

## THE CYCLICAL BEHAVIOUR OF RESIDENTIAL INVESTMENT: SOME STYLISED FACTS

## The cyclical behaviour of residential investment: some stylised facts

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### *Introduction*<sup>1</sup>

From the mid-1990s until the beginning of the latest recession a large number of the most advanced economies recorded a notable increase in residential investment, accompanied by sharp increases in house prices. These trends have come to an end in recent years, with a substantial adjustment in prices and volumes. Analysis of the housing market in Spain is of particular interest, given the dynamism of residential investment during the boom and the intensity of the subsequent correction. During the expansionary phase, housing investment grew at an average annual rate of more than 8% and, as a proportion of nominal GDP, it peaked in 2007 at 9.3%, somewhat more than five percentage points (pp) above its level in 1995 and well above the euro area and US levels (see Chart 1). The strong growth in housing supply entailed a notable expansion of employment in construction, which as a share of total employment reached 13.8% in 2007, up almost 5 pp from 1996. Since 2008 residential investment has adjusted sharply and its importance in terms of GDP and employment has fallen rapidly.

There are many interactions between housing market developments and the rest of the economy and these have been the subject of different analyses. Some authors have studied the extent to which house prices are consistent with their macroeconomic fundamentals (Ayuso and Restoy (2006)), while others have highlighted the role of non-financial wealth – practically all in the form of housing – as a determinant of household spending (L'Hotellerie and Sastre (2006)). The role of residential investment in the monetary transmission mechanism has also received detailed attention. Finally, general equilibrium models are increasingly being used that take into account specific features of the housing market (Rubio (2009)).

From a different standpoint, Leamer (2007) has emphasised the importance of residential investment developments when analysing the business cycle. In fact, according to this author, eight of the last ten recessions in the United States were preceded by contractions in residential investment. This article, which is part of a broader joint research project with the central banks of Germany, France and Italy, analyses the nature of the cyclical fluctuations in the Spanish housing market over the period 1980-2008, in order to highlight a set of stylised facts.<sup>2</sup> Following this introduction, the next section sets out the evidence available for housing investment as a leading indicator and, insofar as this is possible, it makes an international comparison. Afterwards, the possible existence of asymmetries in fluctuations in GDP and housing market variables is discussed, and finally the main conclusions are drawn.

### *Residential investment as a leading indicator*

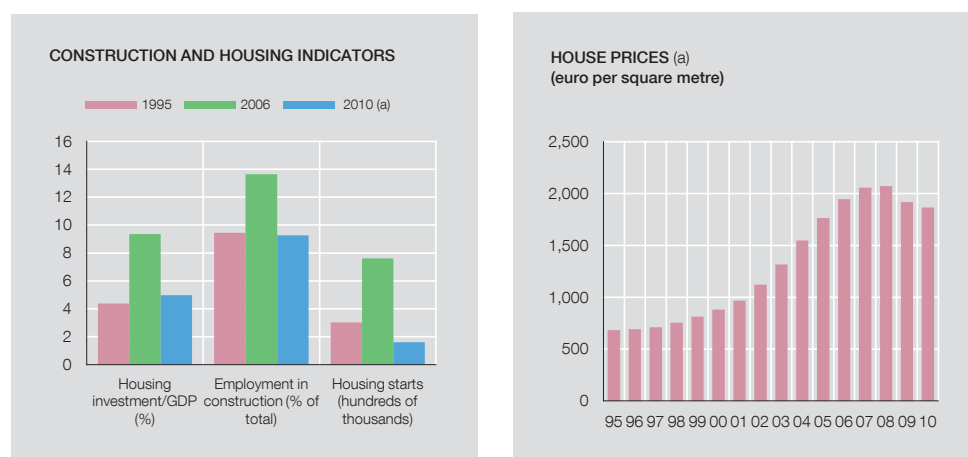
The aim of this section is to ascertain the extent to which residential investment cycles in Spain tend to precede GDP cycles, as in the United States and other countries, as well as to characterise the cyclical behaviour of a set of housing-related variables.<sup>3</sup> The cyclical behaviour of

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1. This article is a summary of Álvarez, L.J. and Cabrero, A. (2010), "Does housing really lead the business cycle?", Working Paper, Banco de España. 2. Álvarez et al. (2010) analyse the interdependence between the housing markets of the main euro area countries. 3. Owing to the idiosyncrasy of housing markets and the heterogeneity of the sources and quality of the statistical information available, it is desirable that methodological approaches be adopted that are flexible enough to allow these problems to be addressed. Thus, non-parametric methods are used to define the cycle and to date turning points. The filtering procedures used highlight the cyclical and temporary fluctuations, eliminating from the time series those that are permanent in nature (associated with the trend). This requires what is known in the literature as an "ideal band pass filter". Those readers interested in the technical aspects may refer to the working paper on which this article is based.

## CONSTRUCTION AND HOUSING INDICATORS

CHART 1



SOURCES: Instituto Nacional de Estadística and Ministerio de Vivienda.

a. The 2010 data refer to the first quarter.

## CROSS-CORRELATIONS BETWEEN DEMAND COMPONENTS AND GDP Epanechnikov filter

TABLE 1

	Volatility (a)	Variable leads GDP				Contemporaneous	Variable lags GDP			
		4	3	2	1		0	4	3	2
Private consumption	1.1	0.53	0.63	0.72	0.78	0.80	0.79	0.76	0.73	0.72
Government consumption	1.0	0.43	0.51	0.58	0.64	0.70	0.75	0.78	0.78	0.76
Investment in machinery and equipment	5.2	0.79	0.82	0.85	0.86	0.84	0.79	0.71	0.62	0.51
Residential investment	3.8	0.86	0.87	0.87	0.86	0.83	0.79	0.74	0.68	0.61
Non-residential construction investment	3.4	0.51	0.59	0.66	0.71	0.74	0.75	0.75	0.74	0.72
Other investment	2.5	0.87	0.89	0.90	0.89	0.86	0.81	0.76	0.70	0.64
Exports of goods and services	2.0	0.08	0.12	0.15	0.16	0.15	0.11	0.05	-0.01	-0.06
Imports of goods and services	3.9	0.78	0.84	0.88	0.90	0.90	0.86	0.81	0.74	0.66

SOURCES: INE and Banco de España.

a. Ratio between the standard deviation of the component and that of GDP.

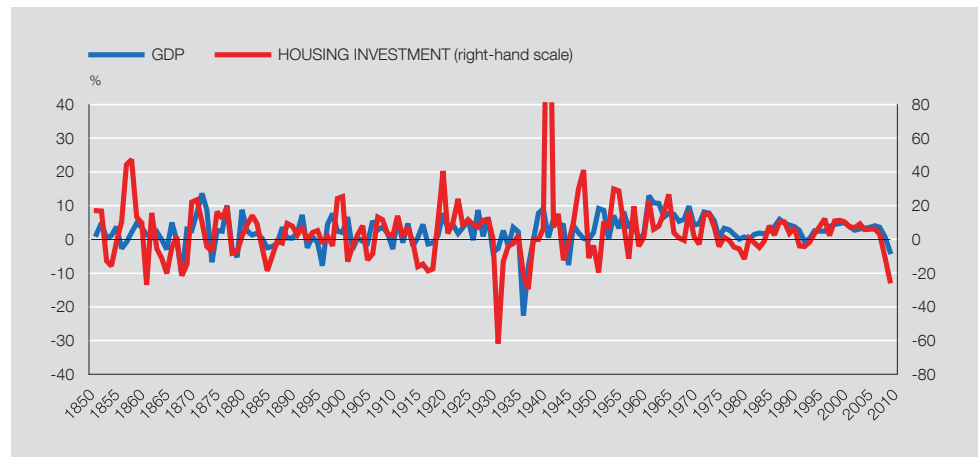
residential investment can be examined in comparison with that of other spending components. A correlation analysis using an Epanechnikov filter, like the one used in Leamer (2007), shows that residential investment leads GDP fluctuations, is procyclical and displays considerably larger variations than GDP itself and household consumption spending (see Table 1). In fact, residential investment is found to be more closely linked to future than to contemporaneous or past GDP, in line with the results of Leamer (2007) for the United States, with a relatively high maximum correlation coefficient (0.87).<sup>4</sup>

The above evidence relates to quarterly developments in housing investment in recent decades. However, this leading behaviour of residential investment is confirmed historically. Specifically, Chart 2 shows annual growth of housing investment and GDP in Spain for the period 1850-2010, using the estimates of Prados de la Escosura, linked to national accounts data for

4. To analyse the robustness of the results, alternative estimates have been made, which confirm that housing market fluctuations are procyclical and lead GDP fluctuations. The lead is estimated to be from one to three quarters, depending on the estimation procedure used.

HISTORICAL DEVELOPMENTS IN HOUSING INVESTMENT AND GDP IN SPAIN (1850-2009)

CHART 2



SOURCES: Prados de la Escosura (2003) and INE.

INTERNATIONAL COMPARISON

TABLE 2

	Variable leads GDP (No of quarters)				Maximum cross-correlation			
	France	Germany	Italy	Spain	France	Germany	Italy	Spain
Residential investment	0	2	0	1	0.53	0.71	0.53	0.76
Building permits	5	5	nd	4	0.75	0.59	nd	0.75
Housing starts	4	nd	nd	4	0.58	nd	nd	0.75

SOURCES: Ministerio de Vivienda, Colegio de Arquitectos and Datastream.

the most recent period. A correlation analysis conducted on this long sample period, excluding the years 1935-1940, confirms the leading nature of housing investment, since residential investment fluctuations tend to precede those in GDP by one year.

This evidence is also found in certain other developed countries. In Germany, residential investment leads GDP, but in France and Italy is contemporaneous with it (see Table 2). However, using an alternative estimation procedure Ferrara and Vigna (2009) find that French residential investment leads the business cycle, and this finding is corroborated when building permits and housing starts in that country are analysed.

Nevertheless, theoretical literature has, to date, not been able to provide an analytically based explanation for why housing investment should lead activity. In general equilibrium models with different sectors it is found that positive technological shocks tend to reduce the price of housing, which boosts households' demand for housing. These models therefore entail a trade off between prices and volumes in the housing market, a feature that is not observed in the data. Some more recent models are capable of explaining why housing investment should lead business investment, but not why it should lead GDP. A key element of this second family of models (Fisher (2007)) is that the labour productivity of households increases as they consume housing services. The empirical evidence available for the United States indicates that, for a given level of education and professional activity, workers living in larger dwellings are more productive, as they enjoy more rest. In this context, an increase in productivity is

	Volatility (a)	Variable leads GDP				Contemporaneous	Variable lags GDP			
		4	3	2	1	0	4	3	2	1
Non-residential construction investment	3.4	0.51	0.59	0.66	0.71	0.74	0.75	0.75	0.74	0.72
Gross value added of construction	2.7	0.70	0.76	0.81	0.83	0.84	0.83	0.80	0.77	0.73
Building permits	11.1	0.73	0.70	0.66	0.60	0.52	0.44	0.35	0.26	0.17
Housing starts	9.1	0.64	0.63	0.62	0.59	0.55	0.50	0.44	0.37	0.29
Cement production	5.8	0.59	0.65	0.70	0.74	0.75	0.72	0.68	0.63	0.56
Cement consumption	6.1	0.77	0.82	0.87	0.89	0.90	0.88	0.84	0.79	0.73
Employment in construction (Full-time equivalent)	11.6	0.91	0.93	0.92	0.88	0.81	0.73	0.63	0.53	0.43
Mortgages	3.4	0.19	0.28	0.36	0.43	0.49	0.54	0.57	0.59	0.60

SOURCES: INE and Ministerio de Vivienda.

a. Ratio between the standard deviation of the component and that of GDP.

associated with an increase in residential investment relative to business investment, reflecting the spillover effect on productivity. Recently, Yuan (2009) has developed a theoretical model capable of explaining why residential investment leads GDP. In this model, households have collateral constraints and observe a future productivity signal one period in advance, which induces them to increase their current spending, so that they can smooth the fluctuations in their consumption. This higher spending is financed through access to the mortgage market, since its interest rates are more favourable than those for consumer finance. Thus, the initial increase in consumer spending is accompanied by higher investment in housing. In the next period the anticipated increase in productivity materialises and stimulates aggregate activity.

In addition to housing investment, other housing sector indicators are also seen to lead GDP. Building permits and housing starts tend to lead GDP by four quarters (see Table 3), in line with the evidence for France and Germany presented above, and employment in construction also precedes the expansion of activity. The anticipatory nature of such indicators could be useful for monitoring and analysing cyclical developments, and in the preparation of short-term forecasts. However, when the gross value added of the construction sector is analysed, it does not appear to lead the business cycle, possibly because this variable has other components, such as non-residential construction, including public investment. Finally, input indicators, such as the output of construction materials or cement consumption, are seen to be more linked to current than to future GDP.

House prices, for their part, have behaved procyclically with respect to residential investment, although their fluctuations do not coincide with those of investment. This result is highly robust, as can be seen in Table 4, which presents a correlation analysis using six different estimation procedures. In each case a positive correlation is observed between the two variables. This suggests that housing demand factors (e.g. demographics and interest rates), which move prices and volumes in the same direction if there are no supply restrictions, may have been more important in the time period analysed than supply factors.

### ***Asymmetries in expansions and recessions***

A recurrent theme in the analysis of cyclical fluctuations is their possible asymmetry, that is to say the extent to which cyclical contractions are shorter or more intense than expansions. There exists an abundant theoretical literature presenting diverse mechanisms that would a priori justify the existence of these asymmetries. Although this literature focuses on the asym-

	Volatility (a)	Prices lead housing investment				Contemporaneous	Prices lag housing investment			
		4	3	2	1		4	3	2	1
Hodrick-Prescott	0.8	0.38	0.46	0.51	0.55	0.58	0.60	0.62	0.62	0.62
Hodrick-Prescott band pass	0.9	0.40	0.47	0.53	0.57	0.60	0.63	0.65	0.65	0.64
Baxter-King	0.9	0.35	0.43	0.49	0.54	0.58	0.61	0.65	0.68	0.69
Christiano-Fitzgerald	0.8	0.26	0.33	0.38	0.44	0.49	0.52	0.55	0.58	0.57
Butterworth	0.6	0.38	0.50	0.59	0.65	0.70	0.72	0.72	0.70	0.64
Epanechnikov	1.0	0.45	0.51	0.57	0.61	0.64	0.68	0.70	0.72	0.74

SOURCES: Ministerio de Vivienda, INE and Banco de España.

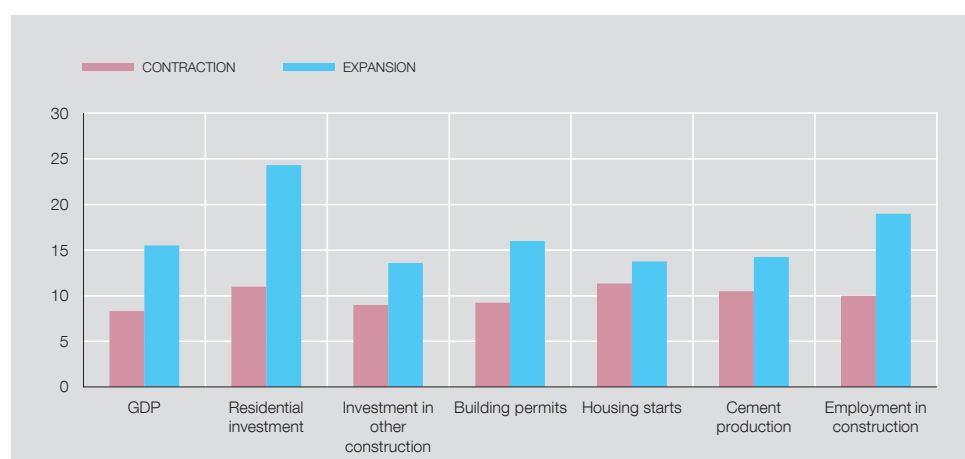
a. Ratio between the standard deviation of housing investment and house prices.

metries in the fluctuations in aggregate GDP, the arguments apply equally to investment. First, some economists attribute the asymmetries to the presence of capacity constraints. Productive activity is carried out in firms that operate at a variable level of capacity utilisation. In contractions, firms operate at a lower level of capacity utilisation, or stop operating altogether. However, in expansions firms are constrained by their installed capacity, which cannot be expanded in the short run. Other researchers rationalise the asymmetries on the basis of the existence of credit constraints, which are particularly important in the housing market; in contractions, households and firms may desire to obtain greater financing than they are granted by the financial markets. Other authors emphasise labour market asymmetries; while firms can adjust employment easily during contractions, during expansions they are constrained in the short run by the need to select workers and train them to do their jobs. This mechanism can be expected to be less important in construction investment than in other productive activities, since the skill level of workers in this sector is generally lower than in the economy as a whole.

Expansion and contraction periods are defined using the Harding and Pagan (2001) methodology, which is also used by the OECD to determine turning points. First, the local peaks and troughs in the cyclical fluctuations are identified intuitively and subsequently those periods of expansion or contraction that last for less than a minimum number of quarters established beforehand are eliminated, which ensures that the expansions and recessions alternate.

In the sample period analysed five peaks and four troughs are detected for most of the variables considered, all of which are related to construction investment. The average duration of a cycle (the expansion and recession periods combined) is six years, with a relatively homogeneous distribution across the variables. There is, however, considerable heterogeneity in terms of the amplitude of fluctuations. The fluctuations in GDP are much less pronounced than those in residential investment, which in turn vary less than the short-term development indicators housing starts and building permits.

Asymmetries are analysed by calculating the average duration of expansions and contractions. The results obtained tend to confirm that periods of GDP contraction are shorter than those of expansion (see Chart 3). Although the quantitative results differ somewhat depending on the estimation procedure used, contractions are generally found to last somewhat more than two years, while expansions last for four years. Residential investment displays the same asymmetrical pattern, with a longer cycle both in the contractions and, especially, in the expansions. By contrast, price variables do not display significant asymmetries.



SOURCES: INE, Colegio de Arquitectos, Ministerio de Vivienda and Banco de España

a. Sample period: 1980 Q1-2008 Q4

## Conclusions

This article has presented a set of stylised facts about the cyclical behaviour of the Spanish housing market, showing that residential investment leads GDP over the business cycle, something that is also seen in the United States and in Germany and, less clearly, in France. This type of empirical regularity, which may be useful for the purposes of analysing and monitoring business conditions, is still lacking a sufficiently well grounded, clear theoretical explanation, so that further research efforts are needed to help improve its interpretation. The boom in residential investment in Spain between the mid-1990s and the beginning of the latest recession was accompanied by notable increases in house prices. This close association between house price fluctuations and residential investment is in keeping with a view of housing market cycles which basically sees them as linked to demand developments. The latter were fundamentally driven in Spain during this period by immigrant inflows and relatively low interest rates. Finally, some asymmetries in the behaviour of housing investment have been identified: contractions in GDP and real housing market variables have tended to be considerably shorter than expansions, while house price cycles display greater symmetry.

10.6.2010.

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