NBER WORKING PAPERS SERIES

LOCAL HOUSE PRICE INDEXES: 1982-1991

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Working Paper No. 3933

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
December 1991

We thank Anne Dorrian for research assistance, and we acknowledge Ed Sturgeon of the Lexington Chamber of Commerce, Joan Lange of the National Association of Realtors, and Lane Barnett of Coldwell Banker for assistance in obtaining their data sets. Any opinions expressed are those of the authors and not those of the National Bureau of Economic Research.

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ABSTRACT

We begin with a description of three house price panel data sets for the period 1982 to 1991. Next, we estimate a model that assumes the three sources are derived from an underlying unobserved price series, and we construct composite indexes that report house prices for 135 locations. These series can be used either as explanatory variables in studies of household formation, housing demand, and migration or to test models of the determinants of spatial and intertemporal variations in house prices. Finally, we construct regional series (based, alternatively, on census and Salomon Brothers regions) and two national aggregates and describe their movements. Our series are compared to other local, regional, and national series.

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Empirical study of the determinants of variations in local house prices requires a panel data set where house prices are measured for multiple cities over a period of time. While many studies have developed price indexes for particular localities or for the nation, panel data for constant quality housing have not been readily available. The three panels that we focus on are collected by the National Association of Realtors, the American Chamber of Commerce, and Coldwell Banker. While the latter two purport to be constant quality series, they hold only a limited number of attributes constant.

Panel data on local house prices are required for a variety of studies, including the impact of housing costs on household formation and mobility decisions. Haurin, Hendershott, and Kim (1991) find that house prices affect young adults choices of whether to live with parents or independently, and whether to live with a group or separately. It is also possible that house prices can affect the timing of marriage and childbearing. Winkler (1991) reports a significant influence of housing costs on female heads' decisions about whether to form a household, and Gabriel, Shack-Marquez, and Wascher (1991) report that high housing prices in potential destination areas significantly reduce immigration.

Another use of panel data on local house prices is the study of the efficiency of the market for owner-occupied single-family houses. Case and Shiller (1989) report that markets in four cities are inefficient in that annual changes in prices are significantly positively related to previous year annual changes. They also (1990) find that house prices and excess returns on housing (both leveraged and non-leveraged) are forecastable with lagged values of such variables as real construction costs and real per capita income growth. These hypotheses can be retested with the broader based data set developed here.

Lastly, the determinants of local house prices are themselves a subject of interest. Models of the price determination process range from theoretical urban equilibrium models (Haurin, 1980) to empirically oriented estimation models (Ozanne and Thibodeau, 1983, and Hendershott and Thibodeau, 1990). Understanding variations in house prices in local markets is especially important to home mortgage insurers (lenders, private mortgage insurers, and FHA/VA) because house price declines or slow increases are the primary ex post determinant of mortgage default (Cooperstein, Redburn, and Meyers, 1991). The Peek and Wilcox (national data) and Gill and Haurin (local data) papers that appear in this volume are examples of empirical house price determination models.

Three Data Sources

The National Association of Realtors (NAR) local house price data have been collected since 1979. Initially series for about 20 cities were collected, this number has increased to 119 by 1991. The data are collected by the Association from local Realtor boards and include all sales recorded by the local association. Each quarter the median house price is extracted.

over time, the quality of the housing stock should rise systematically because of upgrading of existing housing and the entry of relatively high quality units and removal of low quality ones. In a study of NAR data for 14 cities over 4 to 7 year time periods, Hendershott and Thibodeau (1990) find the median house quality rose an average of 2.0% annually. Similar results are obtained by Case and Shiller (1987) for four cities and by Peek and Wilcox (1991) for the U.S. In the following analysis, we use a NAR house price series that is adjusted for intertemporal quality variations (a 2.0% annual reduction is applied to house price increases in all localities).

The median priced house will also vary in quality over time because of variations in the distribution of sold houses compared to the stock. The quality of the median house may also differ among localities. No adjustment has been proposed to account for these variations in NAR data; thus we model the series as being measured with error. Our annual data report the index in the first quarter of the year, 1982 to 1991.

Coldwell Banker reports the price of constant quality houses near year-end for the 1982 to 1991 period. Our sample includes 105 cities surveyed in at least one year. The quality level is defined as a 2000 square foot house with three bedrooms, two baths, family room and two-car garage in communities that corporate transferees would tend to locate.[1] Some spatial variation in quality would be expected using this standard. Further, the data are based on only three house price observations per locality; measurement error is likely. We believe we have reduced this error by computing price levels from 1989 using the annual percentage changes in house price reported each year.

Our sample of the American Chamber of Commerce data reports the cost of housing for 121 cities in at least one survey year. Their survey attempts to hold quality constant by pricing a new house of standard quality, 1800 square feet of living space and a lot size of 10000 square feet.[2] Data are collected by various groups ranging from local chambers to universities and state agencies. While coverage is of the urbanized area, the use of new houses tends to yield estimates of price variations in non-core areas. At least five sources of house sale prices are contacted unless a single source maintains comprehensive records for the locality (e.g., a real estate research center). We select their fourth quarter reports from the previous year.

A Measurement Model of Local House Price Indexes

We utilize these three data sets to obtain a "best" house price index for the localities in which the three series are available for the 1982-1991 period. The model of the process that generates the three indexes is:

[INSERT FIGURE 1]

where the d_i are uncorrelated random normal errors and the three observed price series are: CB = Coldwell Banker, CC = Chamber of Commerce, NAR = National Association of Realtors. The single underlying unobserved house price series that generates the observed data is p^*, and e represents an unobserved random factor that causes measurement error in p^*. The links between the unobserved series and our three observed series are through the coefficients b_i. This model is an example of the measurement submodel of Joreskog and Sorbom's linear structural relationship model (LISREL, 1985).[3] We use the maximum likelihood method of estimation to determine the coefficients b_i, their standard errors, and measures of goodness of fit. The LISREL model also estimates weights that can be applied to the three price series, yielding a prediction of the underlying house price series. This "factor score" equals the expected value of p^* conditional on the observed values of the three house price series. (Further discussion of factor scores is contained in Bartholomew, 1987, pp. 66-69.)

We scale p^* so that it has unit variance; scaling is required to identify the model (Long, 1984, pp. 49-52). Three coefficients are estimated, b_1, b_2, b_3, as are the three variances of the d's, which are assumed to be uncorrelated. Because we have three data series, the model is just identified (there are zero degrees of freedom), and the data fit perfectly. This type of model is useful because it yields information about the reliability of the three house price indexes and it allows us to use all three series to predict p^*.

A drawback of this particular model is that it ignores the time series aspect of the data. More specifically, it does not account for the autocorrelation of measurement errors in any of the three observed price series (one observation of a locality-year is treated the same as another). Another basic assumption is that there is a single p^*, rather than differing price trends for different qualities of housing. The CB and CC indexes represent housing that is of higher quality than the NAR series. Because the model is not over-identified, we cannot test for differences in appreciation rates among houses of different qualities.

We can provide some average data, however. We have data for 44 NAR cities in 1982 and 1991, 82 CB cities, and 74 CC cities. For these, the average appreciation rates for the nine year period are: NAR = 23%, CB = 55%, and CC = 35%. If we weight the cities by population, the averages are: NAR = 28%, CB = 47%, and CC = 32%. Thus, the CB appreciation rate appears to be much greater than that for NAR and CC. However, the cities for which the series are available differ, and thus the comparisons are inappropriate.

This problem is resolved by comparing data sources using the same localities. Table 1 reports unweighted and population weighted data for cities where two of the three series exist. To see whether the results depend on the 1982 recession (higher quality housing may have been more depressed and thus grew more rapidly in subsequent years), we performed the same comparative matched-city price appreciation calculations for the 1985-91 period. For the 33 cities where we have both CB and CB data in both 1982 and 1991, the average aggregate increases in house prices are CB = 49% and CC = 33%. These are significantly different at the 0.05 level, but not at the 0.1 level. Note further that the population weighted-average difference in indexes is only half as great (0.076 versus 0.161). Moreover, for the 1985-91 period, the differences, unweighted and weighted are much smaller (the unweighted means are not significantly different at the 0.1 level). We conclude that the rates of increase in the CB and CC series are not different. On the other hand, the rates of increase in both the CB and CC series have been statistically greater (at the 0.001 level) than that of the NAR series.

[INSERT TABLE 1]

To estimate our model, we extract a subsample of data from the three data sets. For a locality to be included, all three data sources must be observed in that year. Because the coverage of the three series rises over time, our estimation sample increases from 22 cities in 1982 to 56 in 1991. A total of 324 observations are used in the estimation representing 67 cities for various years in the period 1982-1991. As expected from the definitions of the series, they measure different qualities of housing. The mean prices of the series in 1989 are: CB = $111,188, CC = $99,218, NAR = $74,203. To scale the house price series into the standard indexes, we compute the average house price in each series in 1989 and divide the 1982-1991 observations by the respective average price. The three 1989 indexes average 1.0 for these common areas; all other house prices are relative to this base.[4]

Results

The estimates of the b's are: b-CB = 0.265, b-CC = 0.175, b-NAR = 0.196.[5] The t values all exceed 17; thus we are confident that each observed series is related to p*. Squared multiple correlations indicate how well any particular observed index serves as a measure of the unobserved house price index. This value, also referred to as the reliability index, "indicates the percentage of variation in an observed variable that is explained by the common factor that it is intended to measure" (Long, 1983, p. 72). We find the squared multiple correlations are: CB = 0.818, CC = 0.734, NAR = 0.699; thus the Coldwell Banker data appear to be most reliable. The coefficient of determination for the model indicates how well all of the variables measure p*, and we find its value is 0.906.[6]

While the single best single measure of p* in this sample is the Coldwell Banker price index, the three series in combination yield a better indicator. The result of the factor score regression are used to create our underlying index p*. The weights (rescaled so that their sum is 1.0) are: w-CB = 0.381, w-CC = 0.354, w-NAR = 0.266. To extend the results to cities where less than three series are available, we use an ad hoc technique of weighting any two price series in the same proportion as the estimated weights. For example, if only NAR and CB data are present for a locality in some year, these indexes are weighted as:

NAR: w-NAR/(w-NAR + w-CB) = 0.429

CB: w-CB/(w-NAR + w-CB) = 0.571.

If only one index is available, that series is used.

We report in Table 2 the house price index for 135 localities that are MSAs or part of an MSA. Often a survey skipped a city or began its data collection after 1982. Forty-four localities have a consistent combination of underlying price indexes between 1982 and 1991. In the other 91, the available series change in at least one year, possibly inducing error in p^* at the time of the change. To determine the level of a series, we always use the latest year in which the greatest number of component series are available. In years of transition between series, we set the price change equal to that of the underlying time-consistent series.[7] The resultant series are smoothed because the errors created by switching components are reduced. Table 3 lists the various combinations of the three price series that generate p^* allowing the reader to judge the likelihood that a change in p^* results from a change in the composition of the index.

[INSERT TABLES 2 AND 3 SEQUENTIALLY ABOUT HERE]

Space limits discussion of individual city data. However, a few comparisons with the data reported by other authors in this issue are in order. These include Hartford (Clapp, Giacotto, and Tirtiroglu, 1991) for 1981-88, San Francisco and Oakland (Meece and Wallace, 1991) for 1982-88, and Houston (Smith and Tesarek, 1991) for 1982-89. C-G-T find a 90% nominal increase; we have a

75% increase. Meece and Wallace report 106% and 77% increases, respectively, in San Francisco and Oakland during the 1982-88 period. Our estimates are increases of 123% and 41%, respectively. On average, then, the two increases are about the same, but individually the increases differ considerably (especially for Oakland). Smith and Tesarek compute a 25% real decline between 1984 and 1987; our calculation is a 21% real decline.

Low cost urban areas in 1991 include some of the Oil/Mineral Extraction cities (Tulsa, Oklahoma City, Omaha, Lincoln, and San Antonio) and economically depressed Rapid City and Youngstown. At the other extreme, relative large urban areas with high nominal house prices include San Francisco (and its suburbs San Rafael and Walnut Creek), Honolulu, Oakland, and Stamford.[8] The variation in real house prices across cities is undoubtably lower than that in nominal prices owing to the positive cross-sectional correlation of the prices of houses and other goods.

Regional House Price Series

While the primary value of our data likely lies in their individual variation, we briefly summarize some regional series. The U.S. was divided into eight regions by Salomon Brothers (Hartzell, Shulman, and Wertzebach, 1988), these regions being defined to be more homogeneous than the Census regional breakdown. Our regional indexes are population-weighted averages of the local house prices observed in all localities in the region, where the 1986 population data are from the bureau of

Census (1988).[9]

Table 4 presents population-weighted nominal house price levels for the eight regions in 1989 based upon an assumed average price of $100,000 in the 33 cities where all three price indexes are available (the number of cities in each region is also listed). Nominal house price levels are highest in the Northern California, including the Northwest, the Mid-Atlantic corridor and New England, followed by Southern California, including the Southwest. Next are the Industrial Midwest and Old South, and prices are lowest in the Farmbelt and Oil/Mineral Extraction areas. The third column lists the number of 1990 jobs in each region; these numbers used as weights in the construction of a national house price index.

[INSERT TABLE 4]

To compare price movements in these eight regions over the last decade, we have scaled prices to 1.0 in 1982 and have plotted the resultant series in Figure 2. As can be seen, the increase in nominal house prices in the New England region was the largest of any (92%) during the 1982-1991 period. Following New England were Northern California (81%), the Mid-Atlantic corridor (69%), and Southern California (54%). Next come the Industrial Midwest (48%) and the Old South (31%), and last are the Farmbelt (15%) and Oil/Mineral Extraction region (5%). Within regions, the largest nominal increases are found in 1983 through 1987 in New England and the Mid-Atlantic corridor, and in 1986-87 through 1989 in the West (both Northern and Southern

California). Moderate decreases in nominal house prices occurred for New England and the Mid-Atlantic (1989-91) and the Oil/Mineral Extraction region (1985-88).

[INSERT FIGURE 2]

The regional difference in nominal house prices increased between 1982 and 1991, rising from a 59% differential to 164% (Northern California compared to Farmbelt in both cases, although Northern California prices were below New England prices in the 1986-88 period). Further research is required to understand the causes of this divergence in house prices.

We have also computed population-weighted averages for the four census regions. The levels, from a base of 1.0 in early 1982, for the 1982-91 period are plotted in Figure 3. Northeast prices grew especially rapidly through 1987, and West prices grew relatively rapidly after 1987. Prices in the Midwest were flat through 1984, and those in the South have been sluggish throughout the entire period.

Table 5 compares increases in our regional series during the 1984-89 period (midyear to midyear) with those of Abraham and Schauman (1991) and the Commerce Department's constant quality index (the latter two series growth rates are from A-S's Table 4). As can be seen, the A-S series grow more rapidly than ours in all regions and the difference is 3.2 to 4.5% per year in all regions except the Midwest. In contrast, our series increases less rapidly than the constant quality series in two regions and more rapidly in the other two, with the largest difference in annual growth rate being 2.7%.

National House Prices

We have computed two average national series by weighting our eight regional series by the number of jobs in the eight regions in 1990 (Salomon Brothers, 1990, p. 20) and our four regional series by population in the regions in 1986. (We first obtain mean price levels during each year by averaging beginning and end of year data.) These series and a comparable one drawn from Peek and Wilcox (1991) are plotted in Figure 3, scaled to equal 1.0 in 1984. As can be seen, the series rise smoothly and similarly between 1982 and 1987, after which both of our series taper off but the P-W series does not. For the 1984-89 period, our 8-region series rises by 5 percentage points less than the P-W series, and our 4-region series rises by 10 percentage points less. These differences cast further doubt on the house price acceleration in the late 1980s indicated by the Freddie Mac repeat-sales index.

[INSERT FIGURE 3]

Conclusion

We have used three published house price series to compute "best" annual indexes for 135 local areas for the 1982-91 period. The series utilized are those reported by the American Chamber of Commerce, Coldwell Banker, and the National Association of Realtors. For selected cities, we compare our indexes with those of other authors in this volume, usually finding reasonably comparable results.

The local series have been utilized to compute two sets of regional price series based on the four regions of the Bureau of Census and the eight regions of Salomon Brothers. Rates of increase in the four census regions during the 1984-89 period are then compared with the Census Bureau constant-quality regional series and series computed by Abraham and Schauman (1991). Our rates of increase are generally comparable to those of the Census Bureau, but much lower than those of A&S.

The regional data sets are then further aggregated into two annual series, and the increases between 1982 and 1989 are compared with the annual series calculated by Peek and Wilcox (1991), based on the Freddie Mac repeat sale index of A&S. Our series increase comparably with the P-W series during the 1982-87 period, but the P-W series grows much more rapidly since then. Both our regional and annual calculations cast doubt on the rapid appreciation of house prices recorded in the Freddie-Mac repeat-sale index in recent years.

FOOTNOTES

1. The size increased to four bedrooms and 2200 square feet in 1990.

2. In 1989, the size of the lot changed to 8000 square feet. Many additional requirements on structural characteristics are imposed before a sale is included in the sample. Further details are given in the ACCRA Cost of Living Index Manual, pp. 2.11-2.15, 1988.

3. The model is also an example of confirmatory factor analysis. A straightforward introduction is in Long (1983).

4. In the estimation, variables are measured as deviations from their mean. We find that for these adjusted series, the standard deviation of CB is largest (0.29) and of CC is smallest (0.20). The covariance matrix among the three variables contains six elements: (CB,CB)=0.0859, (CC,CC)=0.0417, (NAR,NAR)=0.0549, (CB,CC)= 0.0464, (NAR,CB) = 0.0520, (CC,NAR)=0.0343. An alternative method of deriving covariances is to select all pairwise elements (any observation with two of the three series observed), yielding the advantage of using more of the observed data; however, this procedure can result in estimation problems.

5. The level of the coefficients is not particularly meaningful because of the indeterminacy of the scaling of p^*.

6. We note that p^* is simply the underlying series that generates the observed data; we cannot claim that it is the "true" house price series for the locality.

7. For example, if a location has two series until 1986 and then all three, the level of the series is set by the value in 1991. Data for 1986 to 1991 are consistent, so we compute levels backward from 1991 using percentage changes. Price increases for 1982 to 1985 are also internally consistent, but the 1985 and 1986 series are not. To calculate the 1985-86 transition, we compare the result for the two series that existed in 1985 to the result for 1986 using these same two series. This percentage change is then applied to the 1986 three-component series yielding a 1985 value. Then the percentage changes from 1982 to 1985 for the two-component series are used to calculate backwards the remainder of the

values.

8. We remind the reader that our list of cities is not comprehensive. A number of major metropolitan areas are omitted (New York, Los Angeles) because the sampled areas within the MSA changed during the 1982-91 period.

9. Our population weights are derived using cities rather than MSAs. Even with this restriction, almost a fifth of the U.S. population resides in our 135 cities. Because the underlying house price series are based on a broader concept of locality than the jurisdictional boundaries of a city, the local series we report are generally applicable to urbanized areas.

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Figure 1.
Measurement Model for House Prices

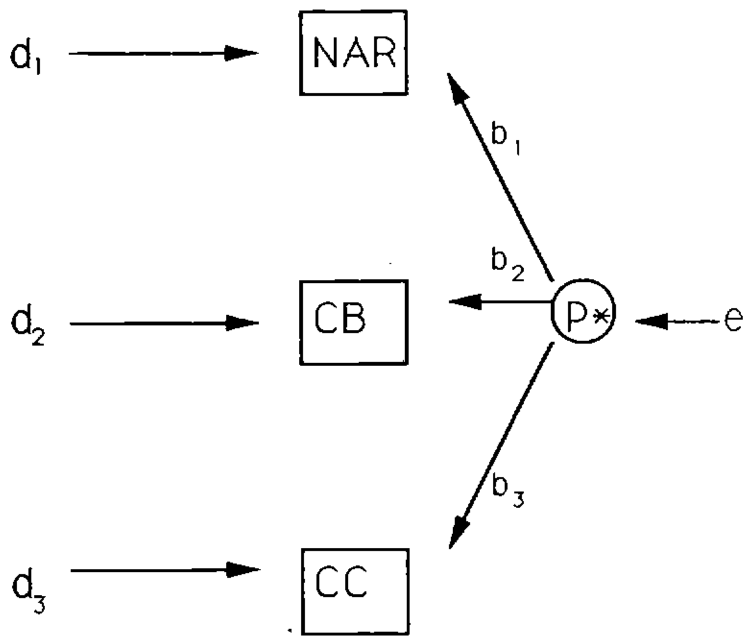

Figure 2.
Regional House Price Series

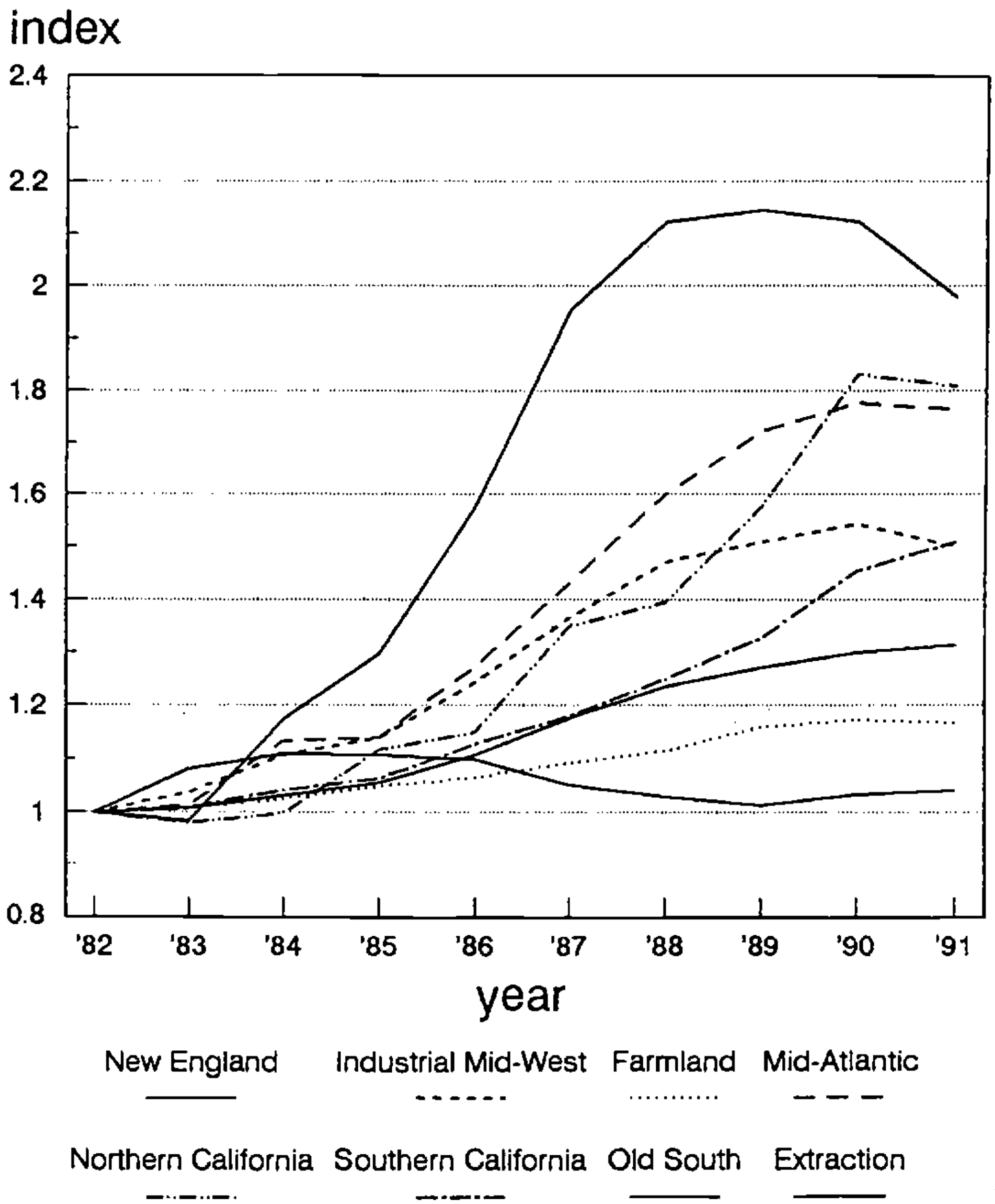

Figure 3.
Regional House Price Series

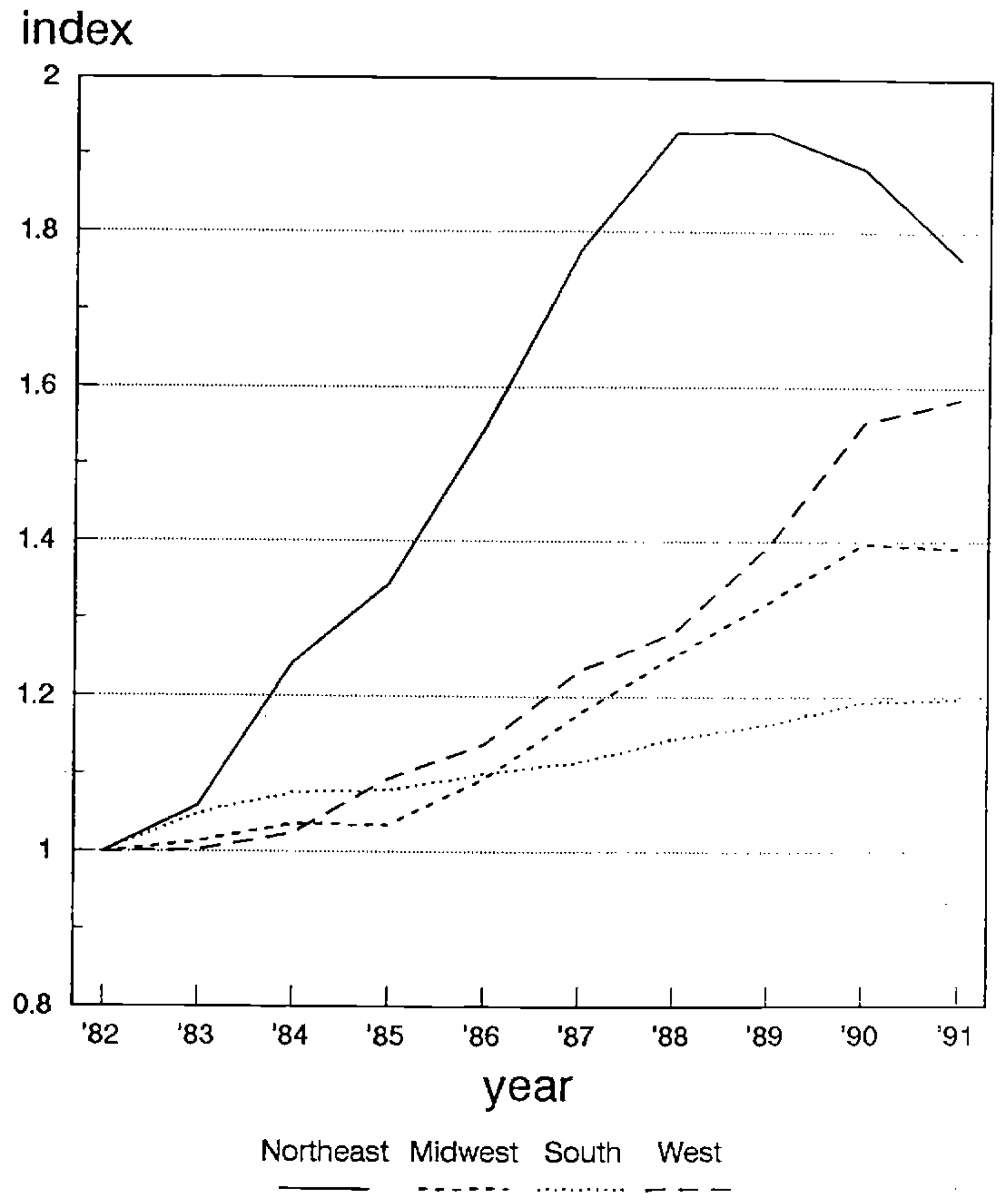

Figure 4.
National Average House Price Series

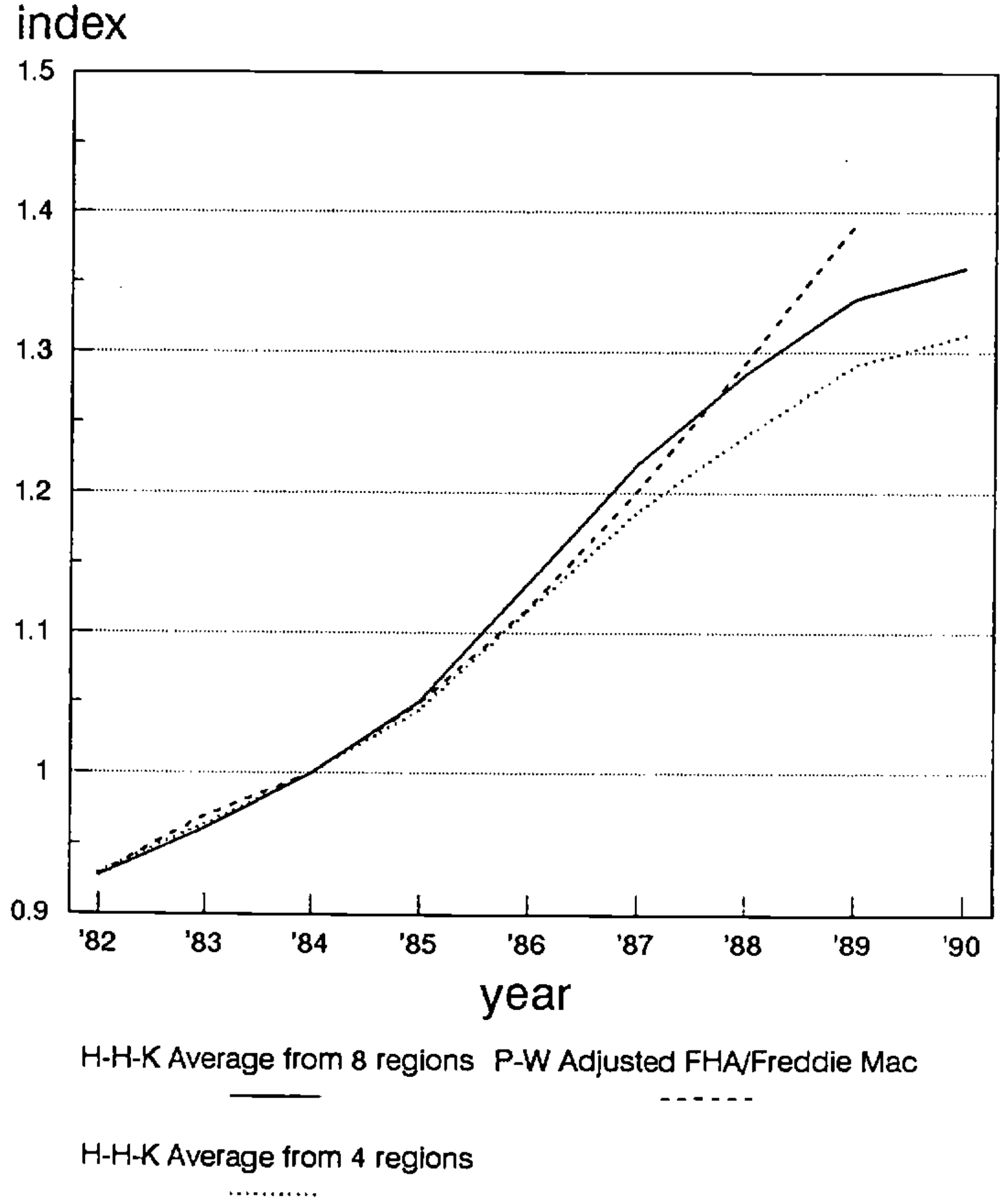

Table 1

Mean Cumulative Changes in House Price Series

	1982-91			1985-91		
	Location	Unweighted	Weighted	Location	Unweighted	Weighted
CB-CC	33			40		
CB		.488	.338		.315	.220
CC		.327	.262		.269	.213
significance prob.		.070			.350	
CB-NAR	33			38		
CB		.444	.419		.356	.305
NAR		.173	.162		.141	.114
significance prob.		.000			.000	
CC-NAR	22			29		
CC		.259	.208		.269	.219
NAR		.077	.026		.132	.096
significance prob.		.000			.000	

The significance probability is the probability under which the null hypothesis of the two means being equal is true. A probability less than 0.05 means that we cannot accept the hypothesis that the two means are equal.

Table 2

Nominal House Price Indexes for 135 U.S. Localities

Year	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
<u>New England</u>										
Hartford	1.06	1.05	1.07	1.07	1.27	1.48	1.90	1.85	1.82	1.81
Boston	1.02	1.02	1.34	1.56	1.80	2.09	2.13	2.11	2.05	1.84
Manchester	0.74	0.74	0.75	0.75	1.07	1.51	1.69	1.73	1.65	1.57
Providence	0.88	0.77	0.82	0.82	1.03	1.50	1.81	1.84	1.86	1.95
Burlington	0.51	0.51	0.57	0.57	0.83	0.97	1.09	1.34	1.51	1.42
<u>Industrial Midwest</u>										
Champaign	0.69	0.69	0.66	0.78	0.75	0.82	0.88	0.96	1.03	1.04
Chicago	0.93	0.95	1.02	1.01	1.11	1.19	1.31	1.43	1.56	1.45
Decatur	0.67	0.63	0.63	0.65	0.65	0.78	0.78	0.84	0.86	0.84
Springfield	0.67	0.65	0.64	0.55	0.75	0.84	0.89	0.99	1.00	1.02
Bloomington	0.60	0.65	0.65	0.69	0.70	0.78	0.81	0.87	0.96	1.03
Fort Wayne	0.66	0.66	0.67	0.68	0.75	0.83	0.82	0.95	1.00	1.12
Indianapolis	0.74	0.76	0.76	0.77	0.77	0.84	0.85	0.91	0.97	0.98
South Bend	0.62	0.60	0.62	0.64	0.67	0.70	0.76	0.79	0.84	0.85
Detroit	0.75	0.72	0.72	0.73	0.88	1.02	1.11	1.10	1.13	1.15
Grand Rapids	0.85	0.85	0.87	0.86	0.98	1.08	1.14	1.10	1.20	1.12
Lansing	0.76	0.76	0.76	0.76	0.76	0.82	0.85	0.96	0.99	1.03
Minneapolis	1.06	1.11	1.11	1.00	1.02	1.12	1.18	1.23	1.27	1.31
St. Paul	1.05	1.11	1.02	0.91	0.94	1.04	1.07	1.07	1.11	1.16
St. Louis	0.72	0.72	0.71	0.72	0.79	0.85	0.88	0.92	0.94	0.90
Albany	0.65	0.66	0.74	0.78	0.93	1.09	1.13	1.21	1.17	1.21
Binghamton	0.68	0.62	0.74	0.85	0.82	0.89	1.06	1.06	1.07	1.06
Buffalo	0.58	0.63	0.71	0.73	0.71	0.78	0.89	0.98	1.16	1.21
Rochester	0.76	0.81	0.85	0.92	1.01	1.06	1.13	1.20	1.21	1.22
Syracuse	0.62	0.63	0.69	0.68	0.72	0.74	0.75	0.84	1.01	1.02
Akron	0.65	0.65	0.62	0.73	0.72	0.81	0.84	0.85	0.88	0.98
Cincinnati	0.79	0.80	0.80	0.81	0.83	0.91	0.96	1.05	1.15	1.22
Cleveland	0.89	0.89	0.87	0.88	0.84	0.96	0.98	0.98	1.04	1.05
Columbus	0.90	0.96	0.98	0.88	0.87	0.92	1.00	1.07	1.13	1.20
Dayton	0.64	0.64	0.67	0.68	0.71	0.78	0.83	0.94	1.00	1.05
Youngstown	0.71	0.70	0.70	0.73	0.73	0.72	0.73	0.74	0.77	0.82
Harrisburg	0.70	0.73	0.76	0.76	0.84	0.97	0.97	1.06	1.22	1.25
Pittsburgh	0.65	0.67	0.69	0.69	0.87	0.93	1.01	0.96	1.04	1.13
York	0.78	0.79	0.82	0.85	0.87	0.88	0.89	0.98	1.07	1.17
Charleston	0.79	0.78	0.76	0.78	0.82	0.85	0.90	0.92	1.03	1.06
Green Bay	0.71	0.71	0.73	0.77	0.80	0.82	0.87	0.84	0.86	0.93
Janesville	0.72	0.66	0.71	0.73	0.75	0.74	0.80	0.87	1.08	1.06
La Crosse	0.84	0.81	0.83	0.89	0.75	0.79	0.81	0.82	0.80	0.92
Madison	0.62	0.66	0.66	0.65	0.69	0.76	0.81	0.88	0.95	1.07
Milwaukee	0.87	0.86	0.89	0.85	0.90	0.92	0.99	1.03	1.08	1.10
New London	0.69	0.80	0.79	0.83	0.85	0.88	0.89	0.88	0.89	0.92
Wausau	0.84	0.92	0.78	0.86	0.71	0.83	0.94	1.02	1.29	1.29
<u>Mid-Atlantic</u>										
Stamford	1.12	1.12	1.31	1.45	1.96	2.77	2.98	3.18	3.21	2.86
Wilmington	0.91	0.94	1.00	1.12	1.08	1.16	1.30	1.36	1.39	1.43
Washington	1.33	1.33	1.34	1.25	1.33	1.35	1.66	1.77	1.75	1.72
Baltimore	0.88	0.90	0.94	0.94	1.00	1.10	1.23	1.42	1.50	1.57
Long Island	1.35	1.53	1.84	2.06	2.36	2.67	2.89	2.75	2.44	2.12
Philadelphia	0.71	0.72	0.87	0.89	1.03	1.20	1.31	1.38	1.42	1.38

Old South										
Birmingham	0.76	0.75	0.80	0.81	0.86	0.87	0.95	0.99	1.01	1.03
Huntsville	0.74	0.79	0.79	0.84	0.94	0.92	0.91	1.04	1.11	1.17
Mobile	0.66	0.67	0.70	0.72	0.73	0.75	0.79	0.81	0.84	0.89
Little Rock	0.72	0.72	0.74	0.76	0.75	0.82	0.85	0.85	0.88	0.88
Ft. Lauderdale	1.11	1.07	1.00	0.98	1.11	1.14	1.16	1.17	1.19	1.18
Jacksonville	0.70	0.73	0.76	0.79	0.83	0.85	0.88	0.88	0.89	0.88
Lakeland	0.59	0.69	0.72	0.71	0.73	0.82	0.88	0.96	0.93	0.96
Miami	1.04	1.01	0.98	0.99	1.06	1.04	1.11	1.13	1.20	1.19
Orlando	0.82	0.82	0.89	0.96	0.95	1.00	1.05	1.06	1.08	1.11
Tampa	0.96	0.92	0.95	0.93	0.95	0.99	1.00	1.12	1.12	1.08
West Palm Beach	1.10	1.04	1.01	0.99	1.03	1.17	1.12	1.36	1.30	1.32
Americus	0.87	0.74	0.70	0.79	0.69	0.76	0.78	0.77	0.85	0.89
Atlanta	0.84	0.82	0.83	0.84	0.93	1.02	1.11	1.04	1.08	1.05
Columbus	0.68	0.63	0.71	0.72	0.76	0.84	0.85	0.93	0.96	0.99
Macon	0.78	0.74	0.81	0.78	0.77	0.83	0.86	0.86	0.89	1.00
Savannah	0.63	0.66	0.67	0.64	0.81	0.84	0.86	0.85	0.91	0.91
Lexington	0.74	0.78	0.83	0.85	0.86	0.90	1.00	0.99	1.02	0.99
Louisville	0.65	0.70	0.68	0.68	0.68	0.77	0.80	0.83	0.86	0.94
Jackson	0.61	0.63	0.63	0.64	0.66	0.70	0.78	0.80	0.80	0.87
Charlotte	0.78	0.81	0.86	0.92	0.92	0.95	1.03	1.08	1.16	1.16
Raleigh	0.85	0.90	0.81	0.91	1.02	1.09	1.10	1.16	1.19	1.11
Winston-Salem	0.67	0.68	0.70	0.74	0.75	0.91	0.94	0.97	0.97	1.06
Charleston	0.79	0.76	0.85	0.88	0.89	0.96	0.97	0.97	1.00	0.97
Columbua	0.71	0.71	0.76	0.76	0.77	0.89	0.95	1.00	1.11	1.15
Chattanooga	0.69	0.65	0.67	0.67	0.70	0.75	0.81	0.84	0.84	0.88
Knoxville	0.75	0.75	0.77	0.73	0.73	0.81	0.83	0.91	0.88	0.93
Memphis	0.82	0.83	0.84	0.88	0.89	0.92	0.99	0.94	0.94	0.88
Nashville	0.72	0.74	0.74	0.78	0.90	0.99	1.04	1.12	1.09	1.08
Norfolk	0.79	0.85	0.93	0.88	0.95	1.04	1.10	1.13	1.16	1.11
Richmond	0.99	0.94	0.89	0.89	0.83	0.93	0.95	1.06	1.06	1.30
Roanoke	0.94	0.84	0.88	0.97	0.95	0.96	0.90	1.10	1.11	1.13
Farmbelt										
Des Moines	0.85	0.85	0.84	0.83	0.94	0.93	0.94	0.95	0.99	1.00
Topeka	0.83	0.82	0.85	0.84	0.85	0.86	0.87	0.92	0.88	0.89
Wichita	0.96	0.89	0.88	0.96	0.83	0.76	0.82	0.89	0.91	0.91
Columbia	0.67	0.65	0.75	0.77	0.73	0.77	0.81	0.85	0.87	0.89
Kansas City	0.76	0.80	0.81	0.84	0.85	0.89	0.89	0.90	0.89	0.91
Lincoln	0.78	0.74	0.77	0.79	0.81	0.81	0.81	0.81	0.83	0.84
Omaha	0.68	0.69	0.73	0.74	0.74	0.76	0.77	0.82	0.84	0.82
Fargo	0.71	0.75	0.88	0.88	0.94	0.95	0.96	1.00	1.01	0.93
Rapid City	0.62	0.83	0.73	0.76	0.68	0.73	0.77	0.83	0.84	0.84

<u>Mineral Extraction</u>										
Anchorage	1.30	1.40	1.32	1.64	1.66	1.43	1.34	1.09	1.01	1.24
Colorado Springs	0.66	0.70	0.72	0.72	0.75	0.68	0.78	0.83	0.82	0.95
Denver	1.05	1.07	1.10	1.13	1.09	1.04	1.04	1.12	1.11	1.12
Boise	0.84	0.76	0.76	0.75	0.80	0.90	0.90	0.85	0.91	1.09
Baton Rouge	0.92	0.92	0.93	0.90	0.93	0.85	0.84	0.77	0.81	0.83
New Orleans	0.86	0.87	0.89	0.89	0.87	0.83	0.83	0.90	0.90	0.89
Billings	0.75	0.90	0.92	0.94	0.89	0.81	0.79	0.86	0.86	1.02
Great Falls	0.73	0.70	0.81	0.81	0.80	0.81	0.84	0.86	0.86	0.92
Albuquerque	0.80	0.82	0.85	0.88	0.96	1.03	1.01	1.02	1.04	1.03
Oklahoma City	0.77	0.82	0.82	0.74	0.76	0.74	0.72	0.66	0.68	0.69
Tulsa	0.74	0.76	0.79	0.81	0.86	0.82	0.79	0.74	0.72	0.69
Austin	0.71	0.78	0.83	0.96	1.12	1.02	0.96	0.82	0.76	0.82
Dallas	0.97	1.33	1.41	1.28	1.21	1.19	1.11	1.04	1.05	1.02
El Paso	0.75	0.81	0.77	0.78	0.84	0.81	0.80	0.83	0.88	0.87
Ft. Worth	0.75	0.80	0.89	0.90	0.92	0.92	0.92	0.91	0.92	0.80
Harlingen	0.74	0.91	0.83	0.82	0.78	0.73	0.75	0.72	0.71	0.76
Houston	1.00	1.04	0.99	0.96	0.84	0.78	0.77	0.79	0.87	0.89
Killeen	0.71	0.68	0.69	0.81	0.78	0.84	0.83	0.79	0.74	0.75
Lubbock	0.60	0.64	0.75	0.81	0.79	0.71	0.74	0.81	0.82	0.85
Odessa	0.91	1.03	0.92	0.82	0.83	0.80	0.80	0.79	0.83	0.90
Plano	0.92	0.93	0.99	1.04	1.11	1.11	1.08	1.10	1.11	1.10
San Ontonio	0.72	0.77	0.84	0.87	0.86	0.83	0.81	0.77	0.78	0.73
Tyler	0.71	0.76	0.80	0.81	0.81	0.72	0.74	0.74	0.74	0.79
Salt Lake City	0.75	0.75	0.79	0.83	0.93	0.94	0.92	0.93	0.96	0.94
Casper	0.87	0.87	0.77	0.76	0.74	0.71	0.69	0.71	0.80	0.96
Cheyenne	0.66	0.66	0.54	0.57	0.96	0.96	0.95	1.10	1.12	1.38
<u>Northern California</u>										
Oakland	1.85	1.95	1.67	1.71	1.97	2.32	2.44	2.61	2.90	2.88
Sacramento	0.71	0.72	0.83	0.83	0.99	1.06	1.19	1.33	1.50	1.70
San Francisco	1.79	1.69	1.81	2.47	2.66	3.03	3.32	4.09	4.55	4.33
San Jose	1.26	1.31	1.31	1.56	1.42	2.14	2.02	2.25	2.94	2.61
San Rafael	1.95	1.76	1.77	1.88	1.76	1.99	2.23	2.67	3.20	3.27
Walnut Creek	1.11	1.22	1.22	1.28	1.36	1.72	1.95	2.34	2.84	3.09
Reno	0.88	0.93	1.03	1.06	1.06	1.07	1.11	1.17	1.25	1.30
Eugene	0.92	0.79	0.72	0.72	0.70	0.75	0.78	0.86	0.94	1.01
Portland	0.89	0.82	0.84	0.81	0.76	0.87	0.84	0.94	1.02	1.08
Seattle	1.04	1.00	1.00	1.04	1.04	1.05	1.08	1.16	1.40	1.44
Spokane	0.71	0.71	0.71	0.72	0.75	0.78	0.77	0.74	0.78	0.91
Tacoma	1.05	0.87	0.91	0.88	0.94	0.92	0.94	0.95	0.97	1.10
Yakima	0.72	0.81	0.83	0.86	0.87	0.89	0.87	0.90	0.91	0.98
<u>Southern California</u>										
Phoenix	0.84	0.78	0.89	0.91	0.95	0.96	0.99	0.96	0.96	0.98
Tuscon	0.87	0.80	0.79	0.78	0.82	0.86	0.89	0.94	0.91	0.97
Blythe	0.64	0.64	0.64	0.80	0.76	0.76	1.05	1.06	1.15	1.21
Palm Springs	1.17	1.16	1.10	1.20	1.35	1.36	1.40	1.29	1.39	1.58
Riverside	1.15	1.16	1.16	1.02	1.48	1.45	1.47	1.40	1.55	1.66
San Diego	1.13	1.31	1.28	1.38	1.42	1.50	1.68	1.93	2.32	2.37
Visalia	0.99	0.85	0.92	0.86	0.86	0.96	0.87	0.97	1.04	1.35
Honolulu	2.34	2.11	2.11	2.04	2.04	2.28	2.56	2.90	3.30	3.58
Las Vegas	0.95	0.93	0.96	0.92	0.99	1.01	1.02	1.06	1.10	1.17

Table 3:
Price Series Used in Computation of City Index

	82	83	84	85	86	87	88	89	90	91
New England										
Hartford	3	3	1	1	1	1	3	1	3	1
Boston	3	3	3	3	3	3	4	7	7	7
Manchester	5	5	5	5	5	5	2	2	2	2
Providence	3	3	3	3	3	3	3	3	3	3
Burlington	5	2	5	5	5	5	5	5	5	5
Industrial Midwest										
Champaign	6	6	6	6	6	6	6	6	4	4
Chicago	3	3	3	3	3	3	3	3	3	7
Decatur	6	6	6	6	6	6	6	6	6	6
Springfield	2	2	2	5	2	2	2	2	6	6
Bloomington	6	6	6	6	6	6	6	6	6	6
Fort Wayne	2	2	2	2	2	5	5	2	2	2
Indianapolis	1	1	1	1	1	1	1	1	4	4
South Bend	6	6	6	6	6	2	2	2	1	1
Detroit	3	3	3	3	3	3	7	7	7	7
Grand Rapids	3	3	3	3	3	3	3	3	1	1
Lansing	6	4	4	4	4	3	1	7	7	4
Minneapolis	1	3	3	3	3	3	3	1	1	1
St. Paul	5	2	2	5	5	2	2	2	2	2
St. Louis	1	1	1	1	1	1	1	1	1	1
Albany	3	3	3	7	7	4	7	4	4	4
Binghamton	6	6	6	6	6	6	6	6	6	6
Buffalo	2	1	1	1	1	1	1	1	1	1
Rochester	3	3	3	3	3	3	3	3	3	3
Syracuse	4	7	4	4	4	4	4	4	4	4
Akron	1	1	4	4	4	1	1	1	1	1
Cincinnati	5	1	1	1	1	1	1	1	1	1
Cleveland	5	3	3	3	1	3	3	1	3	1
Columbus	1	1	1	1	1	1	1	1	1	1
Dayton	2	2	2	5	5	2	5	2	3	1
Youngstown	6	6	6	6	6	6	6	6	4	4
Harrisburg	2	2	2	2	2	2	2	2	2	5
Pittsburgh	5	5	5	2	5	5	5	2	1	1
York	6	6	6	6	6	2	2	5	5	5
Charleston	2	2	2	2	2	2	2	2	1	1
Green Bay	6	6	6	6	6	2	2	2	1	1
Janesville	6	6	6	6	6	6	6	6	6	6
La Crosse	6	6	6	6	6	6	6	6	6	6
Madison	2	2	5	5	5	5	5	5	3	3
Milwaukee	3	3	3	3	3	3	3	3	3	3
New London	6	6	6	6	6	6	6	6	6	6
Wausau	6	6	6	6	6	6	6	6	6	6
Mid-Atlantic										
Stamford	5	5	5	5	5	5	5	5	5	5
Wilmington	5	5	5	5	2	5	2	2	4	4
Washington	3	3	3	3	4	7	7	7	7	7
Baltimore	1	1	3	1	1	1	1	3	1	3
Long Island	3	3	3	3	7	7	7	7	4	4
Philadelphia	3	3	3	3	1	1	1	1	1	1

<u>Mineral Extraction</u>										
Anchorage	5	5	2	2	2	2	2	5	2	2
Colorado Springs	2	2	2	2	2	5	2	2	2	2
Denver	1	1	1	1	1	1	1	1	1	1
Boise	2	2	5	5	2	5	2	5	2	2
Baton Rouge	6	2	2	2	2	2	2	2	1	3
New Orleans	2	2	2	2	2	2	2	6	4	4
Billings	2	2	2	2	2	2	5	5	5	5
Great Falls	2	2	2	2	2	2	2	2	5	5
Albuquerque	1	1	3	1	1	1	1	1	1	1
Oklahoma City	1	1	1	1	1	1	1	1	1	1
Tulsa	1	1	1	3	3	3	3	1	1	1
Austin	5	5	5	2	2	2	5	2	5	5
Dallas	5	5	5	5	2	2	2	2	1	1
El Paso	1	3	1	3	3	1	1	1	1	1
Ft. Worth	2	2	2	2	5	2	2	5	1	3
Harlingen	6	6	6	6	6	6	6	6	6	6
Houston	1	1	1	1	1	1	1	1	1	1
Killeen	6	6	6	6	6	6	6	6	6	6
Lubbock	6	6	6	6	6	6	6	6	6	6
Odessa	6	6	6	6	6	6	6	6	6	6
Plano	6	2	2	2	5	5	5	5	5	5
San Antonio	1	1	1	1	1	1	1	1	1	1
Tyler	6	6	6	6	6	6	6	6	6	6
Salt Lake City	1	1	1	1	1	1	1	1	1	1
Casper	6	6	6	6	6	6	6	6	6	6
Cheyenne	5	5	5	5	5	5	5	5	5	5
<u>Northern California</u>										
Oakland	5	5	5	5	5	5	5	5	5	5
Sacramento	2	2	2	5	2	2	2	2	3	1
San Francisco	3	1	1	1	3	3	3	3	3	3
San Jose	2	5	2	2	2	5	2	2	2	5
San Rafael	5	5	5	5	5	5	5	5	5	5
Walnut Creek	5	5	5	5	5	5	5	5	5	5
Reno	2	2	2	2	2	2	2	2	1	1
Eugene	5	5	5	5	5	5	2	2	1	1
Portland	2	1	1	1	3	1	1	1	3	1
Seattle	5	5	5	2	2	2	2	2	1	1
Spokane	5	5	5	2	2	2	2	2	1	1
Tacoma	6	6	6	6	2	2	2	2	1	1
Yakima	6	6	6	6	6	6	6	6	6	6
<u>Southern California</u>										
Phoenix	2	1	3	1	1	1	1	1	1	1
Tucson	5	5	2	2	2	5	5	2	2	2
Blythe	6	6	6	6	6	6	6	6	6	6
Palm Springs	6	6	6	6	6	6	6	6	6	6
Riverside	6	6	2	2	2	2	2	2	1	1
San Diego	6	1	4	4	4	4	4	4	4	4
Visalia	6	6	6	6	6	6	6	6	6	6
Honolulu	5	5	5	5	5	5	5	5	3	3
Las Vegas	1	1	3	1	1	3	1	1	1	1

Code:

1 - Coldwell Banker, Chamber of Commerce, NAR
2 - Coldwell Banker, Chamber of Commerce
3 - Coldwell Banker, NAR
4 - Chamber of Commerce, NAR
5 - Coldwell Banker
6 - Chamber of Commerce
7 - NAR

Old South

Birmingham	1	1	1	1	1	1	1	1	1	1
Huntsville	6	6	6	6	6	6	6	6	6	6
Mobile	2	2	2	2	6	2	2	2	1	1
Little Rock	5	2	5	5	5	5	5	5	1	1
Ft. Lauderdale	1	1	3	1	1	3	3	3	3	3
Jacksonville	3	3	1	1	1	3	1	1	1	1
Lakeland	6	6	6	6	6	6	6	6	6	6
Miami	3	1	1	1	1	1	1	1	1	1
Orlando	3	1	1	1	3	1	3	1	1	1
Tampa	3	3	3	3	3	3	3	3	3	3
West Palm Beach	7	4	1	3	1	3	1	3	3	1
Americus	6	6	6	6	6	6	6	6	6	6
Atlanta	5	2	2	2	2	2	2	2	1	1
Columbus	2	2	2	2	2	2	5	5	5	6
Macon	6	6	6	6	6	6	6	6	6	6
Savannah	5	5	5	5	5	5	5	5	2	2
Lexington	6	6	6	6	6	6	6	6	4	4
Louisville	1	1	1	1	1	1	1	1	1	1
Jackson	5	5	5	5	5	5	5	5	3	3
Charlotte	2	2	2	2	2	2	2	2	1	1
Raleigh	5	5	2	2	2	2	2	2	2	2
Winston-Salem	6	6	6	6	6	6	2	2	2	2
Charleston	4	4	7	4	3	3	1	1	3	1
Columbia	2	5	5	2	2	2	2	2	1	1
Chattanooga	6	4	4	7	4	4	4	4	4	4
Knoxville	7	4	4	7	4	4	4	4	4	4
Memphis	1	3	1	1	1	1	1	1	1	1
Nashville	1	1	1	1	1	1	1	1	1	1
Norfolk	2	2	2	2	5	5	5	5	5	5
Richmond	5	5	5	2	2	5	2	2	1	1
Roanoke	6	6	6	6	6	6	6	6	6	6

Farmbelt

Des Moines	3	3	3	1	4	1	3	3	3	3
Topeka	5	5	5	5	5	5	5	5	5	5
Wichita	5	2	2	2	2	5	2	2	1	1
Columbia	6	6	6	6	6	6	6	6	6	6
Kansas City	1	1	3	1	3	3	3	1	1	1
Lincoln	6	6	6	6	6	6	6	6	4	4
Omaha	1	1	1	1	1	1	1	1	1	1
Fargo	5	5	5	5	5	5	5	5	1	3
Rapid City	2	6	6	6	2	2	2	2	2	2

Table 4

Population-Weighted Constant Quality House Prices for Eight Regions, 1989

	No. of Cities	Average Price	1990 Jobs in Region (mil.)
New England	5	196,519	3.38
Industrial Midwest	36	111,825	18.19
Mid-Atlantic Corridor	6	207,706	13.92
Old South	31	99,312	10.25
Farm Belt	9	87,870	1.60
Mineral Extraction	26	86,776	7.70
Northern California	13	208,723	5.34
Southern California	9	154,132	9.48
total or average	135		69.87

Table 5

Annual Rate of Region Price Increase, 1984-89

	AS	HHK	CQ
Northeast	12.8	8.3	8.6
North Central	6.4	5.6	3.4
South	5.2	2.0	2.7
West	10.9	6.7	4.0

Sources: AS and CQ from Abraham and Schauman (this issue, table 4); HHK computed by the authors.