

## Factors Affecting House Prices in Cyprus: 1988-2008

Panos Pashardes<sup>a\*</sup>, and Christos S. Savva<sup>b</sup>

<sup>a</sup> *Department of Economics and Economics Research Centre, University of Cyprus*

<sup>b</sup> *Department of Commerce, Finance and Shipping, Cyprus University of Technology,  
and Economics Research Centre, University of Cyprus*

---

### Abstract

In this paper we investigate the impact of various macroeconomic variables on house prices in Cyprus during the period 1988-2008. Furthermore, we examine how specific characteristics of the house affect its price. We find house prices to be particularly sensitive to changes in island's population. They are also sensitive to the cost of building materials and labour, economic growth and the sterling-euro exchange rate. As regards the question which of these factors contributed most to the large increase in house prices during the period 1988-2008, our analysis points to increase in the cost of materials and labour, the population and the per capita Gross Domestic Product (GDP). In contrast, developments in the stock market and the increase in the number of foreign workers helped towards restraining house price increases.

**Keywords:** housing market, hedonic analysis, macroeconomic factors.

### 1. Introduction

The housing market in Cyprus, as in most other countries, constitutes a popular topic of study. The main reason for this is the importance it has for the public sector but also for households and enterprises:

- For the public sector the stamp duties imposed on transactions in the real estate market and the taxes on house ownership constitute a big part of government revenue. Revenue from real estate transactions in 2007 amounted to 465 million Euros, representing 22% of total government revenue. The government and the monetary authorities are vigilant about developments in the housing market also because of the importance of house prices for financial stability (Schulz and Werwatz, 2004). The importance of real estate prices in determining

---

\* Corresponding author. Address: Economics Research Centre, University of Cyprus, P.O. Box 20537, 1678 Nicosia, Cyprus. E-mail: p.pashardes@ucy.ac.cy

the currency policy has been emphasized by the European Central Bank (ECB, 2003).

- For most households the value of their house often represents the biggest part, of their wealth, while housing costs roughly absorb one quarter of their disposable income (Muellbauer and Murphy, 1997). Thus, house values have a substantial influence on the propensity to consume among households (Case et al., 2004), and changes in house prices can impact on economic activity through changes in household behaviour patterns.
- House prices play a crucial role for firms operating in the financial market because immovable property is the most common type of collateral for mortgage and other loans to households. As such they impact on the balance sheet of banks and other financial institutions. House prices also influence the portfolio of many other companies directly or indirectly involved with the real estate market. As evidenced from the financial crisis that began in the second half-year of 2008, changes in house prices can create serious repercussions on the financial system which, in turn, feed through to economic activity at large.

Given the importance of house prices outlined above, it is not surprising that there is so much interest in the literature about the factors shaping behaviour in the real estate market and the influence of macroeconomic and other variables on house prices.<sup>1</sup> Certainly, characteristics such as the type and size of residence and its distance from the nearest city centre have a decisive effect on price at the individual house level. Although these characteristics change over time and their effect needs to be accounted for in empirical investigation of changes in house prices over time, the latter changes are more likely to be determined at the macroeconomic level by factors affecting housing demand and supply, such as the interest rate, the rate of GDP and population growth, unemployment, inflation, etc. For a small open economy like Cyprus, with a substantial part of housing demand originating from abroad, changes in house prices can be linked to macroeconomic developments not only at the indigenous but also at the international level.

This paper investigates how specific characteristics of the house affect its price and, in particular, how changes in macroeconomic variables

---

<sup>1</sup> Unless otherwise indicated, the term 'house' in this paper denotes all types of residences, namely apartments and detached and semi-detached houses.

contributed to the large increase in house prices during the period 1988-2008 in Cyprus. The data used have been collected from newspaper advertisements and national statistics. Our empirical analysis draws on econometric methods used in investigations of the same questions in other countries. To our knowledge such methods have not been used in studies examining the effect of characteristics and macroeconomic variables on house prices in Cyprus. Platis and Neroupos (2005) examine only the effect of characteristics on house prices. They find that age, size (squared metres covered), number of rooms/bedrooms, location, type of house and the existence of a swimming pool are important factors in determining house price in Cyprus. Platis and Orfanides (2005) describe potential effects of macroeconomic variables on house price in Cyprus but do not attempt statistical/econometric estimation. They argue that household income, the cost/terms of mortgages, construction cost, land value, returns in the stock exchange, demand and supply of houses and cultural characteristics play an important role in the housing market.

The structure of this paper is as follows: Section 2 discusses factors that affect house prices, as are commonly found in the literature, while paying attention to issues most relevant to Cyprus. Section 3 describes the data collected for the empirical analysis in the paper, while Section 4 presents the methodology and the results of the econometric analysis. Section 5 summarises the main findings of the paper and consider their implications for future developments in the Cyprus housing market.

## **2. Determinants of house prices in the literature**

The literature related to house prices can be separated in two main lines of research:

- (i) The hedonic approach that considers the relationship between the price and the quality characteristics of houses (size, type, location etc) at a microeconomic level, and
- (ii) The macroeconomic analysis that is mostly concerned with factors influencing house prices over time at an economy-wide level (per capita GDP, unemployment, interest rate on loans, inflation, returns in the stock exchange etc).

## 2.1 Housing characteristics<sup>2</sup>

The hedonic approach is based on the consumer theory (Griliches, 1961 and 1964; Lancaster, 1966) and was formalised first by Rosen (1974). There are numerous econometric applications of hedonic analysis investigating the contribution of product characteristics to the determination of its price for a wide range of goods and services, from cars to computers and houses to holiday packages. When applied to housing this analysis examines how and to what extent house prices are determined by broadly defined quality characteristics such as the type of building (e.g. flat, detached, semi-detached, terraced), size and number of rooms, distance from city centre, the age of the building and the presence of facilities like central heating, garage etc. In addition neighbourhood characteristics such as the quality of the local school and social deprivation indicators pertaining to the local community are also considered in studies focusing on these aspects of house prices.

As one would expect, most studies show that the number of rooms and bedrooms (Fletcher, et al., 2000; Li and Brown, 1980 and Adair et al., 2000), the number of bathrooms (Garrod and Willis, 1992; Linneman 1980) and, generally speaking, the size of the residence (Carroll, Clauretje and Jensen, 1996; Rodriguez and Sirmans, 1994) affect positively the price of houses. On the contrary, it appears that the age of the building affects the price negatively (Clark and Herrin, 2000; Kain and Quigley, 1970; Rodriguez and Sirmans, 1994; Goodman and Thibodeau, 1995; and Straszheim, 1975); except for old buildings that have historical or some other importance (Li and Brown, 1980). Regarding the distance from city centre, it appears that it has a negative effect on the price of the house (Messe and Wallace, 2003; Janssen et. al., 2001; Schulz and Werwatz, 2004; and Stevenson, 2004). Other housing characteristics shown in the literature to affect house price are the existence of basement, garage, and facilities like central heating, air conditioning etc. (Forrest, et al., 1996; Garrod and Willis, 1992; Li and Brown, 1980; Michaels and Smith, 1990).

There are also studies showing that the quality of materials do play an important role in the price of a building (Kain and Quigley, 1970; Morris et al., 1972), in addition to the reputation of its constructors (Kestens et al. 2006). Nevertheless, these factors together with some intangible attributes (view, quality of the environment, architectural design etc) are difficult to measure and consider in empirical estimation.

---

<sup>2</sup> This review draws heavily on Leong (2002).

## 2.2 Macroeconomic variables<sup>3</sup>

Studies examining the effect of macroeconomic variables on house prices focus on the per capita GDP, the interest rate on mortgages, inflation and the unemployment rate.

Giussani et al. (1992) found the effect of per capita GDP on house prices to be positive and significant. In contrast, inflation is found to have a negative effect (Kearl, 1979; Hendershott, 1980; Feldstein, 1992; Poterba, 1992) because the resulting increase in the nominal mortgage payments (Kearl, 1979) acts as a disincentive for investing in real estate (Feldstein, 1992).

The mortgage interest rate is probably the most important variable affecting the price of houses (Muellbauer, 1992; Muellbauer and Murphy, 1997; and Maclennan et al., 1998). An increase in the mortgage rate increases the cost of borrowing and limits the capacity of individuals to purchase a house. The resulting decrease in demand for houses has a negative effect on their price. Smith and Tesarek (1991) and Sternlieb and Hughes (1997) show how the housing market activity is influenced by conditions in the labour market. Moreover, Hartzel et al. (1993) argue that regional employment characteristics can also play an important role in investment decisions and house prices.

## 3. Descriptive statistics of the data

The data used in this paper for the empirical investigation of the effects of characteristics and macroeconomic factors on house prices in Cyprus came from the advertising section of two local newspapers, the national accounts and other sources.<sup>4</sup>

- The data collected from newspaper advertisements consist of 4872 observations on various housing types (apartments of one, two or three bedrooms, semi-attached and detached houses), covering the period January 1988 - July 2008. In addition to the price, the data include house characteristics such as size (in square metres), number of bedrooms, geographical location and distance from the nearest city centre.

---

<sup>3</sup> This part draws on Apergis και Rezitis (2003).

<sup>4</sup> Consequently, the price of the house is the 'asking price' and can be above the 'sale price'. This, however, does not affect the analysis in this paper because its focus is how house prices are affected by various factors; the price level from which these effects are measured is trivial.

- The macroeconomic variables for Cyprus include the per capita GDP, unemployment, inflation and interest rates, population, number of foreign workers, tourism arrivals, the index of the Cyprus Stock Exchange (CSE), the euro equivalent of the British pound and the cost of materials and labour in construction.<sup>5</sup> The per capita GDP, the inflation rate and other macroeconomic variables for the UK and the European Union are also included in our dataset.

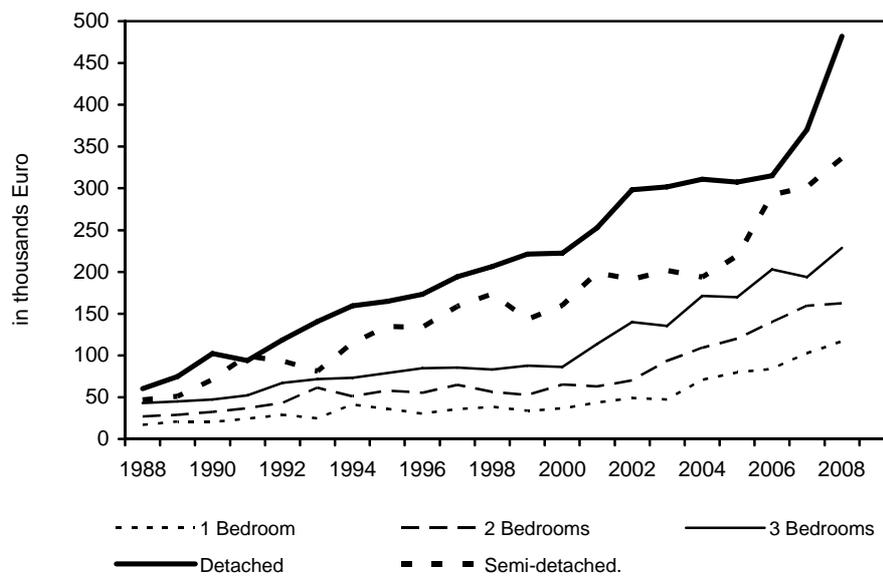
Following preliminary investigation some of the macroeconomic variables listed above were found to be statistically insignificant and are ignored in the discussion that follows.

### 3.1 House price changes over the period 1988-2008

Figure 1 shows the development of the average price (in thousands of Euro) of various types of houses in Cyprus over the period 1988-2008.

FIGURE 1

*Development of prices of various types of residences*



Source: Own calculations.

<sup>5</sup> The outliers have been removed from all the variables using a method proposed by Stock and Watson (2004).

Apartments, on average, show a small increase in price during the period 1998-2000, that becomes much bigger after 2003. The prices of detached and semi-detached houses follow an ascending course throughout the period under review (except for 1990-91 and 1998-99). Furthermore, the prices of detached and semi-detached houses are rising at a much higher rate than those of apartments. This is likely to be due to detached and semi-detached houses having a higher share of land than apartments; and the fact that land has increased in price faster than buildings over the period under investigation.

Table 1 shows the price per square metre of the various types of housing in each of the four sub-periods 1988-92, 1993-97, 1998-02 and 2003-07. In the remainder of our analysis we focus on price per square meter, however for the sake of brevity we simply refer to it as price.

TABLE 1  
*Development of prices per square metre of housing in Cyprus*

Time period	Apartments						Houses			
	1 bedroom		2 bedrooms		3 bedrooms		Detached		Semi-detached	
	Price	Change	Price	Change	Price	Change	Price	Change	Price	Change
1988-1992	335	-	360	-	363	-	392	-	365	-
1993-1997	518	55%	560	56%	629	73%	686	75%	641	76%
1998-2002	618	19%	684	22%	802	28%	859	25%	783	22%
2003-2007	1240	101%	1366	100%	1269	58%	1285	50%	1214	55%

*Source:* Own calculations.

During the period 2003-07 the one and two bedroom apartments display an above average increase in price. The biggest percentage increase in the price of three bedroom apartments and detached and semi-detached houses is observed over the period 1993-97; whereas for one and two bedroom apartments the biggest price increase is observed over the period 2003-07. The smallest percentage increase in price for all the types of housing appears to have occurred during the period 1998-02.

As regards the percentage increase of one type of housing relative to the rest, the two bedroom apartments top the list for the period 1988-92 to 1993-97 with a 60.6% increase; whereas from 1993-97 to 1998-02 the highest percentage increase (24.3%) was observed among the three bedroom

apartments. During the period 2003-07 the price increase for one bedroom apartments was a staggering 69.6%.

### 3.2 House prices and macroeconomic variables

The evolution of house prices over of the period 1988-2008 is shown in Figures 2-10, together with economic and other indicators thought to be of interest in the context of our analysis.

- The percentage change in house prices is shown in all figures by the dashed line and measured along the right hand side vertical axis.
- The solid line in each diagram shows the evolution of an indicator that, according to the literature, can influence house prices; this indicator is measured along the left hand side axis.

The diagrammatic presentation aims at giving a first impression about changes in house prices and in factors that are thought to affect them. Due to the large fluctuations in these changes we have decided to make the diagrammatic presentation using two-year moving averages so as to remove spikes in the data and ease comparison between the lines.

Figure 2 shows the concurrent changes in the house price index and the consumer price index, (inflation) during the period 1989-2008. We observe that the two indices move in the same direction, however, their changes vary in intensity, with the changes of the house price index being much bigger than those of the consumer price index. The large fluctuations in the consumer price index in 1990-92 are likely to be the result of the international economic turmoil ignited by the Gulf war in 1990; while the relatively high inflation in 2000 and in 2003 can be attributed to fluctuations of the dollar exchange rate and the VAT increase that was implemented in preparation for Cyprus's accession to the EU, respectively.

In Figure 3 the growth rate of the Cyprus economy (per capita GD) is shown to increase fast during the period 1988-2008, with an average annual increase of around 3.7%. The fluctuations of the growth rate do not appear to follow those of the index of house prices in the period prior to 1996. After this year, the changes in the two indices seem to follow a similar direction, even though the rate of growth the economy fluctuates less than house prices.

FIGURE 2

*Inflation*

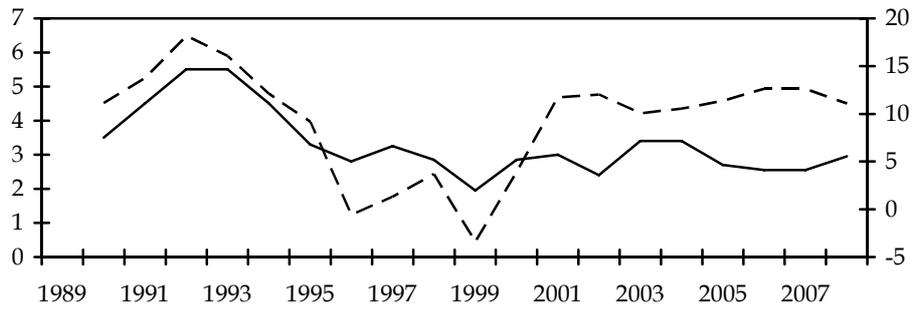


FIGURE 3

*Per capita GDP*

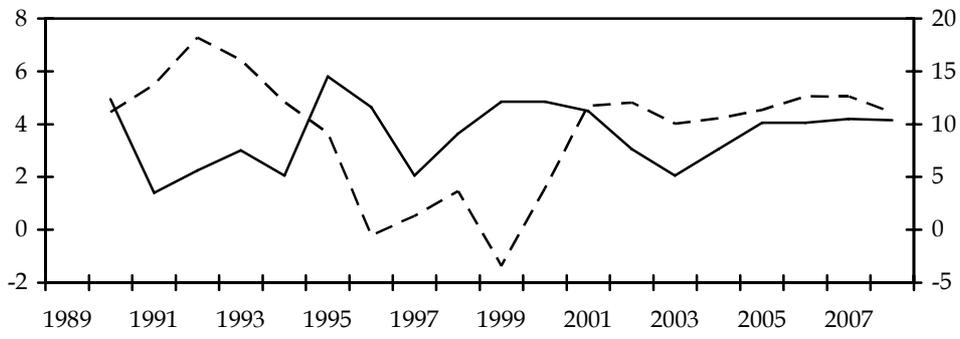


FIGURE 4

*Cost of labour*

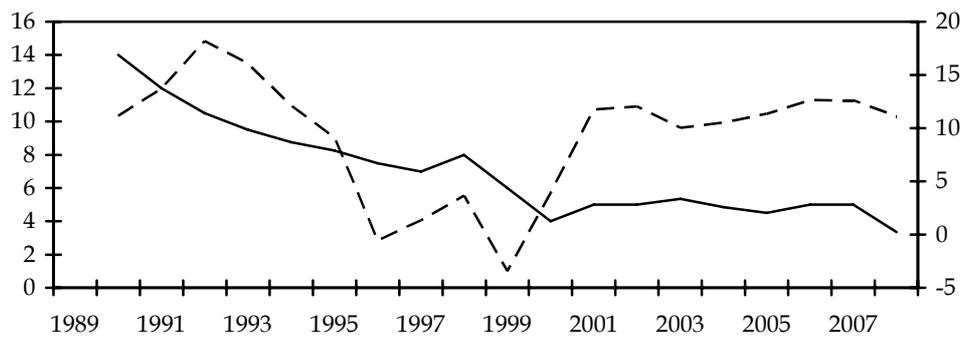


FIGURE 5

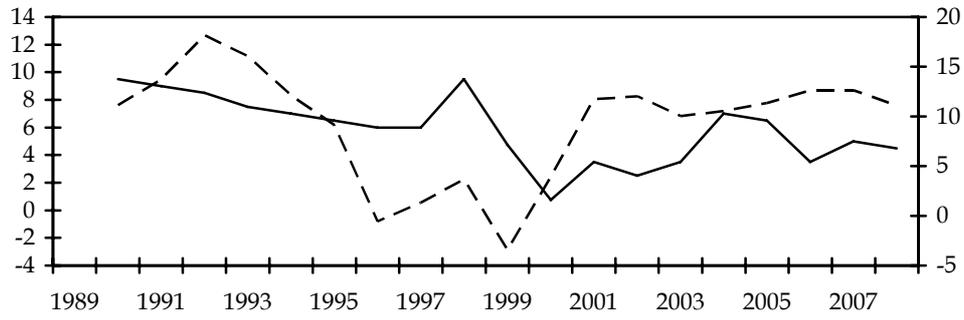
*Cost of materials*

FIGURE 6

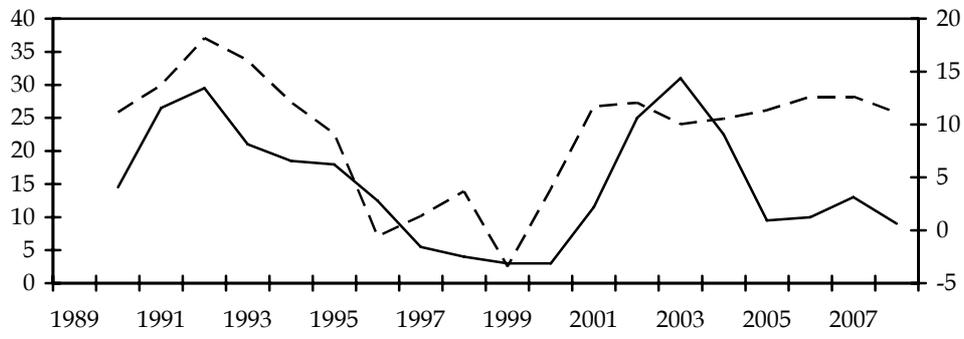
*Foreign workers*

FIGURE 7

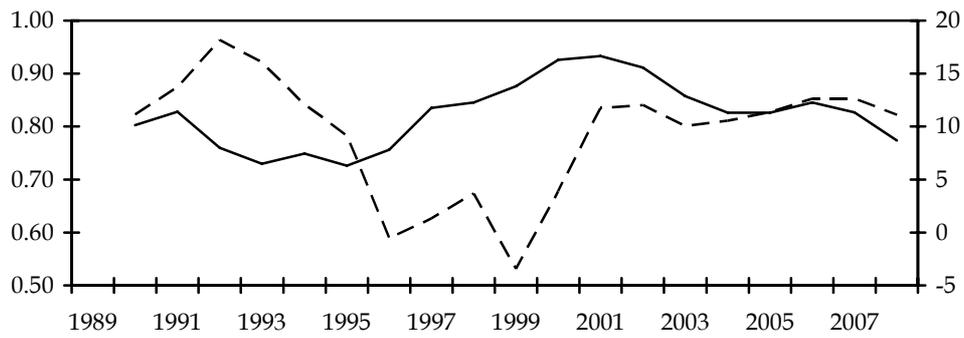
*Sterling exchange rate*

FIGURE 8

*Population*

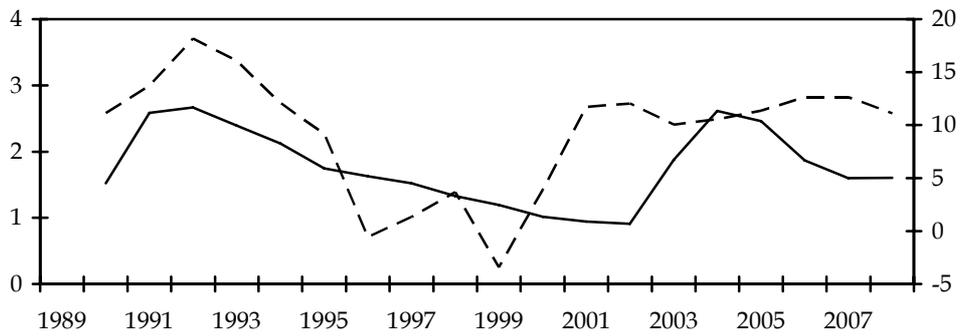


FIGURE 9

*Interest rate on loans*

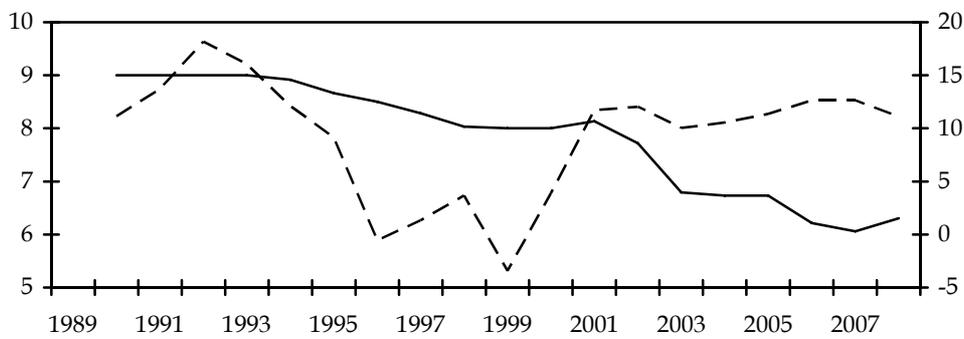
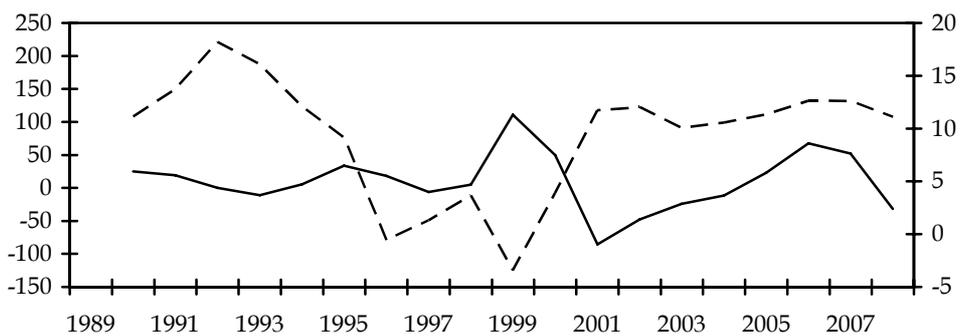


FIGURE 10

*Cyprus stock exchange*



The cost of materials and labour in construction are closely related to the cost of buildings. As a consequence, one would expect to find high correlation between changes of these variables and of house prices. This, however, appears to be the case less for the cost of labour (Figure 4) than the cost of materials (Figure 5).

The rather lower correlation between changes in house prices and labour costs can be due to the large number of low paid foreign workers in the construction sector, especially after the year 2000. As demonstrated by Michael et al. (2006) the influx of foreign workers in Cyprus since the early 1990's has helped raise output while restraining the rise in wages, especially among low paid unskilled workers. Yet, as one can see from the diagram in Figure 6, the changes in the number of foreign workers tracks closely the changes in house prices. One interpretation of these contradicting observations is that foreign workers had two opposite effects on house prices during the period under investigation: a negative one, coming from the supply side, through keeping labour costs down (Figure 4); and a positive one, coming from the demand side, through raising demand for accommodation (as implied by the diagram in Figure 6).

The exchange rate of the Cyprus pound against other currencies can also be a factor influencing demand for and the price of houses. In particular, one would expect the exchange rate of the Cyprus pound to the British sterling to be of particular importance, since Cyprus is a popular place for setting up residence among Cypriots repatriating from Great Britain and British pensioners. As shown in Figure 7, the changes in the purchasing power of the sterling vis-à-vis the Cyprus pound follow closely changes in house prices for most of the period under investigation - albeit with smaller oscillations.

The rate of growth of the population in Cyprus (Figure 8) is positive, but declining in the years prior to 2003. After this year it exhibits a spectacular increase, largely due to net immigration from EU member countries following Cyprus' accession to the EU in 2004. Comparing the changes in population with the changes in house prices we observe a similarity in direction, with house price changes preceding population changes. This is not surprising given that most transactions in the housing market during the period under investigation involve new housing units purchased well before their construction is completed.

Figure 9 presents the concurrent changes in the interest rate on loans and house prices over the period 1988-2008. During this period the financial system in Cyprus gradually changed from a government controlled one, to a system of free movement of capital, floating exchange rate and market determined interest rate. The motivation behind these historical changes

was the goal of the country to become a full member of the EU, a process that started in March 1998 and was completed in February 2004; and was followed by Cyprus's accession to the eurozone in January 2008. Throughout this period interest were declining, along with rising house prices. Clearly, this does not establish a causal relationship between the two variables; yet, the existence of such relationship is worthy of further investigation because it is founded on economic theory and often observed in other empirical studies.

To the extent that it is carried out for investment purposes, the purchase of a house can be influenced by returns obtained from alternative forms of investment, such the purchase of shares in the stock exchange. In periods of high returns in the stock exchange relative to rental income one would expect a lower demand for houses and, consequently, a lower increase in house prices. This suggests that it may not be accidental that the lowest increase in house prices in 1999-2000 coincides with the extraordinary high returns of the Cyprus stock exchange (Figure 10); while the opposite is true during the period 2001-2002, when the Cyprus stock exchange collapsed.

#### **4. Results of econometric analysis**

In spite of the useful information conveyed by the descriptive analysis of the data in the previous section, still remains unanswered whether and to what extent each of the factors considered – and possibly other factors – played a significant role in the large increase in house prices in Cyprus during the period 1988-2008. In this section we try to answer this question using regression analysis, where (the log of) house prices is the dependant variable and all the factors presented in Figures 2-10 are the independent variables.<sup>6</sup> In the discussion below we present the results as elasticities to ease interpretation. The parameter estimates of the regression are given in the Appendix - with their standard errors.

---

<sup>6</sup> We have also experimented with including in the regression a large number of other independent variables thought to affect house prices in Cyprus, such as tourism, general inflation, unemployment etc. Here we report only the results which have been found to be statistically significant.

#### 4.1 Effects of housing characteristics

Table 2a reports the average price per square metre of various types of housing for the period of 1988-2008.<sup>7</sup>

It appears that a square meter of housing in two and three bedroom apartments is more expensive by 14% and 17%, respectively, compared to one bedroom apartments. This can be due to the additional materials and labour required per square metre in larger apartments. Whereas, the higher price per square metre of detached relative to semi-detached houses is likely to reflect differences in land value.

TABLE 2a

*Average house prices: 1988-2008 (euro per square metre)<sup>8</sup>*

Housing type	Price
One bedroom apartment	252.1
Two bedroom apartment	287.1
Three bedroom apartment	304.9
Detached residences	333.6
Semi-detached residences	284.3

Source: Own calculations.

Regarding the price increases reported in Table 2b, it should be noted that these represent an average for all housing types. We observe that over the period 1988 and 2008:

- the average annual increase in house prices was 10.3%;
- the average price of housing increased by 6.5 times - and soared over the five-year period of 2003-2008; and
- the only years in which house prices decline were 1996, 1998 and 1999.

<sup>7</sup> Table 2a and 2b report the parameter estimates obtained from regressing the housing type and year dummies on house prices.

<sup>8</sup> The numbers in Tables 2a and 2b are based on the sample of 4872 advertisements in the newspapers and, as explained in section 3.1, reflect asking prices that may be above the actual sale prices.

TABLE 2b

*House price index and percentage annual change: 1989-2008*

Year	Index 1988=100	Annual % Change
1989	111	11%
1990	116	5%
1991	139	20%
1992	172	23%
1993	175	2%
1994	212	21%
1995	225	6%
1996	210	-7%
1997	236	13%
1998	214	-10%
1999	212	-1%
2000	232	9%
2001	280	21%
2002	300	7%
2003	306	2%
2004	390	27%
2005	410	5%
2006	481	17%
2007	526	9%
2008	649	23%

*Source:* Own calculations.

#### **4.2 Effects of macroeconomic variables**

In order to investigate the effect of the macroeconomic variables on house prices, we apply multiple regression analysis on pooled cross-section time-series data.<sup>9</sup> In addition to the dependent variable (price of house per square metre) all the continued independent variables are expressed in logarithms, except those expressed in rates (i.e. the exchange and interest rate). Consequently, the estimated parameters are interpreted as 'elasticities', i.e. the percentage change in house prices associated with a

<sup>9</sup> This allows the use of raw data (i.e. without averaging that can cause loss of information) in estimation, where the effects of housing characteristics (size, type and geographic location) are estimated together with those of macroeconomic variables.

change in the corresponding macro variable by 1%. Table 3 reports selected results obtained from the estimation, commented on as follows.

- Population appears to have the largest effect on house prices. The estimation suggests that an increase in population by 1% is associated with an increase of 3.37% in house prices.
- On average, house prices appear to increase in proportion to the construction costs (materials and labour).
- House prices also increase with the per capita GDP at a ratio 0.6 to 1 (i.e. 1% increase in per capita GDP is associated with 0.6% increase in house prices).
- An increase in the value of sterling against the euro is also associated with increase in house prices; e.g. an increase in the value of sterling from 1.1 to 1.2 euro is associated with an increase in house prices by around 2,5%.
- In contrast, an increase in the number of foreign workers is associated with a reduction in house prices; this effect, however, is very small in size.
- Even smaller in size negative associations with house prices are estimated for the interest rate on loans and the returns of the Cyprus stock exchange.

TABLE 3  
Effect of macroeconomic variables

Variable:	Elasticity
Population	3.37
Cost of materials in construction	1.12
Cost of labour in construction	0.84
Per capita GDP	0.59
Euro-sterling exchange rate	0.25
Foreign workers	-0.10
Interest rate on loans	-0.001
Cyprus stock exchange	-0.08

Source: Own calculations.

## 5. Discussion and policy conclusions

The current international economic crisis has shown the importance of the housing market for the smooth operation of the financial system. The

credit outburst for house purchases beyond levels households could afford in the USA, Britain and other countries drove house prices to very high levels. Subsequently, the inability of households to keep-up with mortgage repayments set in motion a vicious cycle of house repossessions and further reduction in house prices, insolvencies in the financial system, credit bottlenecks, less investment and growth, higher unemployment, further house repossessions and so on. The repercussions of subprime mortgage debt were spread to the whole economy through the resulting bottlenecks in the credit market not only in the USA, Britain and other countries directly exposed to bad debt but also to other countries, due to lack of confidence in the financial system's ability to assess and manage risk.

The connection between the economic crisis and the housing market is also discussed in Cyprus, with many fearing that the vicious cycle phenomena ignited by falling house prices can also happen here. The results of our analysis do not address this scenario for the Cyprus economy though it helps towards understanding one vital part of it: how house prices are determined. Before we discuss how this connects to speculation about future developments in the housing market it is useful to consider the experience of other countries.

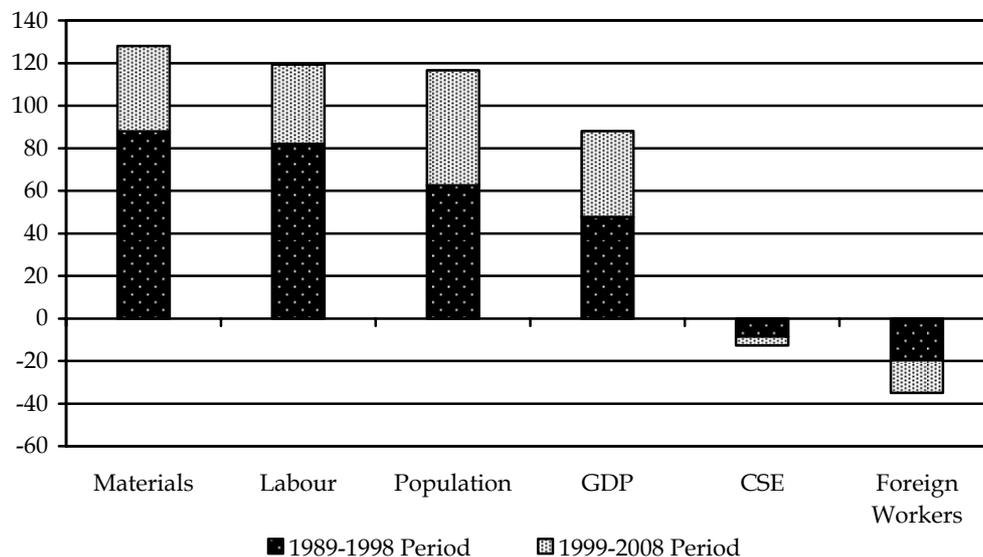
In the USA the financial crisis is thought to be related to the ease at which individuals were able to secure mortgages they could not afford and often at levels above the market value of the property. The bankruptcy of banks that followed when the borrowers were unable/unwilling to repay these loans underpinned the downfall of the business cycle which the country was entering into. The same arguments may also hold true for the UK with, probably, more emphasis on the downfall of the business cycle rather than the prevalence of bad loans. In Spain the spectacular increase in house prices (250% between 1997 and 2005) is attributed to various factors including disincentives to rent, coupled with low cost financing, net migration and foreign demand for holiday residence. This led to an accumulation of a large stock of unoccupied houses, a problem also said to be prevalent in Ireland. In other countries, e.g. Denmark, the problem is thought to have been generated by 'profit seekers' involved with pyramid type operations.

Coming back to our own findings, we have seen in the previous section that house prices in Cyprus are sensitive to the island's population, construction costs (materials and labour), the per capita GDP, the stock exchange returns and foreign workers. Figure 11 shows the contribution of these variables to the increase of house prices during the period 1988-2008, broken down into two sub-periods: 1988-1998 and 1999-2008.

- The increase in the cost of materials, cost of labour, population and per capita GDP are, in that order, responsible for the large increase in house prices over the period 1988-2008.
- The increase in construction costs (materials and labour) led to relatively higher house price increases in the sub-period 1988-1998; whereas the effect of the population and GDP growth remained roughly the same in the two sub-periods.
- Foreign workers, on balance, helped keep the rise in house prices low by a small margin, while an even smaller negative effect on house price increase is attributed to the effect of the Cyprus stock exchange (CSE).

FIGURE 11

*Contribution of various factors to the increase in house prices*



Source: Own calculations.

It should be emphasised here that our empirical findings are subject to a margin of statistical error (see Appendix): around 40% of variation in house prices in Cyprus during the period under investigation is not explained by the variables in Figure 11. Also, the estimates on which the above results are supported are based on data reflecting movements of house prices in the past. Their use to speculate about the future makes sense only when the factors which shaped the development of house prices in the past can be assumed to continue to do likewise in the future.

Subject to the cautions which are outlined above, one could argue that the way in which house prices in Cyprus will evolve in the future, to a large

extent depends on developments vis-à-vis the population, the construction costs and the per capita GDP. The ease by which prospective house buyers can secure a mortgage does not appear to have played an important role in the rise of house prices in Cyprus, at least during the period under investigation in our study. However, given its importance for the housing market in other countries, this factor cannot be ignored. The importance of foreign workforce should also be acknowledged, even when its impact on the housing market appears small due to counterbalancing effects.

On the basis of our empirical findings the return of rapid house price rises in the foreseeable future is not a realistic scenario for Cyprus. This is because the rate of increase of two of the four most important factors that fuelled house price increases in the past, the rate of population and GDP growth, are expected to slow down considerably. It is also expected that construction costs will not continue to increase with the previously observed fast pace. Adding the fact that lending institutions are likely to follow a conservative mortgage policy, at least until the damage incurred in their balance-sheet from the economic crisis is repaired, it is unlikely for house prices to increase fast in the foreseeable future. If a large price rise in house price does occur in the next couple of years, it will probably be part of general inflation, a phenomenon feared by the accumulation of fiscal deficits/debts, partly due to falling government revenue and partly due to fiscal expansion purporting to ease the economy out of the recession.

Turning our attention to the opposite scenario, i.e. collapsing house prices, we think that this is equally unlikely, especially as long as the GDP growth continues to be positive. What in our opinion is more likely to happen is a small reduction and/or a relatively long period of stagnation in house prices (e.g., as in Portugal during past decade) until the market catches-up with the economic fundamentals, i.e. the long-run return on investment in housing becomes competitive. This, however, may differ across parts of the housing market: very little or no reduction in house prices may happen where the long-run return on real estate is expected to recover soon, e.g. city centres; while large price reductions may happen in parts of the market where expectations are not so positive e.g. tourism.

In conclusion, the recent economic crises have once again manifested the interdependence between the housing and financial markets and how malfunctioning in one of these markets is transmitted to the other with unwelcome consequences for the economy. In our opinion government intervention in either of these two markets needs to acknowledge the distinction between practices that serve the accommodation needs of a household (a house is durable consumption good) and practices that serve the profit seeking activities of an investor. With this distinction in mind, financial and other regulatory measures can be designed, implemented

and monitored so that credit facilities and other measures put in place in order to help families satisfy their accommodation needs are not turned into a vehicle for easy profit by unscrupulous investors. Without such regulatory framework - and adequate supervision to ensure that it operates as intended - the housing market will remain vulnerable to irresponsible (if not deceitful) behaviour inherent in markets with information asymmetries.

## Appendix

### Estimated coefficients

The table below reports the parameter estimates obtained from regressing the log of house prices on the variables listed in the table.

Explanatory variables	Parameter	Standard error
Constant	<b>-49.51***</b>	[11.79]
Trend	<b>-0.019***</b>	[0.003]
Trend square	<b>0.00004***</b>	[0.000]
Macro variables		
Population	<b>3.374***</b>	[0.960]
Index of materials cost	<b>1.123***</b>	[0.477]
Index of labour cost	<b>0.840***</b>	[0.395]
Foreign labour	-0.102	[0.101]
Per capita GDP	<b>0.588***</b>	[0.220]
Sterling pound to euro	<b>0.246***</b>	[0.100]
Interest rate	-0.001	[0.021]
Stock exchange index	<b>-0.079***</b>	[0.011]
Housing characteristics (ref: 1 bedroom flat in the centre of Nicosia)		
2 bedroom flat	<b>0.122***</b>	[0.017]
3 bedroom flat	<b>0.149***</b>	[0.018]
Detached house	<b>0.360***</b>	[0.030]
Semi-detached house	<b>0.292***</b>	[0.043]
Famagusta	<b>-0.165***</b>	[0.032]
Larnaca	-0.024	[0.017]
Limassol	<b>0.106***</b>	[0.013]
Paphos	<b>0.079**</b>	[0.031]
Rural area	-0.015	[0.019]
Distance for the nearest city centre	<b>-0.019***</b>	[0.007]

Note: \*, \*\* and \*\*\* denote significance at 10%, 5% and 1%, respectively.

## References

- Adair, A., McGreal, S., Smyth, A., Cooper, J. and Ryley, T. (2000) 'House price and accessibility: The testing of relationships within the Belfast urban area', *Housing Studies*, 15 (5): 699-716.
- Apergis, N. and Reztis, A. (2003) 'Housing prices and macroeconomic factors in Greece: Prospects within the EMU', *Applied Economics Letters*, 10: 561-565.
- Baffoe-Bonnie, J. (1998) 'The dynamic impact of macroeconomic aggregate on housing prices and stock of houses: A national and regional analysis', *Journal of Real Estate Finance and Economics*, 17: 179-197.
- Carroll, T. M., Claretie, T. M., et al. (1996) 'Living next to godliness: Residential property values and churches', *Journal of Real Estate Finance and Economics*, 12: 319-330.
- Case, B. J., Clapp, R. D., and Rodriguez, M. (2004) 'Modelling spatial and temporal house price patterns: A comparison of four models', *Journal of Real Estate Finance and Economics*, 29 (2): 167-191.
- Christofides L., Michael M., Clerides, S. and Hadjiyiannis, C. (2006) 'The impact of foreign workers on the labour market in Cyprus', *Cyprus Economic Policy Review*, 1(2):37-50
- Clapp, J. M. and Giaccotto, C. (1998) 'Residential hedonic models: A rational expectations approach to age effects', *Journal of Urban Economics*, 44: 415-437.
- Clark, D. E. and Herrin, W. E. (2000) 'The impact of public school attributes on home sale price in California', *Growth and Change*, 31: 385-407.
- ECB (2003) 'Structural factors in the EU housing markets', European Central Bank.
- Feldstein, M. S. (1992) 'Comment on James M. Poterba's paper, tax reform and the housing market in the late 1980s: who knew what, and when did they know it?' Federal Reserve Bank of Boston Conference Series, 36: 252-257.
- Fletcher, M., Gallimore, P. and Mangan, J. (2000) 'Heteroskedasticity in hedonic house price models', *Journal of Property Research*, 17 (2): 93-108.
- Forrest, D. and J. a. W. Glen, R. (1996) 'The impact of a light rail system on the structure of house prices', *Journal of Transport Economics and Policy*, 31 (4): 15-29.
- Garrod, G. and Willis, K. (1992) 'Valuing the goods characteristics - an application of the hedonic price method to environmental attributes', *Journal of Environmental Management*, 34 (1): 59-76.
- Giussani, B., Hsia, M. and Tsolocas, S. (1992) 'A Comparative Analysis of the Major Determinants of Office Rental values in Europe', *Journal of Property Valuation and Investment*, 11: 157-173.

- Goodman, A. C. and Thibodeau, G. T. (1995) 'Age-Related Heteroskedasticity in Hedonic House Price Equations', *Journal of Housing Research*, 6 (1): 25-42.
- Griliches, Z. (1961) 'Hedonic price indexes for automobiles: An econometric analysis of quality change', Price Statistics of the Federal Government, NBER.
- Griliches, Z. (1964) 'Notes on the measurement of price and quality changes in models of income determination', Princeton University for NBER.
- Hartzell, D., Eichholtz, P. and Selender, A. (1993) 'Economic diversification in European real estate portfolios', *Journal of Property Research*, 10: 5-25.
- Hendershott, P. (1980) 'Real user costs and the demand for single-family housing', *Brookings Papers on Economic Activity*, 2: 401-444.
- Inland Revenue Department, Collections of Department of Inland Revenue for the year 2007.
- Janssen, C. B., Soderberg, J. Z. and Zhou J. (2001) 'Robust estimation of hedonic models of price and income for investment property', *Journal of Property Investment & Finance*, 19 (4): 342-360.
- Kain, J. F. and Quigley, J. M. (1970) 'Measuring the value of housing quality', *Journal of the American Statistical Association*, 65: 532-548.
- Kearl, J. H. (1979) 'Inflation, mortgages, and housing', *Journal of Political Economy*, 87: 1-29.
- Kestens, T., Theriault, M. and Rosiers, F. D. (2006) 'Heterogeneity in hedonic modelling of house prices: looking at buyers' household profile', *Journal of Geograph Systems*, 8: 61-96.
- Lancaster, K. J. (1966) 'A new approach to consumer theory', *Journal of Political Economy*, 74: 132-157.
- Leong, C. T. (2002). Residential property preferences in Penang, Malaysia: A hedonic price approach. Available at:  
[www.kreaa.org/AsRES/doc/Chin%20Tung%20Leong\(D3\).doc](http://www.kreaa.org/AsRES/doc/Chin%20Tung%20Leong(D3).doc)
- Li, M. and Brown, H. J. (1980) 'Micro-neighbourhood externalities and hedonic housing prices', *Land Economics*, 56 (2): 125-141.
- Linneman, P. (1980) 'Some empirical results on the nature of the hedonic price function for the urban housing market', *Journal of Urban Economics*, 8 (1): 47-68.
- Maclennan, D. and J. a. S. Muellbauer, M. (1998) 'Asymmetries in housing and financial market institutions and EMU', *Oxford Review of Economic Policy*, 14: 54-80.
- Meese, R. and Wallace, N. (2003) 'House price dynamics and market fundamentals: The parisian housing market', *Urban Studies*, 40 (5-6): 1027-1045.

- Michaels, R. G. and Smith, V. K. (1990) 'Market segmentation and valuing amenities with hedonics models: The case of hazardous waste sites', *Journal of Urban Economics*, 31: 273-284.
- Morris, E. and W. a. J. Woods, A. L. (1979) 'The measurement of housing quality', *Land Economics*, 2: 383-387.
- Muellbauer, J. (1992) 'Anglo-German differences in housing market dynamics: The role of institutions and macroeconomic policy', *European Economic Review, Papers and Proceedings*, 36: 539-548.
- Muellbauer, J. and Murphy, A. (1997) 'Booms and busts in the UK housing market', *The Economic Journal*, 107: 1701-1727.
- Platis, S. and Nerouppos, M. (2005) 'Asking price and transaction-based indices for the Cyprus housing market (rebased)', Monograph, BuySell Cyprus Real Estate.
- Platis, S. and Orphanides, S. (2005) 'Factors that shape house prices in Cyprus (in Greek)', Monograph, BuySell Cyprus Real Estate.
- Poterba, J. M., (1992). 'Taxation and Housing: Old Questions, New Answers', *American Economic Review*, 82 (2): 237-242.
- Rodriguez, M. and Sirmans, C. F. (1994) 'Quantifying the value of a view in single-family housing markets', *Appraisal Journal*, 62: 600-603.
- Rosen, S. (1974) 'Hedonic prices and implicit markets: Product differentiation in pure competition', *Journal of Political Economy*, 82 (January/February).
- Schulz, T. and Werwatz, A. (2004) 'A state space model for Berlin house prices: Estimation and economic interpretation', *Journal of Real Estate Finance and Economics*, (28): 37-57.
- Smith, B. A. and Tesarek, W. P. (1991) 'House prices and regional real estate cycles: market adjustment in Houston', *Journal of the American Real Estate and Urban Economics Association*, 19: 346-416.
- Sternlieb, G. and Hughes, J. W. (1997) 'Regional market variations: The northeast versus south', *Journal of the American Real Estate and Urban Economics Association*, 19: 396-416.
- Stevenson, S. (2004) 'New empirical evidence on heteroskedasticity in hedonic housing models', *Journal of Housing Economics*, 13: 136-153.
- Stock, J. H., and Watson, M. W. (2004) 'Combination forecasts of output growth in a seven-country data set', *Journal of Forecasting*, 23: 405-430.
- Straszheim, M. R. (1975) 'An econometric analysis of the urban housing market', National Bureau of Economic Research, New York.