# ECONOMETRIC MODELS OF ELEVEN SINGLE FAMILY HOUSING MARKETS

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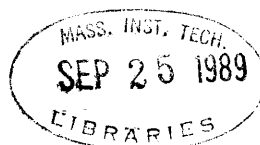Department of Urban Studies and Planning
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## ABSTRACT

Using data from 1960 through 1988 on prices, building permits, level of economic activity, and demographic characteristics in 14 metropolitan areas, we developed and estimated econometric models for the single family housing market. The areas studied were: New York, Chicago, Detroit, Denver, Houston, San Francisco, Minneapolis, Philadelphia, Cleveland, Los Angeles, Dallas, Atlanta, Boston, and Baltimore. We used the models to make an eleven year (1989-1999) forecast of real housing prices and building permits in eleven of the fourteen metropolitan areas. We were unable to obtain reasonable estimation results for Chicago, Detroit, and New York and so did not make forecasts for these three cities.

Based upon our forecasts, real prices will rise over the next decade, with or without recession, in Dallas, Houston, Denver, Cleveland, San Francisco, Boston, Los Angeles, Philadelphia, and Baltimore. Real prices will decline in Minneapolis and Atlanta. The level of construction will rise in Dallas, Houston, Cleveland, Boston, Philadelphia, Baltimore, Minneapolis, and Atlanta and will decline in Denver. In San Francisco and Los Angeles, construction will remain near 1987/1988 levels.

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**CHAPTER ONE**

INTRODUCTION


Our objective was to study local markets for single family housing and to create econometric models for each market to forecast supply, demand, and real housing prices for the next ten years.

Our choice of cities was influenced by the availability of adequate time series data. The cities we studied were: Denver, Houston, Chicago, San Francisco, Minneapolis/St. Paul, Philadelphia, Cleveland, Los Angeles, Dallas, Detroit, Atlanta, New York, Boston, and Baltimore. For this study, a "city" is generally equivalent to the MSA or PMSA, or a combination of PMSA's. Descriptions of the data and its sources and limitations are discussed in detail in Chapter Two.

Other authors have proposed models for the single family housing market. Most of these studies have focussed on housing at the national level; very little work has been done with local housing markets. We have attempted to determine which of these models, if any, best fit the data we have on employment, population, real personal income, building permits, rents, mortgage rates, average sales prices, and inflation.

We hoped to establish what factors influence demand for

single family housing and supply of new single family housing
units. Are prices determined by lower mortgage rates,
anticipated appreciation, relative costs of buying versus
renting, a combination of these factors, or something else?
IS the level of construction determined by economic growth or
decline, changes in incomes, house prices, and/or mortgage
rates, or the level of construction last year?

In some of the cities, growth controls restrict the
creation of new housing; in others, development is almost
entirely uncontrolled. How do these differences affect the
performance of the market?

The models and the estimation results for the supply and
price equations are presented in Chapter Three. The
variables affecting supply and demand were different from
market to market.

Having estimated the equations for construction and real
prices, we created a stock flow model to forecast (using a
recession and nonrecession scenario) permits, stock, and
prices utilizing forecasts of changes in employment,
population, and income as well as mortgage rates and
inflation.

We were unable to obtain reasonable estimation results
for Chicago, Detroit, and New York and did not make any
forecasts for these three cities. Based upon our forecasts,
real prices will continue to rise over the next eleven years,

recession or not, in San Francisco, Boston, Los Angeles, Philadelphia, and Baltimore. Although real prices have increased sharply since 1983 in Minneapolis and Atlanta, we project a decline in real prices in these two cities between now and 1999. The "oil patch" cities of Dallas, Houston, and Denver will reverse their recent trend of price decline and prices will slowly rise again. Cleveland will experience a year or two of declining prices and then rising prices in the early 1990's.

The level of construction will reverse its recent decline and will rise in Dallas, Boston, Philadelphia, Baltimore, Minneapolis, and Atlanta. Construction will also rise, though not as rapidly, in Cleveland and Houston, although it will level off in Houston in the mid 1990's. In Los Angeles and San Francisco, new construction will not change much from 1987/1988 levels. In Denver, construction, which has just begun to show an increase after several years of decline, will decrease again and then level off.

We hope to put each locality in perspective and highlight some of the striking differences between them in terms of prosperity, decline, and housing prices and supply. The methodology, forecasts, and a market summary for each city are presented in Chapter Four.

In Chapter Five, we draw some conclusions about the operation of these markets and the factors that affect

housing prices and construction.  We also make some
observations about the utility and limitations of this type
of model.

# CHAPTER TWO

## THE DATA

We collected data for 25 metropolitan areas. Because complete data for 11 of the cities were unavailable, we were able to study only 14 of the 25 metropolitan areas. Our dataset reflects recessions that occurred in 1970-1971, 1974-1975, and 1981-1982, the entry of the "baby boomers" into the housing market, decreasing family size, a period of double digit inflation, and increased female labor force participation.

Our database included figures for each area, from 1960 through 1988, on non-agricultural employment (EMP), population (POP), total real personal income (YPI), numbers of single family (SFPRMT) and multi-family permits (MFPRMT) issued, average Federal Home Loan Bank Board mortgage rates (MTGR), average resale single family home prices (SFPRICE) (from 1963 to 1988 only), and national inflation rates (INF).

The data on employment, population, personal income, single and multi-family permits, and inflation came from the U.S. Department of Commerce. The Federal Home Loan Bank Board provided contract mortgage rates and purchase prices for single family homes. (See References.)

## AREA DEFINITIONS

The metropolitan area definitions are generally consistent with census bureau definitions of either MSAs or PMSAs or aggregations of them. The San Francisco metropolitan area includes Oakland and the Boston metropolitan area includes Suffolk, Middlesex, Essex, Norfolk, and Plymouth counties. (See Appendix A, Metropolitan Area Definitions.) Because the Census Bureau changed its metropolitan area definitions over the time series, obtaining permit data for the same area from year to year presented some difficulties, which we overcame by using tables that listed individual permit issuing places, e.g. municipalities, rather than the metropolitan area summary tables.

Our study, of necessity, assumed that each metropolitan area constitutes a housing market, which is questionable. For example, New York includes the five counties (boroughs) of New York City, plus Westchester, Rockland, and Putnam counties, but does not include Nassau and Suffolk counties on Long Island or the New Jersey suburbs of New York. Chicago includes only Cook and Du Page counties. Housing markets may be smaller, larger, or just different from our metropolitan area definitions.

PERMITS

There were some inconsistencies in the dataset. The
1972 permit data from the Construction Reports, C40 series,
showed different numbers of permits than the Commerce
Department numbers for that same year. We are not certain
why this is the case, since the data came from the same
source. The Commerce Department permit numbers for 1972
through 1987 may reflect revised unpublished annual figures
or adjustments made for places that issued permits but did
not report them to the Census Bureau. We assumed that this
data was the most accurate and adjusted the permit data from
1960 to 1972 proportionately for consistency with the
Commerce Department data.

The total number of permit-issuing places increased from
approximately 10,000 in 1960 to 17,000 in 1988. This may
have resulted in an underestimate of supply in the early
years of the time series. However, because we are dealing
only with metropolitan areas and these areas were
substantially covered by permit-issuing authorities even in
1960, we believe that this is a relatively unimportant
discrepancy. For the years 1960 through 1965, the permit
data also includes contract awards for publicly owned units.
Since publicly owned housing is mostly multi-family rather
than single family, this was a minor inconsistency.

Variation in local definitions of single family structures
may have had more effect in some cities. The permit data is
based on local building permit officials' reports on numbers
of permits issued. There is no way of knowing whether they
have consistently defined a structure with one unit. For
example, does the local official consider a rowhouse or a one
to four unit building a single family or a multi-family unit?
We have no way of measuring, correcting, or compensating for
these local variations. The Census Bureau's Building Permits
Survey defines single family houses to include all detached
one-family houses and all attached one-family houses
separated by a wall that extends from ground to roof with no
common heating system or interstructural public utilities.
The definition excludes mobile homes.

Permit data is a proxy for actual construction of
housing, although it has been found to be a reliable
indicator of the level of construction. Census Bureau
surveys indicate that construction is undertaken for all but
a small percentage of permit-authorized units. In 1973, the
Census Bureau reported that continuing monthly sample surveys
for the nation as a whole indicated that only about 2 percent
of permit-authorized housing units are never constructed.[1]
Only a small percentage of units constructed in
permit-issuing areas are constructed without permits. In
1988 the Census Bureau reported that a study spanning 4 years

showed that about 3 percent of the single family houses built
in permit-issuing places are built without a permit.[2]
Nationally, less than 5 percent of all privately owned
housing units built are constructed in areas that do not
require building permits.[3]

Permit data does not distinguish units by form of
ownership or tenure.  For this study, we assumed that all
single family units in an area are part of the same for-sale
market.  Our single family data does not include condominiums
in multi-family structures, which, depending upon the place
and the time, may also be part of the same "single family"
for-sale market.  This inability to distinguish rental from
for-sale units is probably not as big a problem for a study
of sales prices for single family homes as it would be for a
study of the rental market.


STOCK

We obtained 1960, 1970, and 1980 housing stock numbers
for each area from the censuses for those years, with the
intention of using them as benchmarks and to determine, in
conjunction with the permit numbers, the survival rates for
single family housing units each area and whether the rate
changed from decade to decade.  However, the data proved to
be impossible to use for those purposes.  The stock numbers
reported in the 1970 and 1980 censuses were inconsistent,

implying spontaneous generation of new housing units,
conversion of multi-family to single family units, or
negative depreciation rates. We think that this is
attributable to a change in the reporting definition from
number of units in a structure to number of units at an
address, which could markedly increase the count of the
"single family" stock. Although the 1960 and 1970 figures
appeared to be more consistent with permit data, we used a
constant annual survival rate of .998 for all areas in our
regressions rather than apply a different rate, derived from
the census and permit data, to each area. Therefore, our
data does not take into account differences in survival rates
among areas and probably does not reflect the actual single
family stock number after 1960 for any area. We used the
1960 stock number reported in the census as the benchmark for
subsequent stock numbers, which we obtained by multiplying
the prior year's stock by .998 (the survival rate) and adding
the prior year's permits.


## ESTK

The variables ESTK (STOCK/EMP) and ESTK1 ($STOCK_{t-1}$/EMP)
represents housing shortfall or surplus in relation to demand
(EMP being a proxy for number of households).

## CPI

The CPI is based upon the national inflation rate, with 1960 equal to 1.00.

## DEMOGRAPHIC VARIABLES

The WAGE and SIZE variables are approximations, not actual data. The SIZE variable (population/employment) as a measure of household size, assuming one household per employee, is somewhat problematic, because it more directly measures labor force participation and may indicate changes in such participation rather than changes in household size. WAGE (real personal income/employment), is a proxy for household income, does not reflect income distribution or disposable income, which may vary from place to place.

## COST OF CAPITAL VARIABLES

We tried three variations of a variable, USER, to measure the homebuyer's cost of capital. USER was the mortgage rate times one minus the tax rate, representing the nominal after-tax cost of capital. USER1 was similar, except that it included the effects of inflation and represented the real after-tax cost of capital. USER2 also included the percentage change in nominal housing prices$_{t-1}$ as a way of capturing the effects of both appreciation and inflation in

the after-tax cost of capital.

## PRICES

Real single family prices are nominal prices deflated
with the applicable CPI.  Single family home price data from
the Federal Home Loan Bank Board may not accurately represent
average prices in an area because it comes from data on
mortgages that they purchase, not a representative sample of
all transactions.  This data also does not control for
changes in the characteristics of houses sold over time.
Contract mortgage interest rates do not reflect changes or
variations in other fees and charges over time or from one
area to another.  A complete list of the variables created
and their formulas is provided in Table 2.1.

## THE REGIONAL MARKETS

We hypothesized that local housing markets behave
differently from one another.  The markets in these 14 cities
did show some similarities over the 25 years for which we
have price data (1963-1988).  In the 1980's, sharply rising
nominal prices was the trend in all the cities.  In addition,
all cities experienced a peak and then a decline in nominal
prices at some point during 1981-1982, although the size of
this spike varies among localities.  Because inflation masks
the real changes in prices, we used real, inflation-adjusted,

prices in our analysis and comparison of the markets and in our forecasts rather than nominal prices.

Between 1963 and 1988 the relative "real priciness" of the cities changed. Table 2.2 shows the differences in real prices for single family homes across the fourteen cities. For example, in 1963 the real average home price in Denver was $4,900 less than the real average home price in Houston, but in 1988 the real average home price in Denver was $5,800 more than in Houston. A more extreme example is a comparison of Cleveland and Los Angeles. In 1963 real prices in Cleveland averaged $1,400 less than in Los Angeles, but by 1988 real prices in Cleveland averaged $23,000 less. In 1963 a move from the least expensive city (Philadelphia) to the most expensive city (New York) entailed a higher average real price of $9,700. In 1988 a move from the least expensive city (Cleveland) to the most expensive (San Francisco) entailed an average real price differential of $26,900. The percentage changes in real prices from 1963 to 1988 are shown in Table 2.3. Clearly, some areas, most notably Cleveland, Houston, Detroit, and Chicago, did not profit nearly as much as others from the "real estate boom" of the 1980's. What caused the widening difference in housing prices from city to city since 1963? Was it a by-product of the decline in midwestern industry or a change in housing policy or something else, such as population shift?

In 1963 the six most expensive areas (in decreasing order) were: New York, San Francisco, Houston, Los Angeles, Chicago, and Boston. (See Table 2.4-Most Expensive to Least Expensive Cities.) By 1988 the list had changed to: San Francisco, Boston, New York, Los Angeles, Baltimore, and Philadelphia. The coastal cities continued to be the most expensive places to live, but in 1988 the list did not include any "heartland" cities. Chicago and Houston were replaced by Baltimore and Philadelphia, two near-coastal cities.

The level of construction (permits) was quite different from one area to another. However, there were similarities. In most of our cities, permits reached a trough in 1970, in 1974 or 1975, and in 1981 or 1982. These were recession years. The peaks were less consistent. In most areas permits either reached a peak or were still rising in 1986 except in the "oil patch" cities of Houston, Dallas, and Denver.

In most of our cities the level of permits in 1988 was at or below the level in 1960. The exceptions were Philadelphia, Baltimore, Atlanta, and Minneapolis.

NOTES TO CHAPTER TWO

[1]Construction Reports, C40-72-13, Appendix I.

[2]BUILDING PERMITS SURVEY DOCUMENTATION: Metropolitan, Consolidated Metropolitan and Primary Metropolitan Statistical Area Statistics for Permit Authorized Construction, 1988.

[3]Ibid.

## TABLE 2.1
### EQUATIONS USED TO CREATE NEW VARIABLES:

$WAGE_t = YPI_t/EMP_t$

$SIZE_t$ (HOUSEHOLD SIZE) $= POP_t/EMP_t$

$DEMP_t$ (CHANGE IN EMPLOYMENT) $= EMP_t - EMP_{t-1}$

$ESTK_t = STOCK_t/EMP_t$

$ESTK1_t = STOCK_{t-1}/EMP_t$

$DPOP_t$ (CHANGE IN POPULATION) $= POP_t - POP_{t-1}$

$DYPI_t$ (CHANGE IN REAL PERSONAL INCOME) $= YPI_t - YPI_{t-1}$

$CPI_t(1960=1) = CPI_{t-1} * (1 + INF_t * .01)$

$RPRICE_t$ (REAL PRICE) $= (NOMINAL\ PRICE_t * CPI_{t=1963})/CPI_t$

$DRPRICE_t$(CHANGE IN REAL PRICE) $= (RPRICE_t-RPRICE_{t-1})/RPRICE_{t-1}$

$USER_t$ (USER COST OF CAPITAL) $= MTGR_t * .6$

$USER1_t$ (USER COST OF CAPITAL 1) $=$
  for years 1960-1986 $= MTGR_t * .6 - INF_t$
  for years 1987 and later $= MTGR_t * .72 - INF_t$

USER2 (USER COST OF CAPITAL 2) $=$
  for years 1960-1986 $= MTGR_t * .6 - DRPRICE_{t-1} * 100 - INF_t$
  for years 1987 and later $= MTGR_t * .72 - DRPRICE_{t-1}*100 - INF_t$

$STOCK_t = STOCK_{t-1} * DEP_t + PERMITS_{t-1}$

$ERPRICE_t = EMP_t * RPRICE_{t-1}$

$EUSER_t = EMP_t * USER_t$

$EUSER1_t = EMP_t * USER1_t$

$EUSER2_t = EMP_t * USER2_t$

VARIABLES IN THE DATASET: EMPLOYMENT, POPULATION, REAL PERSONAL
INCOME, MULTI-FAMILY PERMITS, RENT INDEX, MORTGAGE RATE, NOMINAL
PRICES, SINGLE FAMILY PERMITS, INFLATION RATE.

TABLE 2.2
## DIFFERENCES IN REAL PRICES BETWEEN CITIES

1963 REAL PRICE (IN 000'S)

```
DENVER
 -4.9 HOUSTON
 -3.3   1.6 CHICAGO
 -6.3  -1.4  -2.9 SAN FRANCISCO
 -0.6   4.3   2.7   5.7 MINNEAPOLIS
  3.2   8.1   6.5   9.5   3.8 PHILADELPHIA
 -2.2   2.7   1.1   4.1  -1.6  -5.4 CLEVELAND
 -3.6   1.3  -0.3   2.7  -3.0  -6.8  -1.4 LOS ANGELES
  0.1   5.0   3.4   6.4   0.7  -3.1   2.3   3.7 DALLAS
 -1.0   3.9   2.4   5.3  -0.4  -4.2   1.2   2.6  -1.1 DETROIT
 -0.7   4.2   2.7   5.6  -0.1  -3.9   1.5   2.9  -0.8   0.3 ATLANTA
 -6.5  -1.6  -3.1  -0.2  -5.9  -9.7  -4.3  -2.9  -6.6  -5.5  -5.8 NEW YORK
 -2.4   2.4   0.9   3.8  -1.8  -5.6  -0.3   1.2  -2.6  -1.5  -1.8   4.0 BOSTON
  1.6   6.5   4.9   7.9   2.2  -1.6   3.8   5.2   1.5   2.6   2.3   8.1   4.0 BALTIMORE
```

1988 REAL PRICE (IN 000'S)

```
DENVER
  5.8 HOUSTON
  2.5  -3.2 CHICAGO
-17.8 -23.6 -20.3 SAN FRANCISCO
 -1.5  -7.2  -4.0  16.3 MINNEAPOLIS
 -2.4  -8.2  -5.0  15.4  -1.0 PHILADELPHIA
  9.1   3.3   6.6  26.9  10.6  11.5 CLEVELAND
-14.2 -20.0 -16.8   3.6 -12.8 -11.8 -23.3 LOS ANGELES
  2.5  -3.2   0.0  20.3   4.0   5.0  -6.6  16.8 DALLAS
  8.4   2.7   5.9  26.2   9.9  10.9  -0.6  22.7   5.9 DETROIT
 -2.4  -8.1  -4.9  15.4  -0.9   0.1 -11.4  11.9  -4.9 -10.8 ATLANTA
-15.6 -21.4 -18.2   2.1 -14.2 -13.2 -24.7  -1.4 -18.2 -24.1 -13.3 NEW YORK
-16.4 -22.2 -18.9   1.4 -14.9 -14.0 -25.5  -2.2 -18.9 -24.8 -14.0  -0.7 BOSTON
 -2.6  -8.4  -5.2  15.2  -1.2  -0.2 -11.7  11.6  -5.2 -11.1  -0.3  13.0  13.8 BALTIMORE
```

TABLE 2.3
PERCENTAGE CHANGE IN REAL AND NOMINAL PRICES

| | 1963 REAL PRICE | 1988 REAL PRICE | PERCENT CHANGE | 1963 NOMINAL PRICE | 1988 NOMINAL PRICE | PERCENT CHANGE |
|---|---|---|---|---|---|---|
| DENVER | 20.3 | 34.1 | 68% | 20.3 | 132.2 | 551% |
| HOUSTON | 25.2 | 28.4 | 13% | 25.2 | 109.9 | 336% |
| CHICAGO | 23.6 | 31.6 | 34% | 23.6 | 122.4 | 418% |
| SAN FRANCISCO | 26.6 | 51.9 | 95% | 26.6 | 201.1 | 657% |
| MINNEAPOLIS | 20.9 | 35.6 | 70% | 20.9 | 137.9 | 560% |
| PHILADELPHIA | 17.1 | 36.6 | 114% | 17.1 | 141.6 | 729% |
| CLEVELAND | 22.5 | 25.0 | 11% | 22.5 | 97.0 | 331% |
| LOS ANGELES | 23.9 | 48.4 | 102% | 23.9 | 187.3 | 683% |
| DALLAS | 20.2 | 31.6 | 57% | 20.2 | 122.4 | 507% |
| DETROIT | 21.3 | 25.7 | 21% | 21.3 | 99.5 | 368% |
| ATLANTA | 21.0 | 36.5 | 74% | 21.0 | 141.3 | 574% |
| NEW YORK | 26.8 | 49.8 | 86% | 26.8 | 192.8 | 620% |
| BOSTON | 22.7 | 50.5 | 122% | 22.7 | 195.7 | 761% |
| BALTIMORE | 18.7 | 36.8 | 97% | 18.7 | 142.4 | 661% |

## TABLE 2.4
## MOST EXPENSIVE TO LEAST EXPENSIVE CITIES

|                | RANK 1963 | RANK 1988 |
|----------------|-----------|-----------|
| NEW YORK       | 1         | 3         |
| SAN FRANCISCO  | 2         | 1         |
| HOUSTON        | 3         | 11        |
| LOS ANGELES    | 4         | 4         |
| CHICAGO        | 5         | 10        |
| BOSTON         | 6         | 2         |
| CLEVELAND      | 7         | 13        |
| DETROIT        | 8         | 12        |
| ATLANTA        | 9         | 7         |
| MINNEAPOLIS    | 10        | 8         |
| DENVER         | 11        | 9         |
| DALLAS         | 12        | 10        |
| BALTIMORE      | 13        | 5         |
| PHILADELPHIA   | 14        | 6         |

*Chicago and Dallas were tied for 10th place

FIGURE 2.1

## REAL PRICES

*FOR HOMES 1963 VS. 1988*
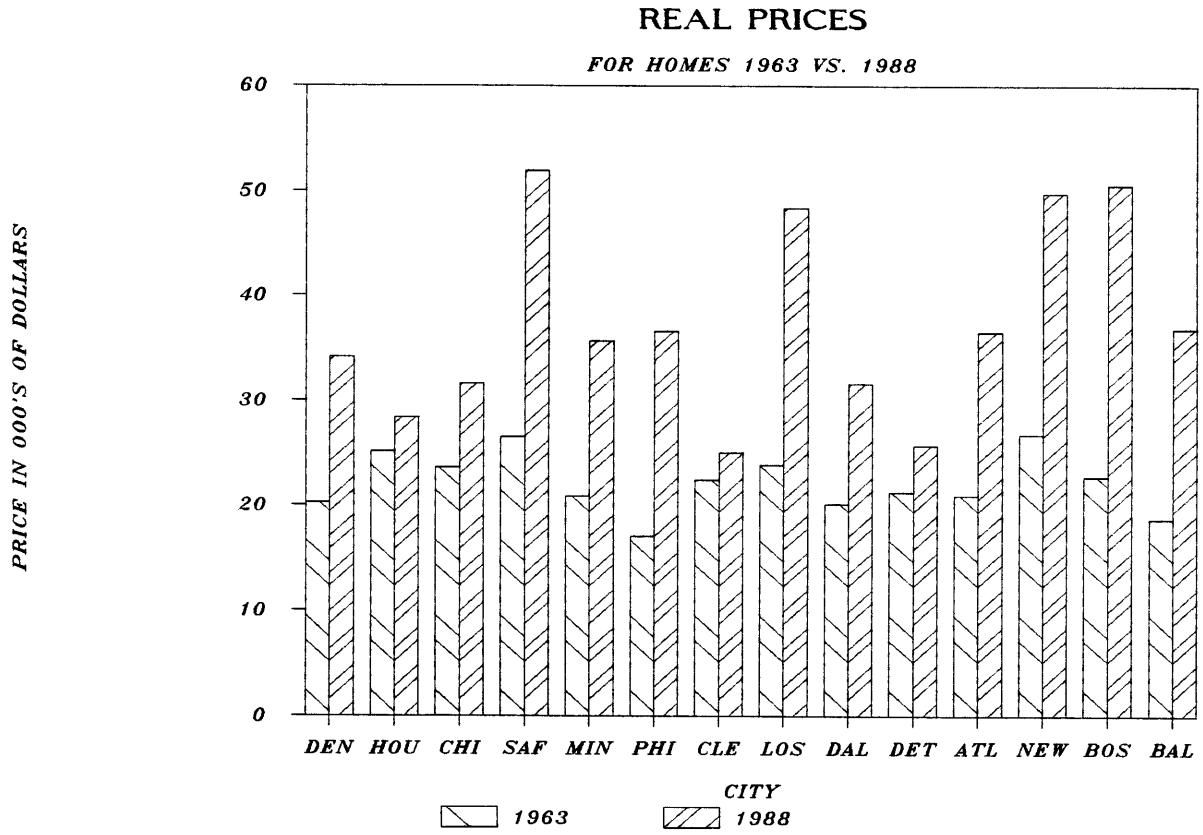
## CHAPTER THREE

## THE MODELS AND THE ESTIMATION RESULTS

Although the significance and magnitude of the effect of the variables is different for each of the cities, the underlying structure of each model is similar. Our models consisted of equations for real housing price and level of new construction (as evidenced by building permits) which we estimated using the 1960 through 1988 dataset. (See Tables 3.1 and 3.2: Price and Permit Equations.) Our stock equation was:

$$STOCK_t = STOCK_{t-1}(1-\text{depreciation rate}) + PERMITS_{t-1}$$

We wanted to create dynamic models for each city where demand is not necessarily equal to supply at any given time, and where prices depend in part upon the amount of new housing built as well as demographic and cost of capital variables. Given the lead time needed to bring new housing stock to market, it seemed reasonable to assume that the market does not clear completely during each period, but rather is continually moving toward its long-run equilibrium price level.

## PRICE EQUATIONS

Our first effort at establishing equations for prices was to run regressions of various combinations of demographic (demand), affordability (cost of capital), and housing stock (supply) variables to see which variables were significant in which cities, using our firsthand real estate experience and our personal knowledge of the Boston, Baltimore, Cleveland, San Francisco, Los Angeles, Detroit, and New York markets to select the initial combinations. We approached the price equations in this manner because there has not been definitive work done on prices and permits at the local level and our purpose was to construct a model that would accurately reflect the behavior of local markets. Our "map" for attempting to describe this local behavior was However, the results were not particularly good, with $R^2$'s in the .70-.85 range, unexpected signs of the coefficients, and insignificant t-statistics for variables that we had expected to be significant in explaining price fluctuations.

We then turned to theory for assistance, estimating equations of the form:

$$PRICE_t - PRICE_{t-1} = a(PRICE^* - PRICE_{t-1}) \text{ [equation 1]}$$

which can be expressed as

$$PRICE_t = aPRICE^* + (1-a)PRICE_{t-1},$$

where $PRICE^*$ is the long-run equilibrium price level, and

$$STOCK = EMP(b + cPRICE^* + dWAGE + eUSER + fSIZE)$$

[equation 2]

which we can solve for PRICE$^*$:

PRICE$^*$ = b/c + d/cWAGE + e/cUSER + f/cSIZE -

1/cSTOCK/EMP [equation 3].

By substituting PRICE$^*$ in equation 3 for PRICE$^*$ in equation 1

we obtain an equation that we can estimate for PRICE$_t$:

PRICE$_t$ = ab/c + ad/cWAGE + ae/cUSER + af/cSIZE -

a/cSTOCK/EMP + (1-a)PRICE$_{t-1}$ [equation 4].

The variables ESTK (STOCK/EMP) and USER were problematic

in that it was difficult to find combinations of them and

other variables such that their coefficients had the expected

negative sign. As a result, some of the equations that we

selected to use in our models had relatively low $R^2$'s (one as

low as .59) and included variables whose t-statistics did not

indicate significance. (See Table 3.1: Price Equations.)

In three cities--New York, Chicago, and Detroit--we

abandoned the effort to develop reasonable price equations as

a result of inadequate results and time constraints.

Therefore, we were unable to forecast prices and permits for

those three cities. In New York, the exclusion of Nassau and

Suffolk counties as well as the New Jersey suburbs of New

York City from the data created a problematic market

definition. In Chicago, the coverage of the data (see

Chapter Two) may also have affected the results. We began

with partial data on 25 cities, were able to complete the

dataset for 14 of those, and were able to find reasonable price equations for forecasting for only eleven cities.

In all cases, except Atlanta, our final equations included the variable ESTK. In Atlanta, ESTK1 yielded better results.

Seven of the final equations--for Denver, Houston, San Francisco, Minneapolis, Cleveland, Dallas, and Atlanta--used USER2. In Boston and Philadelphia, MTGR, the nominal mortgage rate, yielded a higher $R^2$ than USER2 and was used instead. In Los Angeles and Baltimore, USER yielded the best results.

We used $RPRICE_{t-1}$ in all of the final equations. The coefficients of $RPRICE_{t-1}$ in these equations varied substantially. Since 1 minus the coefficient of $RPRICE_{t-1}$ represents the percentage price adjustment in one year (the speed of adjustment) we can see that the Dallas and Houston markets clear more quickly than the others and that the San Francisco and Atlanta markets clear more slowly. (See Table 3.3, Speed of Price Adjustment.)

In Philadelphia and Baltimore the coefficients of $RPRICE_{t-1}$ were greater than one, resulting in negative speeds of adjustment. These results are logically inconsistent, implying that more than 100 percent of this year's price is accounted for by last year's price. We used these equations for our forecast because removing $RPRICE_{t-1}$ from the

equations yielded even more peculiar forecast results.  (See
Chapter Four.)

Our equations for only three cities (Denver, San
Francisco, and Baltimore) included either WAGE or $WAGE_{t-1}$.

Although we estimated equations using SIZE in
combination with ESTK and USER, we did not include SIZE in
the final equations because better overall results were
obtained with the other combinations.

We obtained the best results for price equations in
Boston and Los Angeles, with high $R_2$'s, Durbin Watsons close
to 2.000, and t-statistics indicating significance for all of
the variables included in the equations.


## PERMIT EQUATIONS

For the supply side of our model, we did our regression
analysis using combinations of economic and demographic
indicators (employment, population, income), supply variables
(stock and lagged permits), demand variables (e.g.  wage,
size, mortgage rate), and price level and change in prices.
We included a constant in all equations.

The general form of the equation that we estimated and
used for our final forecast was:

$PERMIT_t$ = a+ $bPERMIT_{t-1}$ + cSTOCK + dDRPRICE + eEMP (or
eDEMP) + fPOP + gINCOME + hWAGE + iSIZE + jMTGR (or
jUSER).

All of the final permit equations included STOCK or PERMIT$_{t-1}$. The equations for Denver and Dallas included both STOCK and PERMIT$_{t-1}$. PERMIT$_{t-1}$ was a significant variable in Houston (t-statistic of 7.479) Cleveland (2.252) and Boston (2.231) indicating a possible "herd" effect in these cities.

Either MTGR or USER2 were included in seven equations and are significant variables in three of these, indicating that, in these markets, builders build more when mortgage rates are down.

Change in real prices (DRPRICE), with t-statistics indicating significance, was included in the equations for only five cities (Baltimore, Boston, Los Angeles, Philadelphia, and Cleveland) while real price (RPRICE) was not included in any of our equations. Surprisingly, price variables were insignificant or the unexpected sign in six cities. Believing that builders would respond to higher prices by building more, we expected RPRICE, RPRICE$_{t-1}$, or DRPRICE to be significant and positive in accounting for changes in supply. Our results suggest that, at least in some markets, builders may rationally look ahead and consider that prices may decline if everyone starts building.

Income (YPI) was used only for Boston, population (POP) for Houston and Los Angeles, employment (EMP) for Atlanta and Dallas, and change in employment (DEMP) for Denver, Philadelphia and Los Angeles. WAGE was included, with

t-statistics indicating significance, in six cities:
Minneapolis, Cleveland, Dallas, Atlanta, Philadelphia, and
Baltimore. (In San Francisco it was included but was not
significant.)

SIZE was significant in Atlanta and in Dallas with
positive signs and in Minneapolis with a negative sign. As
discussed in Chapter Two, the SIZE variable is subject to
several interpretations. With a positive sign it could
indicate that builders build when household size increases,
which may result in a demand for more housing or for housing
different fro m what is available. With a negative sign, it
could indicate that builders build as labor force
participation increases. A fall in SIZE, the ratio of
population to employment, may occur when either the number of
household members in the labor force or the ratio of total
employees to population increases which may increase demand,
i.e. either the number of households able to purchase single
family housing or the number of people able to form
households or both.

$R^2$'s for our equations ranged from .65 for San Francisco
to .92 for Boston. Durbin-Watsons ranged from 1.429 to
2.097. Based upon the t-statistics, the equations for
Atlanta and Boston include only significant variables. Four
of the five variables used for Philadelphia, Los Angeles, and
Dallas and three of the four used for Houston and Minneapolis

have t-statistics indicating significance. (See Table 3.2, Permit Equations.)

TABLE 3.1
ESTIMATION RESULTS--PRICE


CONSTANT

DENVER          5.71148 + -19.00893 ESTK + 0.01892 USER2     + 0.74080  RPRICE(t-1) +383.7799 WAGE
R^2 = .832     (.210)    (-1.374)          (.264)             (4.461)                  (.468)
DW = 1.740


HOUSTON        30.44505 + -19.10701 ESTK +-0.02079 USER2     +0.229130  RPRICE(t-1)
R^2 = .784     (4.341)   (-3.686)          (-.530)            (1.294)
DW = 2.194


SAN FRANCISCO  -0.27193 + -17.42118 ESTK +-0.14795 USER2     + 457.648 WAGE         +0.851602 RPRICE(t-1)
R^2 = .966     (.0115)   (-.681)           (-2.558)           (1.570)                 (7.689)
DW = 2.223


MINNEAPOLIS    42.42316 + -68.51570 ESTK +-0.02064 USER2     + 0.66888  RPRICE(t-1)
R^2 = .866     (2.659)   (-2.517)          (-.378)            (5.062)
DW = 1.975


PHILADELPHIA   31.48102 + -47.72373 ESTK + 1.11013 RPRICE(t-1)+-0.12478 MTGR        +7.335232 DRPRICE(t-1)
R^2 = .955     (3.248)   (-3.575)          (12.021)            (-1.322)               (1.269)
DW = 1.725


CLEVELAND      29.01208 + -28.03675 ESTK +-0.03486 USER2     + 0.37394  RPRICE(t-1)
R^2 = .588     (3.525)   (-2.307)          (-.715)            (2.001)
DW = 1.998


LOS ANGELES    26.33159 + -31.87125 ESTK + 0.86622 RPRICE(t-1) -0.69363 USER
R^2 = .965     (2.084)   (-2.103)          (6.112)             (-2.335)
DW = 1.809


DALLAS         47.85195 + -43.11392 ESTK +-0.02027 USER2     +0.150967  RPRICE(t-1)
R^2 = .829     (4.493)   (-3.989)          (-.438)            (.829)
DW = 2.308


ATLANTA        15.68241 + -22.65880 ESTK1+-0.04984 USER2     + 0.85644  RPRICE(t-1)
R^ = .906      (2.003)   (-2.011)          (-1.102)           (8.362)
DW = 1.687


BOSTON         69.87597 +-134.86680 ESTK + 0.72709 RPRICE(t-1)+-0.69273 MTGR
R^2 = .960     (5.648)   (-6.005)          (8.133)             (-4.271)
DW = 2.159


BALTIMORE      -6.52729 + -3.84859 ESTK +1.062672 RPRICE(t-1)+-0.31519 USER         + 289.233 WAGE
R^2 = .901     (-.364)   (-.162)          (9.090)             (-1.352)               (1.036)
DW = 1.703


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TABLE 3.2
ESTIMATION RESULTS--PERMITS

DENVER        CONSTANT
R^2 = .864    -68498.79 + 0.11571 DEMP + 148.7867 POP + -.42139 STOCK +       7324983 SIZE +.20419 SFPRMT(t-1)+-197.17 MTGR
DW = 2.090    (-2.920)   (3.040)     (5.172)      (-5.153)         (1.501)     (1.194)          (-.602)


HOUSTON
R^2 = .861    20101.81 +27.75089 POP   + -0.17162 STOCK    + 0.81683 SFPRMT(t-1)+ -402.61 MTGR
DW = 1.862    (3.600)   (3.527)      (-3.794)         (7.479)       (-.635)


SAN FRANCISCO
R^2 = .645    18520.84 +66486.34 WAGE   +   0.29702 SFPRMT(t-1)+-1203.85 MTGR
DW = 1.429    (1.302)   (.200)       (1.618)         (-2.984)


MINNEAPOLIS
R^2 = .689    -13734.21 + 1668117 WAGE   +-11155720 SIZE      + 0.15067 SFPRMT(t-1)+ -697.95 MTGR
DW = 1.632    (-.698)   (3.243)      (-3.329)        (.764)        (-2.024)


PHILADELPHIA
R^2 = .844    -48913.33 + 0.04371 DEMP   + 21006.06 DRPRICE   + 1740635 WAGE      + 0.15530 SFPRMT(t-1)+-440.45 MTGR
DW = 2.097    (-4.606)   (3.273)       (2.919)        (5.410)        (1.191)         (-2.730)


CLEVELAND
R^2 = .912    -14780.23 + 7499.35 DRPRICE+503599.30 WAGE    + 1182449 SIZE     + 0.32327 SFPRMT(t-1)+-223.89 MTGR
DW = 1.781    (-1.737)   (3.070)       (3.178)        (1.020)        (2.252)         (-1.730)


LOS ANGELES
R^2 = .749    113530.70 + 0.01777 DEMP   + 14.64743 POP     +-0.12424 STOCK    +28314.54 DRPRICE    +-164.16 USER2
DW = 1.885    (3.870)   (2.631)       (4.454)        (-4.097)        (2.484)         (-1.571)


DALLAS
R^2 = .813    -112139.10 +-0.19598 STOCK +   3495541 WAGE    + 0.07956 EMP      +17161160 SIZE     +0.17816 SFPRMT(t-1)
DW = 1.721    (-3.418)   (-4.264)      (5.108)        (4.208)        (2.325)         (1.110)


ATLANTA
R^2 = .897    -170414.20 +-0.28189 STOCK +   3314750 WAGE    + 0.17744 EMP      +23892520 SIZE
DW = 1.596    (-6.596)   (-4.654)      (4.055)        (5.552)        (3.460)


BOSTON
R^2 = .917    37921.15 +-0.06689 STOCK   + 15587.72 DRPRICE   + 0.30623 SFPRMT(t-1)+ 0.25196 YPI
DW = 1.989    (2.953)   (-2.505)     (.313)         (2.231)        (2.003)


BALTIMORE
R^2 = .756    -29929.62 +16805.83 DRPRICE+   1287327 WAGE    +-2545662 SIZE     + 0.24053 SFPRMT(t-1)
DW = 1.543    (-2.288)   (2.061)       (3.639)        (-1.260)        (1.312)

## TABLE 3.3
## SPEED OF PRICE ADJUSTMENT

|  | RPRICE(t-1) COEFFICIENT | 1 - RPRICE(t-1) COEFFICIENT |
|---|---|---|
| DENVER | 0.74080 | 25.92% |
| HOUSTON | 0.22913 | 77.09% |
| SAN FRANCISCO | 0.85160 | 14.84% |
| MINNEAPOLIS | 0.66888 | 33.11% |
| PHILADELPHIA | 1.11013 | -11.01% |
| CLEVELAND | 0.37394 | 62.61% |
| LOS ANGELES | 0.86622 | 13.38% |
| DALLAS | 0.15097 | 84.90% |
| ATLANTA | 0.85644 | 14.36% |
| BOSTON | 0.72709 | 27.29% |
| BALTIMORE | 1.06267 | - 6.27% |

# CHAPTER FOUR

## THE FORECASTS

Using the equations and estimation results for prices and permits described in Chapter Three, we forecast permits, stock, and prices for the eleven year period 1989 through 1999. The forecast is based upon Wharton Econometric Forecasting Associates' Spring, 1988 long-term forecast of real personal income, non-agricultural employment, and population in the eleven metropolitan areas. (See Table 4.1, Growth Factors and Other Assumptions.) We assumed an inflation rate of 5 percent per year, a mortgage rate of 10 percent, and a stock survival rate of .998 throughout the forecast period. One forecast used these inputs and a second forecast (a "recession" scenario) used these inputs but assumed no growth in income and employment during 1989 and 1990.

Figures 4.1 through 4.11 depict actual real prices and permits in the eleven metropolitan areas from 1963 through 1988 and both the "nonrecession" and "recession" forecasts for the period 1989 through 1999. Tables 4.2a and 4.2b show prices, permits, and the percentage changes in both for each area and each scenario.

In the long term, and in most cases, the forecasts of permits and prices move in the same direction. Notable

exceptions are Atlanta and Minneapolis, where, over the eleven year forecast period, prices trend downward and permits trend upward. In Denver, permits initially rise but then trend downwards, ending the millennium below the 1988 level, while prices end the forecast period slightly above the 1988 level.

The permit equations for Atlanta and Minneapolis do not include price variables, which accounts for the fact that the permit forecasts do not move in the same direction as the price forecasts. In our regression analyses for Atlanta and Minneapolis, RPRICE and/or DRPRICE were insignificant and/or unexpectedly negative.

The "nonrecession" forecast of both prices and permits is generally higher than the "recession" forecast. However, this is not always the case.

Obviously, the forecast results are a function of the estimated equations and the forecast inputs. In Chapter THREE we discussed the fact that the coefficients of $RPRICE_{t-1}$ in the price equations for Baltimore and Philadelphia are greater than 1.00 and the resulting problem. We did make a forecast of prices and permits for these two cities using equations that did not include $RPRICE_{t-1}$. However, the results were bizarre oscillations of prices and permits. At the same time, the forecast results that we have included for these cities, using price equations with

$RPRICE_{t-1}$ coefficients greater than 1.00, are certainly suspect.

The forecast inputs are also questionable. They are based upon Wharton's year-old forecast and generally predict growth in employment, income, and population throughout the forecast period, except in Philadelphia and in Cleveland, where population decline is predicted from 1992-1997 for the former and from 1987-1992 for the latter. Our recession scenario only lasts for the first two years of the forecast and assumes no growth in employment and income during these years. The forecast for Boston, for example, would look quite different if income and employment were stable or declining rather than increasing throughout the period. Our assumptions of stable mortgage and inflation rates are also unrealistic and affect the forecast results.

Following is a description of the forecast for each metropolitan area in historical context.


### THE DENVER MARKET

Population, employment, and personal income grew substantially from 1960 to 1988. Population increased from 879,500 to 1,663,800 (89%); employment grew from 305,183 to 792,900 (160%); real personal income per capita rose from $10,020 to $16,930.

In terms of housing prices, this area gained a little in

its position relative to the other cities we studied. Denver was number 11 in 1963 and 9 in 1988, reflecting lower prices than 10 of the 14 cities in 1963 and lower prices than 8 of them in 1988. Denver had its highest real price percentage increase in 1983 (29% real, 33% nominal) and reached a price peak in 1986 ($42,610 real, $153,000 nominal). Real prices increased by 68% from 1963 to 1988.

In 1987, however, employment declined by almost 3%. This decline continued in 1988, though at a slower rate (1.1%). Since 1960, employment had previously declined only once, in 1975. Population grew at its slowest rate, in 27 years in 1987 (.54%) and in 1988 showed almost no improvement with a .60% increase. Real personal income per capita, however, increased during this period, but at a snail's pace. In the 1960's and 1970's increases of 3% to 5% in real personal income per capita were not uncommon. For 1984 through 1988 the rates of change were 4.05%, .67%, .06%, .56%, and -3.04 respectively. In 1987 and 1988 real housing prices declined substantially (by 11.42% in 1987 and 9.55% in 1988) so that prices in 1988 were slightly below 1983 levels.

We forecast a modest price rise in Denver from 1989 to 1999, although with a dip in the early 1990's. Permits are projected to increase dramatically in 1989 from their 1988 trough but to fall back in the 1990's. The turnaround in the projected 1989 prices and permits from the steep decline of

1987 and 1988 is attributable to the positive forecast of employment (1.3%) income (1.5%) and population (1.0%) growth that we are using for 1989-1992.

FIGURE 4.1

## FORECAST FOR PRICES 1989-1999

*DENVER*



□ ACTUAL    —— W/RECESSION    ◇ W/O RECESSION

## FORECAST FOR PERMITS 1989-1999

*DENVER*



□ ACTUAL    —— W/RECESSION    ◇ W/O RECESSION
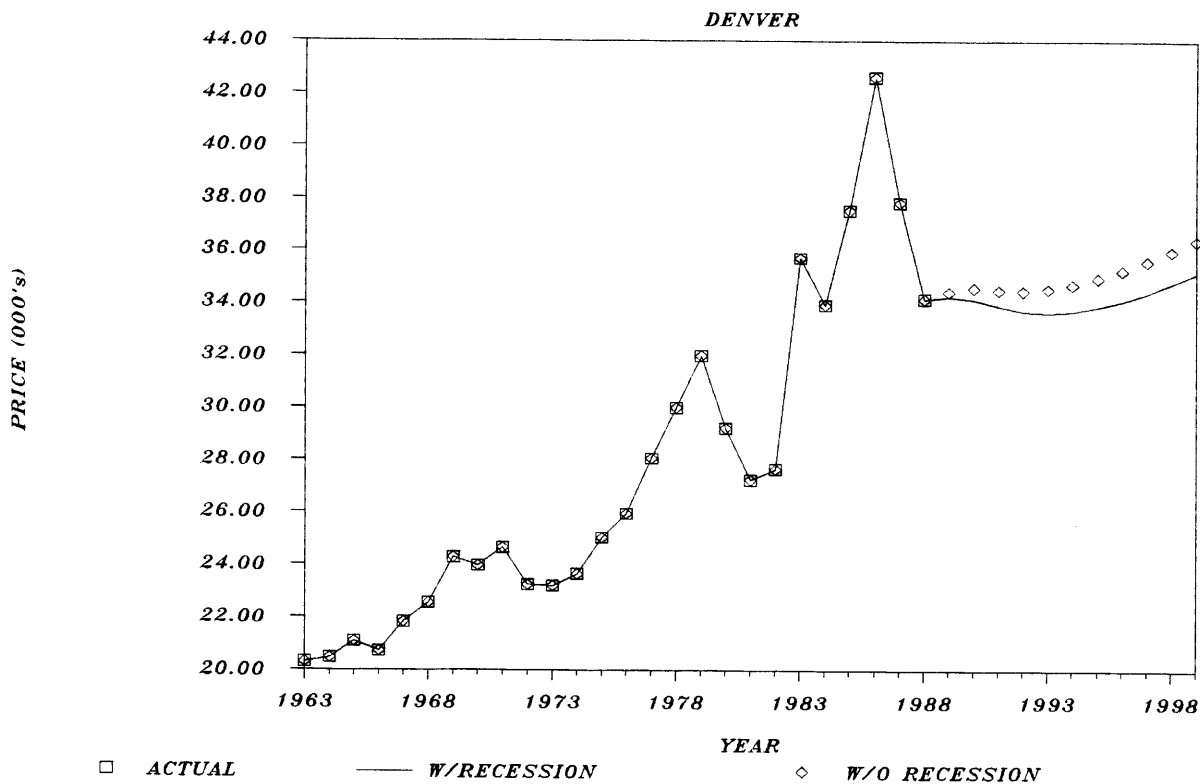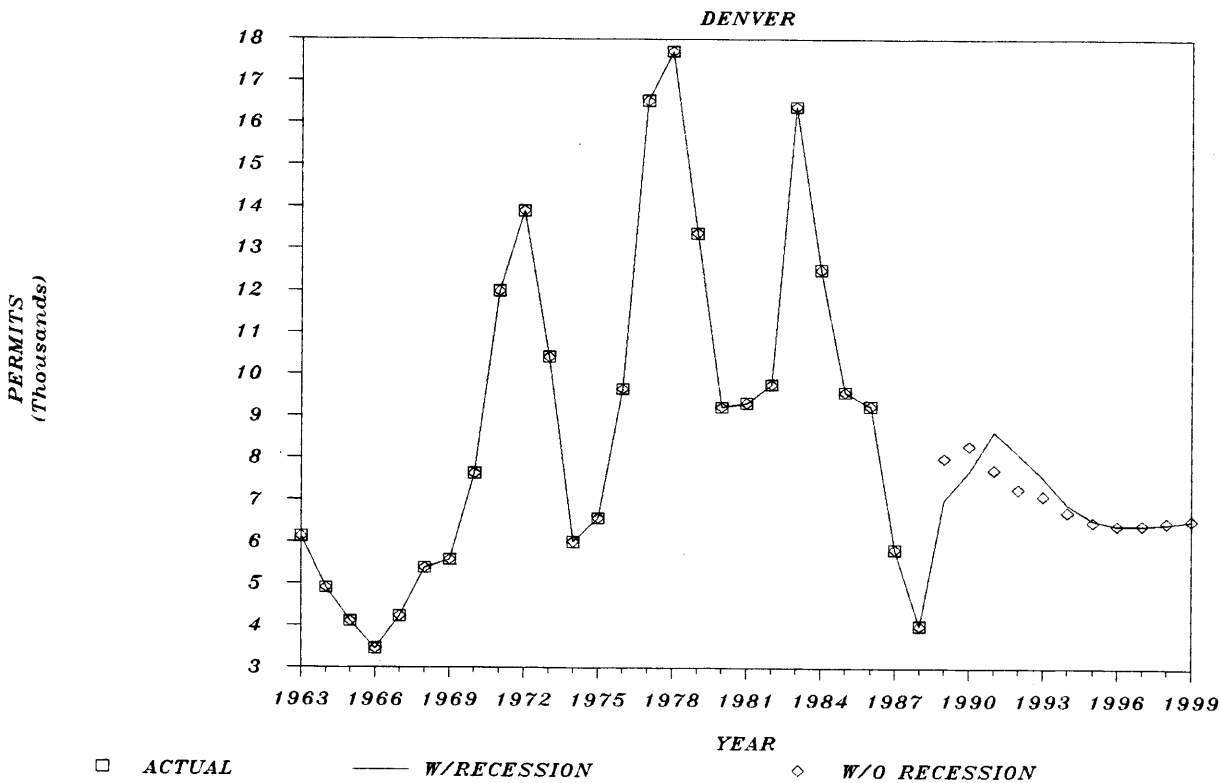
# THE HOUSTON MARKET

Houston, as expected, given the depressed state of the region, underwent declines in real housing prices five times in the 1980's (1981, 1982, 1984, 1985, 1987, and 1988), despite a 336% increase in nominal prices from 1963 to 1988. Real prices in 1988 were actually near 1976 levels, and in fact were lower than in 1971. Between 1963 and 1988 Houston real prices only rose 13%, the second lowest appreciation rate of the 14 cities we studied. In 1963, Houston was near the top of the "priciest" cities in our study, but by 1988 had dropped to eleventh place.

Houston's population grew rapidly and continually until 1984 when growth dropped precipitously (from 5.5% in 1982 to 2.6%, .61%, 1.75%, 1.31%, 1.19%, and .25% from 1983 to 1988). Total employment suffered its first decline since 1960 (6.17%) in 1983 and two subsequent declines in 1986 and 1987. In 1988 there were fewer people working in Houston than there were in 1981. Real personal income per capita declined 5 times during the 1980's, dropping twice to nearly 1976 levels.

Homebuilding, which soared from 3,231 units in 1974 to 16,949 units in 1975 and continued at an even greater pace, adding between 19,000 and 29,000 units per year until 1982, declined to under 7,000 units per year in 1985, with a low of 5,849 units in 1986.

We forecast an increase in prices and permits in Houston in the 1990's, although prices will dip in 1989 and permits will dip through 1991. Prices are a function of ESTK, USER2, and $RPRICE_{t-1}$ while permits are a function of population, stock, lagged permits, and the mortgage rate. Our forecast of slow but steady growth in employment of 1.7% per year from 1989 to 1992 and 2.6% per year from 1992 to 1999, compared to fast growth in the 1960's and 1970's followed by swings from slow growth to fast decline in the 1980's, accounts for the steady, but slow, growth in prices in our forecast period, compared to the more dramatic fluctuations in the data. Our forecast of population growth of 1.2% per year from 1989 to 1992 and of 1.3% per year from 1992 to 1999, compared with the higher growth rates of the pre-1984 period and the low, but fluctuating, rates after that, accounts for the forecast of initial decline followed by moderate growth in permits.

FIGURE 4.2

## FORECAST FOR PRICES 1989-1999

*HOUSTON*



☐ *ACTUAL*        —— *W/ RECESSION*        ◇ *W/O RECESSION*

## FORECAST FOR PERMITS 1989-1999

*HOUSTON*



☐ *ACTUAL*        —— *W/RECESSION*        ◇ *W/O RECESSION*

45
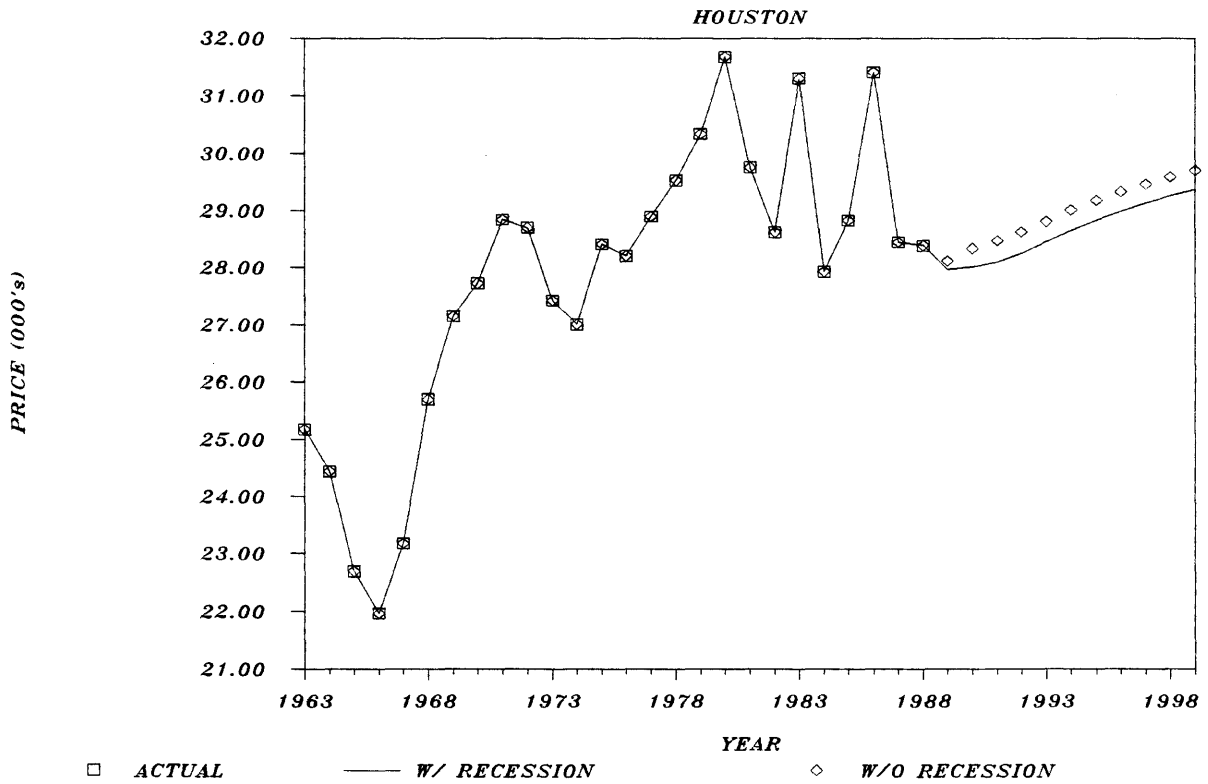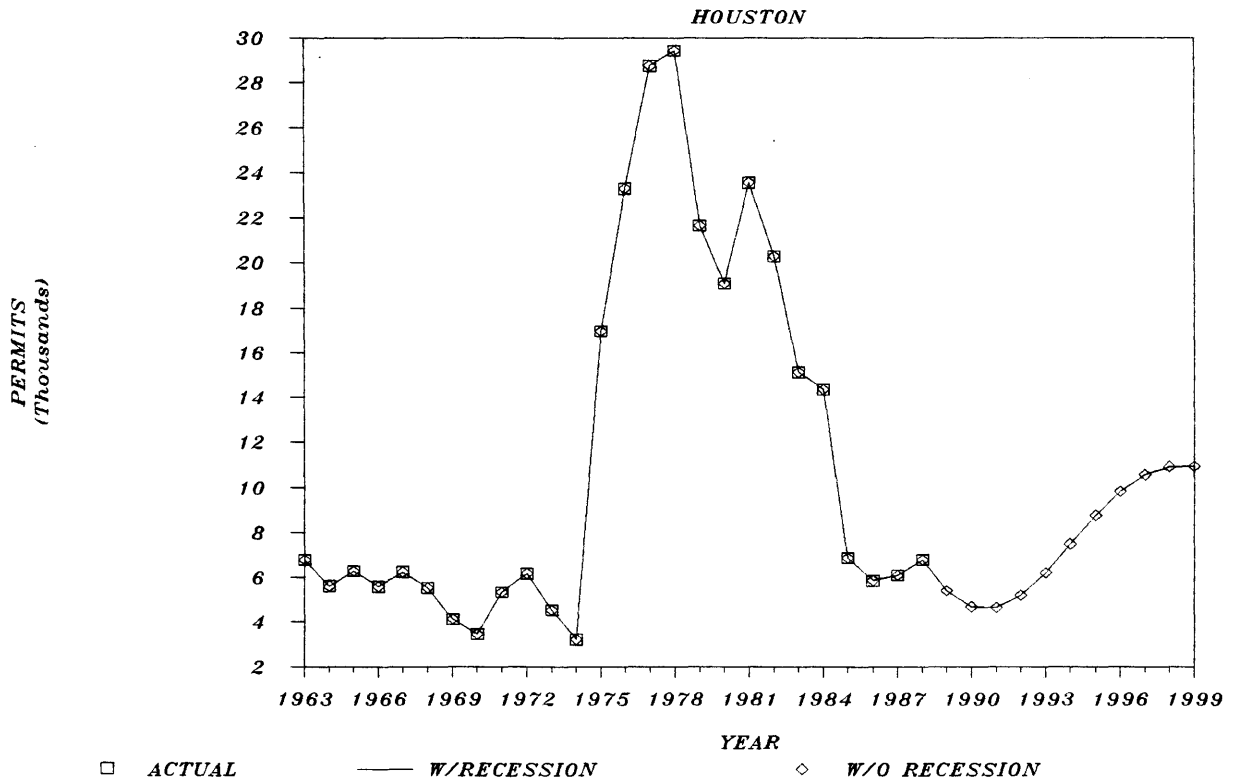
# SAN FRANCISCO MARKET

While San Francisco had the distinction in 1988 of being the most expensive city in our study, having risen from second place in 1963, 4 other cities experienced larger percentage changes in real prices during the 1963-1988 period (Baltimore--97%, Boston--122%, Los Angeles--102%, and Philadelphia--114%) compared to San Francisco's 95% increase. Real prices did not rise continuously in San Francisco, but declined in 1968, 1971, 1981, 1983, and 1984.

Population grew steadily throughout the period, with annual growth averaging about .5% from 1968 to 1980 and 1.45% in the 1980's. Population declined only once, in 1961. Likewise, real personal income per capita rose continuously, with only one decline, of .04%, in 1974.

From 1984 to 1988, new construction of single family homes was at the level of approximately 11,000 to 12,000 units per year. This level was similar to that reached in the late 1970's and came after a slump in housing construction that occurred in the early 1980's, when permits ranged from 3,486 to 8,882 units for four years.

For San Francisco we forecast continued growth in prices through the 1990's and a slight growth in permits. Prices are a function of ESTK, USER2, $RPRICE_{t-1}$ and WAGE. Since employment is increasing at the rates of 1.9% and 2.0% per year and incomes at the rates of 2.5% and 2.1% per year,

fluctuating less, but in the same range, than in the data period, prices continue their upward trend.  Permits are a function of WAGE, $SFPRMT_{t-1}$, and MTGR. Since we are holding the mortgage rate constant, permits increase gradually along with the projected increases in income relative to employment.

## FIGURE 4.3

## FORECAST FOR PRICES 1989-1999

**SAN FRANCISCO**



☐ ACTUAL        —— W/ RECESSION        ◇ W/O RECESSION

## FORECAST FOR PERMITS 1989-1999

**SAN FRANCISCO**



☐ ACTUAL        —— W/RECESSION        ◇ W/O RECESSION

48
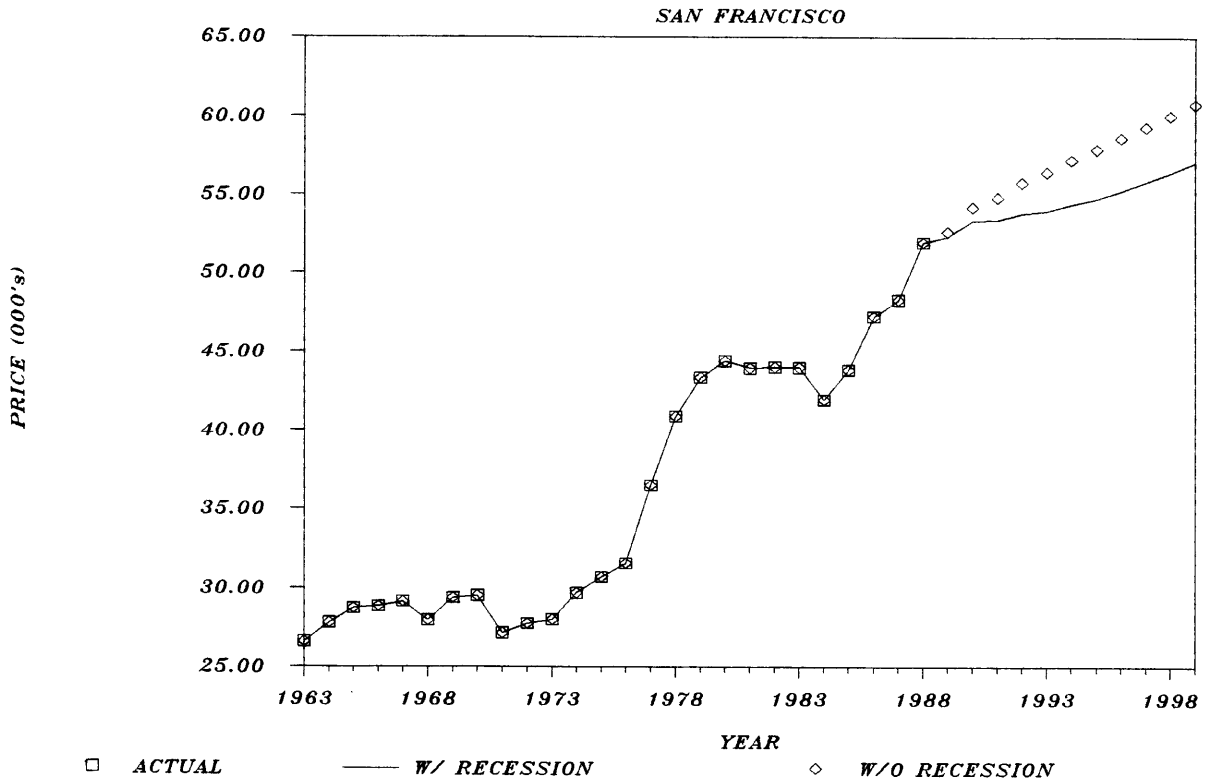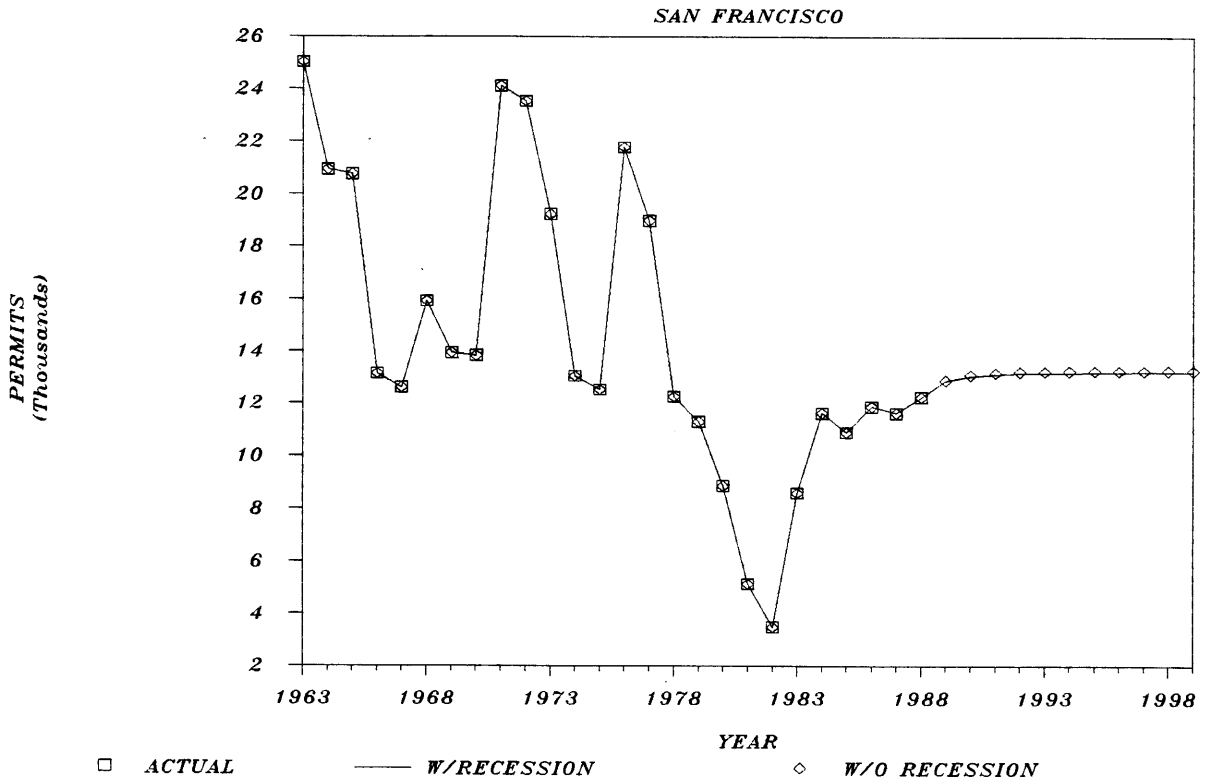
## THE MINNEAPOLIS MARKET

Employment in Minneapolis more than doubled from 579,959 in 1960 to 1,318,000 in 1988, a 127% increase. Population, on the other hand, increased only 40% during this period. Per capita income in this area grew substantially during the early 1960's (5.5%, 1.23%, 7.25%, and 4.01% from 1960 to 1964) and 75.63% from 1960 to 1988. But WAGE did not experience the same growth and was only 8.48% in 1988 higher than it was in 1960. During the 25 years, WAGE decreased fourteen times, sometimes precipitously. In 1988 WAGE declined 5.8%.

In 1988, Minneapolis had an average family size of 1.8, the second smallest of our cities. (In Boston family size averaged 1.7 in 1988.)

Housing prices trended upwards, but changes were characterized by periodic leaps and less dramatic retreats rather than by steady increases or cyclical rises and falls. For example, real prices rose 16.3% in 1969, 14.5% in 1975, 10.4% in 1978, and 22% in 1986, but fell 3.6% in 1971, 4.3% in 1976, 4.3% in 1980, 4.7% in 1982, and 6.1% in 1988. Overall, real prices rose 70.5% from 1963 to 1988, after falling back in 1987 and 1988 from a 1986 high, while nominal prices rose 560%. Minneapolis became slightly more expensive relative to our other thirteen cities. In 1963 it was number 10 but moved up two places to number 8 in 1988, placing it

near the middle of our sample. Permits fluctuated dramatically, dropping 40% from 1968 to 1970 and rising 140% from 1970 to 1972. They reached their highest level in 1978 and were 36% higher in 1988 than they were in 1960.

We forecast continued decline in prices through the 90's, but at a lower rate than in 1987 and 1988, and rising permits (after an initial continuation in our recession scenario of the actual 1988 decline.) Prices are a function of ESTK, USER2, and RPRICE$_{t-1}$. Permits are a function of WAGE, SIZE, MTGR, and SFPRMT$_{t-1}$. Since prices were declining in 1987 and 1988 and we are forecasting steady and modest gains in employment, 1.8% per year in 1989-92 and 1.9% per year in 1992-1999, compared to higher actual growth rates in 1987 and 1988, prices will continue their decline but at a slower rate. Permits are not a function of prices, and lagged permits are not significant. This, combined with our forecast of steady income growth of 2.4% per year and 2.5% per year and slower growth in employment (which results in increased WAGE), will result in growth in permits. Employment will also grow faster than population which will result in a continued decline in SIZE, which has a negative sign in Minneapolis. If our forecast were correct, permits would reach a high in 1999, even under our recession scenario.

FIGURE 4.4

## FORECAST FOR PRICES 1989-1999



*MINNEAPOLIS*

□ ACTUAL   —— W/ RECESSION   ◇ W/O RECESSION

## FORECAST FOR PERMITS 1989-1999



*MINNEAPOLIS*

□ ACTUAL   —— W/RECESSION   ◇ W/O RECESSION
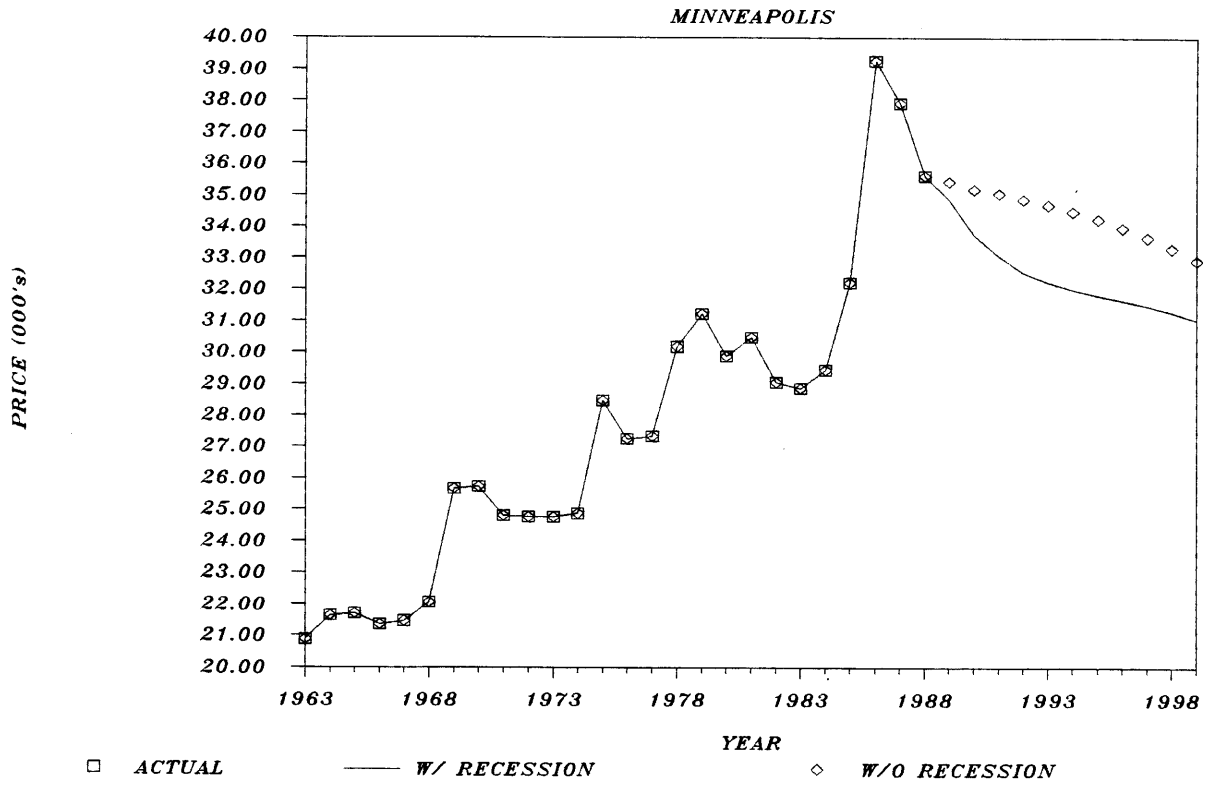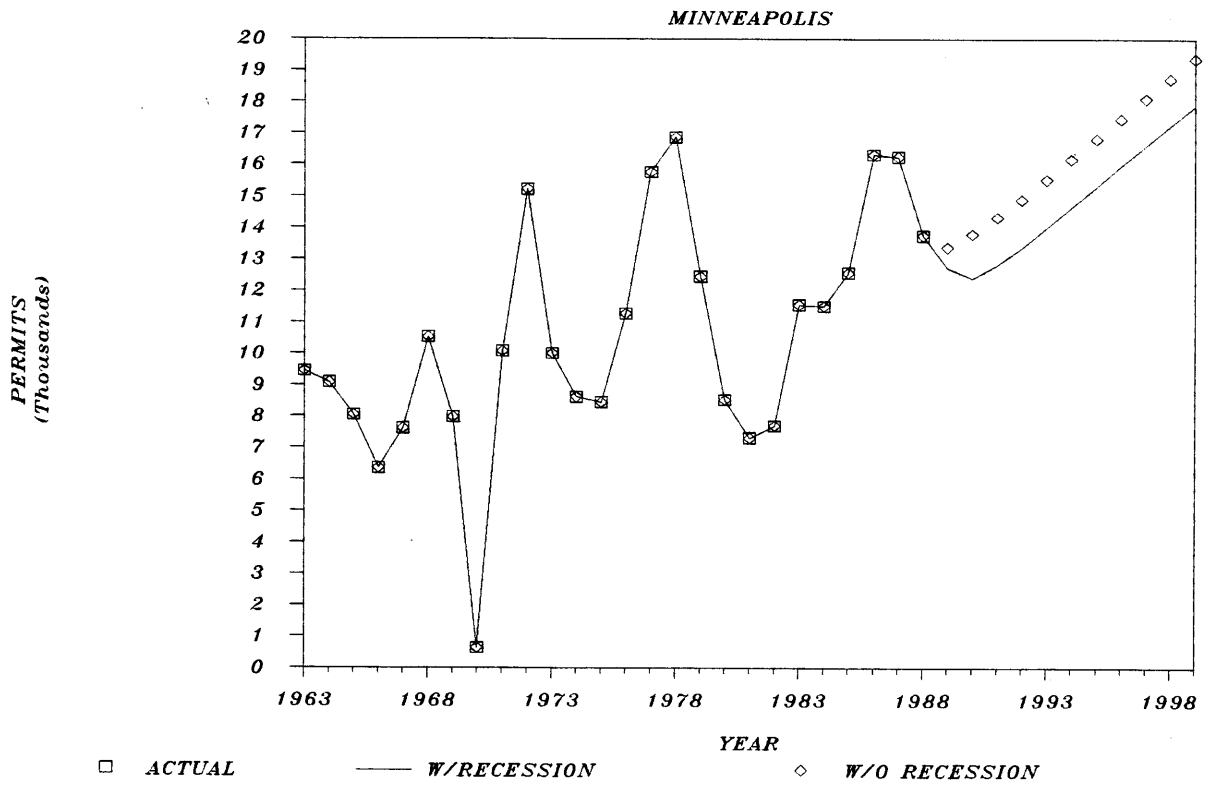
## THE PHILADELPHIA MARKET

Surprisingly, Philadelphia experienced the second largest overall increase in both real and nominal prices. From 1963 to 1988 real prices rose a total of 114% while nominal prices rose a phenomenal 729%. Philadelphia ranked as the least expensive city in 1963 but moved up to sixth place by 1988.

Population in Philadelphia declined steadily for 8 consecutive years from 1972 to 1979, despite some gains in employment, per capita income, and wages. During this time real housing prices fell twice and only gained 2% overall. Real housing prices fell again in 1981, 1982, and 1983, from $23,060 to $20,610, but rose 14.1% during 1986, 16.4% during 1987, and 19% during 1988. Permits fluctuated dramatically, reaching peaks in 1973, 1978, and 1986, and valleys in 1970, 1974, and 1981-82. The valleys correspond to periods of rapidly rising mortgage interest rates and the peaks to periods of growth in employment and/or wages, reinforced in 1986 by a precipitous drop in the mortgage interest rate.

In our forecast, prices are a function of ESTK, $RPRICE_{t-1}$, MTGR, and $DRPRICE_{t-1}$. Permits are a function of change in EMP, WAGE, DPRICE, MTGR, and $SFPRMT_{t-1}$. As discussed in Chapter Three, since the coefficient of lagged price in the price equation exceeds 1.00, the forecast results are particularly suspect. Price is principally a

function of the previous year's prices, which increase after 1982. The slow but steady gains in employment that are forecast for the 1990's contribute to the projected acceleration of housing prices to unimaginable levels (281% of 1988 levels) by 1999. Permits are projected to rise in the 1990's in response to higher rates of income growth than employment growth (resulting in WAGE growth) and accelerating price increases. The projected flat 10% mortgage interest rate exceeds the lower rates of 1986 to 1988 and will result in a dip in permits in 1989 and 1990.

# FIGURE 4.5

## FORECAST FOR PRICES

### PHILADELPHIA



| | | |
|---|---|---|
| □ ACTUAL | —— W/ RECESSION | ◇ W/O RECESSION |

## FORECAST FOR PERMITS 1989-1999

### PHILADELPHIA



| | | |
|---|---|---|
| □ ACTUAL | —— W/RECESSION | ◇ W/O RECESSION |

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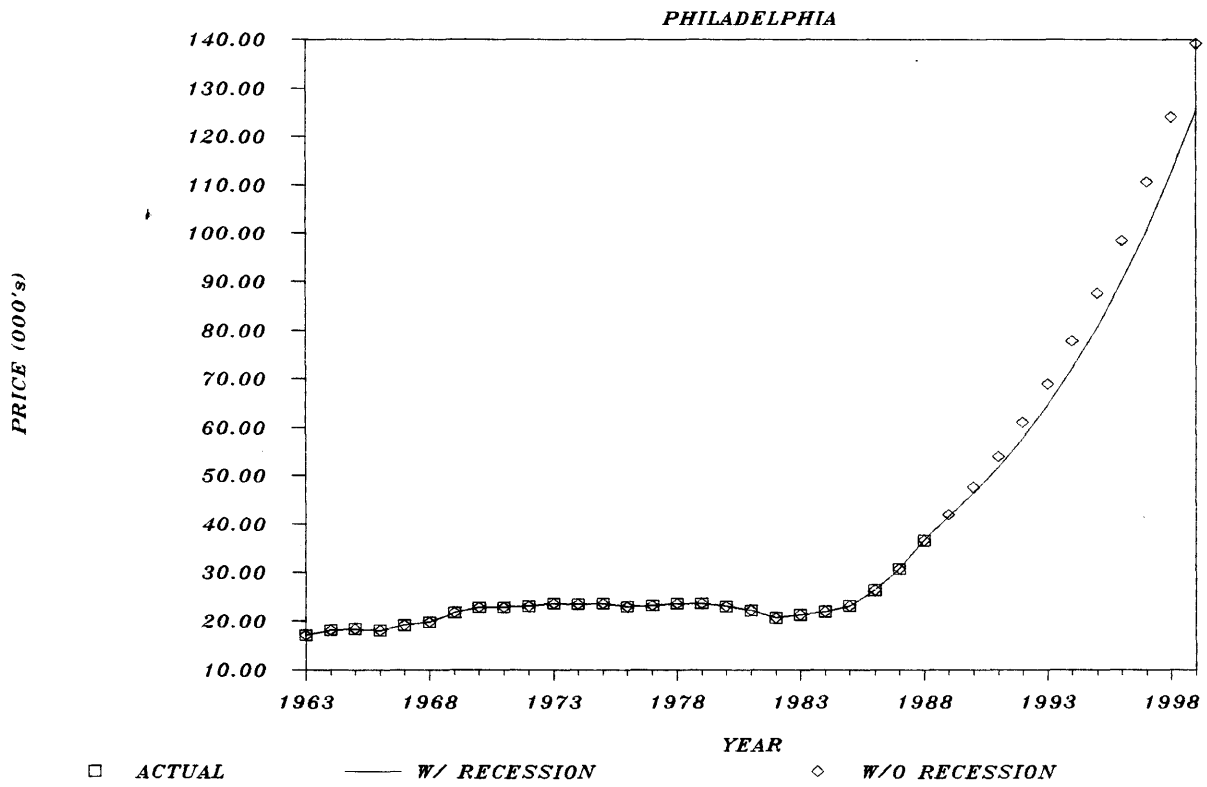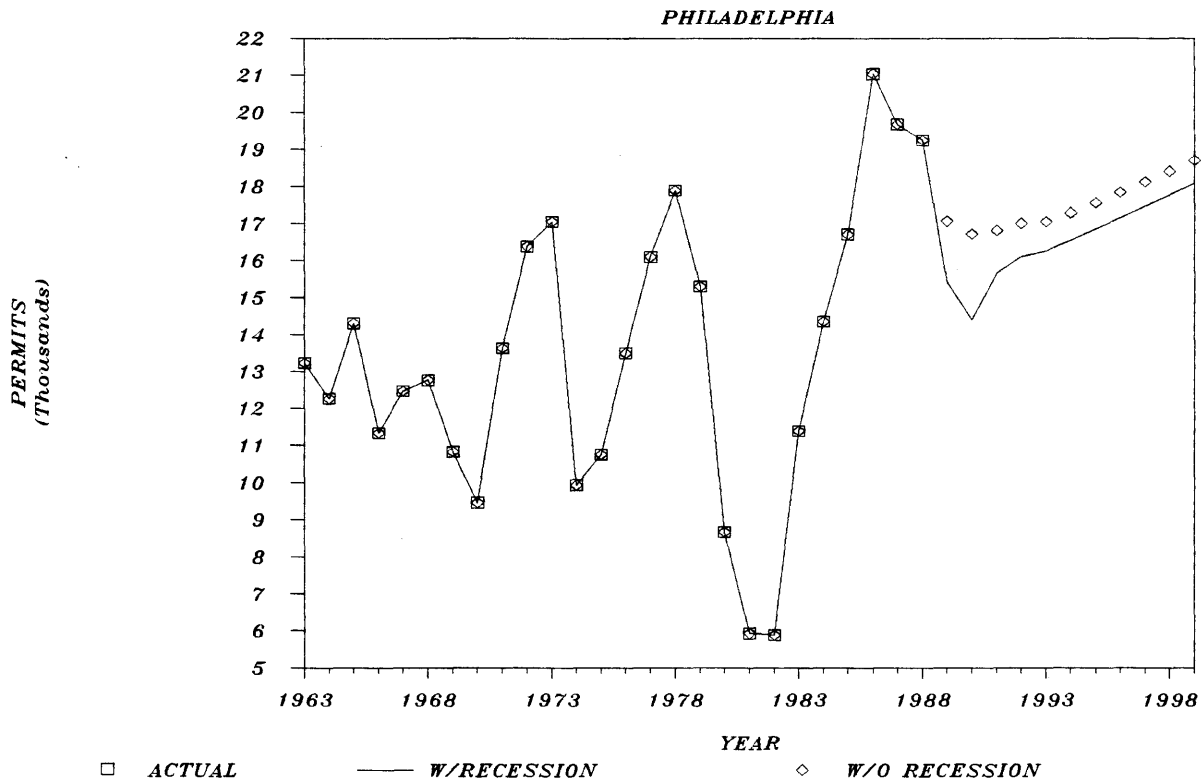
## THE CLEVELAND MARKET

Cleveland holds the record for the longest continual population decline (17 years, from 1971 to 1987.) In 1988 Cleveland's population was smaller than in 1960. However, employment grew in 20 of the 28 years, for a total increase of 30% from 1960 to 1988. Wages stagnated after 1963: the 1988 wage was the same as the 1964 wage and 4% lower than the 1973 high.

Real housing prices fluctuated, reaching a high in 1971 and a low in 1985. In 1988, prices were 11% higher (the smallest increase of any city) than in 1963, but lower than in 1971. In 1963, Cleveland was the seventh most expensive city, but had fallen to last place by 1988. Real prices rose 12% in 1986, 3.3% in 1987, and 4% in 1988, after falling in 12 of the previous 21 years.

In 1960, permits reached a high of 9,000 for the entire period. However, despite the population decline, permits fluctuated between approximately 4,000 and 6,000 units per year until 1979, reaching a peak of 6,400 in 1977, and then fell to a markedly lower level, reaching a low of less than 1,300 in 1982, when mortgage rates peaked, before rising to above 4,000 in 1986 from 1980 until 1985. Permits declined again in 1987 and 1988.

In our forecast, price is a function of ESTK, USER2 and $RPRICE_{t-1}$. Permits are a function of WAGE, SIZE, MTGR,

PERMIT$_{t-1}$, and DRPRICE. We forecast a steep decline in prices through 1991 and then a steady rise through 1999. The steady price rise is a result of slow, but steady, growth in employment through the forecast period and a flat mortgage rate. The initial decline is partially a result of the projected initial increase in the mortgage interest rate. However, since our price equation does not account for a large percentage of historic prices (the $R^2$ is only .59), there is considerable and unexplained discontinuity of the forecast from the actual data. We forecast a continuing decline in permits until 1989 (1990 in the recession scenario) followed by a rise through the 1990's. Permits will decline in 1989 in response to the decline in price and to the increase in mortgage rate but will increase through the 1990's in response to the projected increase in WAGE.

## FIGURE 4.6

## FORECAST FOR PRICES 1989-1999

CLEVELAND



□ ACTUAL    —— W/RECESSION    ◇ W/O RECESSION

## FORECAST FOR PERMITS 1989-1999

CLEVELAND



□ ACTUAL    —— W/RECESSION    ◇ W/O RECESSION

57
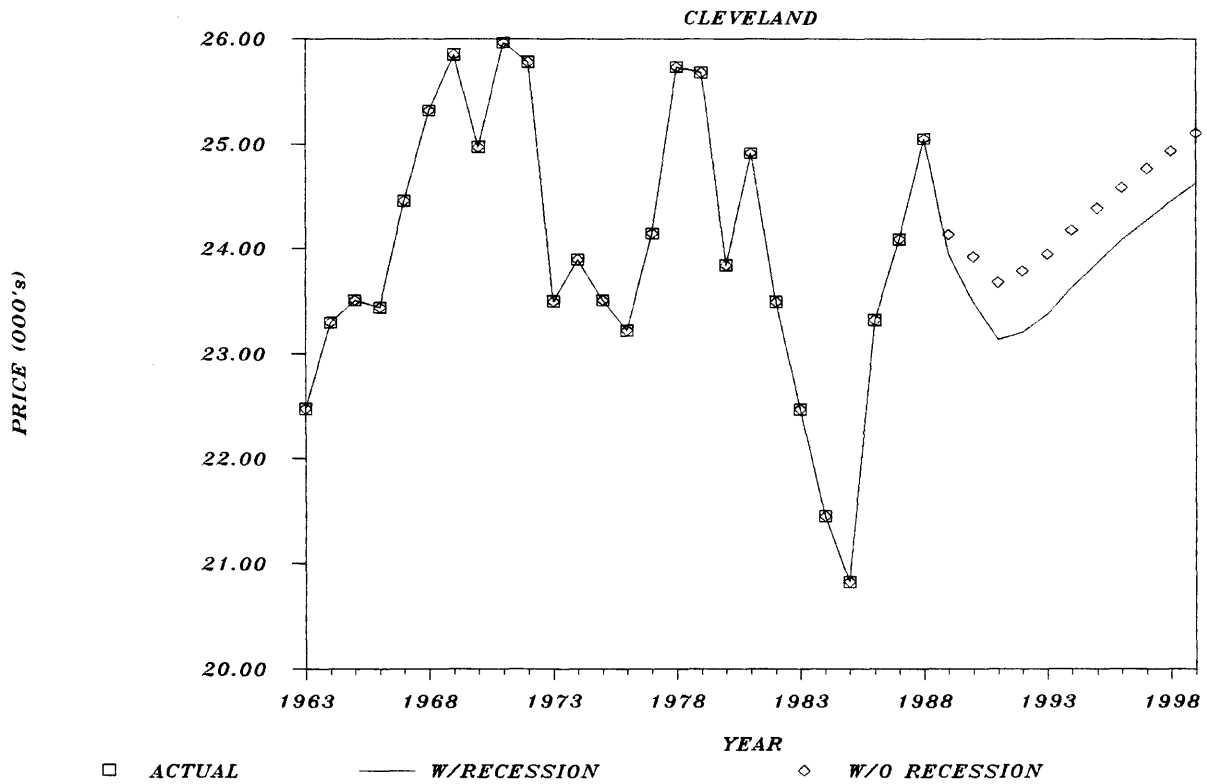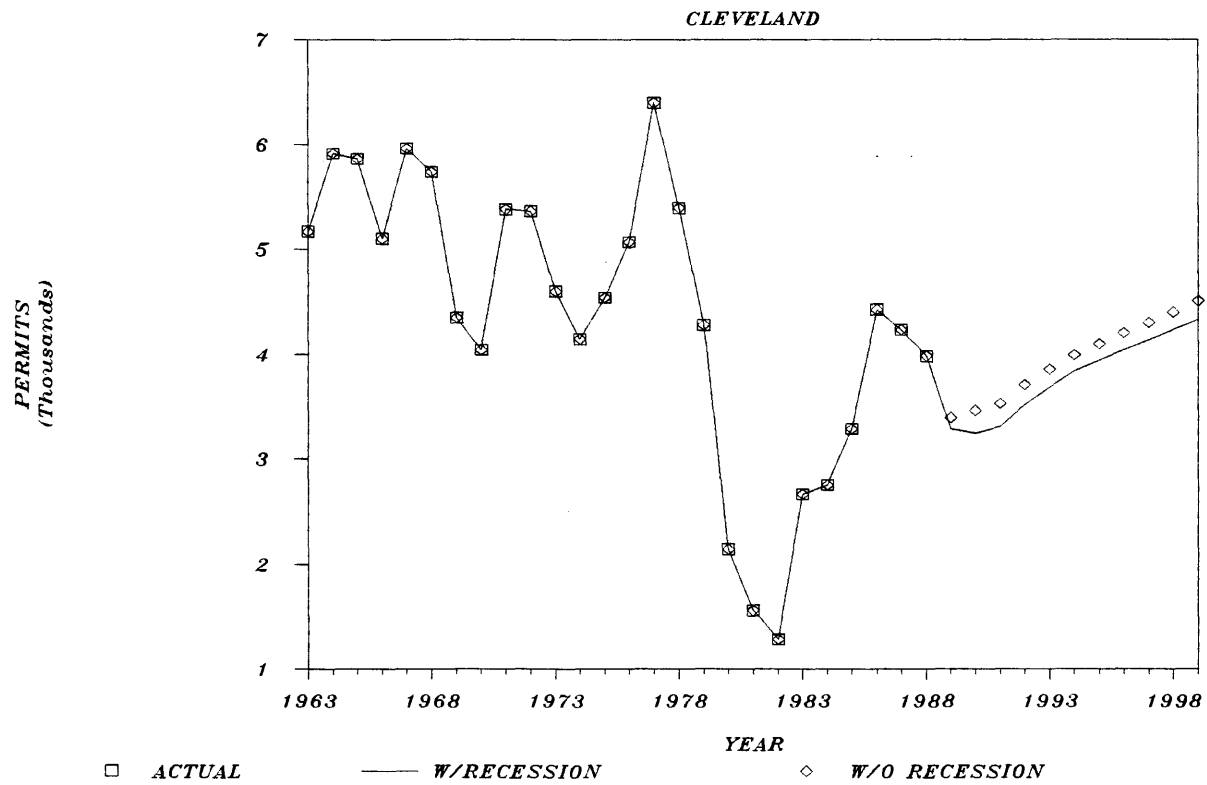
## THE LOS ANGELES MARKET

From 1960 to 1988, population grew by more than
2,500,000, a 42% increase. During that period population
declined in only 2 years, by .5% in 1972 and by .1% in 1973.
Overall, employment increased 86%, although there were
declines in employment in 1970, 1971, 1975, and 1982. But in
1988, WAGE was only 13.5% higher than in 1960.

In terms of price, Los Angeles ranked fourth in 1963 and
still ranked fourth in 1988, behind San Francisco, Boston,
and New York. During this interval nominal prices increased
683%, from $23,900 to $187,300, while real prices increased
102% from $23,900 to $48,400. Real prices declined 8 times,
with the largest decreases in 1981 (5.1%) when mortgage rates
increased from 12.9% to 14.6% and in 1984 (5.4%).

In Los Angeles, price is a function of ESTK, $RPRICE_{t-1}$,
and USER. If EMP increases at a faster rate than STOCK, a
housing shortfall will result and prices will rise.
$RPRICE_{t-1}$, with a t-statistic of 6.112, is very significant
in this equation. Because the coefficient of $RPRICE_{t-1}$
equals .87, prices do not adjust very much toward their
equilibrium price in each period. We forecast a continuation
of the previous rise in real prices throughout the next
decade. This is primarily a result of our assumption of
continued employment growth (2.2% per year through 1992 and
2.1% per year thereafter.) This projected growth rate is

lower than the average 3.0% growth in employment of the
previous five years, but is higher than projected employment
growth rates in all but two cities.  A recession would very
slightly decrease the rate of price increases.

Single family permits behave in a cyclical way, with
peaks in 1961-1963, 1971-1972, 1977, and 1988 and troughs in
1970, 1974, and 1982.  At no time has the level of permits
been as high as in 1960-1964 when permits were averaging over
25,000 per year.  During the most recent peak, permits
reached only 17,500 per year, despite greater population
growth from 1984 to 1988 (674,000) than from 1960 to 1964
(639,000).

From the supply equation, we can see that permits are a
function of DEMP, POP, STOCK, DRPRICE and USER2.  Our
forecast of almost no change in the level of permits through
the 1990's (except for a small decline in 1989 and 1990) is a
result of the projected relatively steady growth in
employment and price.  A recession would accentuate the small
drop in construction in the first year of the forecast,
because DEMP is held to 0% in the initial two years of the
forecast.

FIGURE 4.7

# FORECAST FOR PRICES 1989-1999



LOS ANGELES

□ ACTUAL        —— W/ RECESSION        ◇ W/O RECESSION
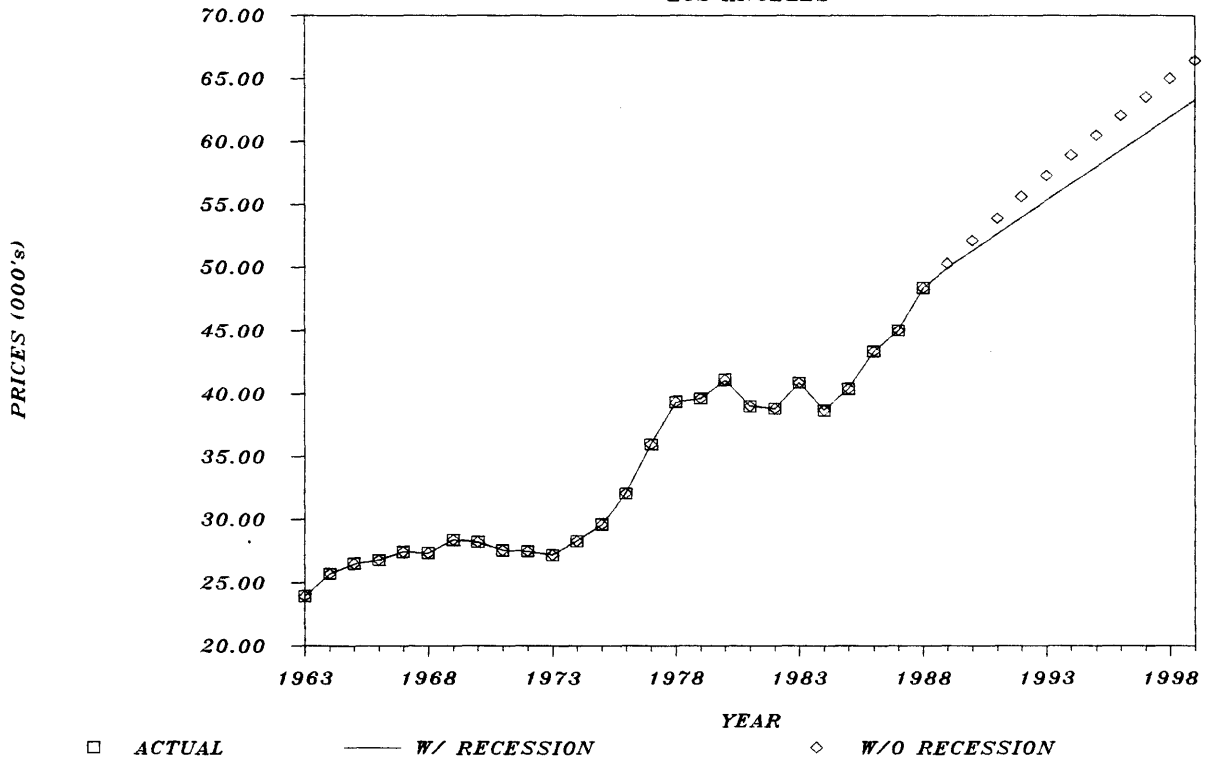
# FORECAST FOR PERMITS 1989-1999



LOS ANGELES

□ ACTUAL        —— W/RECESSION        ◇ W/O RECESSION
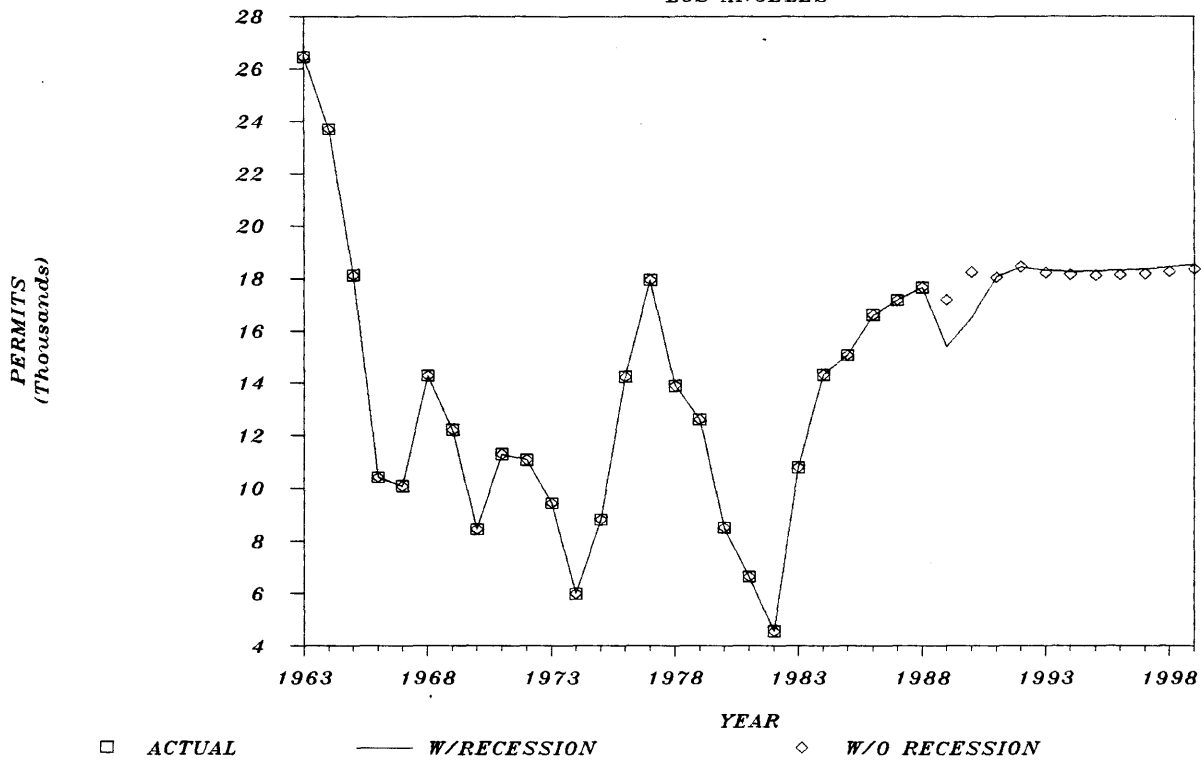
## THE DALLAS MARKET

The Dallas population more than doubled from 1,108,400
in 1960 to 2,469,800 in 1988, a 123% increase. Employment
grew even faster, from 408,612 to 1,329,500, a 225% increase
over the same period. There were only 2 years in which
employment declined, 1975 and 1987; despite the long oil
price recession in Texas, employment in Dallas, unlike
Houston, even continued to grow during the 1980's. Real
personal income declined in 1987 and 1988 and real income per
capita declined steadily from 1985 to 1988, receding to 1981
levels. Our forecast assumed constant growth rates from 1989
to 1992 and then from 1992 to 1999, in employment of 1.7% and
2.9%, in real personal income of 1.9% and 3.5%, and in
population of 1.6% and 1.9%, respectively. Actual 1988 rates
were 1.5% for employment, -2.3% for real personal income, and
1.9% for population.

Permits were issued for only 1,467 multi-family units in
1988, fewer than at any time in the previous 29 years. (The
high was over 51,000 units in 1983.) The level of single
family permits declined from a peak of 21,581 units in 1983
to only 9,013 units in 1988, well below the average of over
17,000 per year from 1982 until 1987. In our forecast
equation, single family permits are a function of STOCK, EMP,
WAGE, SIZE, and $SFPRMT_{t-1}$. Permits are not a function of
price. Our forecast assumptions of increased employment

growth, even higher income than employment growth, and higher employment than population growth, result in a projected sharp rise in the level of permits through 1999. A recession would cause permits to continue their decline for the duration of the recession and to then rise.

Real housing prices fluctuated from 1963 to 1988, with an overall increase of 57%. However, there were 11 real price declines during the period, including a 19.4% drop in 1982. With average real prices in 1988 at $31,600, homes were selling at slightly above 1979 levels. Dallas ranked near the bottom (number 12) of the "real-priciness" scale in 1963 and moved up 2 places to tie with Chicago in tenth position in 1988. Prices in our model are a function of ESTK, USER2, and RPRICE$_{t-1}$. We forecast prices to rise slowly, but steadily, with or without a recession. A recession would dampen the increases very slightly. Prices will rise in response to the growth in employment relative to stock. However, the rapid rise in the level of permits (i.e. construction) will restrain the price increases.

## FIGURE 4.8

## FORECAST FOR PRICES 1989-1999



DALLAS

PRICE (000's)

YEAR

□ ACTUAL ——— W/RECESSION ◇ W/O RECESSION

## FORECAST FOR PERMITS 1989-1999



DALLAS

PERMITS (Thousands)

YEAR

□ ACTUAL ——— W/RECESSION ◇ W/O RECESSION
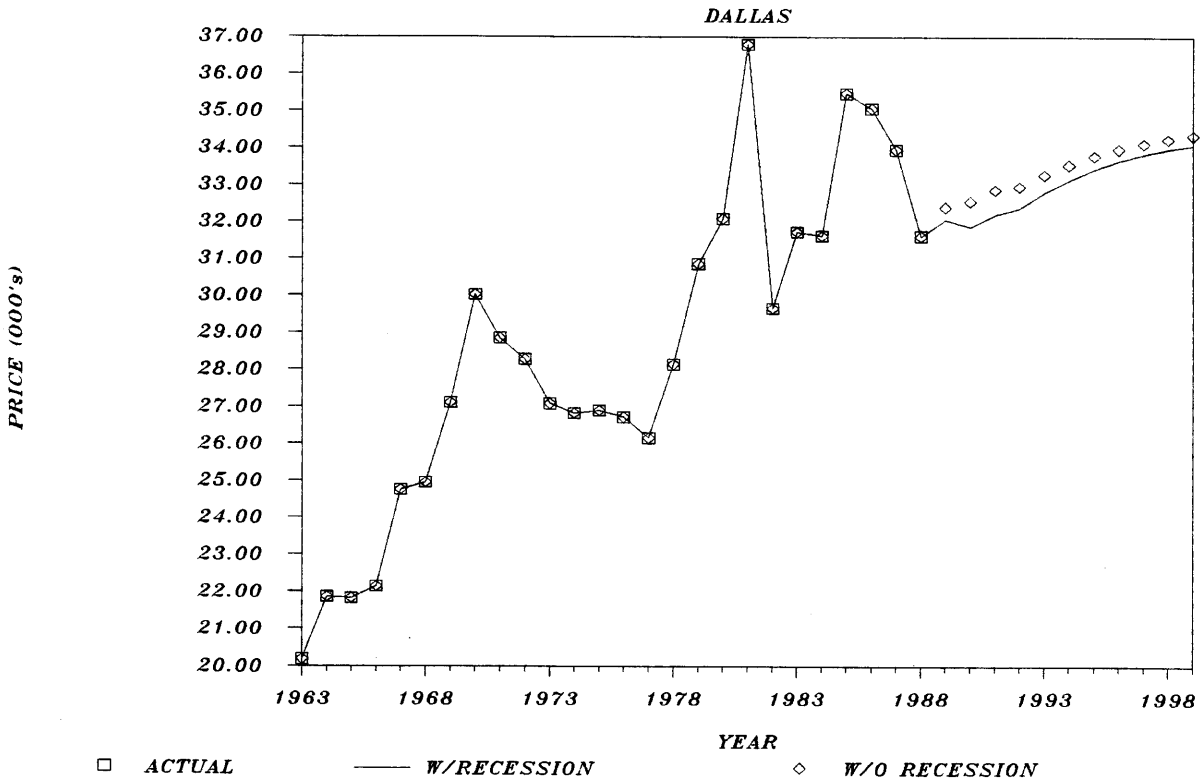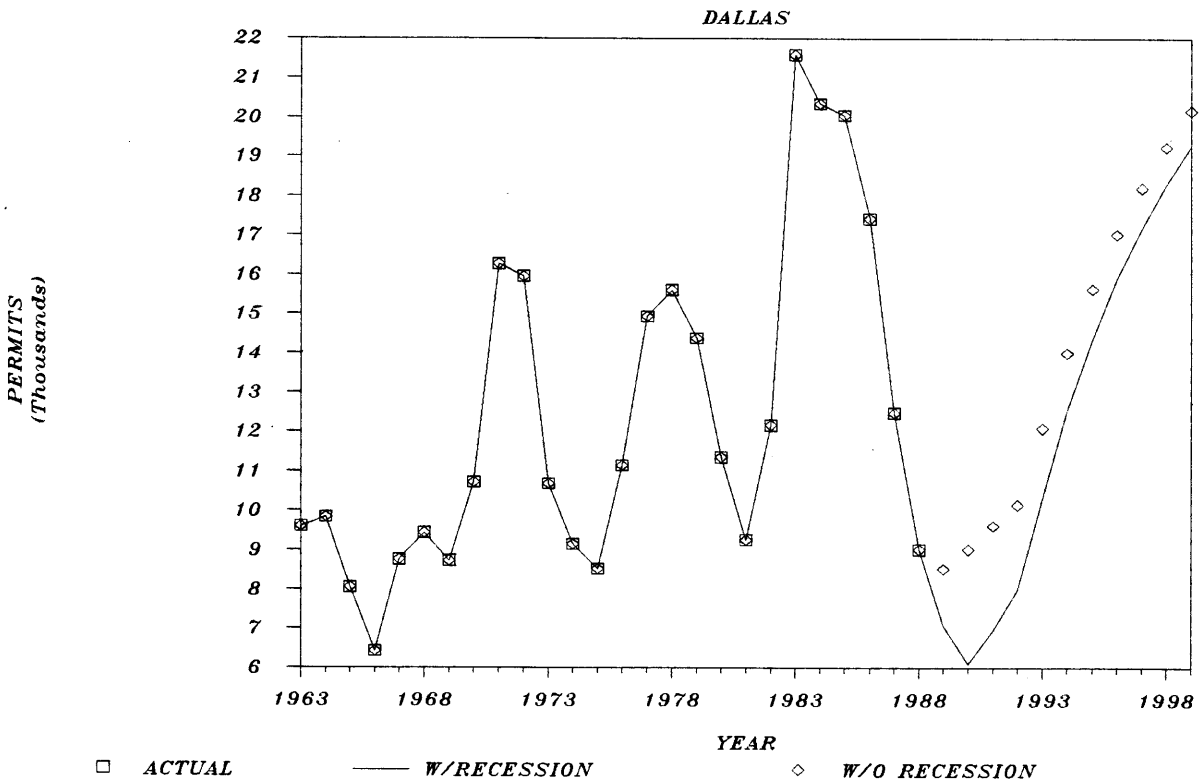
# THE ATLANTA MARKET

Atlanta's population increased 117% from 1,249,400 in 1960 to 2,715,700 in 1988. During this period, employment grew 262%. In 29 years population never increased by less than 1% per year. Employment decreased only in 1975, a recession year. Total real personal income, per capita income, and WAGE decreased several times over the 29 year span of our dataset. WAGE in 1988 was close to the 1961 level. Our forecast assumed growth in YPI of 3.3% and then 4.4%, in EMP of 2.7% and then 3.4%, and in POP of 2.5% and then 2.1%. This compares to 1988 rates of .9% for EMP, 1.0% for YPI, and 3.4% for POP and a 1984-88 average rate per year of 4.9% for EMP, 5.3% for YPI, and 3.2% for POP. The projected growth rates for these variables are much higher than the 1988 figures, which were substantially lower than the 1984-1988 per year averages.

Multi-family permits averaged more than 16,000 units per year from 1983 to 1988, following a 9 year period of low levels. Single family permits averaged more than 31,000 per year from 1983 to 1988. The greatest number of single family permits issued in the previous 20 years was 22,759 in 1972.

In our Atlanta equation, permits are a function of STOCK, WAGE, EMP, and SIZE. They are not a function of price. WAGE and EMP are projected to grow strongly, but SIZE, which has a positive coefficient, will decline.

Permits will remain fairly level until 1993, when the employment and income growth rates will rise, causing a sharp rise in permits. Because our recession assumes no growth in income and employment, the recession scenario will result in a steep drop in permits for the duration of the recession.

Overall, real housing prices increased by 74% from 1963 to 1988, despite 10 years when prices declined. From 1985 to 1988, real prices increased 21%. Atlanta moved up in rank from ninth place in 1963 to seventh place in 1988. We forecast a decline in prices at a decreasing rate through 1999, to end the decade close to 1978 levels.

Prices are a function of ESTK1, USER2, and $RPRICE_{t-1}$. They decline during our forecast period in response to lower average employment growth than in the previous 5 years and high levels of permits. Here, the growth in stock appears to be outpacing employment growth, causing a housing surplus and the drop in prices. When the projected employment growth rate increases beginning in 1993 and the rate of growth in permits decreases, the rate of price decline decreases. As indicated by the coefficient of $RPRICE_{t-1}$ (.86) prices in Atlanta adjust very little toward their equilibrium level in each period.

## FIGURE 4.9

## FORECAST FOR PRICES 1989-1999



ATLANTA

□ ACTUAL     —— W/RECESSION     ◇ W/O RECESSION

## FORECAST FOR PERMITS 1989-1999



ATLANTA

□ ACTUAL     —— W/RECESSION     ◇ W/O RECESSION

66
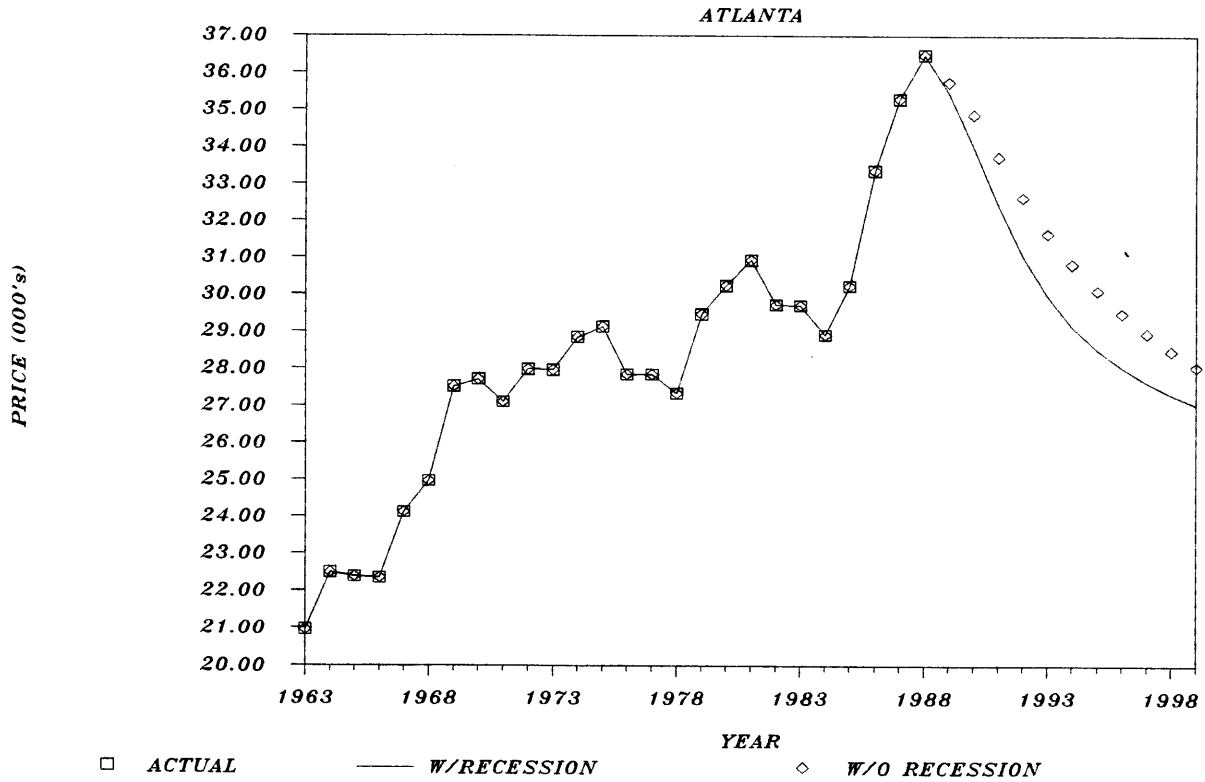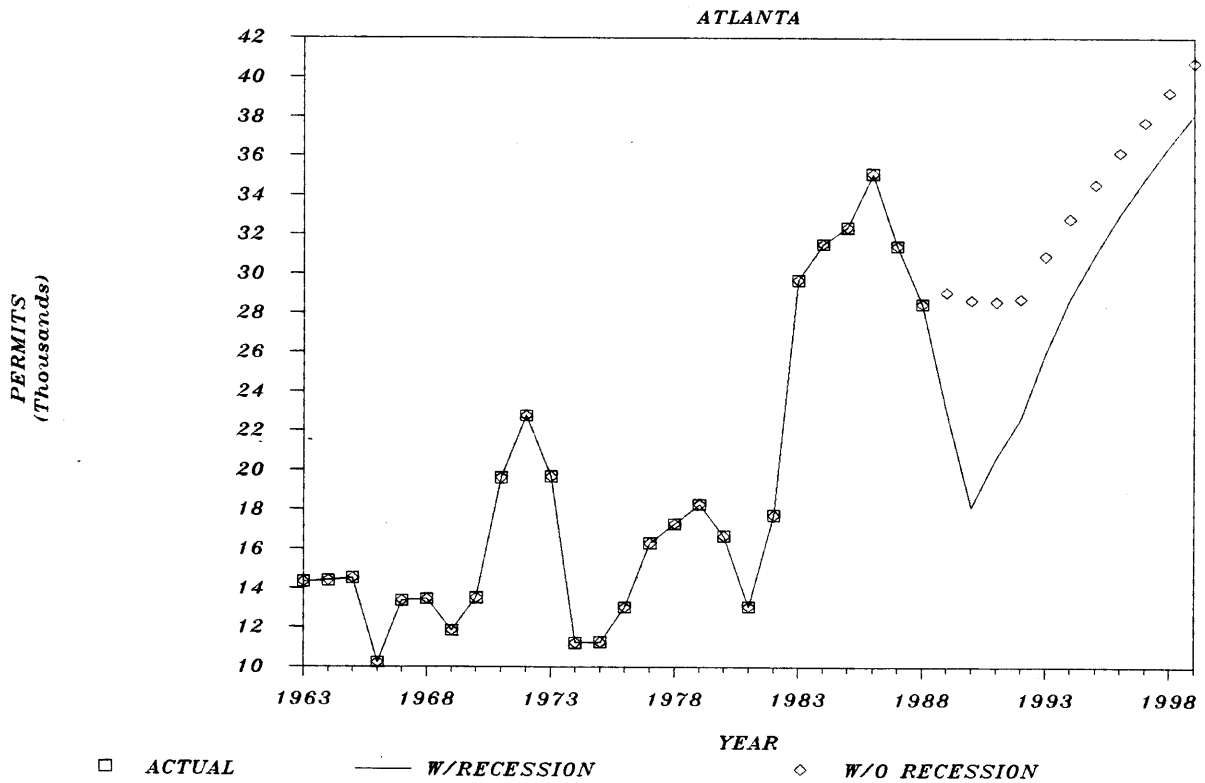
## THE BOSTON MARKET

Boston's population increased a total of 6% in 29 years.
Boston experienced 8 consecutive years of population decline
in addition to 4 other declines during our time series.
However, employment increased by almost 65% overall.  After
1980, there were large increases in YPI, per capita income,
EMP, and WAGE (35%, 33%, 19%, and 14% respectively) in
Boston.  SIZE dropped steadily in Boston, as it did in all of
our cities and in 1988, at 1.7, was the smallest of our
cities.  We used a forecast of growth in YPI of 2.8% and
3.1%, for EMP of 1.9% and 2.4% and POP of .8% and .6%.  This
compares to the 1984 to 1988 averages per year of 2.9% for
EMP, .3% for POP, and 4.2% for YPI.

Single family permits increased during the mid 1980's to
between 10,000 and 12,000 per year, levels not seen since
1971.  In 1988 approximately 9,000 permits were issued.  In
our nonrecession forecast there would be a levelling off of
the decline from previous years and then a rise after 1991.
A recession would cause permits to continue to decline to
below 1988 levels, but permits would begin to rise again at
the end of the recession, although they would not recover to
the nonrecession forecast levels.  In Boston permits are a
function of STOCK, $SFPERMIT_{t-1}$, DRPRICE, and YPI.  The
projected resumption in permit growth will result from the
forecast of rising prices and resumption of strong income

growth, after and actual slowdown in 1988.

There was a phenomenal increase in both real and nominal housing prices during the 1980's. In 1963 Boston ranked sixth, but moved up to second place in 1988, behind San Francisco, in terms of high housing costs. From 1963 to 1980, nominal prices rose very slightly, but from 1980 to 1988 nominal prices increased 184%. From 1980 until 1988 real prices increased 98%. Over the 29 years of our dataset, real prices increased a total of 122%. This exceptional overall price rise came despite seven years of real price declines, some as large as 9.3%.

We forecast steadily rising prices through 1999, although the rate of increase will not be as great as in recent years. A recession would cause prices to plateau at current levels and then begin to rise again at the end of the recession. Prices in Boston are a function of ESTK, $RPRICE_{t-1}$ and MTGR. Because mortgage rates are unchanged throughout the forecast period, lagged prices and ESTK have the greatest effect. Permits will rise in response to the projected growth in employment, after an actual decline in employment in 1988.

FIGURE 4.10

# FORECAST FOR PRICES 1989-1999

**BOSTON**



□ ACTUAL    ——— W/RECESSION    ◇ W/O RECESSION

# FORECAST FOR PERMITS 1989-1999
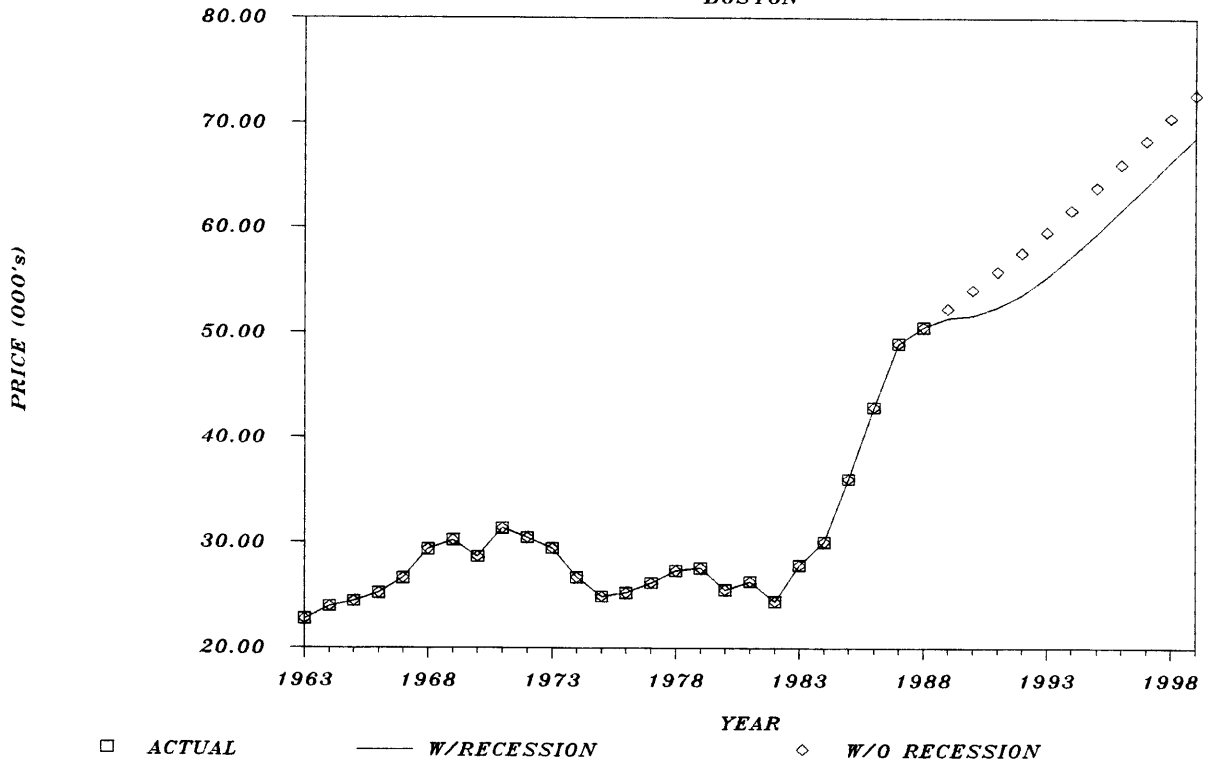
**BOSTON**



□ ACTUAL    ——— W/RECESSION    ◇ W/O RECESSION
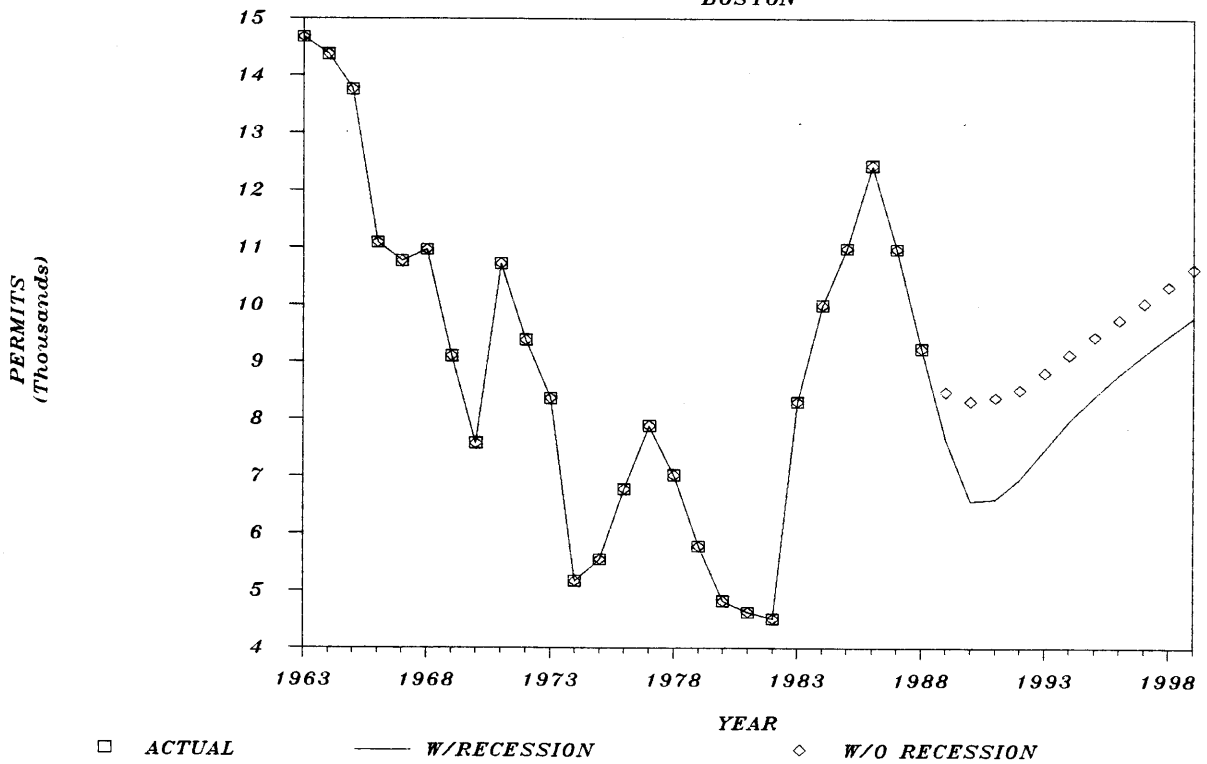
## THE BALTIMORE MARKET

Baltimore, which ranked second to last in 1963 in terms of relative priciness, moved up to fifth place in 1988. In 1963 only Philadelphia was less expensive than Baltimore. By 1988, only Boston, New York, Los Angeles, and San Francisco were more expensive. From 1963 to 1988, nominal housing prices increased 661%, while real prices increased 97%, the fourth largest increase in the sample. Most of this increase occurred from 1984 to 1988 when real prices increased 48%.

From 1960 to 1988, overall employment in Baltimore grew by 75%, population by 26% and real personal income by 122%. These increases were achieved despite employment declines in 1970, 1975, 1981, and 1982, a population decline in 1980, and real personal income declines in 1974, 1975, 1979, 1980, 1982, and 1988. However, real wages in 1988 had dropped below 1971 levels. From 1984 to 1988 growth in EMP averaged 2.6%, in POP 1.0%, and in YPI 2.5%. This compares with our forecast assumptions of growth in EMP of 1.3% and 1.8%, in POP of .7% and .7%, and in YPI of 1.8% and 2.4%.

Construction of multi-family units reached a peak in the early 1970's with permits averaging almost 12,000 units per year from 1970 to 1973. In 1974 multi-family permits dropped precipitously and remained below 5,000 units per year through 1988.

From 1983 to 1988 single family permits averaged over

14,600 permits per year, up from 6,471 in 1982 and reaching a high of 15,414 in 1986. We forecast a drop in permits, recession or not, through 1990 and then an increase. In Baltimore, permits are a function of DRPRICE, WAGE, SIZE, and $SFPRMT_{t-1}$. WAGE and SIZE are both functions of EMP, which in the forecast will grow more slowly through 1999 than it did from 1984 to 1988. This change in growth rates causes the steep drop in permits and is reinforced by $SFPRMT_{t-1}$ which turned downward in 1987. However, the DRPRICE component quickly turns permits around again since prices rise steadily in our forecast. In Baltimore prices are a function of ESTK, RPRICE, USER, and WAGE. We forecast continually rising prices through 1999, although at a marginally lower rate than in the mid 1980's. However, we believe that this forecast is highly suspect, given that the coefficient of RPRICE is greater than one. (See the forecast for Philadelphia above.)

FIGURE 4.11

## FORECAST FOR PRICES 1989-1999

*BALTIMORE*



YEAR

□ ACTUAL　　——— W/RECESSION　　◇ W/O RECESSION

## FORECAST FOR PERMITS 1989-1999

*BALTIMORE*



YEAR

□ ACTUAL　　——— W/RECESSION　　◇ W/O RECESSION

72
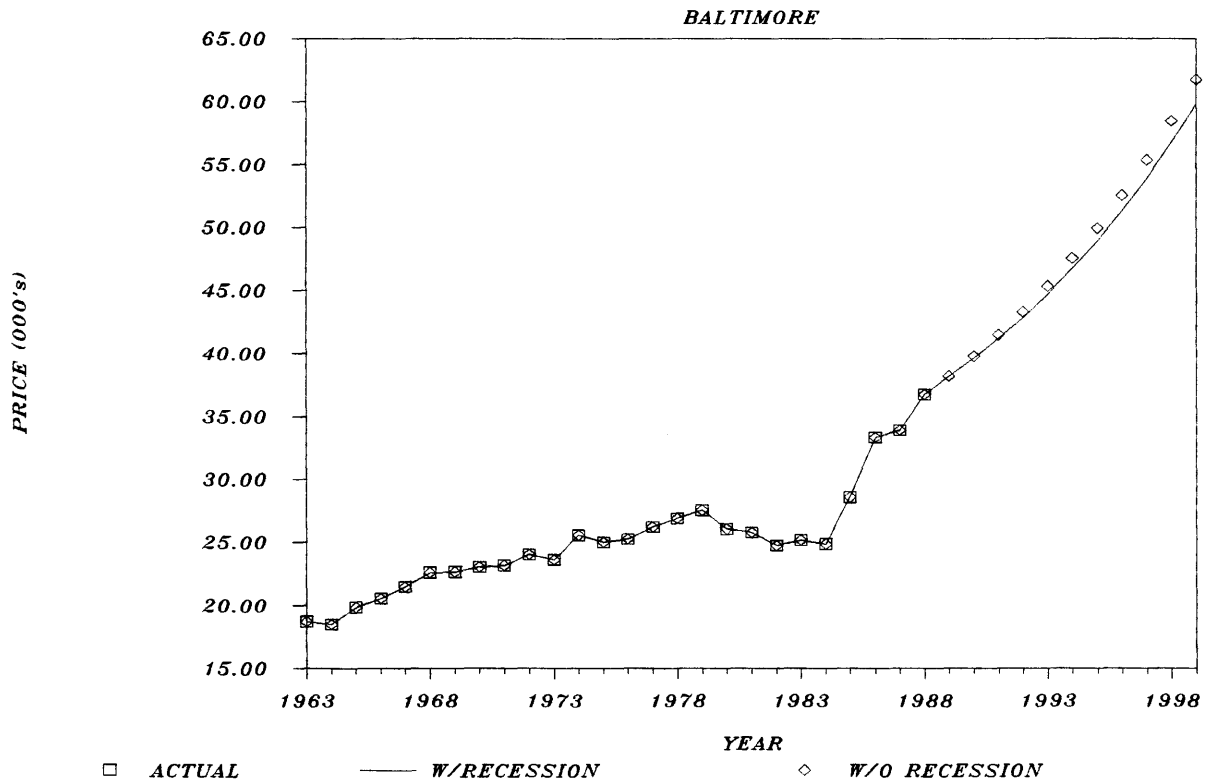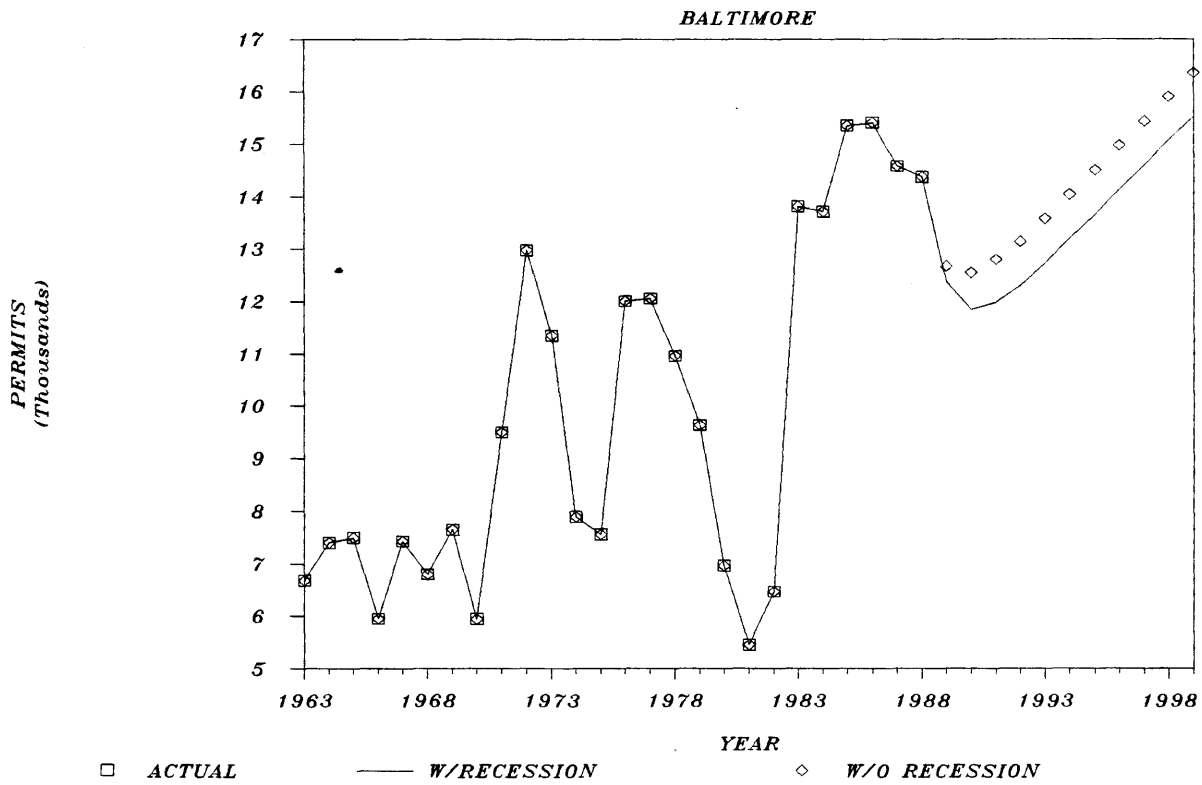
## TABLE 4.1
## GROWTH FACTORS AND OTHER ASSUMPTIONS

INFLATION RATE PER YEAR       5.0%
MORTGAGE RATE       10.0%
1-DEPRECIATION RATE       0.998

| | 87-92 % CHG IN REAL PERSONAL INCOME | 87-92 % CHG NON-AG EMP | 87-92 % CHG POP | 92-97 % CHG IN REAL PERSONAL INCOME | 92-97 % CHG NON-AG EMP | 92-97 % CHG POP |
|---|---|---|---|---|---|---|
| DENVER | 1.5% | 1.3% | 1.0% | 2.2% | 1.7% | 0.9% |
| HOUSTON | 2.2% | 1.7% | 1.2% | 3.9% | 2.6% | 1.3% |
| SAN FRANCISCO | 2.5% | 1.9% | 1.5% | 2.1% | 2.0% | 1.2% |
| MINNEAPOLIS | 2.4% | 1.8% | 0.9% | 2.5% | 1.9% | 0.6% |
| PHILADELPHIA | 1.6% | 1.3% | 0.2% | 1.5% | 1.1% | -0.1% |
| CLEVELAND | 1.8% | 1.3% | -0.1% | 2.1% | 1.5% | 0.0% |
| LOS ANGELES | 3.3% | 2.2% | 1.7% | 2.7% | 2.1% | 1.3% |
| DALLAS | 1.9% | 1.7% | 1.6% | 3.5% | 2.9% | 1.9% |
| ATLANTA | 3.3% | 2.7% | 2.5% | 4.4% | 3.4% | 2.1% |
| BOSTON | 2.8% | 1.9% | 0.8% | 3.1% | 2.4% | 0.6% |
| BALTIMORE | 1.8% | 1.3% | 0.7% | 2.4% | 1.8% | 0.7% |

*NOTE: SAN FRANCISCO IS A WEIGHTED AVERAGE OF GROWTH FORECASTS FOR SAN FRANCISCO AND OAKLAND, USING THE RATIO OF SAN FRANCISCO EMPLOYMENT/OAKLAND EMPLOYMENT.

**NOTE: FOR RECESSION FORECASTS, EMPLOYMENT AND INCOME GROWTH ARE ASSUMED TO EQUAL 0% FOR 1989 AND 1990.

***NOTE: WE ASSUMED THAT THE 1992-1997 GROWTH RATES WOULD BE THE SAME FOR 1998 AND 1999.

TABLE 4.2a

```
********************************************************************************************
NO RECESSION   PERMITS   PRICE   % CHANGE % CHANGE              PERMITS   PRICE   % CHANGE % CHANGE
                                 IN PRICE IN PERMITS                              IN PRICE IN PERMITS
********************************************************************************************
```

| | PERMITS | PRICE | % CHANGE IN PRICE | % CHANGE IN PERMITS | | PERMITS | PRICE | % CHANGE IN PRICE | % CHANGE IN PERMITS |
|---|---|---|---|---|---|---|---|---|---|
| **DENVER** | | | | | **LOS ANGELES** | | | | |
| 1988 | 4008 | 34.14 | | | 1988 | 17677 | 48.37 | | |
| 1989 | 8008 | 34.40 | 0.77% | 99.81% | 1989 | 17209 | 50.28 | 3.95% | -2.65% |
| 1990 | 8299 | 34.57 | 0.48% | 3.63% | 1990 | 18260 | 52.13 | 3.68% | 6.11% |
| 1991 | 7740 | 34.48 | -0.24% | -6.73% | 1991 | 18057 | 53.92 | 3.44% | -1.11% |
| 1992 | 7276 | 34.43 | -0.14% | -6.00% | 1992 | 18462 | 55.66 | 3.23% | 2.24% |
| 1993 | 7112 | 34.52 | 0.24% | -2.25% | 1993 | 18243 | 57.34 | 3.01% | -1.19% |
| 1994 | 6732 | 34.69 | 0.49% | -5.35% | 1994 | 18169 | 58.96 | 2.83% | -0.40% |
| 1995 | 6495 | 34.93 | 0.69% | -3.52% | 1995 | 18139 | 60.54 | 2.67% | -0.17% |
| 1996 | 6414 | 35.23 | 0.86% | -1.24% | 1996 | 18150 | 62.07 | 2.53% | 0.06% |
| 1997 | 6427 | 35.57 | 0.99% | 0.20% | 1997 | 18197 | 63.56 | 2.41% | 0.26% |
| 1998 | 6482 | 35.96 | 1.09% | 0.84% | 1998 | 18272 | 65.02 | 2.30% | 0.42% |
| 1999 | 6549 | 36.38 | 1.16% | 1.04% | 1999 | 18373 | 66.45 | 2.19% | 0.55% |
| **HOUSTON** | | | | | **DALLAS** | | | | |
| 1988 | 6781 | 28.38 | | | 1988 | 9013 | 31.61 | | |
| 1989 | 5403 | 28.11 | -0.95% | -20.33% | 1989 | 8521 | 32.41 | 2.52% | -5.46% |
| 1990 | 4687 | 28.33 | 0.78% | -13.24% | 1990 | 9008 | 32.56 | 0.47% | 5.72% |
| 1991 | 4651 | 28.46 | 0.46% | -0.78% | 1991 | 9609 | 32.87 | 0.95% | 6.67% |
| 1992 | 5190 | 28.62 | 0.57% | 11.60% | 1992 | 10148 | 32.95 | 0.25% | 5.60% |
| 1993 | 6219 | 28.82 | 0.67% | 19.82% | 1993 | 12085 | 33.27 | 0.96% | 19.09% |
| 1994 | 7488 | 29.01 | 0.66% | 20.41% | 1994 | 13996 | 33.54 | 0.82% | 15.82% |
| 1995 | 8754 | 29.18 | 0.60% | 16.91% | 1995 | 15637 | 33.79 | 0.73% | 11.73% |
| 1996 | 9820 | 29.33 | 0.52% | 12.17% | 1996 | 17021 | 33.97 | 0.54% | 8.85% |
| 1997 | 10558 | 29.47 | 0.45% | 7.52% | 1997 | 18203 | 34.12 | 0.43% | 6.95% |
| 1998 | 10922 | 29.59 | 0.41% | 3.45% | 1998 | 19237 | 34.23 | 0.35% | 5.68% |
| 1999 | 10939 | 29.70 | 0.39% | 0.15% | 1999 | 20165 | 34.33 | 0.29% | 4.82% |
| **SAN FRANCISCO** | | | | | **ATLANTA** | | | | |
| 1988 | 12255 | 51.93 | | | 1988 | 28468 | 36.49 | | |
| 1989 | 12897 | 52.61 | 1.30% | 5.24% | 1989 | 29072 | 35.75 | -2.02% | 2.12% |
| 1990 | 13106 | 54.18 | 2.99% | 1.62% | 1990 | 28674 | 34.88 | -2.45% | -1.37% |
| 1991 | 13185 | 54.79 | 1.12% | 0.61% | 1991 | 28593 | 33.74 | -3.26% | -0.28% |
| 1992 | 13227 | 55.75 | 1.76% | 0.31% | 1992 | 28743 | 32.64 | -3.24% | 0.53% |
| 1993 | 13243 | 56.41 | 1.18% | 0.12% | 1993 | 30911 | 31.66 | -3.01% | 7.54% |
| 1994 | 13252 | 57.18 | 1.36% | 0.07% | 1994 | 32819 | 30.83 | -2.63% | 6.17% |
| 1995 | 13258 | 57.86 | 1.19% | 0.05% | 1995 | 34552 | 30.11 | -2.31% | 5.28% |
| 1996 | 13264 | 58.58 | 1.25% | 0.04% | 1996 | 36171 | 29.50 | -2.03% | 4.69% |
| 1997 | 13270 | 59.29 | 1.20% | 0.04% | 1997 | 37722 | 28.97 | -1.81% | 4.29% |
| 1998 | 13275 | 60.01 | 1.22% | 0.04% | 1998 | 39236 | 28.49 | -1.64% | 4.01% |
| 1999 | 13281 | 60.74 | 1.21% | 0.04% | 1999 | 40737 | 28.06 | -1.51% | 3.83% |
| **MINNEAPOLIS** | | | | | **BOSTON** | | | | |
| 1988 | 13755 | 35.61 | | | 1988 | 9233 | 50.54 | | |
| 1989 | 13377 | 35.43 | -0.51% | -2.75% | 1989 | 8472 | 52.32 | 3.53% | -8.24% |
| 1990 | 13796 | 35.19 | -0.69% | 3.13% | 1990 | 8315 | 54.09 | 3.39% | -1.85% |
| 1991 | 14334 | 35.06 | -0.36% | 3.90% | 1991 | 8375 | 55.87 | 3.28% | 0.72% |
| 1992 | 14891 | 34.88 | -0.51% | 3.89% | 1992 | 8514 | 57.64 | 3.17% | 1.66% |
| 1993 | 15525 | 34.70 | -0.53% | 4.26% | 1993 | 8810 | 59.62 | 3.44% | 3.47% |

TABLE 4.2a (continued)

```
*************************************************************************************************
NO RECESSION   PERMITS   PRICE   % CHANGE % CHANGE           PERMITS   PRICE   % CHANGE % CHANGE
                                 IN PRICE IN PERMITS                           IN PRICE IN PERMITS
*************************************************************************************************
```

| NO RECESSION | PERMITS | PRICE | % CHANGE IN PRICE | % CHANGE IN PERMITS | | PERMITS | PRICE | % CHANGE IN PRICE | % CHANGE IN PERMITS |
|---|---|---|---|---|---|---|---|---|---|
| 1994 | 16169 | 34.48 | -0.61% | 4.15% | 1994 | 9129 | 61.74 | 3.54% | 3.63% |
| 1995 | 16813 | 34.24 | -0.71% | 3.99% | 1995 | 9441 | 63.92 | 3.54% | 3.41% |
| 1996 | 17457 | 33.96 | -0.82% | 3.83% | 1996 | 9741 | 66.14 | 3.47% | 3.18% |
| 1997 | 18099 | 33.64 | -0.93% | 3.68% | 1997 | 10036 | 68.36 | 3.36% | 3.03% |
| 1998 | 18740 | 33.29 | -1.04% | 3.54% | 1998 | 10330 | 70.56 | 3.22% | 2.94% |
| 1999 | 19379 | 32.91 | -1.15% | 3.41% | 1999 | 10629 | 72.74 | 3.08% | 2.89% |
| PHILADELPHIA | | | | | BALTIMORE | | | | |
| 1988 | 19252 | 36.57 | | | 1988 | 14372 | 36.77 | | |
| 1989 | 17074 | 41.90 | 14.59% | -11.31% | 1989 | 12679 | 38.21 | 3.90% | -11.78% |
| 1990 | 16725 | 47.59 | 13.57% | -2.04% | 1990 | 12553 | 39.77 | 4.09% | -0.99% |
| 1991 | 16820 | 53.93 | 13.31% | 0.57% | 1991 | 12804 | 41.48 | 4.28% | 2.00% |
| 1992 | 17013 | 61.04 | 13.19% | 1.15% | 1992 | 13145 | 43.33 | 4.46% | 2.67% |
| 1993 | 17067 | 68.96 | 12.98% | 0.32% | 1993 | 13581 | 45.34 | 4.65% | 3.32% |
| 1994 | 17300 | 77.78 | 12.79% | 1.37% | 1994 | 14042 | 47.54 | 4.86% | 3.39% |
| 1995 | 17567 | 87.60 | 12.62% | 1.54% | 1995 | 14508 | 49.94 | 5.05% | 3.32% |
| 1996 | 17843 | 98.52 | 12.47% | 1.57% | 1996 | 14973 | 52.56 | 5.23% | 3.21% |
| 1997 | 18125 | 110.66 | 12.33% | 1.58% | 1997 | 15437 | 55.39 | 5.39% | 3.10% |
| 1998 | 18413 | 124.16 | 12.20% | 1.58% | 1998 | 15900 | 58.46 | 5.54% | 3.00% |
| 1999 | 18704 | 139.17 | 12.09% | 1.58% | 1999 | 16361 | 61.78 | 5.68% | 2.90% |
| CLEVELAND | | | | | | | | | |
| 1988 | 3988 | 25.05 | | | | | | | |
| 1989 | 3395 | 24.13 | -3.67% | -14.86% | | | | | |
| 1990 | 3464 | 23.92 | -0.88% | 2.02% | | | | | |
| 1991 | 3528 | 23.68 | -1.01% | 1.85% | | | | | |
| 1992 | 3712 | 23.79 | 0.46% | 5.21% | | | | | |
| 1993 | 3855 | 23.95 | 0.67% | 3.87% | | | | | |
| 1994 | 3993 | 24.18 | 0.96% | 3.57% | | | | | |
| 1995 | 4100 | 24.39 | 0.86% | 2.69% | | | | | |
| 1996 | 4204 | 24.59 | 0.82% | 2.51% | | | | | |
| 1997 | 4303 | 24.77 | 0.73% | 2.37% | | | | | |
| 1998 | 4406 | 24.94 | 0.69% | 2.39% | | | | | |
| 1999 | 4512 | 25.10 | 0.66% | 2.40% | | | | | |

TABLE 4.2b

| RECESSION | PERMITS | PRICE | % CHANGE IN PRICE | % CHANGE IN PERMITS | PERMITS | PRICE | % CHANGE IN PRICE | % CHANGE IN PERMITS |
|---|---|---|---|---|---|---|---|---|
| DENVER | | | | | LOS ANGELES | | | |
| 1988 | 4008 | 34.14 | | | 17677 | 48.37 | | |
| 1989 | 7015 | 34.24 | 0.29% | 75.02% | 15418 | 49.98 | 3.33% | -12.78% |
| 1990 | 7706 | 34.14 | -0.30% | 9.85% | 16528 | 51.28 | 2.61% | 7.20% |
| 1991 | 8654 | 33.88 | -0.76% | 12.31% | 18084 | 52.62 | 2.61% | 9.42% |
| 1992 | 8110 | 33.68 | -0.57% | -6.30% | 18459 | 53.97 | 2.57% | 2.07% |
| 1993 | 7564 | 33.63 | -0.15% | -6.72% | 18322 | 55.32 | 2.50% | -0.74% |
| 1994 | 6912 | 33.69 | 0.18% | -8.63% | 18297 | 56.66 | 2.43% | -0.13% |
| 1995 | 6540 | 33.85 | 0.46% | -5.38% | 18298 | 58.00 | 2.36% | 0.00% |
| 1996 | 6410 | 34.08 | 0.70% | -1.99% | 18328 | 59.33 | 2.30% | 0.16% |
| 1997 | 6412 | 34.39 | 0.89% | 0.03% | 18383 | 60.66 | 2.24% | 0.30% |
| 1998 | 6467 | 34.74 | 1.03% | 0.87% | 18460 | 61.98 | 2.18% | 0.42% |
| 1999 | 6538 | 35.13 | 1.13% | 1.10% | 18557 | 63.30 | 2.12% | 0.52% |
| HOUSTON | | | | | DALLAS | | | |
| 1988 | 6781 | 28.38 | | | 9013 | 31.61 | | |
| 1989 | 5403 | 27.97 | -1.45% | -20.33% | 7063 | 32.07 | 1.45% | -21.64% |
| 1990 | 4687 | 28.01 | 0.15% | -13.24% | 6095 | 31.87 | -0.60% | -13.70% |
| 1991 | 4651 | 28.09 | 0.30% | -0.78% | 6944 | 32.20 | 1.03% | 13.92% |
| 1992 | 5190 | 28.25 | 0.54% | 11.60% | 7982 | 32.37 | 0.53% | 14.96% |
| 1993 | 6219 | 28.45 | 0.72% | 19.82% | 10308 | 32.80 | 1.31% | 29.14% |
| 1994 | 7488 | 28.65 | 0.71% | 20.41% | 12509 | 33.14 | 1.05% | 21.35% |
| 1995 | 8754 | 28.83 | 0.64% | 16.91% | 14361 | 33.44 | 0.89% | 14.80% |
| 1996 | 9820 | 28.99 | 0.55% | 12.17% | 15896 | 33.66 | 0.66% | 10.69% |
| 1997 | 10558 | 29.13 | 0.48% | 7.52% | 17186 | 33.83 | 0.52% | 8.11% |
| 1998 | 10922 | 29.25 | 0.43% | 3.45% | 18295 | 33.97 | 0.41% | 6.45% |
| 1999 | 10939 | 29.37 | 0.41% | 0.15% | 19273 | 34.09 | 0.34% | 5.35% |
| SAN FRANCISCO | | | | | ATLANTA | | | |
| 1988 | 12255 | 51.93 | | | 28468 | 36.49 | | |
| 1989 | 12880 | 52.31 | 0.72% | 5.10% | 23034 | 35.45 | -2.84% | -19.09% |
| 1990 | 13065 | 53.32 | 1.93% | 1.44% | 18144 | 34.00 | -4.09% | -21.23% |
| 1991 | 13138 | 53.36 | 0.08% | 0.56% | 20649 | 32.42 | -4.65% | 13.81% |
| 1992 | 13177 | 53.78 | 0.78% | 0.30% | 22642 | 31.06 | -4.19% | 9.65% |
| 1993 | 13193 | 53.98 | 0.37% | 0.12% | 25987 | 29.98 | -3.50% | 14.77% |
| 1994 | 13201 | 54.37 | 0.72% | 0.06% | 28720 | 29.15 | -2.76% | 10.52% |
| 1995 | 13207 | 54.76 | 0.71% | 0.05% | 31025 | 28.52 | -2.16% | 8.03% |
| 1996 | 13213 | 55.26 | 0.91% | 0.04% | 33037 | 28.03 | -1.70% | 6.48% |
| 1997 | 13219 | 55.80 | 0.98% | 0.04% | 34849 | 27.65 | -1.38% | 5.49% |
| 1998 | 13224 | 56.41 | 1.09% | 0.04% | 36531 | 27.32 | -1.17% | 4.83% |
| 1999 | 13230 | 57.06 | 1.15% | 0.04% | 38131 | 27.04 | -1.03% | 4.38% |
| MINNEAPOLIS | | | | | BOSTON | | | |
| 1988 | 13755 | 35.61 | | | 9233 | 50.54 | | |
| 1989 | 12726 | 34.88 | -2.05% | -7.48% | 7651 | 51.42 | 1.75% | -17.14% |
| 1990 | 12393 | 33.74 | -3.28% | -2.62% | 6570 | 51.69 | 0.52% | -14.13% |
| 1991 | 12821 | 33.05 | -2.05% | 3.45% | 6610 | 52.49 | 1.56% | 0.61% |
| 1992 | 13363 | 32.54 | -1.53% | 4.23% | 6956 | 53.68 | 2.26% | 5.23% |
| 1993 | 14000 | 32.22 | -0.97% | 4.77% | 7472 | 55.35 | 3.10% | 7.42% |

TABLE 4.2b (continued)

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| RECESSION | PERMITS | PRICE | % CHANGE IN PRICE | % CHANGE IN PERMITS | | PERMITS | PRICE | % CHANGE IN PRICE | % CHANGE IN PERMITS |
|---|---|---|---|---|---|---|---|---|---|
| 1994 | 14650 | 32.00 | -0.69% | 4.64% | 1994 | 7967 | 57.32 | 3.57% | 6.63% |
| 1995 | 15300 | 31.82 | -0.55% | 4.44% | 1995 | 8403 | 59.49 | 3.78% | 5.47% |
| 1996 | 15949 | 31.66 | -0.53% | 4.24% | 1996 | 8788 | 61.75 | 3.82% | 4.58% |
| 1997 | 16597 | 31.48 | -0.57% | 4.06% | 1997 | 9138 | 64.07 | 3.75% | 3.99% |
| 1998 | 17243 | 31.27 | -0.65% | 3.89% | 1998 | 9469 | 66.40 | 3.64% | 3.62% |
| 1999 | 17888 | 31.03 | -0.75% | 3.74% | 1999 | 9790 | 68.72 | 3.49% | 3.40% |
| PHILADELPHIA | | | | | BALTIMORE | | | | |
| 1988 | 19252 | 36.57 | | | 1988 | 14372 | 36.77 | | |
| 1989 | 15420 | 41.51 | 13.51% | -19.90% | 1989 | 12378 | 38.18 | 3.82% | -13.87% |
| 1990 | 14421 | 46.32 | 11.59% | -6.48% | 1990 | 11858 | 39.64 | 3.81% | -4.20% |
| 1991 | 15684 | 51.67 | 11.54% | 8.76% | 1991 | 11994 | 41.17 | 3.88% | 1.15% |
| 1992 | 16120 | 57.72 | 11.72% | 2.78% | 1992 | 12309 | 42.85 | 4.08% | 2.62% |
| 1993 | 16268 | 64.51 | 11.76% | 0.92% | 1993 | 12740 | 44.69 | 4.29% | 3.50% |
| 1994 | 16556 | 72.11 | 11.78% | 1.77% | 1994 | 13201 | 46.70 | 4.51% | 3.62% |
| 1995 | 16864 | 80.60 | 11.77% | 1.86% | 1995 | 13669 | 48.91 | 4.72% | 3.54% |
| 1996 | 17173 | 90.07 | 11.75% | 1.83% | 1996 | 14136 | 51.31 | 4.91% | 3.42% |
| 1997 | 17482 | 100.62 | 11.72% | 1.80% | 1997 | 14603 | 53.92 | 5.09% | 3.30% |
| 1998 | 17791 | 112.39 | 11.69% | 1.77% | 1998 | 15068 | 56.76 | 5.26% | 3.19% |
| 1999 | 18100 | 125.48 | 11.65% | 1.74% | 1999 | 15532 | 59.84 | 5.42% | 3.08% |
| CLEVELAND | | | | | | | | | |
| 1988 | 3988 | 25.05 | | | | | | | |
| 1989 | 3288 | 23.95 | -4.40% | -17.56% | | | | | |
| 1990 | 3245 | 23.49 | -1.92% | -1.31% | | | | | |
| 1991 | 3313 | 23.14 | -1.49% | 2.11% | | | | | |
| 1992 | 3520 | 23.20 | 0.29% | 6.24% | | | | | |
| 1993 | 3687 | 23.38 | 0.74% | 4.76% | | | | | |
| 1994 | 3835 | 23.63 | 1.08% | 3.99% | | | | | |
| 1995 | 3943 | 23.86 | 0.99% | 2.84% | | | | | |
| 1996 | 4043 | 24.08 | 0.91% | 2.52% | | | | | |
| 1997 | 4138 | 24.27 | 0.80% | 2.34% | | | | | |
| 1998 | 4236 | 24.46 | 0.75% | 2.38% | | | | | |
| 1999 | 4338 | 24.63 | 0.71% | 2.41% | | | | | |

# CHAPTER FIVE

## CONCLUSION

Based upon our regression analyses for these 14 housing markets, we found that markets varied in terms of the determinants of price and supply and their significance. We also found that the variables that we considered, i.e. those for which we had time series data, were inadequate to account for prices and supply in several cities, or yielded implausible results.

Several additional variables might have improved our results, for example vacancy rate or some measure of the number of units for sale during the time series, and a measure of the age composition of the population. It would also have been interesting to have been able to use a measure of the relative costs of owning and renting and of the stock of rental housing in our analysis.

Time constraints prevented additional data-gathering efforts or more thorough exploration of price and supply models. It is possible that better models can be developed using the same dataset or the dataset with some additions and modifications.

The validity of any forecast depends upon not only the validity of the data and the skill and success of the model-builder, but also the validity of the forecast of the

exogenous variables.  We used an available but outdated forecast; we did not adjust it.  Even if the forecast were more recent and reliable, we doubt that it would be possible to use it to reliably forecast housing prices and supply over a ten-year period.  The shorter the forecast range, the more confidence we would have in these forecasts.

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APPENDIX A
METROPOLITAN AREA DEFINITIONS

LOS ANGELES/LONG BEACH
        Los Angeles County

SAN FRANCISCO/OAKLAND
        Alameda County
        Contra Costa County
        Marin County
        San Francisco County
        San Mateo County

DENVER*
        Adams County
        Arapahoe County
        Denver County
        Jefferson County
*NOTE: Denver does not include Boulder County.

ATLANTA
        Clayton County
        Cobb County
        De Kalb County
        Fulton County
        Gwinnett County

CHICAGO*
        Cook County
        Du Page County
*NOTE: Chicagoo does not include Kane, Lake, McHenry, or Will
counties.

BALTIMORE
        Anne Arundel County
        Baltimore City
        Baltimore County
        Carroll County
        Howard County

DETROIT
        Macomb County
        Oakland County
        Wayne County

## APPENDIX A (continued)
## METROPOLITAN AREA DEFINITIONS


MINNEAPOLIS/ST.  PAUL
        Anoka County
        Dakota County
        Hennepin County
        Ramsey County
        Washington County

NEW YORK*
        Bronx Borough
        Brooklyn Borough
        Manhattan Borough
        Queens Borough
        Richmond Borough
        Westchester County
        Rockland County
        Putnam County

CLEVELAND
        Cuyahoga County
        Geauga County
        Lake County
        Medina County

PHILADELPHIA
        Bucks County
        Chester County
        Delaware County
        Montgomery County
        Philadelphia County

DALLAS*
        Collin County
        Dallas County
        Denton County
        Ellis County
*NOTE: Dallas does not include Fort Worth

HOUSTON
        Brazoria County
        Fort Bend County
        Harris County
        Liberty County
        Montgomery County

## METROPOLITAN AREA DEFINITIONS

BOSTON

      Suffolk County
      Middlesex County
      Essex County
      Norfolk County
      Plymouth County

| CITY | YEAR | EMP | POP (000's) | REAL PERSONAL INCOME | M/F PERMITS | RENT INDEX | AVG MTG RATE | AVG NOMINAL PRICE | SINGLE FAMILY PERMITS | INF |
|------|------|------|-------------|----------------------|-------------|------------|--------------|-------------------|-----------------------|------|
| DEN | 1960 | 305183 | 879.5 | 8810.4 | 381 | 0.0 | 0.00 | 0.00 | 7748 | 1.6 |
| DEN | 1961 | 322337 | 940.6 | 9365.3 | 9011 | 0.0 | 0.00 | 0.00 | 7962 | 1.0 |
| DEN | 1962 | 331468 | 970.0 | 9785.7 | 8601 | 0.0 | 0.00 | 0.00 | 8469 | 1.1 |
| DEN | 1963 | 336540 | 1003.1 | 10408.9 | 3801 | 0.0 | 6.05 | 20.30 | 6132 | 1.2 |
| DEN | 1964 | 340045 | 1023.9 | 10895.0 | 2286 | 0.0 | 5.94 | 20.73 | 4914 | 1.3 |
| DEN | 1965 | 346778 | 1015.4 | 11035.4 | 2389 | 0.0 | 5.91 | 21.72 | 4106 | 1.7 |
| DEN | 1966 | 367068 | 1024.0 | 11594.8 | 2542 | 0.0 | 6.51 | 21.95 | 3455 | 2.9 |
| DEN | 1967 | 383761 | 1044.1 | 12096.6 | 3240 | 0.0 | 6.51 | 23.79 | 4225 | 2.9 |
| DEN | 1968 | 405711 | 1073.6 | 12873.3 | 5753 | 0.0 | 7.06 | 25.63 | 5393 | 4.2 |
| DEN | 1969 | 425633 | 1092.7 | 13717.6 | 7731 | 0.0 | 8.07 | 29.08 | 5584 | 5.4 |
| DEN | 1970 | 442418 | 1118.1 | 14403.0 | 8452 | 0.0 | 9.01 | 30.40 | 7624 | 5.9 |
| DEN | 1971 | 465429 | 1154.9 | 15583.5 | 17653 | 92.0 | 7.85 | 32.60 | 11990 | 4.3 |
| DEN | 1972 | 507251 | 1196.5 | 16979.2 | 24166 | 91.4 | 7.71 | 31.76 | 13904 | 3.3 |
| DEN | 1973 | 542716 | 1232.9 | 18109.6 | 13745 | 91.3 | 8.00 | 33.66 | 10412 | 6.2 |
| DEN | 1974 | 552417 | 1250.8 | 18136.9 | 4207 | 86.2 | 8.85 | 38.09 | 6008 | 11.0 |
| DEN | 1975 | 546944 | 1273.7 | 18095.7 | 1393 | 80.8 | 8.92 | 43.98 | 6568 | 9.1 |
| DEN | 1976 | 565010 | 1302.9 | 19149.7 | 2190 | 78.3 | 8.87 | 48.24 | 9646 | 5.8 |
| DEN | 1977 | 598559 | 1333.3 | 20300.9 | 2911 | 77.0 | 8.96 | 55.59 | 16527 | 6.5 |
| DEN | 1978 | 652776 | 1376.6 | 21648.3 | 6994 | 77.9 | 9.68 | 64.01 | 17706 | 7.7 |
| DEN | 1979 | 690199 | 1413.8 | 22525.9 | 5813 | 77.6 | 10.73 | 75.90 | 13375 | 11.3 |
| DEN | 1980 | 710449 | 1441.3 | 22726.2 | 5375 | 75.7 | 11.69 | 78.74 | 9216 | 13.5 |
| DEN | 1981 | 736958 | 1484.2 | 23937.0 | 4937 | 75.2 | 13.23 | 81.05 | 9313 | 10.4 |
| DEN | 1982 | 752749 | 1526.3 | 24955.3 | 7880 | 79.0 | 13.97 | 87.30 | 9760 | 6.1 |
| DEN | 1983 | 763091 | 1562.2 | 25877.9 | 11597 | 81.8 | 12.38 | 116.28 | 16379 | 3.2 |
| DEN | 1984 | 804566 | 1587.0 | 27353.0 | 10474 | 82.1 | 12.00 | 115.20 | 12503 | 4.3 |
| DEN | 1985 | 818751 | 1618.0 | 28075.3 | 7204 | 81.4 | 11.12 | 132.15 | 9577 | 3.6 |
| DEN | 1986 | 826233 | 1645.0 | 28560.4 | 7601 | 81.0 | 9.95 | 153.00 | 9238 | 2.0 |
| DEN | 1987 | 802186 | 1653.9 | 28876.5 | 3073 | 78.7 | 8.94 | 140.00 | 5838 | 3.3 |
| DEN | 1988 | 792900 | 1663.8 | 28166.8 | 2070 | 74.0 | 9.11 | 132.20 | 4008 | 4.4 |
| HOU | 1960 | 439266 | 1366.2 | 12329.4 | 1997 | 110.1 | 0.00 | 0.00 | 6207 | 1.6 |
| HOU | 1961 | 449475 | 1425.6 | 13288.2 | 4561 | 108.7 | 0.00 | 0.00 | 6427 | 1.0 |
| HOU | 1962 | 469988 | 1467.9 | 13381.6 | 16583 | 107.5 | 0.00 | 0.00 | 7520 | 1.1 |
| HOU | 1963 | 482276 | 1530.6 | 15099.2 | 14506 | 106.7 | 6.00 | 25.18 | 6789 | 1.2 |
| HOU | 1964 | 506664 | 1579.7 | 15948.1 | 9892 | 105.6 | 6.00 | 24.76 | 5609 | 1.3 |
| HOU | 1965 | 536629 | 1633.6 | 16065.2 | 6286 | 103.4 | 6.06 | 23.38 | 6291 | 1.7 |
| HOU | 1966 | 578315 | 1670.8 | 17131.1 | 6395 | 101.6 | 6.58 | 23.28 | 5593 | 2.9 |
| HOU | 1967 | 654977 | 1731.0 | 18552.2 | 9814 | 100.0 | 6.63 | 25.28 | 6249 | 2.9 |
| HOU | 1968 | 706887 | 1818.6 | 20096.5 | 15306 | 98.1 | 7.12 | 29.21 | 5531 | 4.2 |
| HOU | 1969 | 744144 | 1865.3 | 21423.5 | 20754 | 94.9 | 8.08 | 32.53 | 4127 | 5.4 |
| HOU | 1970 | 769861 | 1910.6 | 22561.1 | 18005 | 91.9 | 8.80 | 35.17 | 3467 | 5.9 |
| HOU | 1971 | 788805 | 1968.9 | 23588.9 | 27700 | 90.5 | 7.96 | 38.16 | 5338 | 4.3 |
| HOU | 1972 | 822033 | 2024.3 | 25307.2 | 24368 | 88.5 | 7.61 | 39.22 | 6174 | 3.3 |
| HOU | 1973 | 878042 | 2089.6 | 27128.4 | 13734 | 84.4 | 8.00 | 39.80 | 4524 | 6.2 |
| HOU | 1974 | 934622 | 2165.5 | 29007.8 | 6015 | 78.6 | 8.79 | 43.52 | 3231 | 11.0 |

| CITY | YEAR | EMP | POP (000's) | REAL PERSONAL INCOME | M/F PERMITS | RENT INDEX | AVG MTG RATE | AVG NOMINAL PRICE | SINGLE FAMILY PERMITS | INF |
|------|------|-----|-------------|----------------------|-------------|------------|--------------|-------------------|-----------------------|-----|
| HOU | 1975 | 993161 | 2261.1 | 31118.0 | 7650 | 77.7 | 8.69 | 49.94 | 16949 | 9.1 |
| HOU | 1976 | 1058055 | 2356.3 | 34024.8 | 16197 | 82.2 | 8.89 | 52.45 | 23295 | 5.8 |
| HOU | 1977 | 1126355 | 2450.0 | 36600.9 | 23171 | 85.8 | 8.90 | 57.24 | 28762 | 6.5 |
| HOU | 1978 | 1229455 | 2551.5 | 39793.5 | 29848 | 83.4 | 9.48 | 62.99 | 29432 | 7.7 |
| HOU | 1979 | 1319000 | 2657.8 | 41914.9 | 28464 | 79.2 | 9.90 | 72.03 | 21667 | 11.3 |
| HOU | 1980 | 1399297 | 2778.6 | 43440.8 | 17695 | 74.1 | 11.26 | 85.39 | 19085 | 13.5 |
| HOU | 1981 | 1516810 | 2916.0 | 47188.4 | 21325 | 73.0 | 13.31 | 88.52 | 23560 | 10.4 |
| HOU | 1982 | 1539695 | 3076.3 | 48783.7 | 43368 | 77.3 | 14.55 | 90.34 | 20303 | 6.1 |
| HOU | 1983 | 1444727 | 3155.7 | 47161.8 | 32025 | 77.2 | 12.19 | 101.99 | 15120 | 3.2 |
| HOU | 1984 | 1475700 | 3174.8 | 48546.3 | 12045 | 72.5 | 11.92 | 94.89 | 14351 | 4.3 |
| HOU | 1985 | 1488470 | 3230.3 | 49586.6 | 4535 | 68.4 | 11.07 | 101.48 | 6873 | 3.6 |
| HOU | 1986 | 1474660 | 3272.6 | 49780.3 | 574 | 66.8 | 9.83 | 112.80 | 5849 | 2.0 |
| HOU | 1987 | 1377180 | 3311.4 | 48189.9 | 207 | 62.5 | 9.07 | 105.50 | 6092 | 3.3 |
| HOU | 1988 | 1411300 | 3319.7 | 48279.0 | 1056 | 58.7 | 9.39 | 109.9 | 6781 | 4.4 |
| | | | | | | | | | | |
| CHI | 1960 | 2204112 | 5638.3 | 65264.8 | 12105 | 106.5 | 0.00 | 0.00 | 17380 | 1.6 |
| CHI | 1961 | 2182527 | 5648.5 | 68839.8 | 17683 | 106.5 | 0.00 | 0.00 | 16756 | 1.0 |
| CHI | 1962 | 2225072 | 5728.7 | 69459.5 | 19217 | 106.2 | 0.00 | 0.00 | 15325 | 1.1 |
| CHI | 1963 | 2237381 | 5810.1 | 75530.8 | 16513 | 105.3 | 5.64 | 23.62 | 14101 | 1.2 |
| CHI | 1964 | 2286793 | 5885.9 | 78635.5 | 16015 | 104.6 | 5.54 | 25.20 | 13534 | 1.3 |
| CHI | 1965 | 2393823 | 5946.4 | 79543.1 | 17305 | 103.2 | 5.52 | 26.04 | 14588 | 1.7 |
| CHI | 1966 | 2517800 | 5969.9 | 83527.8 | 16748 | 101.1 | 6.10 | 26.87 | 12964 | 2.9 |
| CHI | 1967 | 2586032 | 6022.2 | 86147.5 | 23547 | 100.0 | 6.17 | 29.02 | 14966 | 2.9 |
| CHI | 1968 | 2631555 | 6035.4 | 88805.6 | 29970 | 97.7 | 6.63 | 31.57 | 16960 | 4.2 |
| CHI | 1969 | 2684610 | 6062.4 | 91498.9 | 26985 | 95.0 | 7.25 | 33.77 | 13127 | 5.4 |
| CHI | 1970 | 2655767 | 6106.6 | 91696.4 | 18893 | 92.5 | 7.81 | 34.70 | 10954 | 5.9 |
| CHI | 1971 | 2607955 | 6138.8 | 93257.1 | 33652 | 91.0 | 7.26 | 35.97 | 17229 | 4.3 |
| CHI | 1972 | 2592255 | 6134.2 | 96517.1 | 26294 | 90.3 | 7.08 | 38.65 | 17149 | 3.3 |
| CHI | 1973 | 2665627 | 6111.4 | 99895.4 | 22500 | 91.4 | 7.37 | 39.71 | 14714 | 6.2 |
| CHI | 1974 | 2701992 | 6099.7 | 98332.2 | 8523 | 86.4 | 8.25 | 44.74 | 8182 | 11.0 |
| CHI | 1975 | 2600585 | 6092.2 | 95154.2 | 5852 | 82.4 | 8.87 | 46.95 | 9422 | 9.1 |
| CHI | 1976 | 2636430 | 6095.8 | 98606.1 | 9659 | 80.8 | 8.72 | 52.13 | 16578 | 5.8 |
| CHI | 1977 | 2721230 | 6102.6 | 101419.5 | 15225 | 78.6 | 8.61 | 56.92 | 22258 | 6.5 |
| CHI | 1978 | 2810300 | 6094.5 | 102666.6 | 16357 | 77.1 | 9.22 | 66.84 | 19829 | 7.7 |
| CHI | 1979 | 2851710 | 6068.5 | 101204.9 | 12755 | 73.9 | 10.19 | 69.31 | 9085 | 11.3 |
| CHI | 1980 | 2767755 | 6067.1 | 96518.5 | 6552 | 69.8 | 12.11 | 77.19 | 3716 | 13.5 |
| CHI | 1981 | 2765360 | 6085.9 | 96174.9 | 4258 | 67.9 | 13.77 | 81.18 | 3830 | 10.4 |
| CHI | 1982 | 2687247 | 6096.3 | 94397.4 | 6942 | 68.9 | 14.10 | 87.16 | 3386 | 6.1 |
| CHI | 1983 | 2669815 | 6107.4 | 96078.5 | 7501 | 70.4 | 12.38 | 92.30 | 9649 | 3.2 |
| CHI | 1984 | 2810250 | 6135.8 | 100728.6 | 6041 | 71.2 | 11.82 | 90.61 | 10925 | 4.3 |
| CHI | 1985 | 2939677 | 6174.4 | 102908.4 | 15281 | 73.1 | 11.46 | 98.09 | 10422 | 3.6 |
| CHI | 1986 | 2969437 | 6189.8 | 105508.5 | 15891 | 75.4 | 9.93 | 108.39 | 16208 | 2.0 |
| CHI | 1987 | 2997030 | 6215.8 | 107628.0 | 11293 | 76.7 | 9.03 | 116.42 | 16270 | 3.3 |
| CHI | 1988 | 3082900 | 6243.7 | 108182.7 | 10313 | 77.5 | 9.08 | 122.40 | 16322 | 4.4 |

| CITY | YEAR | EMP | POP (000's) | REAL PERSONAL INCOME | M/F PERMITS | RENT INDEX | AVG MTG RATE | AVG NOMINAL PRICE | SINGLE FAMILY PERMITS | INF |
|------|------|-----|-------------|----------------------|-------------|------------|--------------|-------------------|-----------------------|-----|
| SAF | 1960 | 958100 | 2739.4 | 32381.8 | 12993 | 93.0 | 0.00 | 0.00 | 21462 | 1.6 |
| SAF | 1961 | 968200 | 2729.6 | 32912.0 | 17929 | 95.0 | 0.00 | 0.00 | 20105 | 1.0 |
| SAF | 1962 | 997100 | 2781.0 | 34097.9 | 21985 | 97.0 | 0.00 | 0.00 | 22329 | 1.1 |
| SAF | 1963 | 1020000 | 2815.3 | 35088.5 | 25293 | 98.7 | 6.10 | 26.57 | 25013 | 1.2 |
| SAF | 1964 | 1049000 | 2863.0 | 36295.2 | 23007 | 99.9 | 6.03 | 28.13 | 20924 | 1.3 |
| SAF | 1965 | 1083200 | 2913.0 | 37696.3 | 16136 | 100.2 | 6.02 | 29.57 | 20745 | 1.7 |
| SAF | 1966 | 1133000 | 3007.0 | 39319.7 | 5486 | 99.8 | 6.72 | 30.54 | 13161 | 2.9 |
| SAF | 1967 | 1169000 | 3043.0 | 40748.4 | 6812 | 100.0 | 6.64 | 31.79 | 12623 | 2.9 |
| SAF | 1968 | 1214000 | 3072.0 | 42209.5 | 8602 | 101.0 | 7.14 | 31.74 | 15940 | 4.2 |
| SAF | 1969 | 1257000 | 3090.0 | 43485.0 | 11237 | 101.4 | 8.22 | 35.17 | 13941 | 5.4 |
| SAF | 1970 | 1254200 | 3109.0 | 44451.6 | 15918 | 102.6 | 8.79 | 37.44 | 13839 | 5.9 |
| SAF | 1971 | 1232400 | 3121.0 | 44771.1 | 22190 | 103.4 | 7.50 | 35.88 | 24123 | 4.3 |
| SAF | 1972 | 1249899 | 3135.0 | 46344.5 | 19902 | 103.1 | 7.28 | 37.86 | 23531 | 3.3 |
| SAF | 1973 | 1299000 | 3146.0 | 47090.0 | 15597 | 100.1 | 7.39 | 40.61 | 19239 | 6.2 |
| SAF | 1974 | 1321000 | 3152.0 | 47160.6 | 4110 | 93.9 | 9.27 | 47.82 | 13056 | 11.0 |
| SAF | 1975 | 1330000 | 3163.0 | 48307.4 | 2887 | 89.8 | 9.22 | 53.92 | 12539 | 9.1 |
| SAF | 1976 | 1361000 | 3187.0 | 50276.2 | 4558 | 89.9 | 9.05 | 58.68 | 21772 | 5.8 |
| SAF | 1977 | 1406000 | 3201.0 | 52185.5 | 6003 | 90.7 | 9.04 | 72.28 | 18986 | 6.5 |
| SAF | 1978 | 1473000 | 3215.0 | 54484.8 | 8205 | 90.7 | 9.68 | 87.25 | 12269 | 7.7 |
| SAF | 1979 | 1519000 | 3230.0 | 56006.4 | 6330 | 87.5 | 11.05 | 102.96 | 11309 | 11.3 |
| SAF | 1980 | 1558000 | 3260.0 | 57050.1 | 5147 | 86.8 | 12.79 | 119.67 | 8882 | 13.5 |
| SAF | 1981 | 1572000 | 3299.0 | 58425.7 | 3962 | 86.7 | 14.69 | 130.77 | 5142 | 10.4 |
| SAF | 1982 | 1549000 | 3335.0 | 59200.8 | 4671 | 89.5 | 14.80 | 138.94 | 3486 | 6.1 |
| SAF | 1983 | 1564000 | 3377.0 | 61594.8 | 6174 | 95.3 | 12.10 | 143.34 | 8595 | 3.2 |
| SAF | 1984 | 1636000 | 3423.0 | 66068.5 | 8570 | 99.1 | 12.03 | 142.52 | 11643 | 4.3 |
| SAF | 1985 | 1684000 | 3488.0 | 68905.0 | 11610 | 103.4 | 11.46 | 154.32 | 10910 | 3.6 |
| SAF | 1986 | 1710020 | 3544.0 | 71819.4 | 16908 | 110.0 | 9.54 | 169.59 | 11891 | 2.0 |
| SAF | 1987 | 1754000 | 3607.0 | 74501.7 | 13470 | 111.5 | 8.53 | 179.03 | 11644 | 3.3 |
| SAF | 1988 | 1793000 | 3626.0 | 74362.8 | 8040 | 111.5 | 8.45 | 201.10 | 12255 | 4.4 |
| MIN | 1960 | 579959 | 1653.4 | 16420.3 | 3948 | 105.0 | 0.00 | 0.00 | 10088 | 1.6 |
| MIN | 1961 | 584407 | 1679.0 | 17590.3 | 5685 | 105.5 | 0.00 | 0.00 | 8591 | 1.0 |
| MIN | 1962 | 608202 | 1699.1 | 18020.3 | 7879 | 105.4 | 0.00 | 0.00 | 8873 | 1.1 |
| MIN | 1963 | 618754 | 1740.4 | 19796.1 | 8094 | 105.2 | 5.77 | 20.89 | 9446 | 1.2 |
| MIN | 1964 | 633134 | 1760.5 | 20828.0 | 8744 | 104.8 | 5.70 | 21.93 | 9082 | 1.3 |
| MIN | 1965 | 666653 | 1798.4 | 21043.4 | 7670 | 103.6 | 5.66 | 22.36 | 8051 | 1.7 |
| MIN | 1966 | 711138 | 1825.3 | 22353.3 | 4335 | 101.5 | 6.33 | 22.63 | 6362 | 2.9 |
| MIN | 1967 | 743519 | 1865.1 | 23680.8 | 9536 | 100.0 | 6.53 | 23.42 | 7609 | 2.9 |
| MIN | 1968 | 776278 | 1903.6 | 25063.8 | 14454 | 98.? | 7.10 | 25.07 | 10523 | 4.2 |
| MIN | 1969 | 815273 | 1952.1 | 26454.0 | 15174 | 98.0 | 7.76 | 30.75 | 7969 | 5.4 |
| MIN | 1970 | 819361 | 1987.0 | 26879.8 | 10412 | 98.2 | 8.00 | 32.64 | 633 | 5.9 |
| MIN | 1971 | 811418 | 2002.4 | 27332.3 | 13443 | 97.8 | 7.76 | 32.83 | 10067 | 4.3 |
| MIN | 1972 | 844398 | 2006.9 | 28464.9 | 13524 | 96.6 | 7.64 | 33.84 | 15213 | 3.3 |
| MIN | 1973 | 883819 | 2022.2 | 29883.2 | 4072 | 92.3 | 7.73 | 35.94 | 10004 | 6.2 |
| MIN | 1974 | 905256 | 2038.0 | 29344.2 | 3527 | 85.9 | 8.07 | 40.08 | 8613 | 11.0 |

APPENDIX B - DATASET

(continued)

| CITY | YEAR | EMP | POP (000's) | REAL PERSONAL INCOME | M/F PERMITS | RENT INDEX | AVG MTG RATE | AVG NOMINAL PRICE | SINGLE FAMILY PERMITS | INF |
|------|------|-----|-------------|----------------------|-------------|------------|--------------|-------------------|----------------------|-----|
| MIN | 1975 | 901729 | 2046.9 | 28994.2 | 1509 | 82.4 | 8.07 | 50.07 | 8438 | 9.1 |
| MIN | 1976 | 923437 | 2058.6 | 30221.4 | 3132 | 83.0 | 8.47 | 50.70 | 11272 | 5.8 |
| MIN | 1977 | 973226 | 2069.7 | 31813.8 | 6166 | 83.0 | 8.75 | 54.16 | 15767 | 6.5 |
| MIN | 1978 | 1009206 | 2088.8 | 33199.8 | 5301 | 82.1 | 9.33 | 64.38 | 16860 | 7.7 |
| MIN | 1979 | 1081352 | 2113.2 | 34120.3 | 5364 | 80.9 | 10.33 | 74.13 | 12442 | 11.3 |
| MIN | 1980 | 1097025 | 2145.7 | 33456.4 | 5007 | 79.1 | 11.84 | 80.50 | 8517 | 13.5 |
| MIN | 1981 | 1097377 | 2171.9 | 33633.6 | 4507 | 78.7 | 13.60 | 90.68 | 7309 | 10.4 |
| MIN | 1982 | 1070375 | 2194.5 | 34071.5 | 5046 | 79.9 | 13.98 | 91.72 | 7694 | 6.1 |
| MIN | 1983 | 1078242 | 2212.4 | 35092.7 | 6191 | 81.9 | 12.00 | 94.04 | 11559 | 3.2 |
| MIN | 1984 | 1174685 | 2235.5 | 37705.6 | 7916 | 81.8 | 11.35 | 100.06 | 11517 | 4.3 |
| MIN | 1985 | 1212205 | 2264.5 | 38679.0 | 9595 | 84.1 | 10.61 | 113.38 | 12572 | 3.6 |
| MIN | 1986 | 1233565 | 2288.3 | 39639.3 | 10953 | 86.5 | 9.53 | 140.98 | 16320 | 2.0 |
| MIN | 1987 | 1258830 | 2304.5 | 40979.0 | 10904 | 86.8 | 8.59 | 140.65 | 16235 | 3.3 |
| MIN | 1988 | 1318000 | 2317.5 | 40421.5 | 6976 | 84.9 | 8.78 | 137.90 | 13755 | 4.4 |
| | | | | | | | | | | |
| PHI | 1960 | 1500522 | 4307.0 | 43862.9 | 7207 | 102.9 | 0.00 | 0.00 | 15813 | 1.6 |
| PHI | 1961 | 1499542 | 4358.7 | 46214.6 | 10126 | 103.6 | 0.00 | 0.00 | 15521 | 1.0 |
| PHI | 1962 | 1519067 | 4416.2 | 46522.6 | 14186 | 104.1 | 0.00 | 0.00 | 15018 | 1.1 |
| PHI | 1963 | 1516525 | 4510.4 | 50613.6 | 11848 | 104.0 | 5.64 | 17.09 | 13243 | 1.2 |
| PHI | 1964 | 1532910 | 4578.9 | 52653.2 | 16006 | 103.9 | 5.58 | 18.37 | 12275 | 1.3 |
| PHI | 1965 | 1590915 | 4625.5 | 52852.7 | 15196 | 102.5 | 5.56 | 18.93 | 14322 | 1.7 |
| PHI | 1966 | 1665142 | 4671.0 | 55756.3 | 15466 | 100.9 | 5.92 | 19.10 | 11348 | 2.9 |
| PHI | 1967 | 1717812 | 4698.9 | 57943.4 | 15772 | 100.0 | 6.06 | 20.91 | 12490 | 2.9 |
| PHI | 1968 | 1764370 | 4739.9 | 60771.3 | 15293 | 98.0 | 6.53 | 22.44 | 12774 | 4.2 |
| PHI | 1969 | 1807822 | 4778.9 | 62555.5 | 12974 | 96.7 | 6.96 | 26.06 | 10838 | 5.4 |
| PHI | 1970 | 1793275 | 4830.1 | 63096.5 | 14169 | 96.7 | 7.38 | 28.99 | 9472 | 5.9 |
| PHI | 1971 | 1761430 | 4846.6 | 64046.7 | 18820 | 98.2 | 7.61 | 30.28 | 13642 | 4.3 |
| PHI | 1972 | 1794175 | 4830.9 | 66971.3 | 20198 | 99.3 | 7.44 | 31.56 | 16391 | 3.3 |
| PHI | 1973 | 1820792 | 4795.9 | 68122.0 | 13943 | 97.4 | 7.65 | 34.37 | 17060 | 6.2 |
| PHI | 1974 | 1828047 | 4774.2 | 66726.0 | 6327 | 92.6 | 8.85 | 37.93 | 9945 | 11.0 |
| PHI | 1975 | 1780750 | 4762.7 | 65470.6 | 3395 | 90.8 | 9.11 | 41.56 | 10766 | 9.1 |
| PHI | 1976 | 1803952 | 4753.1 | 67334.0 | 4209 | 91.3 | 9.01 | 42.83 | 13513 | 5.8 |
| PHI | 1977 | 1827660 | 4736.4 | 68464.9 | 3892 | 91.5 | 8.73 | 46.03 | 16112 | 6.5 |
| PHI | 1978 | 1883820 | 4721.5 | 69768.1 | 5785 | 89.3 | 9.02 | 50.41 | 17903 | 7.7 |
| PHI | 1979 | 1918492 | 4721.2 | 69208.6 | 4864 | 83.9 | 10.19 | 56.17 | 15310 | 11.3 |
| PHI | 1980 | 1922707 | 4723.2 | 67423.3 | 3707 | 78.8 | 12.16 | 62.15 | 8677 | 13.5 |
| PHI | 1981 | 1927857 | 4734.0 | 67498.0 | 2946 | 77.2 | 14.44 | 66.07 | 5936 | 10.4 |
| PHI | 1982 | 1903437 | 4742.9 | 68164.2 | 3365 | 79.4 | 14.99 | 65.07 | 5885 | 6.1 |
| PHI | 1983 | 1918687 | 4752.1 | 70487.0 | 4168 | 82.6 | 12.66 | 69.51 | 11393 | 3.2 |
| PHI | 1984 | 1987620 | 4770.1 | 73494.6 | 3981 | 84.0 | 12.51 | 74.74 | 14363 | 4.3 |
| PHI | 1985 | 2045402 | 4785.4 | 75900.7 | 3410 | 87.9 | 11.79 | 81.46 | 16721 | 3.6 |
| PHI | 1986 | 2090217 | 4794.6 | 77077.3 | 4649 | 91.7 | 9.92 | 94.81 | 21030 | 2.0 |
| PHI | 1987 | 2157880 | 4831.7 | 79421.2 | 4301 | 94.0 | 9.14 | 114.01 | 19680 | 3.3 |
| PHI | 1988 | 2184600 | 4905.4 | 78955.0 | 3987 | 95.6 | 9.16 | 141.60 | 19252 | 4.4 |

| CITY | YEAR | EMP | POP (000's) | REAL PERSONAL INCOME | M/F PERMITS | RENT INDEX | AVG MTG RATE | AVG NOMINAL PRICE | SINGLE FAMILY PERMITS | INF |
|------|------|-----|-------------|----------------------|-------------|------------|--------------|-------------------|-----------------------|-----|
| CLE | 1960 | 699508 | 1906.9 | 20235.3 | 3262 | 111.0 | 0.00 | 0.00 | 8949 | 1.6 |
| CLE | 1961 | 674094 | 1887.4 | 21419.8 | 3865 | 110.4 | 0.00 | 0.00 | 5566 | 1.0 |
| CLE | 1962 | 687807 | 1902.4 | 21620.7 | 6741 | 108.8 | 0.00 | 0.00 | 5269 | 1.1 |
| CLE | 1963 | 698448 | 1934.3 | 23641.1 | 10910 | 107.4 | 5.76 | 22.48 | 5173 | 1.2 |
| CLE | 1964 | 733677 | 1955.3 | 24674.2 | 7100 | 105.8 | 5.71 | 23.60 | 5914 | 1.3 |
| CLE | 1965 | 764344 | 1997.2 | 25153.0 | 6620 | 103.9 | 5.67 | 24.22 | 5865 | 1.7 |
| CLE | 1966 | 798882 | 2030.3 | 26527.4 | 3576 | 101.6 | 6.17 | 24.85 | 5104 | 2.9 |
| CLE | 1967 | 814900 | 2038.7 | 26938.6 | 7599 | 100.0 | 6.29 | 26.68 | 5963 | 2.9 |
| CLE | 1968 | 839837 | 2046.0 | 28345.7 | 8602 | 97.6 | 6.71 | 28.78 | 5739 | 4.2 |
| CLE | 1969 | 865808 | 2052.5 | 29042.7 | 8347 | 94.7 | 7.66 | 30.97 | 4353 | 5.4 |
| CLE | 1970 | 853402 | 2059.4 | 28310.2 | 3447 | 92.4 | 8.06 | 31.68 | 4045 | 5.9 |
| CLE | 1971 | 827818 | 2047.1 | 27992.4 | 6640 | 91.8 | 7.28 | 34.36 | 5384 | 4.3 |
| CLE | 1972 | 836501 | 2016.2 | 29209.2 | 8188 | 90.2 | 7.10 | 35.24 | 5364 | 3.3 |
| CLE | 1973 | 863722 | 1998.1 | 30273.4 | 3361 | 86.4 | 7.57 | 34.11 | 4604 | 6.2 |
| CLE | 1974 | 877790 | 1978.9 | 29824.9 | 2973 | 80.3 | 8.61 | 38.50 | 4146 | 11.0 |
| CLE | 1975 | 849236 | 1967.0 | 28684.9 | 1265 | 76.7 | 8.92 | 41.33 | 4545 | 9.1 |
| CLE | 1976 | 858555 | 1953.4 | 29546.0 | 1819 | 76.7 | 8.77 | 43.19 | 5071 | 5.8 |
| CLE | 1977 | 879335 | 1941.3 | 30605.7 | 3851 | 77.0 | 8.63 | 47.83 | 6400 | 6.5 |
| CLE | 1978 | 904000 | 1928.1 | 30849.7 | 2752 | 76.6 | 9.31 | 54.91 | 5398 | 7.7 |
| CLE | 1979 | 918241 | 1909.6 | 30373.7 | 2744 | 73.1 | 10.67 | 60.98 | 4282 | 11.3 |
| CLE | 1980 | 894352 | 1893.9 | 28831.1 | 1036 | 69.3 | 12.48 | 64.25 | 2146 | 13.5 |
| CLE | 1981 | 879390 | 1883.4 | 28439.2 | 1382 | 66.0 | 13.84 | 74.12 | 1558 | 10.4 |
| CLE | 1982 | 843465 | 1874.8 | 27923.8 | 412 | 65.9 | 14.37 | 74.16 | 1282 | 6.1 |
| CLE | 1983 | 828137 | 1870.7 | 28188.5 | 924 | 67.0 | 12.36 | 73.21 | 2671 | 3.2 |
| CLE | 1984 | 853143 | 1866.0 | 29409.5 | 1123 | 66.8 | 12.28 | 72.88 | 2757 | 4.3 |
| CLE | 1985 | 868286 | 1860.2 | 29935.9 | 2078 | 67.8 | 11.63 | 73.31 | 3286 | 3.6 |
| CLE | 1986 | 886968 | 1858.4 | 30339.2 | 2406 | 69.8 | 9.93 | 83.73 | 4428 | 2.0 |
| CLE | 1987 | 901398 | 1844.2 | 30814.5 | 2457 | 69.1 | 9.22 | 89.34 | 4237 | 3.3 |
| CLE | 1988 | 908500 | 1858.3 | 30544.6 | 1825 | 68.6 | 9.21 | 97.00 | 3988 | 4.4 |
| LOS | 1960 | 2188867 | 6074.0 | 67971.2 | 41317 | 102.5 | 0.00 | 0.00 | 24896 | 1.6 |
| LOS | 1961 | 2203780 | 6235.2 | 72506.0 | 50680 | 103.1 | 0.00 | 0.00 | 26400 | 1.0 |
| LOS | 1962 | 2294732 | 6363.0 | 74772.9 | 66853 | 103.1 | 0.00 | 0.00 | 25814 | 1.1 |
| LOS | 1963 | 2357725 | 6571.2 | 81041.5 | 97861 | 103.6 | 6.25 | 23.91 | 26448 | 1.2 |
| LOS | 1964 | 2415250 | 6713.0 | 85026.9 | 64906 | 103.9 | 6.23 | 26.04 | 23703 | 1.3 |
| LOS | 1965 | 2480385 | 6804.5 | 86869.1 | 33568 | 103.5 | 6.24 | 27.32 | 18141 | 1.7 |
| LOS | 1966 | 2620427 | 6828.3 | 91091.1 | 10532 | 101.7 | 6.70 | 28.39 | 10441 | 2.9 |
| LOS | 1967 | 2700072 | 6896.9 | 94730.0 | 12992 | 100.0 | 6.59 | 29.93 | 10098 | 2.9 |
| LOS | 1968 | 2796062 | 6937.6 | 98045.6 | 19550 | 97.9 | 7.12 | 31.07 | 14292 | 4.2 |
| LOS | 1969 | 2899905 | 6995.9 | 100918.6 | 28872 | 96.5 | 8.04 | 33.99 | 12223 | 5.4 |
| LOS | 1970 | 2860310 | 7050.9 | 100264.4 | 38026 | 96.2 | 8.65 | 35.80 | 8447 | 5.9 |
| LOS | 1971 | 2789792 | 7091.1 | 99593.3 | 33414 | 95.9 | 7.53 | 36.45 | 11304 | 4.3 |
| LOS | 1972 | 2887807 | 7056.5 | 104062.1 | 41860 | 94.6 | 7.30 | 37.56 | 11093 | 3.3 |
| LOS | 1973 | 3029267 | 7049.9 | 105679.6 | 33504 | 91.6 | 7.96 | 39.48 | 9443 | 6.2 |
| LOS | 1974 | 3067307 | 7088.8 | 104580.4 | 14139 | 86.7 | 9.12 | 45.55 | 5988 | 11.0 |

| CITY | YEAR | EMP | POP (000's) | REAL PERSONAL INCOME | M/F PERMITS | RENT INDEX | AVG MTG RATE | AVG NOMINAL PRICE | SINGLE FAMILY PERMITS | INF |
|------|------|-----|-------------|----------------------|-------------|------------|--------------|-------------------|------------------------|-----|
| LOS | 1975 | 3017880 | 7132.7 | 103738.1 | 8851 | 83.6 | 9.16 | 52.04 | 8830 | 9.1 |
| LOS | 1976 | 3109172 | 7213.2 | 108204.5 | 15007 | 84.6 | 9.05 | 59.63 | 14260 | 5.8 |
| LOS | 1977 | 3233230 | 7267.9 | 112282.5 | 21357 | 86.6 | 9.05 | 71.27 | 17965 | 6.5 |
| LOS | 1978 | 3431212 | 7354.8 | 116196.3 | 26376 | 87.9 | 9.70 | 83.94 | 13911 | 7.7 |
| LOS | 1979 | 3584740 | 7415.0 | 117985.0 | 23959 | 86.7 | 11.07 | 94.07 | 12620 | 11.3 |
| LOS | 1980 | 3610340 | 7501.9 | 116574.3 | 20231 | 85.6 | 12.94 | 110.77 | 8530 | 13.5 |
| LOS | 1981 | 3640987 | 7593.5 | 117642.7 | 14445 | 86.3 | 14.61 | 116.05 | 6646 | 10.4 |
| LOS | 1982 | 3533655 | 7714.0 | 117385.8 | 9880 | 89.2 | 14.47 | 122.61 | 4544 | 6.1 |
| LOS | 1983 | 3557000 | 7825.0 | 120374.0 | 17149 | 92.1 | 11.92 | 133.22 | 10818 | 3.2 |
| LOS | 1984 | 3725920 | 7934.8 | 127561.6 | 23354 | 94.8 | 11.75 | 131.52 | 14337 | 4.3 |
| LOS | 1985 | 3825187 | 8117.3 | 133610.5 | 39035 | 99.0 | 11.23 | 142.18 | 15087 | 3.6 |
| LOS | 1986 | 3907592 | 8217.4 | 136772.3 | 52594 | 104.0 | 9.77 | 155.67 | 16630 | 2.0 |
| LOS | 1987 | 4018570 | 8476.6 | 146016.0 | 33728 | 106.2 | 8.71 | 166.96 | 17185 | 3.3 |
| LOS | 1988 | 4128000 | 8608.8 | 145827.1 | 32608 | 106.7 | 8.73 | 187.30 | 17677 | 4.4 |
| | | | | | | | | | | |
| DAL | 1960 | 408612 | 1108.4 | 11032.5 | 3446 | 0.0 | 0.00 | 0.00 | 9140 | 1.6 |
| DAL | 1961 | 423754 | 1162.0 | 11892.7 | 5104 | 0.0 | 0.00 | 0.00 | 12849 | 1.0 |
| DAL | 1962 | 439112 | 1194.7 | 12063.2 | 9746 | 0.0 | 0.00 | 0.00 | 11913 | 1.1 |
| DAL | 1963 | 459924 | 1238.7 | 13518.4 | 14144 | 0.0 | 6.09 | 20.18 | 9596 | 1.2 |
| DAL | 1964 | 479397 | 1284.7 | 14280.4 | 9530 | 106.4 | 6.01 | 22.16 | 9850 | 1.3 |
| DAL | 1965 | 502991 | 1318.5 | 14337.2 | 5974 | 104.2 | 6.00 | 22.50 | 8051 | 1.7 |
| DAL | 1966 | 536681 | 1350.4 | 15351.1 | 5245 | 101.3 | 6.55 | 23.49 | 6428 | 2.9 |
| DAL | 1967 | 571299 | 1398.1 | 16616.3 | 9644 | 100.0 | 6.62 | 27.01 | 8761 | 2.9 |
| DAL | 1968 | 614366 | 1453.6 | 18201.9 | 21388 | 98.5 | 7.31 | 28.36 | 9437 | 4.2 |
| DAL | 1969 | 665880 | 1512.4 | 19853.3 | 16607 | 96.5 | 8.19 | 32.49 | 8728 | 5.4 |
| DAL | 1970 | 678244 | 1562.9 | 20241.1 | 18414 | 94.7 | 8.76 | 38.09 | 10715 | 5.9 |
| DAL | 1971 | 678838 | 1592.5 | 20631.7 | 13634 | 92.0 | 7.75 | 38.18 | 16277 | 4.3 |
| DAL | 1972 | 709376 | 1616.9 | 22087.9 | 10748 | 89.2 | 7.54 | 38.66 | 15957 | 3.3 |
| DAL | 1973 | 755054 | 1658.5 | 23358.6 | 7773 | 85.2 | 8.01 | 39.33 | 10683 | 6.2 |
| DAL | 1974 | 774711 | 1701.0 | 23617.0 | 8001 | 79.1 | 8.92 | 43.24 | 9143 | 11.0 |
| DAL | 1975 | 766759 | 1735.8 | 23679.7 | 2889 | 75.7 | 8.70 | 47.31 | 8516 | 9.1 |
| DAL | 1976 | 801660 | 1775.8 | 25195.8 | 6844 | 75.8 | 8.95 | 49.71 | 11144 | 5.8 |
| DAL | 1977 | 846131 | 1812.8 | 26751.6 | 14731 | 77.3 | 8.88 | 51.83 | 14944 | 6.5 |
| DAL | 1978 | 912210 | 1858.0 | 28490.2 | 15741 | 79.6 | 9.50 | 60.03 | 15609 | 7.7 |
| DAL | 1979 | 979434 | 1911.3 | 29939.2 | 12140 | 79.4 | 10.09 | 73.28 | 14380 | 11.3 |
| DAL | 1980 | 1034460 | 1976.6 | 30559.9 | 10402 | 77.5 | 12.36 | 86.46 | 11357 | 13.5 |
| DAL | 1981 | 1077115 | 2031.1 | 31986.6 | 10690 | 77.5 | 13.44 | 109.49 | 9254 | 10.4 |
| DAL | 1982 | 1100830 | 2088.0 | 33229.6 | 25217 | 79.1 | 13.70 | 93.62 | 12160 | 6.1 |
| DAL | 1983 | 1139237 | 2154.5 | 35374.5 | 51789 | 83.0 | 12.42 | 103.36 | 21581 | 3.2 |
| DAL | 1984 | 1248557 | 2220.5 | 38459.1 | 30998 | 83.5 | 11.82 | 107.45 | 20339 | 4.3 |
| DAL | 1985 | 1312460 | 2315.5 | 40085.8 | 27974 | 84.0 | 10.97 | 124.87 | 20048 | 3.6 |
| DAL | 1986 | 1346500 | 2367.7 | 40653.7 | 16062 | 85.3 | 9.84 | 125.93 | 17425 | 2.0 |
| DAL | 1987 | 1309410 | 2423.4 | 39856.2 | 2696 | 81.6 | 9.20 | 125.91 | 12476 | 3.3 |
| DAL | 1988 | 1329500 | 2469.8 | 38944.6 | 1467 | 76.1 | 9.32 | 122.40 | 9013 | 4.4 |

| CITY | YEAR | EMP | POP (000's) | REAL PERSONAL INCOME | M/F PERMITS | RENT INDEX | AVG MTG RATE | AVG NOMINAL PRICE | SINGLE FAMILY PERMITS | INF |
|------|------|-----|------|------|------|------|------|------|------|------|
| DET | 1960 | 1247093 | 4127.2 | 40232.4 | 1548 | 107.9 | 0.00 | 0.00 | 18476 | 1.6 |
| DET | 1961 | 1256116 | 4141.1 | 43245.5 | 1611 | 105.4 | 0.00 | 0.00 | 17528 | 1.0 |
| DET | 1962 | 1298113 | 4180.6 | 42339.8 | 4941 | 103.2 | 0.00 | 0.00 | 17712 | 1.1 |
| DET | 1963 | 1350693 | 4231.1 | 48932.7 | 6177 | 101.4 | 5.66 | 21.26 | 19014 | 1.2 |
| DET | 1964 | 1422544 | 4293.6 | 51596.2 | 8846 | 100.5 | 5.65 | 21.07 | 21451 | 1.3 |
| DET | 1965 | 1522133 | 4373.7 | 53781.1 | 12469 | 100.0 | 5.64 | 22.89 | 22831 | 1.7 |
| DET | 1966 | 1605459 | 4435.8 | 56952.9 | 9765 | 99.7 | 6.35 | 24.12 | 17539 | 2.9 |
| DET | 1967 | 1616487 | 4499.4 | 57401.2 | 12892 | 100.0 | 6.42 | 25.17 | 21416 | 2.9 |
| DET | 1968 | 1664172 | 4517.6 | 60714.9 | 14886 | 99.1 | 6.78 | 27.15 | 17173 | 4.2 |
| DET | 1969 | 1712980 | 4535.2 | 62470.0 | 14865 | 97.5 | 7.49 | 33.72 | 13398 | 5.4 |
| DET | 1970 | 1674572 | 4561.5 | 60531.0 | 9637 | 95.9 | 8.40 | 34.12 | 15104 | 5.9 |
| DET | 1971 | 1656652 | 4579.2 | 62463.1 | 16223 | 96.0 | 7.78 | 33.18 | 24049 | 4.3 |
| DET | 1972 | 1711282 | 4574.0 | 66872.8 | 15349 | 95.9 | 7.55 | 31.79 | 17955 | 3.3 |
| DET | 1973 | 1789932 | 4558.7 | 70329.0 | 17677 | 93.3 | 7.78 | 35.69 | 15497 | 6.2 |
| DET | 1974 | 1779190 | 4542.9 | 67188.9 | 9494 | 87.9 | 8.88 | 40.55 | 10437 | 11.0 |
| DET | 1975 | 1638897 | 4516.4 | 63819.5 | 4040 | 84.3 | 8.95 | 43.11 | 10429 | 9.1 |
| DET | 1976 | 1690670 | 4489.4 | 67827.4 | 5144 | 83.0 | 8.91 | 43.11 | 13831 | 5.8 |
| DET | 1977 | 1761497 | 4483.7 | 72069.0 | 6472 | 83.1 | 8.80 | 45.77 | 19203 | 6.5 |
| DET | 1978 | 1850557 | 4489.0 | 74603.1 | 7788 | 83.2 | 9.29 | 53.57 | 19534 | 7.7 |
| DET | 1979 | 1867032 | 4489.2 | 73375.1 | 6482 | 81.2 | 10.90 | 59.79 | 14188 | 11.3 |
| DET | 1980 | 1725742 | 4474.4 | 68034.0 | 4040 | 78.6 | 12.71 | 68.03 | 5900 | 13.5 |
| DET | 1981 | 1676362 | 4429.2 | 64286.8 | 2588 | 75.7 | 14.51 | 78.31 | 3027 | 10.4 |
| DET | 1982 | 1582462 | 4364.3 | 61304.1 | 2712 | 74.1 | 14.25 | 85.28 | 2064 | 6.1 |
| DET | 1983 | 1591750 | 4323.2 | 62777.2 | 2808 | 73.8 | 11.79 | 74.70 | 5590 | 3.2 |
| DET | 1984 | 1679185 | 4316.7 | 66604.2 | 4452 | 73.5 | 11.54 | 75.87 | 7199 | 4.3 |
| DET | 1985 | 1749670 | 4317.2 | 68038.4 | 9205 | 75.1 | 11.62 | 80.00 | 10769 | 3.6 |
| DET | 1986 | 1805857 | 4318.6 | 70634.5 | 11343 | 79.1 | 10.17 | 81.68 | 13141 | 2.0 |
| DET | 1987 | 1873100 | 4398.3 | 75062.5 | 8704 | 80.1 | 9.34 | 92.98 | 13273 | 3.3 |
| DET | 1988 | 1868200 | 4347.8 | 73279.3 | 7753 | 79.2 | 9.19 | 99.50 | 12918 | 4.4 |
| ATL | 1960 | 385290 | 1249.4 | 11047.6 | 4680 | 106.2 | 0.00 | 0.00 | 11519 | 1.6 |
| ATL | 1961 | 390496 | 1295.9 | 12121.6 | 3967 | 105.8 | 0.00 | 0.00 | 12130 | 1.0 |
| ATL | 1962 | 413613 | 1318.0 | 12193.2 | 7389 | 105.5 | 0.00 | 0.00 | 12010 | 1.1 |
| ATL | 1963 | 441729 | 1372.0 | 14159.8 | 12485 | 104.7 | 5.97 | 20.97 | 14326 | 1.2 |
| ATL | 1964 | 464951 | 1426.1 | 15120.2 | 8534 | 103.4 | 5.91 | 22.80 | 14391 | 1.3 |
| ATL | 1965 | 496711 | 1493.6 | 15598.5 | 9808 | 102.5 | 5.94 | 23.07 | 14519 | 1.7 |
| ATL | 1966 | 531387 | 1538.6 | 16766.1 | 6998 | 100.7 | 6.61 | 23.71 | 10216 | 2.9 |
| ATL | 1967 | 559815 | 1583.6 | 17725.8 | 13406 | 100.0 | 6.85 | 26.33 | 13377 | 2.9 |
| ATL | 1968 | 586922 | 1637.5 | 18867.1 | 13836 | 98.4 | 7.19 | 28.39 | 13458 | 4.2 |
| ATL | 1969 | 659446 | 1670.0 | 20230.7 | 14314 | 96.1 | 8.07 | 32.97 | 11829 | 5.4 |
| ATL | 1970 | 686404 | 1703.7 | 20921.8 | 19729 | 94.5 | 8.64 | 35.16 | 13508 | 5.9 |
| ATL | 1971 | 707489 | 1758.2 | 21982.1 | 33569 | 93.8 | 7.77 | 35.88 | 19612 | 4.3 |
| ATL | 1972 | 760598 | 1817.0 | 24387.8 | 20684 | 93.4 | 7.63 | 38.26 | 22759 | 3.3 |
| ATL | 1973 | 811160 | 1878.0 | 25910.0 | 11054 | 90.4 | 8.06 | 40.60 | 19680 | 6.2 |
| ATL | 1974 | 846759 | 1923.1 | 25774.8 | 5205 | 84.7 | 8.69 | 46.50 | 11230 | 11.0 |

(continued)

| CITY | YEAR | EMP | POP (000's) | REAL PERSONAL INCOME | M/F PERMITS | RENT INDEX | AVG MTG RATE | AVG NOMINAL PRICE | SINGLE FAMILY PERMITS | INF |
|------|------|------|------|------|------|------|------|------|------|------|
| ATL | 1975 | 803886 | 1942.3 | 25106.8 | 870 | 80.0 | 8.66 | 51.23 | 11253 | 9.1 |
| ATL | 1976 | 831895 | 1967.6 | 26178.7 | 1100 | 77.0 | 8.70 | 51.81 | 13040 | 5.8 |
| ATL | 1977 | 879218 | 2006.1 | 27778.8 | 2889 | 74.6 | 8.71 | 55.17 | 16302 | 6.5 |
| ATL | 1978 | 939584 | 2049.0 | 29335.5 | 3042 | 71.6 | 9.28 | 58.33 | 17283 | 7.7 |
| ATL | 1979 | 990572 | 2104.2 | 29914.1 | 6282 | 70.1 | 10.37 | 69.98 | 18274 | 11.3 |
| ATL | 1980 | 1019250 | 2155.6 | 29837.2 | 5882 | 68.1 | 12.42 | 81.52 | 16677 | 13.5 |
| ATL | 1981 | 1043440 | 2205.8 | 30540.1 | 5894 | 69.2 | 14.22 | 92.03 | 13051 | 10.4 |
| ATL | 1982 | 1048065 | 2254.7 | 31299.0 | 6774 | 69.1 | 14.59 | 93.83 | 17730 | 6.1 |
| ATL | 1983 | 1098647 | 2316.5 | 33910.1 | 15468 | 71.8 | 12.50 | 96.78 | 29687 | 3.2 |
| ATL | 1984 | 1192092 | 2392.6 | 37011.8 | 18625 | 72.8 | 11.80 | 98.27 | 31506 | 4.3 |
| ATL | 1985 | 1270270 | 2479.5 | 39579.3 | 17671 | 76.0 | 10.59 | 106.44 | 32364 | 3.6 |
| ATL | 1986 | 1324185 | 2551.2 | 41353.4 | 17919 | 79.8 | 9.67 | 119.80 | 35095 | 2.0 |
| ATL | 1987 | 1382330 | 2627.1 | 43301.5 | 11652 | 82.0 | 8.66 | 130.94 | 31413 | 3.3 |
| ATL | 1988 | 1395300 | 2715.7 | 43741.7 | 15967 | 80.9 | 8.73 | 141.30 | 28468 | 4.4 |
| | | | | | | | | | | |
| NEW | 1960 | 3809430 | 8703.3 | 100100.5 | 16369 | 98.2 | 0.00 | 0.00 | 7578 | 1.6 |
| NEW | 1961 | 3801717 | 8667.5 | 104929.6 | 25785 | 99.8 | 0.00 | 0.00 | 7673 | 1.0 |
| NEW | 1962 | 3843805 | 8751.4 | 107039.4 | 19263 | 101.0 | 0.00 | 0.00 | 8330 | 1.1 |
| NEW | 1963 | 3824912 | 8871.1 | 113928.4 | 30394 | 101.5 | 5.63 | 26.76 | 8410 | 1.2 |
| NEW | 1964 | 3862005 | 8934.8 | 118084.2 | 20499 | 102.2 | 5.59 | 28.18 | 7675 | 1.3 |
| NEW | 1965 | 3895285 | 8959.4 | 119248.2 | 27489 | 102.1 | 5.60 | 29.29 | 7727 | 1.7 |
| NEW | 1966 | 3947090 | 8962.3 | 123466.8 | 23135 | 100.8 | 5.91 | 29.86 | 6475 | 2.9 |
| NEW | 1967 | 4006690 | 8937.1 | 128040.3 | 25077 | 100.0 | 6.00 | 32.77 | 5805 | 2.9 |
| NEW | 1968 | 4078350 | 8938.6 | 134153.2 | 28232 | 98.5 | 6.61 | 36.36 | 5451 | 4.2 |
| NEW | 1969 | 4167572 | 9027.9 | 135674.9 | 20995 | 96.7 | 7.41 | 39.22 | 5021 | 5.4 |
| NEW | 1970 | 4121277 | 9079.0 | 136734.3 | 26166 | 95.4 | 7.46 | 40.92 | 3607 | 5.9 |
| NEW | 1971 | 3986660 | 9078.4 | 137271.4 | 37502 | 98.3 | 7.31 | 42.25 | 4437 | 4.3 |
| NEW | 1972 | 3949850 | 9002.2 | 139692.6 | 41085 | 101.5 | 7.21 | 43.21 | 4457 | 3.3 |
| NEW | 1973 | 3935280 | 8866.8 | 137706.4 | 23212 | 102.6 | 7.55 | 48.05 | 3762 | 6.2 |
| NEW | 1974 | 3841382 | 8770.1 | 132749.9 | 15521 | 98.2 | 8.49 | 52.48 | 3054 | 11.0 |
| NEW | 1975 | 3675617 | 8679.7 | 128768.9 | 3113 | 95.3 | 8.66 | 55.13 | 2682 | 9.1 |
| NEW | 1976 | 3599772 | 8603.5 | 128562.2 | 2927 | 95.3 | 8.62 | 58.77 | 3378 | 5.8 |
| NEW | 1977 | 3590605 | 8484.4 | 128318.7 | 6884 | 94.4 | 8.50 | 61.52 | 3416 | 6.5 |
| NEW | 1978 | 3659722 | 8373.8 | 130610.7 | 11106 | 92.2 | 8.71 | 68.88 | 4093 | 7.7 |
| NEW | 1979 | 3716475 | 8306.5 | 127816.5 | 7850 | 86.8 | 9.84 | 79.04 | 4408 | 11.3 |
| NEW | 1980 | 3747815 | 8284.2 | 124586.8 | 6187 | 82.1 | 12.20 | 94.47 | 2430 | 13.5 |
| NEW | 1981 | 3809330 | 8289.1 | 125133.9 | 8687 | 79.9 | 15.10 | 96.34 | 2484 | 10.4 |
| NEW | 1982 | 3800055 | 8311.3 | 127311.6 | 7839 | 80.5 | 15.52 | 102.52 | 2437 | 6.1 |
| NEW | 1983 | 3818640 | 8358.2 | 132813.3 | 11615 | 82.9 | 12.49 | 113.02 | 3862 | 3.2 |
| NEW | 1984 | 3919530 | 8392.4 | 140588.8 | 11665 | 83.7 | 12.05 | 125.67 | 4327 | 4.3 |
| NEW | 1985 | 3987495 | 8466.4 | 145996.6 | 19703 | 85.3 | 11.47 | 138.72 | 5603 | 3.6 |
| NEW | 1986 | 4059832 | 8494.2 | 150497.8 | 8710 | 90.1 | 9.83 | 156.18 | 6628 | 2.0 |
| NEW | 1987 | 4118470 | 8483.6 | 154167.0 | 12447 | 93.1 | 8.69 | 181.62 | 6072 | 3.3 |
| NEW | 1988 | 4166000 | 8465.8 | 156177.2 | 9227 | 94.1 | 8.79 | 192.80 | 4259 | 4.4 |

| CITY | YEAR | EMP | POP (000's) | REAL PERSONAL INCOME | M/F PERMITS | RENT INDEX | AVG MTG RATE | AVG NOMINAL PRICE | SINGLE FAMILY PERMITS | INF |
|------|------|-----|-------------|----------------------|-------------|------------|--------------|-------------------|-----------------------|-----|
| BOS | 1960 | 1336837 | 3488.8 | 34715.8 | 2632 | 97.0 | 0.00 | 0.00 | 14859 | 1.6 |
| BOS | 1961 | 1345545 | 3474.0 | 36765.5 | 5912 | 99.3 | 0.00 | 0.00 | 14253 | 1.0 |
| BOS | 1962 | 1358730 | 3522.3 | 37544.2 | 8140 | 100.6 | 0.00 | 0.00 | 14481 | 1.1 |
| BOS | 1963 | 1366194 | 3562.7 | 40610.9 | 8914 | 101.0 | 5.33 | 22.73 | 14673 | 1.2 |
| BOS | 1964 | 1375772 | 3564.9 | 42399.8 | 14660 | 101.6 | 5.34 | 24.27 | 14373 | 1.3 |
| BOS | 1965 | 1418065 | 3596.4 | 42617.2 | 9145 | 101.9 | 5.31 | 25.18 | 13764 | 1.7 |
| BOS | 1966 | 1480758 | 3618.6 | 44807.0 | 5216 | 101.9 | 5.83 | 26.74 | 11090 | 2.9 |
| BOS | 1967 | 1530639 | 3650.1 | 47307.1 | 8380 | 100.0 | 6.17 | 29.05 | 10767 | 2.9 |
| BOS | 1968 | 1565220 | 3664.9 | 49422.4 | 12385 | 98.6 | 6.75 | 33.38 | 10961 | 4.2 |
| BOS | 1969 | 1611121 | 3688.2 | 51068.8 | 11512 | 99.1 | 7.66 | 36.21 | 9102 | 5.4 |
| BOS | 1970 | 1614480 | 3720.2 | 51985.0 | 13598 | 99.2 | 8.44 | 36.35 | 7574 | 5.9 |
| BOS | 1971 | 1585667 | 3741.6 | 52917.5 | 17983 | 101.2 | 7.50 | 41.51 | 10716 | 4.3 |
| BOS | 1972 | 1617530 | 3753.2 | 55337.2 | 15706 | 103.1 | 7.33 | 41.58 | 9383 | 3.3 |
| BOS | 1973 | 1652532 | 3745.8 | 56453.6 | 14584 | 102.3 | 7.73 | 42.74 | 8360 | 6.2 |
| BOS | 1974 | 1664767 | 3726.3 | 55047.1 | 7994 | 96.8 | 8.78 | 43.04 | 5169 | 11.0 |
| BOS | 1975 | 1608157 | 3708.8 | 53543.6 | 4748 | 92.8 | 9.15 | 43.74 | 5551 | 9.1 |
| BOS | 1976 | 1616037 | 3696.7 | 54428.5 | 3354 | 91.9 | 8.84 | 46.87 | 6778 | 5.8 |
| BOS | 1977 | 1671880 | 3687.3 | 55781.5 | 5149 | 91.6 | 8.28 | 51.82 | 7880 | 6.5 |
| BOS | 1978 | 1744877 | 3676.9 | 57390.1 | 5791 | 89.1 | 8.91 | 58.31 | 7021 | 7.7 |
| BOS | 1979 | 1816360 | 3669.8 | 57545.8 | 5796 | 84.2 | 10.72 | 65.46 | 5779 | 11.3 |
| BOS | 1980 | 1857747 | 3667.0 | 56896.9 | 4089 | 80.6 | 12.98 | 68.81 | 4817 | 13.5 |
| BOS | 1981 | 1871702 | 3671.8 | 57880.8 | 4413 | 81.7 | 16.00 | 78.25 | 4619 | 10.4 |
| BOS | 1982 | 1865865 | 3671.3 | 59451.3 | 3353 | 84.9 | 15.94 | 76.99 | 4504 | 6.1 |
| BOS | 1983 | 1915670 | 3681.5 | 62895.0 | 4031 | 87.8 | 12.86 | 90.67 | 8302 | 3.2 |
| BOS | 1984 | 2033490 | 3693.4 | 67439.9 | 6205 | 89.1 | 12.76 | 102.08 | 9993 | 4.3 |
| BOS | 1985 | 2087415 | 3739.9 | 70119.4 | 9730 | 93.0 | 11.76 | 127.08 | 10985 | 3.6 |
| BOS | 1986 | 2139832 | 3735.1 | 72763.5 | 11203 | 98.0 | 9.98 | 154.23 | 12431 | 2.0 |
| BOS | 1987 | 2209790 | 3749.7 | 76281.4 | 9457 | 101.8 | 8.96 | 181.65 | 10977 | 3.3 |
| BOS | 1988 | 2204700 | 3738.1 | 77056.6 | 6038 | 103.6 | 9.12 | 195.70 | 9233 | 4.4 |
| BAL | 1960 | 621549 | 1870.0 | 16673.3 | 1021 | 105.0 | 0.00 | 0.00 | 5890 | 1.6 |
| BAL | 1961 | 623820 | 1886.2 | 17891.1 | 3681 | 104.8 | 0.00 | 0.00 | 6315 | 1.0 |
| BAL | 1962 | 638734 | 1906.8 | 18291.1 | 4253 | 104.6 | 0.00 | 0.00 | 6894 | 1.1 |
| BAL | 1963 | 649994 | 1953.4 | 20188.3 | 8293 | 104.8 | 5.57 | 18.71 | 6683 | 1.2 |
| BAL | 1964 | 660661 | 1980.4 | 21263.7 | 2153 | 104.3 | 5.53 | 18.73 | 7405 | 1.3 |
| BAL | 1965 | 683872 | 2007.5 | 21597.2 | 7493 | 103.3 | 5.56 | 20.46 | 7503 | 1.7 |
| BAL | 1966 | 724268 | 2033.5 | 23078.9 | 10040 | 101.5 | 5.86 | 21.79 | 5946 | 2.9 |
| BAL | 1967 | 748367 | 2049.8 | 24008.0 | 7383 | 100.0 | 6.00 | 23.43 | 7435 | 2.9 |
| BAL | 1968 | 768402 | 2062.9 | 24999.0 | 7244 | 97.6 | 6.56 | 25.66 | 6809 | 4.2 |
| BAL | 1969 | 789399 | 2076.2 | 25780.3 | 7242 | 94.9 | 7.61 | 27.12 | 7649 | 5.4 |
| BAL | 1970 | 789069 | 2100.4 | 26366.4 | 10621 | 91.9 | 7.92 | 29.24 | 5938 | 5.9 |
| BAL | 1971 | 792971 | 2133.5 | 27184.6 | 12322 | 90.8 | 7.40 | 30.64 | 9500 | 4.3 |
| BAL | 1972 | 811982 | 2153.9 | 28627.0 | 13539 | 89.9 | 7.30 | 32.81 | 12976 | 3.3 |
| BAL | 1973 | 841327 | 2169.1 | 29725.9 | 11483 | 87.2 | 7.77 | 34.27 | 11357 | 6.2 |
| BAL | 1974 | 857637 | 2179.6 | 29458.9 | 5514 | 82.1 | 8.69 | 41.16 | 7896 | 11.0 |

APPENDIX B - DATASET

(continued)

| CITY | YEAR | EMP | POP (000's) | REAL PERSONAL INCOME | M/F PERMITS | RENT INDEX | AVG MTG RATE | AVG NOMINAL PRICE | SINGLE FAMILY PERMITS | INF |
|------|------|------|------|------|------|------|------|------|------|------|
| BAL | 1975 | 839240 | 2184.9 | 28994.6 | 3361 | 79.0 | 9.07 | 43.97 | 7565 | 9.1 |
| BAL | 1976 | 840014 | 2191.1 | 29925.7 | 3179 | 79.5 | 8.94 | 47.00 | 12013 | 5.8 |
| BAL | 1977 | 869676 | 2201.6 | 30581.1 | 3438 | 79.3 | 8.84 | 51.94 | 12063 | 6.5 |
| BAL | 1978 | 911102 | 2205.1 | 31714.2 | 4254 | 79.1 | 9.39 | 57.39 | 10969 | 7.7 |
| BAL | 1979 | 962555 | 2207.7 | 31696.6 | 3388 | 75.2 | 10.49 | 65.40 | 9638 | 11.3 |
| BAL | 1980 | 965388 | 2204.8 | 31045.5 | 1309 | 70.4 | 12.23 | 70.22 | 6969 | 13.5 |
| BAL | 1981 | 963014 | 2211.4 | 31359.6 | 1245 | 68.9 | 13.92 | 76.67 | 5451 | 10.4 |
| BAL | 1982 | 934732 | 2219.4 | 31331.1 | 2215 | 70.8 | 14.52 | 78.07 | 6471 | 6.1 |
| BAL | 1983 | 959285 | 2229.8 | 32769.6 | 2754 | 74.2 | 12.47 | 82.04 | 13816 | 3.2 |
| BAL | 1984 | 993281 | 2245.1 | 34425.8 | 3817 | 75.5 | 11.93 | 84.47 | 13718 | 4.3 |
| BAL | 1985 | 1024110 | 2251.8 | 35593.7 | 4186 | 77.2 | 11.32 | 100.65 | 15352 | 3.6 |
| BAL | 1986 | 1044452 | 2283.6 | 36163.3 | 4010 | 80.6 | 9.93 | 119.76 | 15414 | 2.0 |
| BAL | 1987 | 1069130 | 2299.6 | 37301.1 | 3450 | 81.1 | 8.95 | 125.85 | 14579 | 3.3 |
| BAL | 1988 | 1089000 | 2348.5 | 36998.7 | 3658 | 81.6 | 8.96 | 142.40 | 14372 | 4.4 |