



UNIVERSITY OF CYPRUS
ECONOMICS RESEARCH CENTRE



Economic Analysis Papers

Factors Affecting Housing Prices: International Evidence

Christos S. Savva

*Cyprus University of Technology
and
Economics Research Centre*

No. 06-16

November 2016

Publication Editor: Christos Koutsampelas

ERC Sponsors (in alphabetical order)

Central Bank of Cyprus

Economics Department, University of Cyprus

Ministry of Finance

Ministry of Labour, Welfare and Social Insurance

Planning Bureau

University of Cyprus

Disclaimer: the views expressed in the Economic Policy Papers and Economic Analysis Papers are of the authors and do not necessarily represent the ERC.

Factors Affecting Housing Prices: International Evidence

Christos S. Savva[♦]

Abstract

This paper investigates how changes in key macroeconomic variables influence the growth in house prices, using a panel data methodology for a sample of 24 countries under. The main findings suggest that population; economic growth, stock returns and inflation are key factors for the increase in the housing price index. Moreover, as expected, construction cost is associated with the housing prices. In contrast, interest and unemployment rates adversely affect housing prices.

[♦] E-mail: christos.savva@cut.ac.cy

CONTENTS

<i>ΠΕΡΙΛΗΨΗ.....</i>	<i>vii</i>
<i>1. INTRODUCTION.....</i>	<i>9</i>
<i>2. THE DATA.....</i>	<i>10</i>
<i>3. METHODOLOGY.....</i>	<i>11</i>
3.1. Empirical Specification	11
3.2. Expected signs of the variables of interest	12
<i>4. EMPIRICAL FINDINGS.....</i>	<i>13</i>
<i>5. DISCUSSION AND CONCLUSIONS.....</i>	<i>16</i>
<i>REFERENCES.....</i>	<i>17</i>

Παράγοντες που επηρεάζουν το Δείκτη Τιμών Ακινήτων: Διεθνή στοιχεία

Χρήστος Σ. Σάββα

ΠΕΡΙΛΗΨΗ

Στο άρθρο αυτό εφαρμόζουμε την οικονομετρική μεθοδολογία Panel Data, η οποία αναλύει τις επιπτώσεις των μακροοικονομικών μεταβολών στο ρυθμό αλλαγής του δείκτη τιμών των κατοικιών σε 24 χώρες, χρησιμοποιώντας. Τα αποτελέσματα εισηγούνται ότι ο πληθυσμός, η οικονομική ανάπτυξη, οι αποδόσεις του χρηματιστηρίου και ο πληθωρισμός αποτελούν σημαντικούς παράγοντες για την αύξηση του δείκτη τιμών των κατοικιών. Επιπλέον, το κατασκευαστικό κόστος είναι άμεσα συνυφασμένο με τις τιμές των κατοικιών. Αντιθέτως, το επιτόκιο δανεισμού και η ανεργία επηρεάζουν αρνητικά τις τιμές των κατοικιών.

1. INTRODUCTION

The housing sector in most countries is the main driver of economic growth and constitutes a popular topic of study. From the public sector's perspective, the weakening of this sector has severe implications for future economic expansion because it constitutes a big part of government revenue (through taxes on house ownership and stamp duties imposed on transaction in real estate market). From the households' perspective, it constitutes the biggest part of their wealth influencing consumer spending, saving decisions, and the tide of residential construction jobs.

In many countries around the globe (see for instance the cases of the US, UK, Spain, Ireland, Japan among others) housing markets experienced large cyclical variations in prices and volumes, with these cycles being characterized by a surge in prices followed by a fall or crash (Nneji et al., 2013). Hence, in combination with the importance of housing market mentioned above, it is important to identify which macroeconomic variables and how they are linked to house price dynamics. It is also of great importance to examine these linkages under an econometric framework that takes into account as many countries as possible.

In the first step, a selection of the most important macroeconomic variables should be identified. In the extant literature, the majority of studies identify interest rates as the most important explanatory variable for various countries (Abraham and Hendershott, 1992; for the US, Iacoviello and Minetti, 2003; for European countries including the UK, Himmelberg et al., 2005; Adams and Füss, 2010; Holly and Jones, 1997; McQuinn and O'Reilly, 2008; Bouchouicha and Fiti, 2012; among others). Mayer and Somerville (2000) suggested construction cost as a possible factor that affect house prices while Brunnermeier and Julliard (2008) conclude that inflation plays important role. Beltratti and Morana (2009) suggest global macroeconomic shocks, Adams and Füss (2010) provide evidence that variables linked to economic activity (such as industrial production and the level of unemployment) influence house price¹ Finally, Pashardes and

¹ See also the work of Englund and Ioannides (1997), Tsatsaronis and Zhu (2004) and Glindro et al. (2011) for similar suggestions.

Savva (2009) suggest that population and financial performance (stock returns) are good candidates to explain the fluctuations in housing market.

Nevertheless, the majority of above studies deal with a single country or region; hence they do not depict the true picture of the relationship between macroeconomic factors and house prices growth for a larger number of countries. Therefore, they may lead incomplete picture regarding the effects of real economy on housing market.

The purpose of this study is to investigate how changes in key macroeconomic variables could influence house prices growth, using a panel data methodology for a sample of 24 countries. The main findings suggest that population; economic growth, stock returns and inflation are key factors for the increase in the housing price index. Moreover, construction cost is associated with the housing prices while in contrast to the above, lending (interest) and unemployment rates adversely affect housing prices.

The rest of the paper is organised as follows: Section 2 describes the data while Section 3 discusses the methodology. Section 4 presents the results and Section 5 indicates the policy implications of the main findings and concludes.

2. THE DATA

Based on the related literature we use quarterly data for the following series: For house market price index we use the index constructed by Eurostat. Further, we employ for each country in the dataset; Lending Rate, Gross Domestic Product, Unemployment rate, Stock market Index, Construction Cost Index, Population and Inflation Rate. All series were transformed to render stationarity. Specifically, as a dependent variable we use the percentage change of house price index (ΔHP), while for independent variables we employ change in Lending Rate (ΔLR), percentage change of GDP, which basically proxies for economic growth ($GROWTH$), percentage change of Stock Price Index, i.e. stock returns (SR), and percentage change of Construction Cost Index ($CONSTR$). Unemployment Rate ($UNEMP$) is expressed in rates while inflation ($INFL$) is the percentage change of the consumer price index. Finally, population growth ($POPUL$) is expressed as the percentage change of the population. The data spans from

2001Q1-2014Q4 and covers 24 countries, namely: Germany, Spain, Italy, Lithuania, Ireland, France, Luxemburg, Hungary, Cyprus, Austria, the Netherlands, Finland, Portugal, Bulgaria, Slovenia, Sweden, Malta, Belgium, Estonia, Romania, Denmark, UK, Czech Republic and Slovenia. The choice of the countries was based on data availability.

3. METHODOLOGY

3.1. Empirical Specification

Our main objective is to examine the short-run determinants of the change in housing prices in various economies. The estimation strategy, in terms of the choice of potential determinants is driven by the existing literature, as outlined in the introduction. We wish to draw attention, however, to the short-run determinants given the limited empirical work on this front. Given our main interest, the regression specification is:

$$\Delta HP_{it} = \beta_0 + \beta_1 \Delta LR_{it} + \beta_2 GROWTH_{it} + \beta_3 CONSTR_{it} + \beta_4 UNEMPL_{it} + \beta_5 SR_{it} + \beta_6 POPUL_{it} + \beta_7 INFL_{it} + \varepsilon_{it} \quad (1)$$

The panel estimations we use consider a variety of techniques. We first estimate equation (1) with pooled OLS with robust standard errors adjusted for heteroskedasticity and serial correlation. We next consider the random effects estimator and control for unobserved country-specific effects using the fixed effects estimator.² In both cases we report robust standard errors adjusted for arbitrary serial correlation and heteroskedasticity. An additional way to correct for serial correlation in the errors is to assume that the errors follow an AR(1) process. We therefore estimate parametric models with the fixed and random effects GLS estimators that allow for AR(1) structure of the error term. For

² The fixed-effects model controls for all time-invariant differences between the individuals, so the estimated coefficients of the fixed-effects models cannot be biased because of omitted time-invariant characteristics. The rationale behind random effects model is that, unlike the fixed effects model, the variation across entities is assumed to be random and uncorrelated with the predictor or independent variables included in the model.

robustness, we also estimate the models with FGLS with panel heteroskedasticity and panel specific autocorrelation with AR(1) disturbances.

Furthermore, we consider models using fixed and random effects that also account for time effects. Finally, a dynamic specification (that includes the lag value of the dependent variable) is also employed.

3.2. Expected signs of the variables of interest

As stated in introduction a number of variables were identified as possible candidates that affect housing prices. In the next paragraphs, based on economic/finance theory we report the expected sign of the effect of these variables on housing prices.³

Starting with the lending rate we expect a negative impact. The economic literature suggests that an increase in the mortgage rate reduces the affordability of housing assets. This fact compels some potential buyers to abandon the market. As a result, this decline in demand for housing curbs housing prices.

GDP growth which generally accounts for the prosperity of households is expected to have a positive effect on housing prices. More specifically, any increase in households' ability to consume more makes it more affordable to purchase a home. Therefore increases demand for housing and induces an increase in housing prices appreciation since the supply of housing is fixed in the short run.

As for the unemployment, we expect rising unemployment to reduce the demand for housing. Increase in unemployment reduces disposable income and the purchasing power of the household. Consequently, it reduces the ability of the household to buy a house.⁴

³ This part heavily draws on the work of Arestis and Gonzalez (2013).

⁴ Indirect effects of unemployment also have effects on housing market. For instance, in the presence of unemployment, households freeze any plan for investments and banks are reluctant to issue new mortgages causing a decline in demand for housing, which reduces housing prices appreciation. Finally, because of the unemployment some home owners have to sell their properties in order to cover their needs.

House prices are expected to negatively correlate to equity prices, mainly because of the existence of substitution effects. When stock returns are high, investors (i.e. people who buy and sell houses to make profit) are moving from housing market to stock market when the latter is more profitable, and vice versa.

Moving to the case of population growth, the effects are expected to be positive. For instance, an increase in population fuels demand for housing since more people have to share the existing number of housing properties.

Finally, construction cost and inflation are expected to positively correlate to housing prices since higher cost in materials/labour leads to higher prices.

The previous discussion can be summarized in equation below:

$$\Delta HP = F(\Delta LR, GROWTH, CONSTR, UNEMP, SR, POPUL, INFL)$$

- + + - - + +

4. EMPIRICAL FINDINGS

We begin our investigation by estimating equation (1) for the short-run determinants of the change in housing prices with OLS, FE, RE, and Dynamic specification using the set of control variables described above. The results are presented in Table 1 and all six columns verify the expected signs in accord with economic theory (except from the case of stock returns).

More specifically, population growth positively affects housing prices changes. This effect may be attributed to two components that influence population growth. The first one is the natural population growth (i.e. higher birth-rates in combination with lower mortality rates, which takes place slowly over longer periods of time) and the increase of immigration, which occurs quickly and unexpectedly. The difference between the two components is the degree of predictability of each of the components. The former follows an expected course while the latter is sudden and market-driven.⁵

⁵ The size of impact of each component remains an open question for further research.

Unemployment rate is negatively correlated with housing prices changes. Countries with high unemployment rates have lower demand for properties, therefore housing prices drop. Furthermore, some anecdotal evidence suggest that house prices do not bottom in real terms until the unemployment rate has peaked.

GDP growth is highly significant and has the expected positive sign in all regressions, indicating that changes in income are strongly positively related to changes in house prices.

House prices in the countries in our sample, by contrast to what expected are positively correlated with equity prices, indicating possible wealth effects. A possible explanation is that people investing in stock markets become richer and reinvest some of their profits in housing market, increasing in that manner the demand for properties.

As indicated in previous section, construction cost and inflation rate are expected to positively correlate to housing prices, since higher cost in materials/labour leads to higher prices. Indeed, the empirical findings support the positive effects of the two variables on housing prices.

Lending rate coefficients in all cases have the expected negative sign and are highly significant, indicating that lowering of lending rates is associated with rising in house prices.

Finally, column 6 of the table presents the results of the dynamic panel data specification which includes the lag value of the dependent variable. The coefficient of this variable is highly significant and relatively big in magnitude suggesting that there are some persistence effects in housing market. For instance when prices are high during one quarter tend to remain high in subsequent quarters and vice versa.

Table 1. Change in housing prices – estimation results

Variable	OLS (1)	FE (2)	RE (3)	FE-time effects (4)	RE-time effects (5)	Dynamic Panel (6)
Constant	9.090 (10.618)	8.345 (10.546)	8.826 (12.864)	53.312 (55.210)	53.099 (56.048)	-0.347 (0.775)
Population	0.029 ^{***} (0.007)	0.025 ^{***} (0.007)	0.028 ^{***} (0.007)	0.014 ^{**} (0.007)	0.016 ^{**} (0.007)	0.022 ^{***} (0.008)
Unemployment	-0.030 ^{***} (0.003)	-0.032 ^{***} (0.003)	-0.031 ^{***} (0.003)	-0.030 ^{***} (0.003)	-0.029 ^{***} (0.003)	-0.028 ^{***} (0.002)
Growth	0.015 ^{***} (0.005)	0.015 ^{***} (0.005)	0.015 ^{***} (0.005)	-0.004 (0.005)	-0.003 (0.005)	0.012 ^{**} (0.006)
Stock Returns	0.030 ^{***} (0.005)	0.029 ^{***} (0.005)	0.029 ^{***} (0.005)	0.016 ^{***} (0.006)	0.016 ^{***} (0.006)	0.027 ^{***} (0.004)
Construction Cost	0.546 ^{**} (0.294)	0.599 ^{**} (0.294)	0.566 ^{**} (0.293)	0.488 ^{**} (0.289)	0.449 ^{**} (0.288)	0.358 (0.307)
Inflation Rate	0.118 ^{***} (0.026)	0.121 ^{***} (0.026)	0.119 ^{***} (0.026)	0.109 ^{***} (0.031)	0.106 ^{***} (0.031)	0.103 ^{***} (0.026)
Lending Rate	-0.183 ^{***} (0.026)	-0.182 ^{***} (0.025)	-0.183 ^{***} (0.025)	-0.098 ^{***} (0.033)	-0.099 ^{***} (0.033)	-0.106 ^{***} (0.043)
Lag Dependent	-	-	-	-	-	0.358 ^{***} (0.080)
Countries/Observations	24/1032	24/1032	24/1032	24/1032	24/1032	24/984
R-square	0.228	0.272	0.272	0.366	0.366	

Notes: Dependent variable is the log change in housing prices index. Robust standard errors adjusted for heteroskedasticity and serial correlation for the OLS, FE, and RE estimators are reported in parentheses. *** and ** denote 1% and 5% level of significance, respectively. Country and time dummies are not reported.

5. DISCUSSION AND CONCLUSIONS

This study (by employing a panel data methodology) investigates how changes in key macroeconomic variables (such as lending rate, growth, construction cost, unemployment, stock returns, population and inflation) influence housing prices growth, using a sample of 24 countries over the period that spans from the first quarter of 2005 to the fourth quarter of 2015.

The main findings suggest that population; economic growth, stock returns and inflation are key factors for the increase in the housing price index. Moreover, construction cost is positively associated with the housing prices. In contrast, with the above, interest and unemployment rates adversely affect housing prices.

Hence, if the policy makers want their policies to have effect on housing market they should seek for the following:

- Increase the growth rate of the economy which will lead to an increase in household income and consumption.
- Proceed with innovations in mortgage markets starting with the reduction of lending rates..
- Introduce policies that reduce unemployment.
- Generally, improve macro economic conditions (create stable economic climate of low inflation and positive economic growth).

REFERENCES

- Abraham, J.M., Hendershott, P.H., 1992. Patterns and determinants of metropolitan house prices, 1977 to 1991. In: Browne, Lynn E., Rosengren, Eric S. (Eds.), *Real Estate and the Credit Crunch*. Boston, M.A, Federal Reserve Bank of Boston, pp. 18–42.
- Adams, Z., Füss, R., 2010. Macroeconomic determinants of international housing markets. *Journal of Housing Economics* 19, 38–50.
- Arestis, P. and González-Martínez, A. R., 2015. Residential Construction Activity in OECD Economies. *The Manchester School*, 83: 451–474.
- Beltratti, A., Morana, C., 2009. International house prices and macroeconomic fluctuations. *Journal of Banking and Finance* 34, 533–545.
- Bouchouicha, R., Ftiti, Z., 2012. Real estate markets and the macroeconomy: a dynamic coherence framework. *Economic Modelling* 29, 1820–1829.
- Brunnermeier, M. K., Julliard, C., 2008. Money Illusion and Housing Frenzies. *Review of Financial Studies* 21(1), 135-180.
- Englund, P., Ioannides, Y. M., 1997. House Price Dynamics: An International Empirical Perspective. *Journal of Housing Economics*, 6 (2), 119-136.
- Glindro, E., Subhanij, T., Szeto, P., Zhu, H., 2008. Determinants of House Prices in Nine Asia-Pacific Economies. *BIS Working Paper* (263).
- Himmelberg, C., Mayer, C., Sinai, T., 2005. Assessing high house prices: bubbles, fundamentals and misperceptions. *Journal of Economic Perspectives* 19, 67–92.
- Holly, S., Jones, N., 1997. House prices since the 1940s: cointegration, demography and asymmetries. *Economic Modelling* 14, 549–565.
- Iacoviello, M., Minetti, R., 2003. Financial liberalization and the sensitivity of house prices to monetary policy: theory and evidence. *The Manchester School* 71, 20–34.

- Mayer, C. J., Somerville, C. T., 2000. Residential Construction: Using the Urban Growth Model to Estimate Housing Supply. *Journal of Urban Economics* 48, 85-109.
- McQuinn, K., O'Reilly, G., 2008. Assessing the role of income and interest rates in determining house prices. *Economic Modelling* 25, 377–390.
- Nneji, O., Brooks, C., Ward, C.W.R., 2013. House Price Dynamics and their Reaction to Macroeconomic Changes. *Economic Modelling* 32, 172-178.
- Pashardes, P., Savva, C.S., 2009. Factors Affecting House Prices in Cyprus: 1988-2008. *Cyprus Economic Policy Review*, 3 (1), 3-25.
- Tsatsaronis, K., Zhu, H., 2004. What Drives Housing Price Dynamics: Cross-Country Evidence. *BIS Quarterly Review*, 65-78.

RECENT ECONOMIC POLICY/ANALYSIS PAPERS

- 05-16 Papamichael, C. and N. Pashourtidou, "The role of survey data in the construction of short-term GDP growth forecasts, September 2016.
- 04-16 Karagiannakis, C., P. Pashardes, N. Pashourtidou and S. Andreou "The CypERC property price index: data and estimation methods", May 2016.
- 03-16 Michail A. M. and M.C. Polemidiotis " Estimates of Public, Housing and Other Private Sectors Net Capital Stocks for the Cyprus Economy: 1995Q1-2015Q4", April 2016.
- 02-16 Polycarpou, A. "The output gap in Cyprus and EU-28", April 2016,
- 01-16 Koutsampelas, C. "The Cypriot GMI scheme and comparisons with other European countries", April 2016.
- 10-15 Polycarpou, A. "Methodologies for estimating the output GAP with an application to Cyprus", December 2015.
- 09-15 Ketteni, E. and T. Mamuneas "Comparisons of Productivity among European Sectors and Cyprus: The Case of Tourism Sector", December 2015.
- 08-15 Clerides, S. and C. Karagiannakis " Recent trends in the Cypriot electronic communications sector", December 2015
- 07-15 Koutsampelas, C., S. Andreou and P. Tsakloglou "The Progressivity of Public Education in Greece in the Era of Depression", December 2015.
- 06-15 Kourtellos, A, and K. Petrou "Preferences for Redistribution in Cyprus", December 2015.