.60%	0.45%	0.45%	494	422
1993	11.545	103,259	11.39289	88,689	98,096	84,254	8.52%	7.89%	0.46%	0.41%	559	447
1995	11.4579	94,650	11.31956	82,418	89,917	78,297	8.37%	8.27%	0.46%	0.45%	512	441
1997	11.4423	93,178	11.34843	84,832	88,519	80,591	8.12%	8.03%	0.49%	0.48%	521	470
1999	11.3452	84,559	11.24238	76,296	80,331	72,482	7.68%	7.44%	0.46%	0.44%	455	399
2001	11.3397	84,095	11.26587	78,110	79,890	74,204	7.60%	7.64%	0.40%	0.40%	417	389
2003	11.4639	95,215	11.37404	87,033	90,454	82,681	6.60%	6.28%	0.36%	0.33%	449	395

	Future capital gain applying the same growth rate to the next 8 years		Step 1: Current value of future gain (discounted by 10 year treasury note)		Step 2: Expected Capital Gain per month		Step 3: User cost of Capital = (monthly mortg pmt - expected K gain per month)		monthly household income		Step 4: **User Cost to Income Ratio**	
	all owners	new owners	all owners	new owners	all owners	new owners	all owners	new owners	all owners	new owners	all owners	new owners
1985	-	-	-	-	-	-	480	492	3,710	3,618	12.9%	13.6%
1987	8,082	7,442	5,570	5,129	58	53	728	685	3,830	3,534	19.0%	19.4%
1989	39,639	36,344	29,792	27,316	310	285	296	288	3,954	3,447	7.5%	8.4%
1991	31,131	26,594	23,494	20,069	245	209	249	213	4,075	3,362	6.1%	6.3%
1993	25,114	21,570	20,059	17,229	209	179	350	267	4,394	3,514	8.0%	7.6%
1995	706	615	530	462	6	5	507	437	4,229	3,697	12.0%	11.8%
1997	-	-	-	-	-	-	521	470	4,005	2,962	13.0%	15.9%
1999	-	-	-	-	-	-	455	399	5,102	4,880	8.9%	8.2%
2001	-	-	-	-	-	-	417	389	5,077	3,041	8.2%	12.8%
2003	2,411	2,203	2,103	1,923	22	20	427	375	5,267	7,849	8.1%	4.8%

Appendix A2. Effect of Expected Capital Gains on Owner Costs by CMSA, Dallas

	all owners		new owners		Calculating monthly mortgage payment for Step 3: after 5% downpaid		Current yearly interest rates		Real Monthly interest rates		Monthly mortgage pmt after 5% downpaid	
	pred val	exp(pred val)	pred val	exp(pred val)	**all owners**	**new owners**	**all owners**	**new owners**	**all owners**	**new owners**	**all owners**	**new owners**
1985	11.6333	112,792	11.49735	98,455	107,152	93,532	9.91%	11.52%	0.53%	0.66%	666	684
1987	11.6011	109,221	11.51862	100,571	103,760	95,543	9.41%	9.59%	0.48%	0.50%	606	569
1989	11.4775	96,515	11.39068	88,493	91,689	84,068	9.66%	9.93%	0.40%	0.43%	483	457
1991	11.463	95,127	11.30543	81,262	90,371	77,199	9.58%	9.60%	0.45%	0.45%	506	433
1993	11.3748	87,095	11.22265	74,806	82,741	71,065	8.52%	7.89%	0.46%	0.41%	471	377
1995	11.3743	87,059	11.23596	75,808	82,706	72,018	8.37%	8.27%	0.46%	0.45%	471	406
1997	11.3467	84,683	11.25283	77,098	80,449	73,243	8.12%	8.03%	0.49%	0.48%	473	427
1999	11.362	85,989	11.25914	77,586	81,689	73,707	7.68%	7.44%	0.46%	0.44%	462	406
2001	11.4168	90,837	11.34299	84,372	86,295	80,153	7.60%	7.64%	0.40%	0.40%	450	420
2003	11.5152	100,223	11.42529	91,609	95,212	87,029	6.60%	6.28%	0.36%	0.33%	472	416

	Future capital gain applying the same growth rate to the next 8 years		**Step 1** Current value of future gain (discounted by 10 year treasury note)		**Step 2** Expected Capital Gain per month		**Step 3** User cost of Capital = (monthly mortg pmt - expected K gain per month)		monthly household income		**Step 4** **User Cost to Income Ratio**	
	all owners	**new owners**	**all owners**	**new owners**	**all owners**	**new owners**	**all owners**	**new owners**	**all owners**	**new owners**	**all owners**	**new owners**
1985	26,871	23,456	15,669	13,677	163	142	503	541	6,206	7,937	8.1%	6.8%
1987	-	-	-	-	-	-	606	569	5,955	5,691	10.2%	10.0%
1989	-	-	-	-	-	-	483	457	5,751	5,983	8.4%	7.6%
1991	-	-	-	-	-	-	506	433	5,628	6,110	9.0%	7.1%
1993	-	-	-	-	-	-	471	377	5,404	5,218	8.7%	7.2%
1995	-	-	-	-	-	-	471	406	4,834	4,285	9.7%	9.5%
1997	-	-	-	-	-	-	473	427	5,415	3,975	8.7%	10.7%
1999	3,254	2,936	2,475	2,233	26	23	437	383	6,048	6,291	7.2%	6.1%
2001	11,472	10,655	9,699	9,008	101	94	349	327	6,731	6,046	5.2%	5.4%
2003	20,535	18,771	17,919	16,379	187	171	286	245	7,142	4,046	4.0%	6.1%

Appendix A2. Effect of Expected Capital Gains on Owner Costs by CMSA, Denver

					Calculating monthly mortgage payment for Step 3							
	all owners		**new owners**		after 5% downpaid		Current yearly interest rates		Real Monthly interest rates		Monthly mortgage pmt after 5% downpaid	
	pred val	exp(pred val)	pred val	exp(pred val)	**all owners**	**new owners**	**all owners**	**new owners**	**all owners**	**new owners**	**all owners**	**new owners**
1985	11.8875	145,431	11.75152	126,946	138,160	120,599	9.91%	11.52%	0.53%	0.66%	859	882
1987	11.8607	141,587	11.77816	130,374	134,508	123,855	9.41%	9.59%	0.48%	0.50%	786	738
1989	11.7038	121,025	11.61698	110,966	114,973	105,418	9.66%	9.93%	0.40%	0.43%	606	573
1991	11.62	111,306	11.4625	95,082	105,741	90,328	9.58%	9.60%	0.45%	0.45%	592	507
1993	11.5816	107,113	11.42953	91,999	101,757	87,399	8.52%	7.89%	0.46%	0.41%	580	464
1995	11.6454	114,163	11.50701	99,410	108,455	94,440	8.37%	8.27%	0.46%	0.45%	618	532
1997	11.851	140,217	11.75711	127,658	133,207	121,275	8.12%	8.03%	0.49%	0.48%	784	707
1999	11.9083	148,490	11.80544	133,979	141,065	127,280	7.68%	7.44%	0.46%	0.44%	798	701
2001	12.0593	172,705	11.98551	160,413	164,070	152,393	7.60%	7.64%	0.40%	0.40%	856	799
2003	11.9215	150,460	11.8316	137,530	142,937	130,654	6.60%	6.28%	0.36%	0.33%	709	624

			Step 1		**Step 2**		**Step 3**				**Step 4**	
	Future capital gain applying the same growth rate to the next 8 years		Current value of future gain (discounted by 10 year treasury note)		Expected Capital Gain per month		User cost of Capital = (monthly mortg pmt - expected K gain per month)		monthly household income		**User Cost to Income Ratio**	
	all owners	**new owners**	**all owners**	**new owners**	**all owners**	**new owners**	**all owners**	**new owners**	**all owners**	**new owners**	**all owners**	**new owners**
1985	27,193	23,736	15,856	13,841	165	144	694	737	5,707	3,627	12.2%	20.3%
1987	-	-	-	-	-	-	786	738	6,102	4,625	12.9%	16.0%
1989	-	-	-	-	-	-	606	573	4,945	3,983	12.3%	14.4%
1991	-	-	-	-	-	-	592	507	5,477	4,291	10.8%	11.8%
1993	-	-	-	-	-	-	580	464	5,436	3,739	10.7%	12.4%
1995	6,390	5,564	4,800	4,180	50	44	568	489	5,155	5,064	11.0%	9.7%
1997	37,266	33,928	27,210	24,772	283	258	500	449	5,325	3,640	9.4%	12.3%
1999	76,587	69,103	58,241	52,550	607	547	192	154	6,418	3,283	3.0%	4.7%
2001	112,264	104,274	94,911	88,156	989	918	(132)	(119)	7,542	6,318	-1.8%	-1.9%
2003	78,583	71,830	68,570	62,677	714	653	(5)	(29)	7,208	5,444	-0.1%	-0.5%

Appendix A2. Effect of Expected Capital Gains on Owner Costs by CMSA, Hartford

	all owners		new owners		Calculating monthly mortgage payment for Step 3: after 5% downpaid		Current yearly interest rates		Real Monthly interest rates		Monthly mortgage pmt after 5% downpaid	
	pred val	exp(pred val)	pred val	exp(pred val)	**all owners**	**new owners**	**all owners**	**new owners**	**all owners**	**new owners**	**all owners**	**new owners**
1985	11.6763	117,742	11.5403	102,775	111,855	97,637	9.91%	11.52%	0.53%	0.66%	696	714
1987	11.9879	160,789	11.90534	148,055	152,750	140,652	9.41%	9.59%	0.48%	0.50%	892	838
1989	12.2166	202,125	12.12988	185,328	192,018	176,061	9.66%	9.93%	0.40%	0.43%	1,012	957
1991	11.8746	143,576	11.71708	122,649	136,397	116,516	9.58%	9.60%	0.45%	0.45%	764	654
1993	11.8455	139,455	11.69338	119,776	132,483	113,787	8.52%	7.89%	0.46%	0.41%	755	604
1995	11.8555	140,853	11.7171	122,651	133,810	116,519	8.37%	8.27%	0.46%	0.45%	763	657
1997	11.8353	138,033	11.7414	125,668	131,132	119,385	8.12%	8.03%	0.49%	0.48%	771	696
1999	11.7384	125,295	11.6356	113,052	119,031	107,399	7.68%	7.44%	0.46%	0.44%	674	592
2001	11.9048	147,980	11.83101	137,449	140,581	130,577	7.60%	7.64%	0.40%	0.40%	734	685
2003	11.8443	139,288	11.75444	127,318	132,324	120,952	6.60%	6.28%	0.36%	0.33%	656	578

	Future capital gain applying the same growth rate to the next 8 years		**Step 1** Current value of future gain (discounted by 10 year treasury note)		**Step 2** Expected Capital Gain per month		**Step 3** User cost of Capital = (monthly mortg pmt - expected K gain per month)		monthly household income		**Step 4** **User Cost to Income Ratio**	
	all owners	**new owners**	**all owners**	**new owners**	**all owners**	**new owners**	**all owners**	**new owners**	**all owners**	**new owners**	**all owners**	**new owners**
1985	9,911	8,651	5,779	5,045	60	53	635	661	5,531	6,227	11.5%	10.6%
1987	95,274	87,729	65,662	60,462	684	630	208	208	5,409	6,080	3.9%	3.4%
1989	158,214		118,910	109,028	1,239	1,136	(226)	(179)	5,398	5,928	-4.2%	-3.0%
1991	53,404	45,620	40,302	34,428	420	359	344	295	6,056	5,781	5.7%	5.1%
1993	-	-	-	-	-	-	755	604	6,045	4,903	12.5%	12.3%
1995	-	-	-	-	-	-	763	657	5,955	7,043	12.8%	9.3%
1997	-	-	-	-	-	-	771	696	5,384	5,411	14.3%	12.9%
1999	145,066	-	-	-	-	-	674	592	6,951	4,158	9.7%	14.2%
2001	9,534	8,856	8,061	7,487	84	78	650	607	5,498	9,385	11.8%	6.5%
2003	40,749	37,247	35,556	32,501	370	339	286	239	6,635	5,882	4.3%	4.1%

Appendix A2. Effect of Expected Capital Gains on Owner Costs by CMSA, Los Angeles

	all owners		new owners		Calculating monthly mortgage payment for Step 3: after 5% downpaid		Current yearly interest rates		Real Monthly interest rates		Monthly mortgage pmt after 5% downpaid	
	pred val	exp(pred val)	pred val	exp(pred val)	all owners	new owners	all owners	new owners	all owners	new owners	all owners	new owners
1985	12.1844	195,714	12.04846	170,836	185,928	162,294	9.91%	11.52%	0.53%	0.66%	1,156	1,186
1987	12.1973	198,249	12.11477	182,548	188,337	173,421	9.41%	9.59%	0.48%	0.50%	1,100	1,034
1989	12.4884	265,232	12.4016	243,190	251,970	231,031	9.66%	9.93%	0.40%	0.43%	1,329	1,255
1991	12.4599	257,777	12.30231	220,204	244,888	209,194	9.58%	9.60%	0.45%	0.45%	1,371	1,173
1993	12.3173	223,530	12.16519	191,988	212,353	182,389	8.52%	7.89%	0.46%	0.41%	1,210	967
1995	12.2873	216,930	12.14896	188,898	206,084	179,453	8.37%	8.27%	0.46%	0.45%	1,174	1,012
1997	12.1215	183,772	12.02761	167,311	174,583	158,946	8.12%	8.03%	0.49%	0.48%	1,027	926
1999	12.1512	189,312	12.04832	170,812	179,846	162,272	7.68%	7.44%	0.46%	0.44%	1,018	894
2001	12.2586	210,786	12.18477	195,785	200,247	185,995	7.60%	7.64%	0.40%	0.40%	1,045	976
2003	12.5539	283,200	12.46406	258,864	269,040	245,921	6.60%	6.28%	0.36%	0.33%	1,335	1,174

	Future capital gain applying the same growth rate to the next 8 years		Step 1: Current value of future gain (discounted by 10 year treasury note)		Step 2: Expected Capital Gain per month		Step 3: User cost of Capital = (monthly mortg pmt - expected K gain per month)		monthly household income		Step 4: **User Cost to Income Ratio**	
	all owners	new owners	all owners	new owners	all owners	new owners	all owners	new owners	all owners	new owners	all owners	new owners
1985	34,747	30,330	20,261	17,686	211	184	945	1,002	6,214	6,362	15.2%	15.8%
1987	29,017	26,718	19,998	18,414	208	192	892	842	6,760	6,194	13.2%	13.6%
1989	130,248	119,424	97,891	89,756	1,020	935	309	321	6,721	6,194	4.6%	5.2%
1991	123,570	105,558	93,254	79,662	971	830	400	344	6,481	5,890	6.2%	5.8%
1993	64,151	55,099	51,240	44,009	534	458	676	509	5,790	5,530	11.7%	9.2%
1995	-	-	-	-	-	-	1,174	1,012	5,853	5,345	20.1%	18.9%
1997	-	-	-	-	-	-	1,027	926	6,054	5,032	17.0%	18.4%
1999	-	-	-	-	-	-	1,018	894	6,994	6,292	14.6%	14.2%
2001	13,656	12,684	11,545	10,723	120	112	925	864	8,004	6,532	11.6%	13.2%
2003	160,100	146,342	139,699	127,695	1,455	1,330	(121)	(156)	7,208	5,857	-1.7%	-2.7%

Appendix A2. Effect of Expected Capital Gains on Owner Costs by CMSA, Miami

					Calculating monthly mortgage payment for Step 3							
	all owners		**new owners**		after 5% downpaid		Current yearly interest rates		Real Monthly interest rates		Monthly mortgage pmt after 5% downpaid	
	pred val	exp(pred val)	pred val	exp(pred val)	**all owners**	**new owners**	**all owners**	**new owners**	**all owners**	**new owners**	**all owners**	**new owners**
1985	11.6972	120,238	11.56128	104,954	114,226	99,707	9.91%	11.52%	0.53%	0.66%	710	729
1987	11.7024	120,861	11.61989	111,289	114,818	105,725	9.41%	9.59%	0.48%	0.50%	671	630
1989	11.7477	126,465	11.66095	115,954	120,142	110,156	9.66%	9.93%	0.40%	0.43%	633	599
1991	11.5967	108,735	11.43913	92,886	103,298	88,242	9.58%	9.60%	0.45%	0.45%	578	495
1993	11.7019	120,805	11.54982	103,758	114,764	98,570	8.52%	7.89%	0.46%	0.41%	654	523
1995	11.5422	102,975	11.40387	89,668	97,826	85,185	8.37%	8.27%	0.46%	0.45%	557	480
1997	11.7678	129,033	11.67398	117,475	122,581	111,601	8.12%	8.03%	0.49%	0.48%	721	650
1999	11.6776	117,899	11.57475	106,378	112,004	101,059	7.68%	7.44%	0.46%	0.44%	634	557
2001	11.6824	118,462	11.60853	110,032	112,539	104,531	7.60%	7.64%	0.40%	0.40%	587	548
2003	11.9843	160,219	11.89445	146,452	152,209	139,129	6.60%	6.28%	0.36%	0.33%	755	664

			Step 1		**Step 2**		**Step 3**				**Step 4**	
	Future capital gain applying the same growth rate to the next 8 years		Current value of future gain (discounted by 10 year treasury note)		Expected Capital Gain per month		User cost of Capital = (monthly mortg pmt - expected K gain per month)		monthly household income		**User Cost to Income Ratio**	
	all owners	**new owners**	**all owners**	**new owners**	**all owners**	**new owners**	**all owners**	**new owners**	**all owners**	**new owners**	**all owners**	**new owners**
1985	-	-	-	-	-	-	710	729	5,196	4,178	13.7%	17.4%
1987	-	-	-	-	-	-	671	630	5,398	6,663	12.4%	9.5%
1989	-	-	-	-	-	-	633	599	5,290	5,079	12.0%	11.8%
1991	-	-	-	-	-	-	578	495	5,124	4,440	11.3%	11.1%
1993	-	-	-	-	-	-	654	523	4,595	6,104	14.2%	8.6%
1995	-	-	-	-	-	-	557	480	4,281	3,503	13.0%	13.7%
1997	-	-	-	-	-	-	721	650	4,402	4,094	16.4%	15.9%
1999	5,632	5,082	4,283	3,864	45	40	589	517	5,665	4,573	10.4%	11.3%
2001	22,062	20,492	18,652	17,324	194	180	393	368	6,245	4,641	6.3%	7.9%
2003	77,584	70,917	67,698	61,881	705	645	50	20	5,948	8,636	0.8%	0.2%

Appendix A2. Effect of Expected Capital Gains on Owner Costs by CMSA, New York City

	all owners		new owners		Calculating monthly mortgage payment for Step 3: after 5% downpaid		Current yearly interest rates		Real Monthly interest rates		Monthly mortgage pmt after 5% downpaid	
	pred val	exp(pred val)	pred val	exp(pred val)	**all owners**	**new owners**	**all owners**	**new owners**	**all owners**	**new owners**	**all owners**	**new owners**
1985	12.0612	173,023	11.92524	151,031	164,372	143,479	9.91%	11.52%	0.53%	0.66%	1,022	1,049
1987	12.3938	241,289	12.31124	222,179	229,224	211,070	9.41%	9.59%	0.48%	0.50%	1,339	1,258
1989	12.3539	231,865	12.26715	212,596	220,272	201,966	9.66%	9.93%	0.40%	0.43%	1,161	1,098
1991	12.1088	181,460	11.95125	155,011	172,387	147,260	9.58%	9.60%	0.45%	0.45%	965	826
1993	12.0856	177,293	11.93344	152,274	168,429	144,661	8.52%	7.89%	0.46%	0.41%	960	767
1995	12.1316	185,639	11.99319	161,650	176,357	153,568	8.37%	8.27%	0.46%	0.45%	1,005	866
1997	11.9777	159,167	11.88387	144,910	151,209	137,665	8.12%	8.03%	0.49%	0.48%	889	802
1999	12.052	171,442	11.94917	154,689	162,870	146,954	7.68%	7.44%	0.46%	0.44%	922	810
2001	12.0981	179,532	12.02428	166,755	170,556	158,417	7.60%	7.64%	0.40%	0.40%	890	831
2003	12.4677	259,811	12.37785	237,483	246,821	225,609	6.60%	6.28%	0.36%	0.33%	1,224	1,077

	Future capital gain applying the same growth rate to the next 8 years		Step 1: Current value of future gain (discounted by 10 year treasury note)		Step 2: Expected Capital Gain per month		Step 3: User cost of Capital = (monthly mortg pmt - expected K gain per month)		monthly household income		Step 4: **User Cost to Income Ratio**	
	all owners	**new owners**	**all owners**	**new owners**	**all owners**	**new owners**	**all owners**	**new owners**	**all owners**	**new owners**	**all owners**	**new owners**
1985	87,025	75,964	50,745	44,295	529	461	494	588	6,031	6,770	8.2%	8.7%
1987	237,199	218,414	163,476	150,529	1,703	1,568	(364)	(310)	6,823	7,524	-5.3%	-4.1%
1989	221,956	203,511	166,817	152,954	1,738	1,593	(576)	(496)	7,052	7,031	-8.2%	-7.1%
1991	96,276	82,243	72,656	62,066	757	647	208	180	6,536	7,560	3.2%	2.4%
1993	24,265	20,841	19,382	16,647	202	173	758	594	6,017	6,862	12.6%	8.7%
1995	-	-	-	-	-	-	1,005	866	6,533	6,706	15.4%	12.9%
1997	-	-	-	-	-	-	889	802	6,527	5,912	13.6%	13.6%
1999	1,167	1,053	887	801	9	8	913	801	8,069	7,706	11.3%	10.4%
2001	39,537	36,723	33,425	31,046	348	323	542	508	9,029	7,423	6.0%	6.8%
2003	148,380	135,628	129,473	118,346	1,349	1,233	(124)	(155)	8,835	9,270	-1.4%	-1.7%

Appendix A2. Effect of Expected Capital Gains on Owner Costs by CMSA, Pittsburgh

	all owners		new owners		Calculating monthly mortgage payment for Step 3: after 5% downpaid		Current yearly interest rates		Real Monthly interest rates		Monthly mortgage pmt after 5% downpaid	
	pred val	exp(pred val)	pred val	exp(pred val)	**all owners**	**new owners**	**all owners**	**new owners**	**all owners**	**new owners**	**all owners**	**new owners**
1985	11.2008	73,191	11.06488	63,888	69,532	60,693	9.91%	11.52%	0.53%	0.66%	432	444
1987	11.2551	77,276	11.17263	71,156	73,412	67,598	9.41%	9.59%	0.48%	0.50%	429	403
1989	11.3564	85,511	11.26963	78,404	81,235	74,484	9.66%	9.93%	0.40%	0.43%	428	405
1991	11.119	67,440	10.96145	57,610	64,068	54,729	9.58%	9.60%	0.45%	0.45%	359	307
1993	11.3066	81,355	11.15447	69,875	77,287	66,382	8.52%	7.89%	0.46%	0.41%	440	352
1995	11.2898	80,005	11.15147	69,666	76,004	66,183	8.37%	8.27%	0.46%	0.45%	433	373
1997	11.337	83,871	11.24319	76,358	79,677	72,540	8.12%	8.03%	0.49%	0.48%	469	423
1999	11.3088	81,534	11.20594	73,566	77,457	69,888	7.68%	7.44%	0.46%	0.44%	438	385
2001	11.2595	77,615	11.18568	72,091	73,734	68,486	7.60%	7.64%	0.40%	0.40%	385	359
2003	11.3408	84,183	11.2509	76,949	79,974	73,102	6.60%	6.28%	0.36%	0.33%	397	349

	Future capital gain applying the same growth rate to the next 8 years		**Step 1** Current value of future gain (discounted by 10 year treasury note)		**Step 2** Expected Capital Gain per month		**Step 3** User cost of Capital = (monthly mortg pmt - expected K gain per month)		monthly household income		**Step 4** **User Cost to Income Ratio**	
	all owners	**new owners**	**all owners**	**new owners**	**all owners**	**new owners**	**all owners**	**new owners**	**all owners**	**new owners**	**all owners**	**new owners**
1985	-	-	-	-	-	-	432	444	3,986	4,075	10.8%	10.9%
1987	-	-	-	-	-	-	429	403	4,258	4,755	10.1%	8.5%
1989	4,555	4,176	3,423	3,139	36	33	393	372	4,275	4,631	9.2%	8.0%
1991	4,938	4,218	3,726	3,183	39	33	320	274	4,589	5,961	7.0%	4.6%
1993	12,830	11,020	10,248	8,802	107	92	334	260	4,444	4,342	7.5%	6.0%
1995	5,601	4,877	4,207	3,663	44	38	389	335	4,490	3,295	8.7%	10.2%
1997	4,242	3,862	3,097	2,820	32	29	436	393	4,815	2,617	9.1%	15.0%
1999	6,407	5,780	4,872	4,396	51	46	388	339	5,061	3,659	7.7%	9.3%
2001	5,449	5,062	4,607	4,279	48	45	337	315	5,725	13,227	5.9%	2.4%
2003	13,972	12,771	12,191	11,144	127	116	270	233	5,472	4,791	4.9%	4.9%

Appendix A2. Effect of Expected Capital Gains on Owner Costs by CMSA, Portland

	all owners		new owners		Calculating monthly mortgage payment for Step 3: after 5% downpaid		Current yearly interest rates		Real Monthly interest rates		Monthly mortgage pmt after 5% downpaid	
	pred val	exp(pred val)	pred val	exp(pred val)	**all owners**	**new owners**	**all owners**	**new owners**	**all owners**	**new owners**	**all owners**	**new owners**
1985	11.6148	110,726	11.47886	96,651	105,189	91,818	9.91%	11.52%	0.53%	0.66%	654	671
1987	11.8607	141,587	11.77816	130,374	134,508	123,855	9.41%	9.59%	0.48%	0.50%	786	738
1989	11.7038	121,025	11.61698	110,966	114,973	105,418	9.66%	9.93%	0.40%	0.43%	606	573
1991	11.6263	112,005	11.46876	95,680	106,405	90,896	9.58%	9.60%	0.45%	0.45%	596	510
1993	11.7695	129,255	11.61742	111,015	122,792	105,464	8.52%	7.89%	0.46%	0.41%	700	559
1995	11.8441	139,263	11.70575	121,267	132,300	115,204	8.37%	8.27%	0.46%	0.45%	754	649
1997	12.0034	163,316	11.9096	148,687	155,150	141,253	8.12%	8.03%	0.49%	0.48%	913	823
1999	11.916	149,648	11.81321	135,024	142,165	128,273	7.68%	7.44%	0.46%	0.44%	805	707
2001	11.9545	155,512	11.88065	144,444	147,737	137,222	7.60%	7.64%	0.40%	0.40%	771	720
2003	12.0131	164,896	11.92322	150,726	156,651	143,190	6.60%	6.28%	0.36%	0.33%	777	684

	Future capital gain applying the same growth rate to the next 8 years		Step 1: Current value of future gain (discounted by 10 year treasury note)		Step 2: Expected Capital Gain per month		Step 3: User cost of Capital = (monthly mortg pmt - expected K gain per month)		monthly household income		Step 4: **User Cost to Income Ratio**	
	all owners	**new owners**	**all owners**	**new owners**	**all owners**	**new owners**	**all owners**	**new owners**	**all owners**	**new owners**	**all owners**	**new owners**
1985	-	-	-	-	-	-	654	671	5,166	4,054	12.7%	16.6%
1987	-	-	-	-	-	-	786	738	5,122	3,692	15.3%	20.0%
1989	-	-	-	-	-	-	606	573	5,078	3,319	11.9%	17.3%
1991	8,002	6,835	6,039	5,158	63	54	533	456	5,034	2,957	10.6%	15.4%
1993	34,275	29,438	27,377	23,513	285	245	414	314	5,109	3,995	8.1%	7.9%
1995	66,528	57,931	49,975	43,517	521	453	233	196	5,286	6,729	4.4%	2.9%
1997	99,722	90,790	72,811	66,289	758	691	154	133	5,365	5,672	2.9%	2.3%
1999	68,209	61,544	51,870	46,801	540	488	264	219	5,560	6,438	4.8%	3.4%
2001	54,680	50,788	46,228	42,938	482	447	289	273	6,986	7,091	4.1%	3.8%
2003	41,921	38,319	36,579	33,436	381	348	396	336	6,530	5,553	6.1%	6.0%

Appendix A2. Effect of Expected Capital Gains on Owner Costs by CMSA, Providence

	all owners		new owners		Calculating monthly mortgage payment for Step 3: after 5% downpaid		Current yearly interest rates		Real Monthly interest rates		Monthly mortgage pmt after 5% downpaid	
	pred val	exp(pred val)	pred val	exp(pred val)	all owners	new owners	all owners	new owners	all owners	new owners	all owners	new owners
1985	11.5596	104,778	11.42365	91,459	99,539	86,886	9.91%	11.52%	0.53%	0.66%	619	635
1987	12.138	186,844	12.05552	172,046	177,502	163,444	9.41%	9.59%	0.48%	0.50%	1,037	974
1989	12.1617	191,325	12.07496	175,424	181,759	166,653	9.66%	9.93%	0.40%	0.43%	958	906
1991	11.743	125,864	11.58542	107,519	119,571	102,143	9.58%	9.60%	0.45%	0.45%	670	573
1993	11.7745	129,903	11.62243	111,573	123,407	105,994	8.52%	7.89%	0.46%	0.41%	703	562
1995	11.7811	130,758	11.64273	113,861	124,220	108,168	8.37%	8.27%	0.46%	0.45%	708	610
1997	11.7893	131,828	11.69541	120,020	125,236	114,019	8.12%	8.03%	0.49%	0.48%	737	664
1999	11.7353	124,898	11.63242	112,693	118,653	107,058	7.68%	7.44%	0.46%	0.44%	672	590
2001	11.804	133,784	11.73015	124,262	127,095	118,049	7.60%	7.64%	0.40%	0.40%	663	619
2003	12.0891	177,925	11.99927	162,636	169,029	154,504	6.60%	6.28%	0.36%	0.33%	838	738

	Future capital gain applying the same growth rate to the next 8 years		Step 1: Current value of future gain (discounted by 10 year treasury note)		Step 2: Expected Capital Gain per month		Step 3: User cost of Capital = (monthly mortg pmt - expected K gain per month)		monthly household income		Step 4: **User Cost to Income Ratio**	
	all owners	new owners	all owners	new owners	all owners	new owners	all owners	new owners	all owners	new owners	all owners	new owners
1985	19,482	17,006	11,360	9,916	118	103	501	532	4,939	4,486	10.1%	11.9%
1987	119,019	109,593	82,027	75,531	854	787	182	187	5,700	5,579	3.2%	3.4%
1989	190,927	175,058	143,496	131,570	1,495	1,371	(536)	(465)	4,896	6,673	-11.0%	-7.0%
1991	83,026	70,925	62,658	53,525	653	558	17	15	4,928	1,351	0.3%	1.1%
1993	34,213	29,386	27,327	23,471	285	244	418	318	5,404	5,012	7.7%	6.3%
1995	-	-	-	-	-	-	708	610	4,786	2,823	14.8%	21.6%
1997	-	-	-	-	-	-	737	664	4,740	7,123	15.5%	9.3%
1999	-	-	-	-	-	-	672	590	5,226	2,990	12.8%	19.7%
2001	20,214	18,775	17,089	15,873	178	165	485	454	5,668	4,116	8.6%	11.0%
2003	100,958	92,282	88,093	80,523	918	839	(79)	(101)	5,398	2,667	-1.5%	-3.8%

Appendix A2. Effect of Expected Capital Gains on Owner Costs by CMSA, St. Louis

	all owners		new owners		Calculating monthly mortgage payment for Step 3: after 5% downpaid		Current yearly interest rates		Real Monthly interest rates		Monthly mortgage pmt after 5% downpaid	
	pred val	exp(pred val)	pred val	exp(pred val)	all owners	new owners	all owners	new owners	all owners	new owners	all owners	new owners
1985	11.3204	82,487	11.18445	72,002	78,363	68,402	9.91%	11.52%	0.53%	0.66%	487	500
1987	11.5479	103,558	11.46538	95,357	98,380	90,589	9.41%	9.59%	0.48%	0.50%	575	540
1989	11.5416	102,910	11.45485	94,358	97,764	89,640	9.66%	9.93%	0.40%	0.43%	515	487
1991	11.5033	99,041	11.34576	84,606	94,089	80,376	9.58%	9.60%	0.45%	0.45%	527	451
1993	11.3915	88,568	11.23942	76,071	84,140	72,267	8.52%	7.89%	0.46%	0.41%	479	383
1995	11.3185	82,332	11.18014	71,692	78,215	68,108	8.37%	8.27%	0.46%	0.45%	446	384
1997	11.3719	86,850	11.2781	79,071	82,508	75,117	8.12%	8.03%	0.49%	0.48%	485	438
1999	11.4204	91,163	11.31757	82,254	86,604	78,142	7.68%	7.44%	0.46%	0.44%	490	431
2001	11.4439	93,326	11.37002	86,684	88,659	82,349	7.60%	7.64%	0.40%	0.40%	463	432
2003	11.539	102,643	11.44916	93,823	97,511	89,131	6.60%	6.28%	0.36%	0.33%	484	426

	Future capital gain applying the same growth rate to the next 8 years		Step 1: Current value of future gain (discounted by 10 year treasury note)		Step 2: Expected Capital Gain per month		Step 3: User cost of Capital = (monthly mortg pmt - expected K gain per month)		monthly household income		Step 4: **User Cost to Income Ratio**	
	all owners	new owners	all owners	new owners	all owners	new owners	all owners	new owners	all owners	new owners	all owners	new owners
1985	-	-	-	-	-	-	487	500	4,549	4,676	10.7%	10.7%
1987	-	-	-	-	-	-	575	540	4,625	3,040	12.4%	17.8%
1989	9,831	9,014	7,389	6,775	77	71	438	417	5,270	5,185	8.3%	8.0%
1991	3,911	3,341	2,952	2,521	31	26	496	425	4,338	4,643	11.4%	9.1%
1993	-	-	-	-	-	-	479	383	4,388	3,507	10.9%	10.9%
1995	-	-	-	-	-	-	446	384	5,023	3,345	8.9%	11.5%
1997	-	-	-	-	-	-	485	438	4,710	4,387	10.3%	10.0%
1999	8,894	8,025	6,764	6,103	70	64	420	367	5,378	4,522	7.8%	8.1%
2001	18,143	16,852	15,339	14,247	160	148	303	284	5,966	2,025	5.1%	14.0%
2003	27,984	25,579	24,418	22,320	254	232	229	193	5,103	3,363	4.5%	5.7%

Appendix A2. Effect of Expected Capital Gains on Owner Costs by CMSA, Seattle

	all owners		new owners		Calculating monthly mortgage payment for Step 3: after 5% downpaid		Current yearly interest rates		Real Monthly interest rates		Monthly mortgage pmt after 5% downpaid	
	pred val	exp(pred val)	pred val	exp(pred val)	all owners	new owners	all owners	new owners	all owners	new owners	all owners	new owners
1985	11.7602	128,057	11.62429	111,780	121,654	106,191	9.91%	11.52%	0.53%	0.66%	757	776
1987	11.8001	133,263	11.71756	122,708	126,600	116,572	9.41%	9.59%	0.48%	0.50%	740	695
1989	11.899	147,116	11.81221	134,889	139,761	128,145	9.66%	9.93%	0.40%	0.43%	737	696
1991	12.0998	179,841	11.9423	153,630	170,849	145,948	9.58%	9.60%	0.45%	0.45%	957	819
1993	12.0697	174,500	11.91757	149,877	165,775	142,383	8.52%	7.89%	0.46%	0.41%	944	755
1995	11.9801	159,546	11.84172	138,929	151,569	131,983	8.37%	8.27%	0.46%	0.45%	864	744
1997	12.0823	176,709	11.98842	160,881	167,874	152,837	8.12%	8.03%	0.49%	0.48%	987	891
1999	11.9909	161,274	11.88803	145,514	153,210	138,239	7.68%	7.44%	0.46%	0.44%	867	762
2001	12.1924	197,280	12.11856	183,241	187,416	174,079	7.60%	7.64%	0.40%	0.40%	978	913
2003	12.2092	200,616	12.1193	183,377	190,586	174,208	6.60%	6.28%	0.36%	0.33%	945	832

	Future capital gain applying the same growth rate to the next 8 years		Step 1: Current value of future gain (discounted by 10 year treasury note)		Step 2: Expected Capital Gain per month		Step 3: User cost of Capital = (monthly mortg pmt - expected K gain per month)		monthly household income		Step 4: **User Cost to Income Ratio**	
	all owners	new owners	all owners	new owners	all owners	new owners	all owners	new owners	all owners	new owners	all owners	new owners
1985	12,013	10,486	7,005	6,114	73	64	684	713	5,615	4,716	12.2%	15.1%
1987	-	-	-	-	-	-	740	695	6,077	5,493	12.2%	12.6%
1989	13,875	12,722	10,428	9,561	109	100	628	597	5,830	5,191	10.8%	11.5%
1991	66,984	57,221	50,551	43,183	527	450	430	369	5,811	5,200	7.4%	7.1%
1993	65,272	56,062	52,135	44,779	543	466	401	289	5,574	6,974	7.2%	4.1%
1995	53,669	46,734	40,316	35,106	420	366	444	378	5,502	4,165	8.1%	9.1%
1997	39,931	36,355	29,156	26,544	304	277	684	614	5,864	4,756	11.7%	12.9%
1999	28,205	25,448	21,448	19,352	223	202	644	560	6,744	5,815	9.5%	9.6%
2001	56,480	52,461	47,750	44,352	497	462	481	451	6,979	6,078	6.9%	7.4%
2003	73,848	67,502	64,437	58,900	671	614	274	218	7,037	6,086	3.9%	3.6%