

# The Dynamics and Contrast of House Prices in Portugal and Spain<sup>1</sup>

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## ABSTRACT

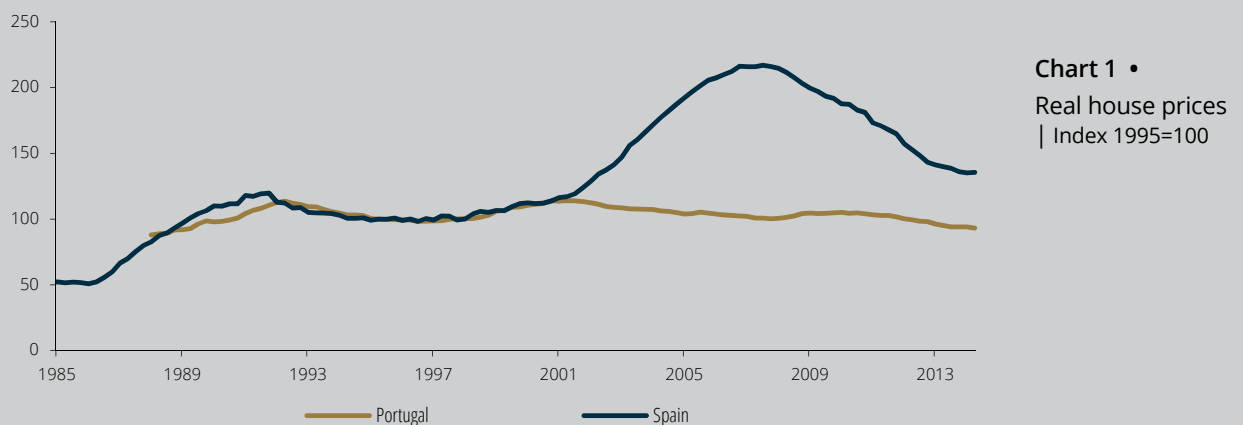
Following the accession to the European Union (EU) in the eighties, the housing market has evolved very differently in Portugal and Spain. This article provides evidence on these differences and tries to explain the behaviour of house prices in both cases. For this purpose, we analyze the evolution of house prices using three different approaches: (1) a comparative analysis of the evolution of the price-to-rent and price-

to-income ratios; (2) an assessment of the determinants of house prices based on a Error Correction Model; and (3) an analysis of the existence of speculative bubbles in the Portuguese and Spanish housing markets, using an econometric methodology based on the arbitrage-free model. These three approaches allow us to draw some conclusions regarding the dynamics and contrast of house prices in Portugal and Spain.

## Introduction

Spain and Portugal joined the EU in 1986 and both made the process of convergence to the single currency in 1999. It was in this context that for two decades, until the beginning of the financial crisis in 2007, house prices grew on average less than 1 per cent per year in real terms in Portugal and above 6 per cent in Spain (Chart 1). Developments in Spain were quite heterogeneous as compared to Portugal.<sup>3</sup> Between 1985 and 1998 house prices rose about 1 per cent a year in Portugal and 5 per cent in Spain. Between 1999 and 2006 house prices registered a zero annual growth in Portugal, having increased almost 10 per cent per year in Spain. Since 2007 house prices fell about 1 per cent per year in Portugal and 6 per cent in the Spanish case.

Developments in the housing market may have major implications on economic activity, particularly through the credit channel and the impact of housing wealth on consumption.<sup>4</sup> It is therefore



Sources: OECD and Banco de Portugal.

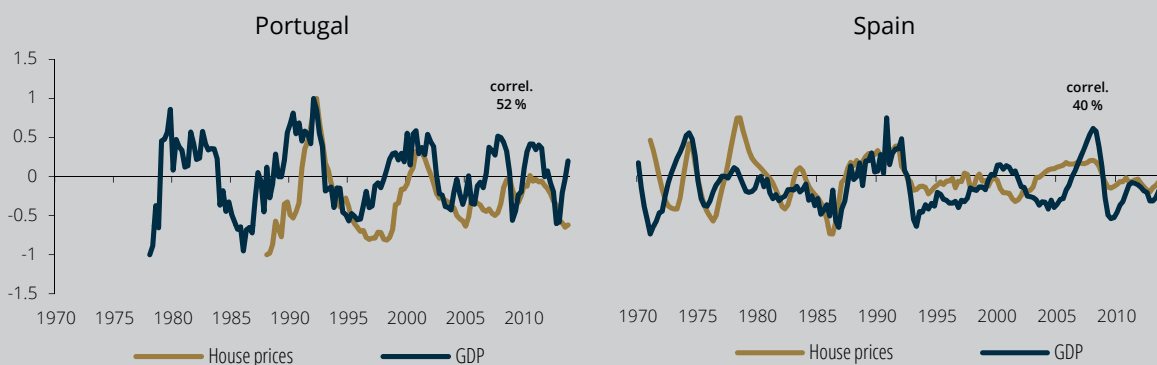
important to analyze the relationship between business cycles and house prices. In the period between 1970 and 2013 it appears that house-price and business cycles turning points roughly coincide in Spain and Portugal (Chart 2). These results using the Hodrick-Prescott filter, are in line with the dating of the economic cycle performed by the Economic Cycle Research Institute for the Spanish economy.<sup>5</sup> The contemporaneous correlation between economic cycles and house prices is stronger in Portugal (52 per cent) than in Spain (40 per cent).

With respect to the degree of synchronization of changes in house prices between countries, this is an issue that is more difficult to handle owing to the segmentation in housing markets (significant differences in market dimensions, regulation and taxation, competition, rental market developments, social housing as well as demographic aspects affect housing demand). Thus, to characterize and understand the different evolution of the housing markets in both economies it is useful to analyze a broad range of indicators that are common to the two countries.

## Overview of the housing market in Spain and Portugal

When analyzing the evolution of residential investment in Portugal and Spain we found that the biggest difference between the two economies was mainly from the late nineties onwards, when residential investment rose sharply in Spain in the context of low interest rates and significant flows of immigration.<sup>6</sup> The impact of immigration flows in Spain resulted in a significant increase in the active population at the beginning of the XXI century (Chart 3), and contributed to an increase in housing demand. Between 1999 and 2006 the Spanish residential investment grew at an average annual rate of about 12 per cent, which compares with a GDP growth of 4 per cent (Chart 4). Turning to Portugal, residential investment, which in previous years had increased in line with GDP growth, between 1999 and 2006 saw a contraction of 3 per cent on average per year compared to a GDP growth of about 1.5 per cent during the same period.

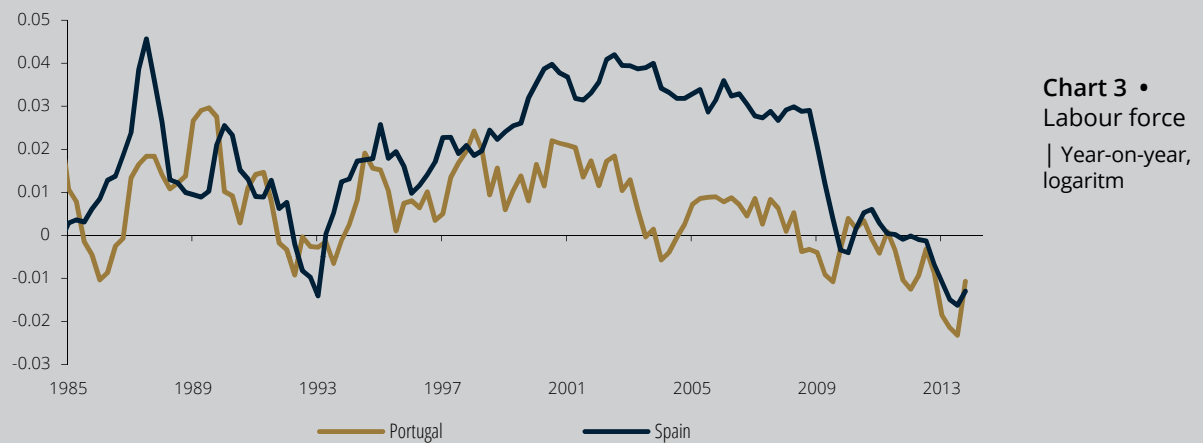
Chart 2 • Housing cycles and business cycles



Sources: OECD, Banco de Portugal and authors' calculations.

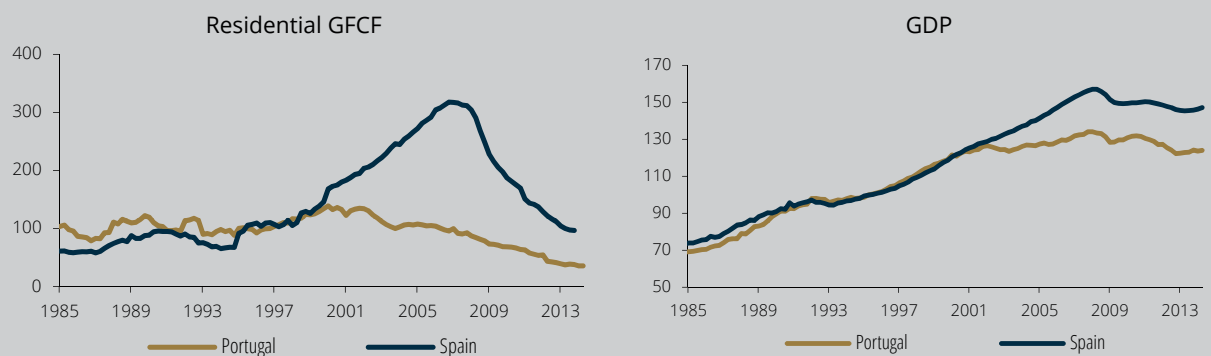
Data on the number of permits issued for residential new dwellings and business confidence in this sector are consistent with the differential evolution between the two countries from the late nineties to 2006 (Charts 5 and 6). It is notable that although the economic sentiment is similar in both countries the business confidence in the residential construction sector is very different. Between 1997 and 2007 confidence in Spain is clearly superior to that in Portugal probably reflecting some difficulties in the sector in Portugal. The number of permits issued for residential new dwellings in Spain increased sharply between 2000 and 2006, coinciding with the sizeable influx of immigrants, contrary to Portugal where the number of permits has been decreasing since the late nineties.

From 2007 onwards there was a sharp contraction in residential investment in Spain which compares to a less marked evolution of GDP. In Portugal residential investment had already been



Sources: OECD and Banco de Portugal.

**Chart 4 • Evolution of residential GFCF and Gross Domestic Product in real terms**  
| Index 1995=100

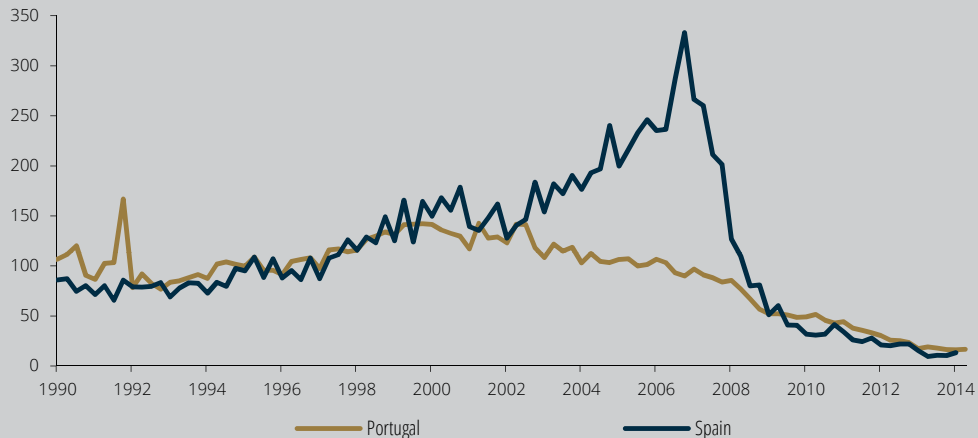


Sources: OECD, ECB and Banco de Portugal.

declining since the end of the 90's. Between 2007 and 2013, residential investment fell at an annual average rate of about 12 per cent in Portugal and 15 per cent in Spain, compared with a fall below 1 per cent of GDP in both economies. In terms of residential investment as GDP percentage we see that in the Spanish case there was a significant increase from 8 percentage points at the end of the nineties to 13 per cent in 2006. In contrast, in Portugal residential investment represented 5 per cent of GDP in 2006, about 3 percentage points lower than in 1999.

To determine whether the expansion of residential investment that occurred between the end of the nineties and 2006 may have originated an "housing overhang" it is necessary to look at an extended period of time, since an excess supply of housing does not occur in one or two years of high rates of growth in this sector. One possibility to determine the excess of houses available is to calculate the difference between the value of current residential GFCF and the previous 20 years average (both as a percentage of GDP), and accumulate the difference over the period 2000-2006.

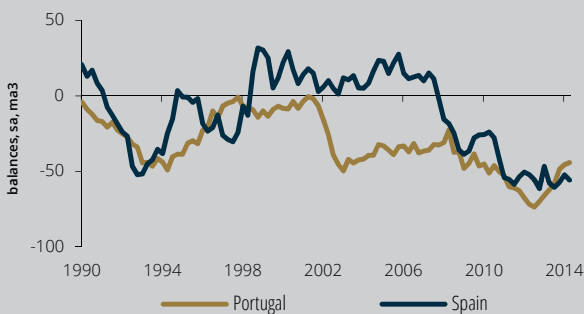
**Chart 5 •**  
Permits issued  
for residential  
new dwellings  
| Index 1995=100



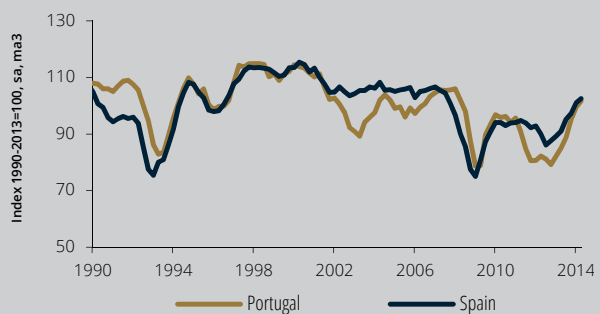
Sources: Banco de España and Banco de Portugal.

**Chart 6 • Confidence indicators**

**Business confidence  
in the residential construction sector**



**Economic sentiment**



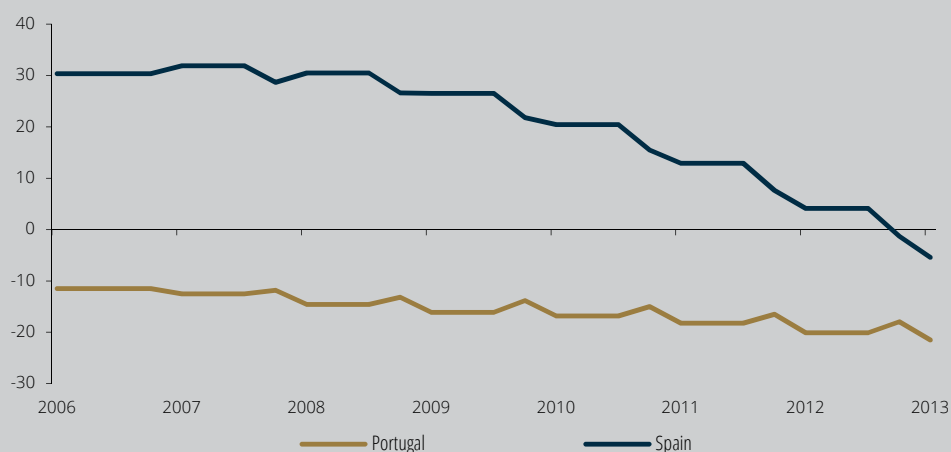
Source: European Commission.

This indicator can be seen as the cumulative loss that would occur in domestic demand if residential construction activity returned to its “long term” level (Gros, 2007). For Spain, this indicator suggested an “excess” of about 30 per cent of houses accumulated in 2006, while in Portugal there was a negative stock of 11 per cent. For comparison’s sake, it is noted that in the UK and France, where between 1999 and 2006 house prices had similar increases to those of Spain, there was no excess supply of houses in 2006. However, since 2007 there has been a correction in Spain and after six years this indicator suggests that there has been a contraction in demand for housing of about 30 per cent (Chart 7). In 2013, the ratio of residential GFCF to GDP was 2 per cent for Portugal and 4 per cent for Spain.

Another indicator that allows us to draw some conclusions in terms of the housing market by country is the price in euros per square metre (m<sup>2</sup>) of housing. The comparability between countries is difficult given the differences in data sources and sample size, e.g. for Portugal data is only available since after the crisis. In the Portuguese case the price per m<sup>2</sup> is obtained from bank appraisals which are collected through a monthly survey, gathering information on homes that are object of bank financing, and where there is a technical evaluation of each property. In Spain the price per m<sup>2</sup> is obtained through real estate evaluations made by companies specialized in this area.<sup>7</sup>

The data indicate that between 1999 and 2007 prices per m<sup>2</sup> increased by about 170 per cent in Spain, with Andalucía and Comunidad Valenciana the regions with greater increases, followed by Madrid (Chart 8). The regions with smallest increases were Castilla y León and Galicia. Since 2008 prices per m<sup>2</sup> fell about 29 per cent in Spain, with a slightly larger correction in regions that had risen most (32 per cent). In Portugal the price per m<sup>2</sup> fell by about 12 per cent since 2008, ranging from a low of 9 per cent in the North and a maximum of 21 per cent in the Algarve and Madeira. Lisbon recorded a 16 per cent drop.

Finally, given its relevance for the housing sector and the impact it may have on the cost of financing it is also important to analyze credit in detail. Data on bank lending indicate the existence of episodes of very high growth in mortgage loans between the mid-1990s and 2006 (Chart 9). This annual growth was about 16 per cent on average in Portugal and in Spain, in the context of de-



**Chart 7 •**  
Housing overhang  
| Per cent

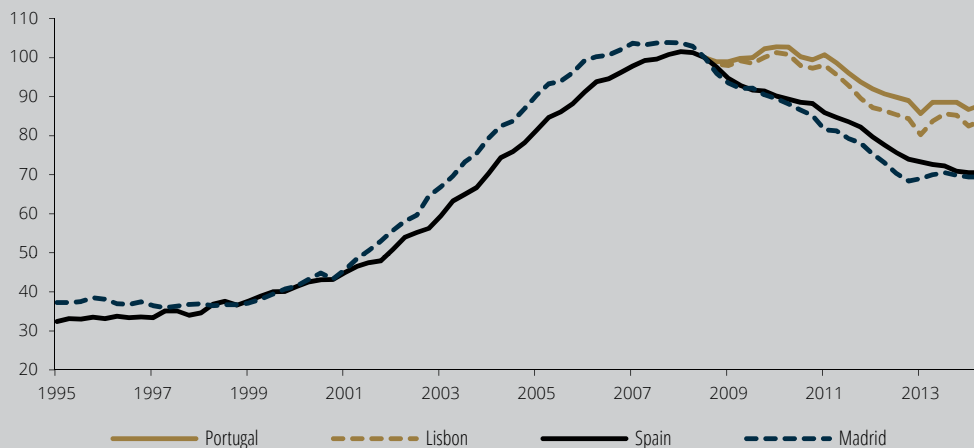
Sources: OECD, ECB, Banco de Portugal and authors' calculations.

clining costs of bank loans and high and sustained growth in household disposable income, which was reflected in an increase of indebtedness of such families. Within a decade the indebtedness of Portuguese and Spanish families, measured as mortgage loans in terms of disposable income, rose from about 25 per cent to over 90 per cent in 2006. The significant deceleration of credit to housing from 2007 onwards should be seen in the context of the international financial crisis which had a negative impact on the supply, given a significant tightening in lending conditions, and on housing credit demand.

## House prices, macroeconomic fundamentals and speculative bubbles

After this general characterization of the housing markets in Portugal and Spain we will evaluate the relationship between house prices and macroeconomic fundamentals. The idea is to determine

**Chart 8 •**  
Price of dwellings  
per square metre  
| Index 2008=100



Sources: Instituto Nacional de Estadística, Banco de España and authors' calculations.

**Chart 9 •**  
Housing loans,  
Annual growth  
rate in real  
terms  
| Per cent



Sources: Banco de Portugal and Banco de España.

whether in the period under analysis prices were overvalued at some point. Based on the evolution presented above it is possible that Spain may have faced a period of exuberance from the late 90s to 2006, resulting from a strong demand given *inter alia* the flow of immigration.

To answer this question we use three approaches: (1) a comparative analysis of the evolution of house prices and rents and house prices and income; (2) an assessment of the importance of some macroeconomic determinants for the evolution of house prices (interest rates, disposable income and labour force); and (3) the application of a test specifically designed for the detection of bubbles proposed by Philips, Shi and Yu (2013).

### Comparative analysis of the evolution of price-to-rent and price-to-income ratios

Asset pricing theory predicts a clear relation between house prices, rents, and discount rates based on arbitrage opportunities between buying and renting real estate. Thus, the price-to-rent ratio captures the long-term relationship between the cost of owning a house and the return on renting it out.<sup>8</sup> In other words, when house prices are very high compared to rents, potential buyers find it more advantageous to rent than to buy, leading to a reduction in demand for real estate, which in turn will exert downward pressure on house prices. The reasoning is the opposite when the ratio between house prices and rents is very low, in this case it is better to buy a home than to rent. If by any chance the price-to-rent ratio remains high for a very long period of time, it can be argued that house prices are being supported by unrealistic expectations of future earnings from the sale of housing and not the true value (or fundamental) of rents. In this sense, there may be conditions in which there is a “bubble” / overvaluation of house prices.

Another conventional measure used in assessing the dynamics of house prices is the price-to-income ratio. In this case, we compare the total cost of a home relative to median annual income, measuring whether or not housing is within reach of the average buyer. This indicator captures the notion that in the long run house prices are limited by the families' capacity to bear the burden of the real estate purchase, including service of the debt incurred for the house purchase from the stream of income. If the ratio is above the long-term level this means that potential buyers do not have available funds to purchase real estate, leading to a reduction in demand, which in turn exerts a downward pressure on prices.

Table 1 shows the long-term averages of the price-to-rent and price-to-income ratios for Portugal, Spain and other countries (column 1), the latest values observed (column 2) and the relationship between the two (column 3). Chart 10 shows the cyclical deviations from the medium and long-term trends. Column (3) indicates that, in most countries, including Portugal and Spain, house prices are currently in line with long-term averages. This is a very different situation from what happened in the period between 1999 and 2006, in particular for Spain. At that time, the deviations from the long-term average in Spain exceeded 50 per cent, which may suggest the existence of overvaluation of house prices in the Spanish case. In Portugal deviations were always in line with long-term values.

Table 1 • Price-to-rent ratio and price-to-income ratio

	Price-to-rent ratio			Price-to-income ratio		
	Average (1)	Last quarter (2)	(3)=(2)/(1)×100	Average (1)	Last quarter (2)	(3)=(2)/(1)×100
Austria	100	115	116	99	120	121
Belgium	65	102	156	69	101	146
Finland	74	100	134	98	97	99
France	75	97	129	78	99	127
Germany	126	118	93	130	114	88
Greece	96	81	84	94	85	90
Ireland	76	76	100	86	82	95
Italy	92	86	93	84	89	106
Netherlands	74	77	105	71	82	116
Portugal	103	86	84	105	101	96
Spain	74	77	105	74	80	108
UK	73	103	141	83	105	127
US	98	103	105	110	99	90

Source: OECD.

Note: Average considering available information since 1980. Last observation 2<sup>nd</sup> quarter 2014. 2010=100.

It should be noted that there are some caveats in using these conventional metrics. It is possible that in some occasions these measures may, however, fail to reflect accurately the state of housing costs and indicate that house markets can appear exuberant when house prices are in fact reasonably priced. According Himmelberg *et al.* (2005) the price of a dwelling corresponds to the annual cost of owning, so rising house prices does not necessarily indicate that ownership is becoming more expensive or that housing is overvalued. It is also possible that there is significant variability in the price-to-rent ratios across markets, given the differences in expected appreciation rates of houses and taxes, and also depending on rental markets being liquid or not. Note that in Portugal the rental market is relatively underdeveloped in the period. Finally, Himmelberg *et al.* (2005) also reported that the sensitivity of house prices to fundamentals is greater when real long-term interest rates are already very low (as has been observed since the late nineties), so that an acceleration in house price growth may not mean that there is a bubble.

### The fundamentals of house prices

To analyze which fundamentals are relevant in determining the dynamics of house prices ( $hp_t$ ), we estimated for Portugal and Spain several error correction models. Given the sample size, we opted for regressions that considered only real disposable income ( $y_t$ ), the interest rate ( $r_t$ ) and labour force ( $l_t$ ). The models considered were estimated for the entire sample period, as well as for pre and post-crisis periods, in order to verify which relevant determinants in the pre-crisis period remained significant in the post-crisis period.

The estimated error correction model was the following,

$$\Delta hp_t = c + \sum_{i=1}^2 \alpha_i \Delta hp_{t-i} + \sum_{i=0}^2 (\beta_i r_i + \delta_i \Delta y_{t-i} + \vartheta_i \Delta l_{t-i}) + \gamma (hp_{t-1} - \widehat{hp}_{t-1}^*) + u_t \quad (1)$$

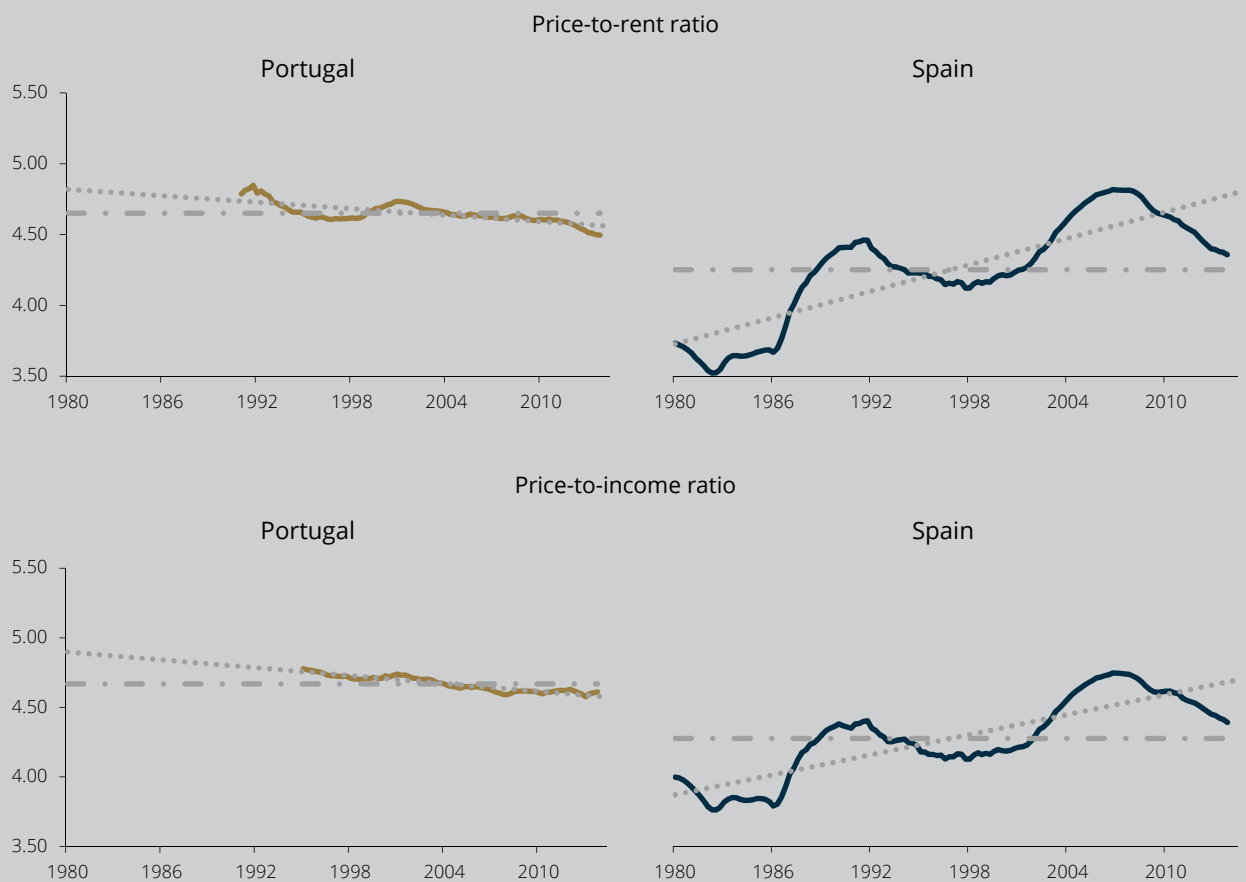


where  $\widehat{hp}_t^* = \hat{a} + \hat{\phi}_1 y_t + \hat{\phi}_2 l_t$ ,  $\Delta hp_t$ ,  $\Delta y_t$ , and  $\Delta l_t$  represent the first differences of  $hp_t$ ,  $y_t$  and  $l_t$ ; and  $u_t$  are identically and independently distributed errors with zero mean and constant variance.

The variables considered are those that have a direct impact on housing demand: the interest rate ( $r_t$ ), the logarithm of disposable income ( $y_t$ ), time lags of house prices ( $\Delta hp_{t-i}$ ), the logarithm of labour ( $l_t$ ) and the error correction term ( $hp_{t-1} - \widehat{hp}_{t-1}^*$ ), (the deviations from the long-term equilibrium). The error correction term ensures that house prices are, in the long-run, in line with the economic fundamentals that determine the equilibrium level.

The short term part of the model, *i.e.*,  $\Delta hp_{t-i}$ ,  $i=1,2$ , captures, among other things, influences on the speculative market or market inefficiency<sup>9</sup>,  $\gamma$  measures the degree of mean reversion and the parameters  $\beta_i$ ,  $\delta_i$  e  $\vartheta_i$ ,  $i = 0$ , measure the contemporaneous adjustment of house prices to shocks in the explanatory variables, *i.e.*, correspond to the impact multipliers. The deviations from the long-run equilibrium are indicative of over or undervaluation of house prices. Thus, if  $(hp_t - hp_t^*) > 0$  it means that house prices are overvalued and if  $(hp_t - hp_t^*) < 0$  it means that house prices are undervalued relatively to the determinants. Several variants of the error correction model considered in (1) are often used in the literature as representative of house prices; *e.g.*, Barot and Yang (2012), Hort (1998), Malpezzi (1999), Gallin (2006), Hadjimatheou Giussani (1992) and Jones and Holly (1997).

**Chart 10 • Cyclical deviations around the average | In logarithms, base 2010**



Sources: OECD and authors' calculations.

The estimation of the long-term relationship considers that variables are integrated of at most order 1, *i.e.*, non-stationary. Applying the augmented Dickey-Fuller test to the three determinants considered and to house prices, it appears that with the exception of the interest rate ( $r_t$ ), the null hypothesis of non-stationarity is not rejected for any of the other series. Thus, the long-term relationship for house prices will be established only with disposable income and labour.

The estimation of the error correction model proceeds in two steps: first, we estimate the long-term relationship (in levels) using ordinary least squares; and second, the residuals resulting from the long-term model estimated in the first step are included in regression (1) as the error correction term, and this model is also estimated by ordinary least squares.

The estimation results for model (1) following a general to specific approach for Portugal, for the three periods considered, are presented in table 2 and for Spain in table 3.

**Table 2 • Error correction models for Portugal**

	1988:02-2014:02 Coef.	1988:02-2007:02 Coef.	2007:02-2014:02 Coef.
$C$	-0.0018*	-0.0030*	-0.0014
$\Delta y_t$	0.1527*	0.3263***	
$r_t$	0.0018*		
$(hp_{t-1} - \widehat{hp}_{t-1}^*)$	-0.0408**	-0.0256	-0.2178**
$\Delta l_{t-1}$	0.6131***	0.6850**	
$r_{t-1}$	-0.0015		
$\Delta hp_{t-1}$	0.4786***	0.4849***	0.5048***
R-squared	0.4940	0.4955	0.4865
Adj. R-squared	0.4627	0.4671	0.4438

Sources: OECD, ECB, Banco de Portugal and authors' calculations.

Note: \*, \*\* and \*\*\* indicates statistical significance at 1 per cent, 5 per cent and 10 per cent, respectively and Coef indicates coefficients.

From table 2 it appears that in the context of the period under analysis (1988Q2-2014Q2), contemporaneous income and interest rates are significant, but the interest rate has a relatively low short-term impact (0.0018). Regarding labour,  $\Delta l_{t-1}$  is statistically significant, but there is no contemporaneous effect.

The decomposition of the sample in the pre- and post-crisis subsamples illustrates a different causality relationship. In the pre-crisis period only income and the lagged labour force are significant, and both variables have positive impact on prices. However, after 2007 this significance disappears, suggesting that the dynamics of house prices in this period may have been caused by different factors than those considered in our model (disposable income, interest rate and labour).

The graphical representation of the deviations from the long-run equilibrium,  $(hp_{t-1} - \widehat{hp}_{t-1}^*)$ , shows that between 1989 and 1994, and 1999 and 2005 in Portugal there were slight positive deviations (Chart 11). These periods with positive deviations, indicative of possible overvaluation of house prices are in accordance with the cycle of prices observed for Portugal (Chart 2), *i.e.*, correspond to periods of some market heating, however the deviations are too small to be considered periods of exuberance.

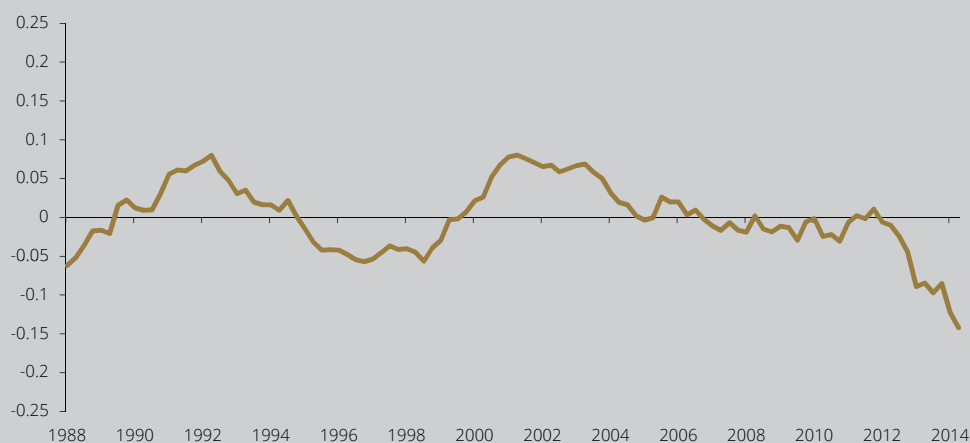
From table 3 it appears that in the case of Spain, between 1977Q2 and 2013Q4 contemporaneous disposable income and labour force, and their time lags (the first two for income and the first one for labour) are significant, and that the interest rate, although significant, has relatively little impact. Similar behaviour is observed in the period before the crisis (1977Q2-2007Q2). In the post-crisis period, both interest rate and labour do not show statistical significance, only disposable income and the long-run equilibrium are relevant in the explanation of the behaviour of house prices.

**Table 3 • Error correction models for Spain**

	1977:02-2013:04 Coef.	1977:02-2007:02 Coef.	2007:02-2013:04 Coef.
$C$	-0.0011	-0.0006	-0.0156***
$\Delta l_t$	-0.9139*	-0.9771*	
$\Delta y_t$	0.7338***	0.7754***	0.6064***
$(hp_{t-1} - \widehat{hp}_{t-1}^*)$	-0.0353***	-0.0350***	-0.0769*
$\Delta l_{t-1}$	0.9793**	1.0203*	
$\Delta y_{t-1}$	-0.3822**	-0.4595**	
$r_{t-1}$	-0.0017**	-0.0016**	
$\Delta hp_{t-1}$	0.5572***	0.5598***	
$\Delta y_{t-2}$	0.2468*	0.3528*	
$r_{t-2}$	0.0013*	0.0013*	
$\Delta hp_{t-2}$	0.2384***	0.2023**	
R-squared	0.6910	0.6565	0.5080
Adj. R-squared	0.6683	0.6253	0.4652

Sources: OECD, ECB, Banco de Portugal and authors' calculations.

Note: \*, \*\* and \*\*\* indicates statistical significance at 1 per cent, 5 per cent and 10 per cent, respectively and Coef indicates coefficients.



**Chart 11 • Error correction model for Portugal: deviations from the long-run equilibrium**

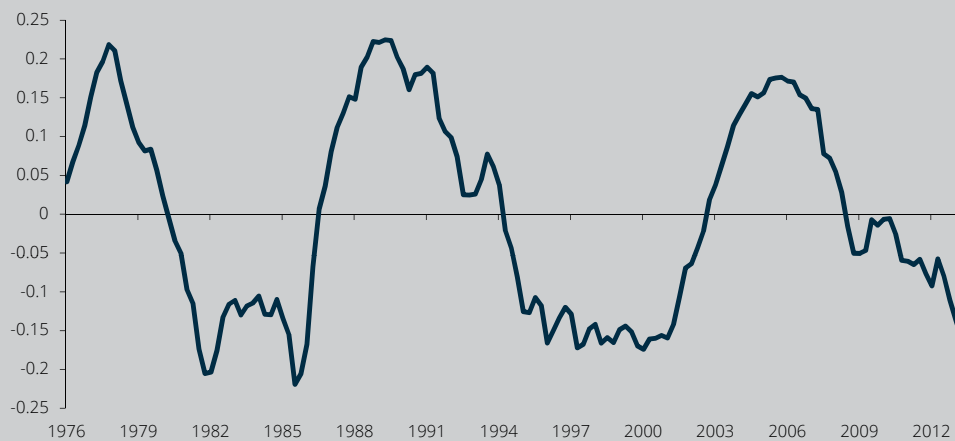
Sources: OECD, ECB, Banco de Portugal and authors' calculations.

The graphical representation of the deviations from the long – term,  $(hp_{t-1} - \widehat{hp}_{t-1}^*)$ , in Spain allows us to identify three periods of overvaluation, 1977-1980, 1986-1995, and 2003-2008 (Chart 12). Furthermore, as expected, the deviations coincide with the evolution of the cycle of house prices in Spain. However, and in contrast to Portugal, it appears that the magnitude of these deviations is considerably larger, meaning that in this case the overestimation may be associated with episodes of exuberance.

### Existence of speculative bubbles in house prices

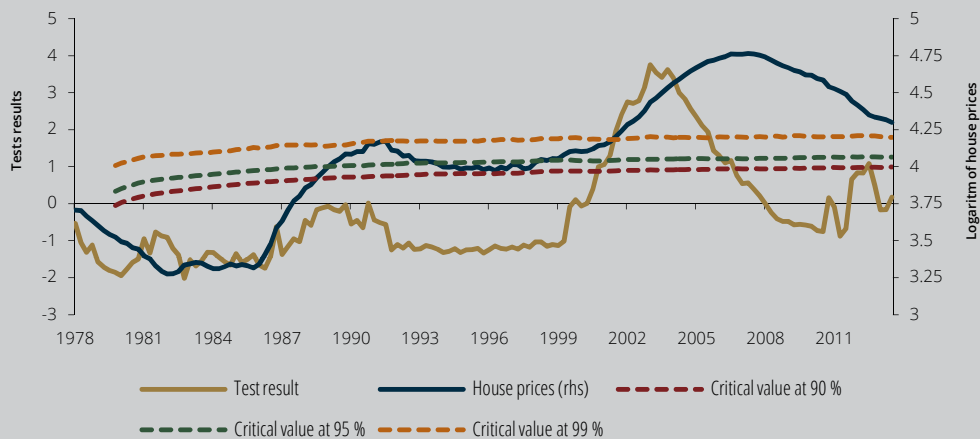
To complement the previous analysis, we applied a method for the detection of bubbles recently proposed by Phillips, Shi and Yu (2013). This approach is based on a General Arbitrage-Free Model and allows for the detection of periods that may be associated with speculative bubbles. House prices, based on this theory, can be explained by two components: market fundamentals and

**Chart 12 •**  
Error correction model for Spain:  
deviations from the long-run equilibrium



Sources: OECD, ECB, Banco de Portugal and authors' calculations.

**Chart 13 •**  
Philips *et al.* test results for Spain



Sources: OECD, Banco de Portugal and authors' calculations.

speculative bubbles. The latter typically originates explosive behaviour in prices which temporarily dominate the behaviour of the time series. The procedure proposed by Phillips, Shi and Yu (2013) aims to detect these episodes of exuberance in the series.

The application of the test of Phillips, Shi and Yu (2013) to the log of real house prices indicates that there are no periods of exuberance for Portugal, but detects the existence of bubbles in Spain. For Portugal, the test value was 0.1445, not rejecting the null hypothesis of no speculative bubbles. In contrast, for Spain the result of the test was 3.7537, thus rejecting the null hypothesis at a significance level of 1 per cent (strong rejection).

The rejection of the null hypothesis in the case of Spain calls for the graphical representation of the results of the recursive test by Phillips *et al.* (2013). This graphical representation is useful because it allows us to determine the periods when speculative bubbles occurred (Chart 13). According to this chart, it can be seen that the rejection of the test by Phillips *et al.* (2013) indicates a speculative bubble in Spain between 2000 and 2006.

## Conclusions

Following the accession to EU in the eighties, the housing market has evolved very differently in Portugal and Spain. In particular, between the adoption of the single currency in 1999 and the beginning of the financial crisis, house prices saw a zero annual growth in Portugal and on the contrary increased by almost 10 per cent per year in Spain. During this period, both economies registered a remarkable increase in bank lending for house purchase in a common framework of sustained growth in household disposable income and low interest rates, and a significant influx of immigration, in the Spanish case. In this period, residential investment has evolved differently in the two countries. In Spain there was a significant expansion in residential investment since 2000, well above the GDP dynamics. An indicator of housing overhang suggests an "excess" of about 30 per cent of houses in Spain in 2006. From 2007 onwards there was a sharp contraction in residential investment in Spain, which is distinguished from the less marked evolution to GDP. In Portugal, residential investment has been slowing down since the end of the 90's. The estimation of error correction models for Portugal and Spain confirms that real disposable income, labour and real interest rates are relevant in determining the dynamics of house prices. The analysis indicates that the periods of positive deviations from the long-term agree with the cycle of the prices observed in Portugal and Spain. This overvaluation of house prices (positive deviations), depending on its magnitude, may suggest the formation of speculative bubbles. To test for bubbles we applied the test proposed by Philips *et al.* (2013) to the Portuguese and Spanish housing markets. The results show that there are no periods of exuberance in Portugal, however they point to the existence of a bubble in Spain in the period before the financial crisis of 2007.

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## Notes

1. The authors thank Raúl Guerreiro for his help in the extraction of the cycles mentioned in the article and Nuno Alves for helpful comments and suggestions. The opinions expressed in this article are those of the authors and do not necessarily coincide with those of Banco de Portugal or the Eurosystem. Any errors and omissions are the sole responsibility of the authors.

2. Banco de Portugal, Economics and Research Department.

3. Since 1988 in the case of Portugal.

4. Research shows that homes are the major assets in households portfolio (Englund *et al.* 2002) and that changes in housing-wealth can lead to changes in homeowners’ consumption (Case, Quigley and Shiller, 2005).

5. The ECRI has no dating of the economic cycle for Portugal. However, the definition of two consecutive quarters of falling GDP to indicate the trough is also in line with these results.

6. According to the census data between 2000 and 2006 the population of Spain increased by nearly 4 million to over 44 million people, 3.2 million of whom were foreigners between 15 and 64 years (80 per cent). The Ley Orgánica 4/2000 of inmigración y Extranjería that enshrined the right of free access to public services like education and health may have played a part in increasing the flow of immigrants since 2000. In 2013 the number of foreigners in Spain was about 5.5 million to a total population of 47 million.

7. Asociación de Análisis del Valor and Asociación de Sociedades de Valoración de Bienes Inmuebles.

8. It is the equivalent in real estate markets of the price to earnings ratio (PER), the most common measure of the cost of a stock.

9. The two lags considered were necessary to ensure the absence of autocorrelation in the residuals.