

The Market for Single-Family Homes in the Boston Area

For the past two years the popular press has carried frequent articles on the escalation of real estate values in Boston and New York City. Nearly all reports have been based upon median sales price data from the National Association of Realtors, which are released monthly in a publication called *Existing Home Sales*. Those data show that in 1985 the median sales price of existing single-family homes rose 38 percent in the Boston metropolitan area and 30 percent in the New York City area. In the second quarter alone, the median sales price in Boston rose from \$108,600 to \$131,000, an increase of over 20 percent.

This study begins with an attempt to verify the picture of the market that emerges from the National Association of Realtors (NAR) data. While median sales price will increase with inflation in home prices, it will also increase if the composition of sales changes. An increase in the turnover of higher value properties relative to lower value properties will increase the median sales price in a given time period even if there has been no inflation. Also, if the quality of housing improves over time, the median price will rise even if the prices of constant quality units remain unchanged. Thus, there are some problems associated with using the NAR data as a measure of pure price inflation. Nonetheless, it is the only consistent source of data available for cross-city comparisons of home prices over time.

Using data on 1,514 Boston area properties that were sold more than once between January 1978 and November 1985, this study develops a fairly detailed picture of the pattern of pure housing price inflation in the area over that period. While the results are not quite as dramatic as the NAR data suggest, they reveal an extraordinary run-up in home prices in the last two years.

The second part of the study attempts to explain the observed rates of increase in Boston housing prices relative to those in other parts of the United States. First, the study uses descriptive data and a structural supply and demand model to explore the extent to which observed price

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movements can be explained by market fundamentals: population growth, employment growth, increasing income, mortgage rates, construction costs and so forth. Next, the paper turns to recent financial market theory to help explain the extraordinary acceleration of prices in the last two years. Finally, the paper comments on the likelihood that the boom will continue.

I. National Association of Realtors Data

Table 1 presents data on home prices since 1976. To the extent that these data reflect price movements rather than changes in quality or in the composition of sales, they reveal a strong national housing market between 1976 and 1980. During that period California housing prices boomed, while those in Boston and New York lagged. In 1976, average sales prices in New York, Los Angeles and San Francisco were virtually identical; in Boston prices were about 20 percent lower, but slightly above the national average.

Over the next four years, 1977-80, the average selling price in Boston increased at about the same rate as consumer prices in the United States. In San Francisco and Los Angeles, however, the average selling price increased nearly twice as fast.

Between 1981 and 1985, the housing market turned around. First, the national market softened, with median prices growing more slowly than prices in general. At the same time gains in Boston and New York were greater than the gains registered in the earlier period in California.

The Boston market seems to have taken off sometime during 1983. In that year, its median home price was less than two-thirds that of San Francisco and just 17 percent above the national median. At the end of 1985, the median sales price in Boston was 94 percent above the national average and slightly higher than the San Francisco figure. The increase was 75.3 percent in just two and one-half years, a period during which inflation averaged just 3.8 percent. That is the most rapid increase recorded in any city since the NAR has been keeping records.

II. Boston Data on Multiple Sales

In order to document the amount of true price inflation in the Boston market for single-family homes, data on 1,514 properties that had been sold at least twice between January 1978 and November 1985 were obtained from official records in one city and four towns. Table 2 lists the municipalities and sample sizes and several characteristics for each as reported in the 1980 Census. They were selected because they were geographically spread out and socioeconomically diverse, and because they had good records of sales. All are inside the Boston SMSA and are within 30 minutes driving time of downtown Boston. Stoneham and Malden are to the north of Boston and Quincy is to the south; Wellesley and Lexington are west and northwest, respectively.

Each of the 1,514 observations in the data set contains two selling prices for the same single-family home at different times between January 1978 and

Table 1
Sales Prices of Existing Single-Family Homes and Inflation, 1976-85

	Mean Price		Percent Change (Annual Rate)	Median Price			Percent Change (Annual Rates)	
	1976	1980		1976-80	1981	1983	1985:4	1981-83
United States	\$42,200	\$ 72,800	14.6	\$ 66,400	\$ 70,300	\$ 74,800	2.9	2.6
Boston	45,800	65,400	9.3	79,400	82,600	144,800	2.0	26.7
New York City	58,000	85,000	10.0	73,800	88,900	139,800	9.8	21.0
Los Angeles	59,200	110,800	17.0	111,400	112,700	119,900	0.6	2.6
San Francisco	58,100	120,200	19.9	121,600	129,500	141,100	3.2	3.7
Consumer Prices, U.S.	—	—	9.7	—	—	—	4.7	3.8

Source: National Association of Realtors, *Existing Home Sales, Monthly Report*. U.S. Bureau of Labor Statistics, *Monthly Labor Review: Consumer price index, all urban consumers, for the United States*.

Table 2
Size of Survey Sample and Characteristics of Sample Communities, 1980

	Number of Multiple Sales (Jan. 1978/Nov. 1985)	Median Family Income	Median Value of Owner-Occupied Housing	Population
Lexington	233	\$34,989	\$85,200	29,479
Malden	182	19,819	46,300	53,386
Quincy	409	21,509	44,600	84,743
Stoneham	210	24,526	60,000	21,424
Wellesley	480	36,745	99,400	27,209

Source: Author's survey and U.S. Bureau of the Census, *1980 Census of Population and Housing, Summary Characteristics for Governmental Units*, PHC80-3-23.

November 1985. For each of the five localities, all properties sold more than once were included. The data were used to estimate quarterly rates of increase in house prices using a regression model. The estimation procedure is described in detail in appendix A. The results using the entire sample are presented in table 3.

Between 1979 and 1982, the price of a single-family home in Boston rose at about the same rate as urban prices in general. A noticeable increase began in the first quarter of 1983, and the real acceleration started in the first quarter of 1984. From that point the rate of increase grew steadily to a peak of 37 percent annually in the second quarter of 1985. Since then, the rate of increase appears to be slowing. Between the second quarter of 1983 and the fourth quarter of 1985 home prices in the five towns rose an average of 57.8 percent, while prices in general rose less than 10 percent. These rates of increase are not as dramatic as the growth rates calculated from the NAR data, but they are extraordinary. If the late 1984/early 1985 increases were sustained, home prices would double approximately every three years.

Table 4 presents estimates of price increases for each of the five communities separately. All experienced a boom from mid-1984 through late 1985, and all show evidence of a slight decline in the third quarter. The samples were too thin for a fourth-quarter estimate by community.

There seems to be no relationship between price increases and incomes across the towns. Stoneham, the town in the center of the income distribution, had the most inflation, while Lexington had the least. Malden, Wellesley and Quincy had virtually identical experiences with very different populations, housing stocks and locations.

Three things are clear: first, there has been a very rapid increase in the value of single-family homes in the Boston area, and it has accelerated in the last two years. Second, the increase is not part of a national housing market boom; only the New York City metropolitan area seems to be experiencing comparable increases. In the United States as a whole, the median sales price of existing single-family homes fell 7 percent in real terms between 1981 and 1985. Many cities

Table 3
Increases in Sales Prices of Single-Family Homes in Five Boston Communities, 1979-85

	Percent Change in House Prices (Annual Rate)	Percent Change in Consumer Prices (Annual Rate)
1979	16.2	11.3
1980	12.6	13.5
1981	9.1	10.4
1982	5.1	4.5
1983:1	11.7	4.4
:2	9.5	4.2
:3	8.1	4.1
:4	9.5	5.3
1984:1	17.2	3.7
:2	19.2	3.7
:3	26.0	3.5
:4	27.7	3.3
1985:1	33.0	4.2
:2	37.5	2.4
:3	26.9	4.1
:4 ^a	11.9	2.4

^a Estimate based on data through November.

Source: Author's survey data on 1,514 multiple sales between January 1978 and November 1985; U.S. Bureau of Labor Statistics, *Monthly Labor Review*; Consumer Price Index, all urban consumers for the United States.

Table 4

Changes in Sales Prices of Single-Family Homes in Sample Communities, 1983-85

Percent

	Lexington	Malden	Quincy	Stoneham	Wellesley	All
1983:3	-8	-7	4	-7	6	
:4	6	9	2	-1	10	
1984:1	8	9	12	16	13	
:2	16	34	15	17	17	
:3	22	23	27	30	23	
:4	24	25	21	53	9	
1985:1	28	35	29	33	30	
:2	25	22	40	51	36	
:3	21	27	19	27	23	
Overall Change, 1983:3 to 1985:3	48.4	58.4	57.4	69.7	56.9	57.8
Increase in All Consumer Prices						7.6
Real Change in Home Prices	40.8	50.8	49.8	62.1	49.3	50.2

Note: The number of sales was too small to permit separate estimates by community for the fourth quarter of 1985.

Source: See table 3.

including Albany, Houston, Cincinnati, Miami, San Jose and others have seen nominal declines in house prices. Third, the Boston inflation is not confined to any one segment of the single-family housing market; communities with very different housing stocks and populations have had similar experiences.

Two questions remain: What lies behind the recent acceleration? How long will it continue? The paper will address them in that order.

The Causes of Local Housing Inflation: The Fundamentals

Prices in any market are determined by the interaction of supply and demand. Since housing is durable, only a small percentage of the total stock is on the market at any moment, and new construction accounts for about one-sixth of all units sold. Out of a national housing stock of approximately 60 million single-family homes, roughly three million existing units are sold each year and another million new units are constructed.

Demand depends upon the number of potential buyers and their willingness to pay. It is important to think of housing demanders in two ways: as consumers of housing services and, equally important in the current environment, as investors looking for a good rate of return.

Population Growth, Employment and Income. We will look first at three key structural determinants of

the demand for housing: population growth, employment, and income. Table 5 presents summary data on each for the United States and Massachusetts over the last decade. The population data show that the current boom can hardly be explained by a great influx of people. Indeed, the population of Massachusetts increased only 1 percent from 1976 to 1985, while the U.S. population grew over 10 percent. By contrast, the population of California grew at nearly twice the national rate from 1976 to 1981, the period when housing prices soared.

Employment growth has been more rapid in Massachusetts than in the United States as a whole, but the numbers are hardly staggering. The extra growth in Massachusetts has created 92,000 additional jobs: that number has been sufficient to reduce the unemployment rate to a low level, but it is not likely to have thrown the housing market into chaos.

Even more surprising, in 1982, 1983, and 1984 when the housing boom began, employment growth in Boston and in Massachusetts lagged behind the nation's. In 1985, both Boston and Massachusetts employment grew at a rate slightly above the national average, but that was well after the housing price acceleration had been firmly established. By contrast, between 1976 and 1980, employment in California grew 25 percent, a rate 50 percent above the nation as a whole.

Personal income per capita in Massachusetts has grown more rapidly than in the country as a whole

Table 5

Growth in Population, Employment and Income in the United States and Massachusetts, 1976-85

Percentage Change, Annual Rates

	Population		Employment			Real Per Capita Personal Income	
	United States	Mass.	United States	Mass.	Boston SMSA	United States	Mass.
1976-80	1.3	-.1	3.3	3.2	4.1	.5	1.2
1981-83	1.0	0	-.5	-1.1	-1.2	.9	4.2
1983-85	.9	.5	3.9	4.6	5.8	3.8	5.5

Note: Personal income data converted from nominal to real using the Consumer Price Index, All Urban Consumers.

Source: U.S. Bureau of the Census, *Statistical Abstract of the United States*; 1985 Massachusetts figure from Boston office, U.S. Bureau of the Census. U.S. Bureau of Labor Statistics, *Employment & Earnings*, August 1976 to August 1985, and Federal Reserve Bank of Boston, *Economic Indicators* (1976-86), Table B-2, revised as of March 1986. U.S. Department of Commerce, *Survey of Current Business*, October 1979 and October 1985.

for seven of the last nine years. Real per capita personal income in Massachusetts grew an average of 4.5 percent per year over the decade, while the corresponding figure for the United States has been only 2.2 percent. For the period 1981-85, the figures are 4.9 percent for Massachusetts and 1.9 percent for the United States. This amount of income growth undoubtedly had a significant effect on housing demand.

Demographic Change. Another possible explanation could be that the age distribution of the population is changing and that even though population growth has been slow, more households are moving into the home-buying years. While there are no data since the 1980 Census, there are projections based on an "aging" of the population and migration trends. Demographic research done at the Joint Center for Urban Studies of MIT and Harvard University predicts that the total number of adults between the ages of 25 and 34 and the total number of households will grow more slowly between 1980 and 1990 than during the previous decade. In addition, while specific projections are not done for Boston, the rate of growth for New England in those categories is forecast to be slower than in any region of the country except the Middle Atlantic.¹

The so-called "baby boom" generation actually began to enter the housing market in the early seventies and was without question partially responsible for the national run-up in housing prices of the late 1970s. The leading edge of that population distribution is now approaching 40 years of age, and rates of increase in the number of households in the prime home-buying years are declining.

Demographic trends led the analysts to conclude: "Unlike the 1970s, we anticipate that increases in house values in the 1980s will be modest."² This has indeed been an accurate forecast for the national housing market.

Cost of Construction. Another determinant of housing prices is the cost of constructing new units. If new construction became sufficiently costly, it would slow the rate of construction and push up prices. The Boeckh building cost index shows that since 1980, construction costs have risen at about the same rate as inflation in the United States (table 6). In Boston, however, construction costs have increased slightly faster than inflation. Between 1980 and 1983, *Engineering News Record* reports, the construction cost index rose at an annual rate of 8.3 percent while inflation was running at 6.6 percent. Between 1983 and 1985 the rate of increase in construction costs in Boston slowed to an average of 6.4 percent per year, with inflation averaging 4.0 percent.

Some of the increase in home prices in Boston can thus be attributed to increases in construction costs. Even if those costs were fully passed on in higher prices to home buyers, however, they would explain less than one-fourth of the observed inflation in the Boston housing market between 1983 and 1985.

Interest Rates. Some people blame the current housing market inflation on falling interest rates. Lower mortgage rates will, of course, stimulate demand. There is no evidence, however, that lower mortgage rates have contributed significantly to the recent boom.

First, the average interest rate on fixed-rate mortgages in Boston was 14.9 percent in May 1984 when

Table 6

Changes in Factors Affecting Housing Demand and Supply, 1980-85

	1980	1983	1985	Percent Increases (Annual Rate)	
				1980-83	1983-85
Employment (000)					
United States	90,406	90,196	97,421	-.1	3.9
Massachusetts	2,668	2,634	2,882	-.4	4.6
Income \$					
United States	9,288	11,562	13,395	7.5	7.6
Massachusetts	9,896	13,179	15,749	10.0	9.3
Mortgage Rate %					
United States	12.95	12.82	12.12	-.3	-2.8
Boston	14.32	12.94	13.03	-3.3	.3
Fuel and Utilities (Index)					
United States	278.6	369.3	393.0	9.8	3.2
Boston	315.4	373.5	383.0	5.8	1.3
Construction Cost (Index)					
United States	129	155	169	6.3	4.4
Boston	3,143	4,001	4,530	8.3	6.4

Source: National Association of Realtors, *Existing Home Sales*, May 1985; U.S. Department of Commerce, *Survey of Current Business*; Data Resources, Inc., Regional Forecasting Service; Boeckh's Construction Cost Index, *Survey of Current Business*; *Engineering News Record*, April 1980, 1983, 1985; and sources, table 5.

the housing boom was well under way—not far below the 1982 peak and higher than in 1980. As late as May 1985, the average interest rate on fixed-rate mortgages in Boston was over 13 percent—taking expected inflation into account, that's a higher real rate than in 1982.

The effect of lower interest rates on housing prices is ambiguous. While falling interest rates stimulate demand for housing, they also stimulate supply. The evidence suggests that home builders are even more sensitive to interest rates than are home buyers. This is indeed the result in the model estimated in appendix B. If supply expands faster than demand, you would expect to see prices fall.

What makes matters worse is that housing production reacts to *short-term* interest rates; construction financing is generally for the term of the project. During the critical period of price run-up in Boston, short-term interest rates came down dramatically while the mortgage rate lagged.

Finally, between 1981 and 1984, mortgage rates fell nationwide more than they did in Boston, and yet the national housing market remained flat. If declining mortgage rates were a powerful stimulus they would have had an impact on the market beyond Boston and New York.

In early 1986, the mortgage rate fell sharply to under 10 percent. This lower rate may simply have removed some of the resistance to continued upward movement of prices that the market seemed to encounter in the last two quarters of 1985.

Lower Taxes. It has been argued that lower property tax rates from Proposition 2 1/2 may have been capitalized into higher property values, causing the housing boom. The impact of a property tax reduction on home values should be the present value of the difference between expected property tax payments before and after the law was enacted.

To estimate the order of magnitude of such an effect, assume that prior to 1981 a homeowner expected property taxes to increase for the next 10 years at the same rate as they had during the previous four years. Between 1976 and 1980, property taxes grew 22 percent in nominal terms or at a rate of 5 percent per year.³ Projected over 10 years into the future, that would mean an increase of 64.2 percent.

Assume further that the homeowner lived in a town with an effective property tax rate of 3 percent, which is above the 2 1/2 percent cap. In such a town, the levy would have to decline 15 percent per year until it reached a rate of 2 1/2 percent, at which point it could grow at 2 1/2 percent per year. Assuming a

discount rate of 7 percent this would lead to a one-time increase in home value of about 8 percent, or \$8,041 for a \$100,000 house. Even this figure overstates the potential effect, since property taxes are deductible from income in calculating federal income taxes. Thus, even under extreme assumptions, tax capitalization can only explain a small fraction of the observed increases in home prices.

Fuel and Utilities. Fuel and utilities are complements to housing. If they are less expensive, the housing bundle is less expensive, and consumers are likely to demand more. Between 1980 and 1985, fuel and utility costs increased faster than inflation in the United States. In Boston, however, prices in general rose 28 percent while fuel and utilities rose 21.4 percent. (See table 6.)

The National Association of Realtors estimates the average annual fuel and utility bill at about \$2,000. The decline in real price is saving the typical customer \$126 per year, too small to have any observable effect on housing prices.

A Structural Model of the Housing Market

Appendix B presents a model estimated with pooled data on 11 cities at 10 points in time. The model consists essentially of a supply function and a demand function and includes as variables most of the factors discussed in the preceding paragraphs. There are 108 observations in the data set used to estimate the equations. The price variable is the "average" selling price of existing single family homes for each of the 11 cities from 1971 to 1980. The dependent variable in each equation is the log of total housing starts in each SMSA in each year. All variables are in nominal terms. Since the model was estimated in double log form, the coefficients are elasticities. Solving simultaneously for price yields the elasticities shown in table 7.

Table 8 uses the model to retrospectively "predict" the amount of home price inflation between 1980 and May of 1985. The percentage increases are simply the elasticities in table 7 applied to the variable changes in table 6. Since they represent partial effects in a double log specification, the predictive changes can simply be added together. From 1980 to 1983, the model predicts annual price increases of 9.1 percent for the United States and 11.1 percent for Boston. The slightly higher predicted rate of increase for Boston is due to faster income growth and rising construction costs. Actual price increases averaged 4.2 percent nationally and 7.8 percent in Boston.

Table 7
Estimated Price Response Elasticities

Variable	Price Response Elasticity
Employment	.82
Income	.56
Interest Rates	.54
Fuel and Utilities	-.13
Construction Costs	1.01

Source: Appendix B.

For the period 1983-85, healthy income and employment growth along with construction cost increases contributed to a prediction of 10 percent home price inflation nationally and 15.5 percent in Boston. The higher prediction for Boston comes again primarily from faster income growth and construction cost increases.

The actual increases during the period are strikingly different. As we have seen, prices in the Boston area accelerated upwards at a rate 60 percent higher than the predicted rate. Prices in the United States as a whole slumped along at one-quarter of the predicted rate, falling in real terms.

The model does predict a significant change in the Boston market in 1983, but it does not predict the very rapid acceleration that actually occurred. The flat national market is as big a puzzle as the rapid increases in Boston.

Table 8
Model's Predictions of Changes in House Prices, United States and Boston, 1980-85

Percentage Changes, Annual Rates

Contributing Variable	1980-83		1983-85 (May/May)	
	U.S.	Boston	U.S.	Boston
Employment	-.1	-.3	3.2	3.8
Income	4.3	5.7	4.3	5.3
Mortgage Rate	-.2	-1.8	-1.5	.2
Fuel and Utilities	-1.3	-.8	-.4	-.2
Construction Cost	6.4	8.3	4.4	6.4
Total	9.1	11.1	10.0	15.5
Actual Change	4.2	7.8	2.5	24.6
Change in CPI	6.6	—	4.0	—

III. An Alternative Explanation: Rational Choice in an Inflationary Environment

Earlier in the paper it was argued that it is important to think of home buyers in two ways: first, as consumers of housing services, second, as investors looking for a good rate of return. In this section we will focus on housing as an investment.

A substantial body of work by economists studying financial markets and international exchange rates has focused on the impact of expectations on asset values. The full return to any asset has two parts: the income that it generates directly and any appreciation in its value. A common stock, for example, generates dividends and can also increase in value over time, generating capital gains for its owner.

It is easy to show mathematically that when capital gains are anticipated, asset values can grow at an accelerating rate. Consider a common stock that generates a dividend of \$100 per year. If interest rates are 10 percent and the dividend is expected to remain unchanged, the stock would sell for about \$1,000. Now assume that some information (new management, a big contract award, etc.) suggests that the stock is likely to appreciate at 2 percent or \$20 per year. That means that the overall return would be \$120 (\$100 dividend plus \$20 capital gains) and that the stock's value would rise to \$1,200.

Thus, expectation of 2 percent appreciation led to an actual increase in price of 20 percent. Suppose that people's expectations are then revised in the face of actual price behavior. An anticipated continuing capital gain of just 10 percent (or \$100 instead of \$20) would mean that the expected overall return would be \$200 per year. That would push the stock's value all the way to \$2,000, twice its initial value.

Regardless of whether people form their expectations on the basis of "extraneous" information or on the basis of actual price behavior, the result can be explosive. Clearly, such a process cannot continue indefinitely since asset prices would go to infinity. When an asset price runs ahead of its "fundamental value" or long-run yield, we observe what is referred to as a "bubble."

Some markets are more likely than others to generate "bubbles." Most bonds have a fixed yield over a finite period of time. Thus, the "fundamental" yield is known with certainty. Capital gains will occur if interest rates fall, but continuing appreciation cannot occur without a continuing decline in interest rates. Thus, the likelihood of an explosive run-up in bond prices is low; knowledge of fundamental yields and

general understanding of the price dynamics on the part of buyers constrain it.

It was once thought that rational expectations would keep asset prices in all markets in line with market fundamentals and that "bubbles" were evidence of irrational behavior. It has been shown rigorously, however, that asset price "bubbles" can be created by fully rational investors.⁴

The housing market is more likely than others to generate price "bubbles." First of all, information on the "fundamental" yield of a housing unit is difficult to obtain. The fundamental yield of an owner-occupied housing unit flows to owners in the form of housing services; it is not observable and no transaction occurs to establish its basic value. Rents on comparable units might provide a clue, but housing is extremely heterogeneous and information is certainly imperfect.

Another potential source of trouble for the housing market has to do with the way expectations of potential capital gains are formed. Because housing is heterogeneous and therefore difficult to value precisely, buyers and sellers are forced to rely on "expert" judgments. These judgments come from real estate agents, who presumably watch the market carefully.

Real estate agents charge a fixed percentage of sales price as a commission, a practice that has not changed substantially over many years despite the enormous escalation of housing prices. That means that the incomes of agents move proportionately with house values. Agents also want to list houses; when an agent lists a house he gets half the commission even if he doesn't make the sale himself. If agent A tells you your house is worth more than agent B and information is imperfect, it is rational to list with A. Real estate agents know this.

Agents are also interested in turnover; they want listed properties to sell quickly since their incomes also depend on volume. Thus, there is a clear incentive not to overprice, and agents will advise cutting if a property doesn't move. They also know, however, that properties will move fastest when buyers expect prices to be higher in the future. If prices are indeed rising, it is important for home buyers to know it, and it is irrational for sellers not to "test" the upper limit of the market. If you overlist, you can always cut the asking price; if you underlist, and the house sells in 10 minutes, you can't change your mind.

Thus, in serving the best interests of their clients, agents are likely to generate perfectly rational expectations of future increases. "What is my house worth?" . . . "Well, the house down the street sold for

\$120,000 and things are moving up quickly, why not try \$135,000 and see what happens." If prospective buyers become convinced that next week the price will be \$140,000, we are off to the races. It is very doubtful that real estate agents can start an expectational spiral, but if market fundamentals begin to generate increases, as was the case in Boston in 1983, the potential is there for perfectly rational buyers, sellers and agents to turn those increases into an expectational bubble.

Potential home buyers have every reason to be optimistic. Real estate has been an enormously profitable investment over the past 15 years, when everything else was cyclical. Almost anyone who owned a home during that period did very well. Also, the big upward price movements have lasted for several years. Thus, even if one knew that the California "bubble" would come to an end and ultimately burst, getting in early enough would have been perfectly rational; the potential gains were enormous.

Many homeowners also do not believe that real estate values can fall. People who own homes in California will tell you that the value of their property has not fallen. People hold their homes off the market for long periods of time to get "what it's worth." Others offer below-market financing to potential buyers; this serves to hide nominal price declines. In fact median selling price did not actually fall in California when the "bubble" burst, but increases since 1981 have been less than the rate of inflation.

If prices are in fact downwardly rigid or if there is no healthy aversion to risk on the part of homebuyers, there is, again, the potential for an expectational spiral.

How Long Can It Continue?

One final issue remains. If the Boston market is locked into an expectational spiral, how long can it go on? The ultimate limit is what people are willing to pay. Unfortunately, economic theory provides little help. As Paul Samuelson puts it:

If people think that tulips will appreciate at 10 percent per month, they can be motivated to act so that this will happen. Happen for how long? As far as theory can tell, forever. Even though every tulip mania and stock market bubble have come to an end in history I have long been struck by the fact, and puzzled by it too, that in all the arsenal of economic theory we have absolutely no way of predicting how long such a [bubble] will last. To say that prices will fall back to earth after they reach ridiculous heights represents safe but empty prediction. Why do some

manias end when prices have become ridiculous by 10 per cent, while others persist until they are ridiculous to the tune of hundreds of per cent?⁵

It is true, however, that willingness to pay is ultimately constrained by ability to pay, and ability to pay is limited by income, wealth and the ability to borrow.

One of the constraints on ability to pay, wealth, moves with the housing market. If a consumer is already in the market, his ability to buy a new home depends on the value of the one he owns. The cost of moving up in the market is the incremental cost of the additional housing he decides to buy. Nonetheless, as housing costs increase, potential buyers get screened out and demand must ultimately fall off.

Table 9 presents some rough data on housing

Table 9
Family Income and Median Monthly Payment on a Newly Purchased Existing Single-Family Home, 1981 and 1985

	Median Home Price	Estimated Monthly Payment ^a	Median Monthly Family Income ^b	Ratio of Payment to Income
<u>1981</u>				
United States	\$66,400	\$681	\$1,865	.37
Boston	79,400	816	2,192	.37
San Francisco	121,600	1,250	2,351	.53
<u>1985</u>				
United States	74,800	525	2,312	.23
Boston	144,800	1,017	2,765	.37
San Francisco	141,100	991	2,910	.34

^aAssumes 20 percent down, fixed-rate, 30-year mortgage, no points.

^bMedian family income by region, divided by 12. Assumes 5 percent growth, 1984-85. Figures for Boston and San Francisco assume that the ratio of SMSA income to regional income is the same as it was in the 1980 Census.

Source: National Association of Realtors, *Existing Home Sales, Monthly Report*; U.S. Bureau of the Census, *Current Population Report of Money Income and Poverty Status of Families and Persons in the United States: 1986* (advance data) Series P-60, No. 149, for 1981 Series P-60, No. 142, and U.S. Census of Population and Housing 1980, Series PHC 80-3-6 and 23.

costs relative to income. The right-hand column can be thought of as a crude "index" of the burden of housing costs, determined by interest rates, housing prices and income levels. It is in no way a measure of true "cost" burden since it ignores taxes and other related costs such as utilities.

In 1981, the median monthly payment on a newly purchased existing home was 37 percent of median

income in both the United States and Boston. At the peak of the California boom, the same ratio there stood at 53 percent. Despite the enormous run-up in Boston housing prices, the very recent sharp decreases in interest rates and relatively high rates of income growth put the ratio at the end of 1985 almost exactly where it was in 1981. During the same period, the bursting of the California bubble reduced its ratio to 34 percent, 3 percentage points below the Boston figure. Nationally, housing has become much more "affordable;" low rates of housing price inflation, falling interest rates, and strong income growth have pushed the national ratio down to 23 percent.

To the extent that these indexes measure potential market resistance, Massachusetts housing prices could rise further. Certainly, the California bubble did not burst until the burden was significantly higher than it is in Massachusetts today. However, evidence suggests a slowdown in Massachusetts prices, which could dampen expectations. At the same time it is also true that the big first-quarter drop in mortgage rates pushed the Massachusetts ratio down considerably. If the spiral was encountering resistance in 1985, that resistance has been reduced.

The only thing known with certainty is that the extraordinary rates of price increase of the last few years cannot continue for a long time. If interest rates remain at 10 percent, continued annual price growth of 25 percent would put us at California's 53 percent cost ratio in less than two years.

IV. Summary and Conclusions

While the economy is healthy and income is growing, market "fundamentals" do not seem to offer an adequate explanation for the very rapid increase in home prices in the Boston area since 1983. Recent economic theories of asset price behavior previously used to explain price "bubbles" in financial markets and foreign exchange markets seem to fit the housing market very well.

It is likely that the market is currently locked into an expectational spiral. Buyers factor expectations of capital gains into their willingness to pay, actually creating the anticipated gains. The resulting price "bubbles" burst when asset values get far enough from the level justified by their fundamental yields or when prices ultimately bump into budget constraints.

It is clear that the limits in Massachusetts have not yet been reached. The cost burden on a first-time house buyer is about what it was five years ago. It is equally clear that the accelerating price increases we

have seen in recent years cannot persist for long. If the inflation rates of the past two years were to continue, we would reach the point at which California's bubble burst in less than two years.

It is very important to understand that recent housing price bubbles have not burst, rather they have run out of steam. It is likely that the rate of increase in Boston housing prices will come down in late 1986 and 1987, but the experience of recent history, especially in California, and the strength of the New England economy make a collapse most improbable.

Appendix A

The growth rates presented in tables 3 and 4 were estimated using a data base of 1,514 observations on homes that were sold at least twice during the period January 1978 to November 1985. The estimations used the following functional form:

$$P_j = P_i (1 + a_0)^{D_0} (1 + a_1)^{D_1} (1 + a_2)^{D_2} \dots (1 + a_n)^{D_n}$$

- where i = the month (quarter) of the first sale
- j = the month (quarter) of the second sale
- P_i = the price of the first sale
- P_j = price of the second sale
- a_k = growth rate in month (quarter) k
- D_k = a dummy variable equal to 1 if the period of time between the sales included month (quarter) k , equal to 0 otherwise

Estimated as:

$$\ln P_j - \ln P_i = \hat{\beta}_0 D_0 + \hat{\beta}_1 D_1 + \hat{\beta}_2 D_2 + \dots + \hat{\beta}_n D_n$$

$$\text{where } \hat{\beta}_k = \ln(1 + a_k) \quad a_k = e^{\hat{\beta}_k} - 1$$

In the final tables, a four-quarter moving average of the $\hat{\beta}$'s was used to smooth the data.

Appendix B: Structural Model Used in Estimates Presented in Tables 7 and 8

Table B1

Demand Function

(Dependent Variable = Log of Total Housing Starts)^a

	2SLS ^b		OLS	
	Elasticity	t	Elasticity	t
Prices	-.29	-.5	-.07	.2
Employment	.70	5.4*	.68	5.6*
Income	.48	.8	.38	.7
Interest	-.78	-1.3**	-.85	1.3**
Utilities	-.11	-.3	-.17	.5
Taxes	-.71	4.6*	-.70	4.6*
	R ² = .37		R ² = .37	

^a Regressions run in double log form.

^b Employment, income, interest, utilities and taxes were exogenous.

* Significant at the 1 percent level.

** Significant at the 10 percent level.

Table B2

Supply Function

(Dependent Variable = Log of Total Housing Starts)^a

	OLS		2SLS ^b	
	Elasticity	t	Elasticity	t
Price	.56	.7	.48	1.2
Construction Cost	-.86	-.8	-.75	-.6
Interest Rate	-1.24	-1.7*	-1.01	-1.9*
Atlanta	-.93	-3.5*	-.87	-4.1*
Baltimore	-.53	-1.8*	-.71	1.1
Boston	-1.07	-3.8*	-1.63	-3.7*
Chicago	.39	1.1	.44	.6
Detroit	.49	.1	.68	.2
Los Angeles	.26	.9	.31	.6
Minneapolis	-.48	-1.8*	-.56	2.0*
New York	-.49	-1.7*	-.31	.9
Philadelphia	-.18	-.6	-.19	1.3
San Francisco	-.16	-.5	-.16	.8
	R ² = .43		R ² = .43	

^a Regressions run in double log form.

^b Construction cost, interest rates and city dummies are exogenous.

* Significant at the 1 percent level.

Table B3

Pooled Variables

N = 108

	Overall Unweighted Mean	Standard Error
Average Price of Existing Housing	50,619	16,294
Median Family Income	19,070	4,833
Total Annual Housing Cost	6,286	2,560
Annual Insurance Cost	156	64
Annual Utility Cost	700	255
Annual Real Estate Taxes	1,196	554
Conventional Mortgage Rate	9.4	1.7
Total Employment (000)	1,704	866
Total Housing Starts	23,587	14,010
Multifamily Housing Starts	12,120	10,059
Single-Family Housing Starts	9,253	2,912
Construction Cost Index	8.95	1.92

Note: Variables were obtained from the following SMSAs for each year 1971-80: Atlanta, Baltimore, Boston, Chicago, Detroit, Houston, Los Angeles, Minneapolis, New York, Philadelphia, San Francisco. 1980 starts were not available for Philadelphia and Los Angeles. Total observations = 108.

Source: National Association of Realtors, Economics and Research Division, housing costs and family income. Annual costs are estimated for the "average" existing home sold in each year. Federal Home Loan Bank Board, mortgage rate. Employment data from the State and Area Forecasting Service of Data Resources, Inc. U.S. Department of Commerce, Construction Reports Series C20, housing starts. Construction cost index constructed from annual hourly earnings of wage and salary construction workers, available from Data Resources, Inc. Regional Forecasting Service.

¹ William Apgar, Jr., et al., *The Housing Outlook, 1980-1990*, Praeger Publishers, New York, 1985, pp. 135 and 139.

² *Ibid.* p. 49.

³ Massachusetts Taxpayers Foundation, Inc., *Municipal Financial Data*, 1976 and 1980.

⁴ See Olivier J. Blanchard and Mark W. Watson, "Bubbles, Rational Expectations, and Financial Markets," National Bureau of Economic Research, Working Paper No. 945, July 1982.

⁵ Paul A. Samuelson, "Intertemporal Price Equilibrium: A Prologue to the Theory of Speculation," *Weltwirtschaftliches Archiv* 79, 1957, p. 215, and "Indeterminacy of Development in a Heterogeneous Capital Model with Constant Savings Propensity," in *Essays on the Theory of Optimal Economic Growth*, Karl Shell, ed., Cambridge, Mass., The MIT Press, 1967, p. 230.