



ECFIN *Country Focus*

ECONOMIC ANALYSIS FROM EUROPEAN COMMISSION'S DIRECTORATE-GENERAL FOR ECONOMIC AND FINANCIAL AFFAIRS

HIGHLIGHTS IN THIS ISSUE:

- *The magnitude and pace of adjustment in house prices are key variables in the current crisis, driving both internal rebalancing and bank balance sheet dynamics.*
- *Based on two sets of assumptions on fundamentals, we set up a baseline and an adverse scenario for house prices in 2013.*
- *The impact of house price scenarios on the real economy is significant, affecting GDP mainly via consumption and residential investment.*
- *The correction in house prices would also affect the NPL rate, although the impact on banks is mitigated by recent SAREB transfers.*

Spanish housing market: adjustment and implications

By Carlos Cuerpo and Peter Pontuch*

Summary

The 1997-2007 Spanish housing market upswing was unusually long and intense by historical and cross-country standards. House prices grew at 11.4 per cent per year on average during the 11 years preceding the 2007Q3 peak, with cumulated growth of 232 per cent. In parallel, construction investment grew at 6 per cent per year on average in a substantial re-allocation of resources from the tradable sector. This went hand in hand with rapid private credit growth, leading to highly indebted households and firms (81 and 135 per cent of GDP at the end of 2012, respectively). Since 2008, a sharp and uneven correction has taken place in house prices, residential investment and private credit. Despite significant cumulated adjustment in house prices, the decline accelerated in 2012 against a background of stagnant demand and continued oversupply. The adjustment progressed throughout 2013, though at a more moderate pace, and in 2013Q2 reached a total nominal fall of 37 per cent from the previous peak, according to the National Statistical Institute.

The magnitude and the pace of the correction in house prices are matters of great importance at the current juncture. Both have an impact on the real economy through consumption and investment dynamics. They also affect the financial sector through the deterioration in the value of the assets in banks' balance sheets. Accordingly, house price projections were a key variable in the top-down stress tests aimed at calibrating the capital needs of the Spanish banking sector in view of the financial assistance request in June 2012.

In order to depict the likely magnitude of these effects in 2013 we follow a two-step approach. First we construct a baseline and an adverse short-term scenario for house prices, conditional on their main determinants. These should not be interpreted as forecasts, but merely as the response of prices to two scenarios for demand and supply fundamentals in 2013. Moreover, the actual adjustment in prices also depends on policy and structural developments. In the two illustrative scenarios, nominal house prices would drop in 2013 by 9.7 and 15 per cent, respectively, in annual terms. Second, we simulate the impact of the scenarios on: (i) the real economy via a Bayesian VAR including the main economic aggregates and (ii) the non-performing loans (NPL) rate as a function of house prices, unemployment and private debt. The simulations point to a significant impact of house price changes on the real economy, affecting GDP, consumption and, above all, residential investment. The NPL rate also rises as house prices fall, although moderately so, after taking into account the impact of SAREB, the newly created asset management company.

* Structural reforms and competitiveness, Unit B1, Macroeconomic impact of structural reforms

Latest developments in the Spanish housing market

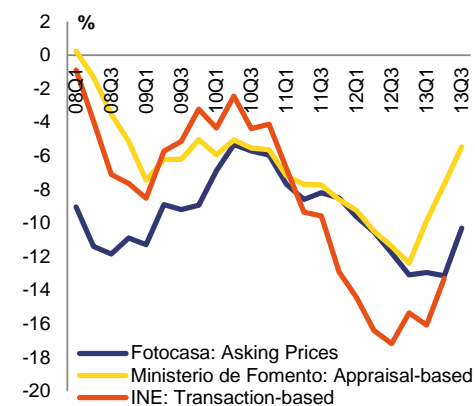
■ *The last housing market upswing was unusually long by historical standards*

History gives an indication of the extent and duration of housing price dynamics, which are of particular interest in the aftermath of a crisis. According to André and Girouard (2008) the relative house price cycle in OECD countries in the 1970-1995 period showed 6 years of booming prices on average, (with cumulated growth of 40 per cent) followed by around 5 years of correction, with an average cumulated adjustment of -25 per cent¹. Moreover, Reinhart and Rogoff (2009) find that bust phases surrounding banking crises yield sharper cumulative declines (around 36 per cent on average) and last longer (6 years). In this light, the pre-crisis price upswing in the euro area has been particularly pronounced with an average length of 9 years. All euro area Member States for which data are available but Germany, Austria and Portugal witnessed cumulated growth rates over 40 per cent.² However, since the second half of 2007, euro area housing markets have clearly entered a cooling phase with an adjustment taking place in most Member States, although its speed and strength differs by country.

By these standards the Spanish upswing period was unusually long and intense. Relative or deflated³ house prices grew at an average pace of 8 per cent during the years preceding the 2007Q3 peak, amounting to a cumulated growth of 155 per cent since the trough in 1996. In parallel, investment in the construction sector grew at 6 per cent per year, on average. Higher expected capital returns in the housing sector relative to the tradable sectors fuelled an intersectoral substitution effect which led to a relative reallocation of resources between the tradable and the non-tradable sectors. As a result, in the bust period an adjustment towards higher production in the tradable sector is required, though the transition phase will likely be associated with low growth and high unemployment.

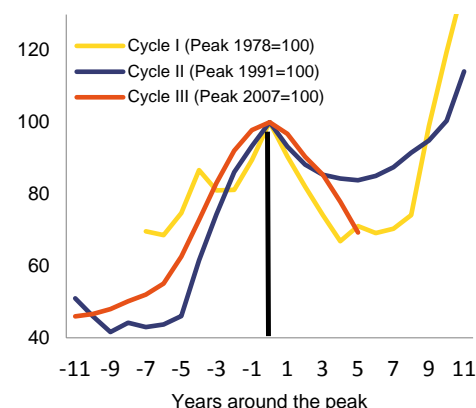
Moreover, movements in house prices went hand in hand with credit flows to the private sector (both to households and non-financial corporates). Indeed, boom and bust cycles in asset markets have been historically associated with large movements in monetary and credit aggregates (see Adalid and Detken 2007). Credit flows for housing purposes averaged 12.8 per cent of GDP over the boom, leaving Spanish households and firms with high levels of accumulated debt (87 and 137 per cent of GDP in 2008, respectively).

Graph 1: Relative house price, yoy changes



Source: INE, Ministerio de Fomento (MdF), Fotocasa
 Latest observation: 2013Q3 (2013Q2 for INE)

Graph 2: Relative house price, Spanish historical episodes



Source: Eurostat, OECD
 Latest annual observation: 2012

■ *The correction so far has been sharp but uneven*

Since then, a sharp but uneven correction has taken place. First, deleveraging was initially contained during the initial dip, helped by expansionary fiscal measures. However, as the economy entered into its second recession since 2008, private deleveraging gained speed, given the existing high debt overhang. Credit to the private sector has been subdued and firms and households have adjusted their balance sheets, faced with credit constraints. Second, construction activity is already at pre-boom levels after plummeting in 2009 and 2010. Third, despite the already significant adjustment, house price correction accelerated in 2012 (see graph 1 for different house price indicators) on the back of stagnant demand and existing oversupply, coupled with presumably more prudent bank lending attitudes following the financial crisis. The

adjustment has continued throughout 2013, though at a more moderate pace, showing the first signs of stabilisation in Q3 when looking at quarter on quarter growth rates.

As of 2013Q2, nominal and relative (deflated) cumulated falls have reached 37 and 44 per cent, respectively (according to the transaction-based data provided by the National Statistical Institute).⁴ Compared with previous downturns, the current adjustment looks similar in its severity to the experience following the oil price shock (graph 2). Moreover, experiences in countries like Ireland, Bulgaria and Latvia show similar orders of magnitude.⁵ Overall, these historical and cross-country experiences seem to confirm the stabilisation signals anticipated by the moderation of house price declines.

In order to proxy the likely impact of house price declines in 2013 on the Spanish economy, we proceed in two steps. First, we model relative house prices by means of their main supply and demand fundamentals. Once estimated, the model is used to simulate alternative paths for relative house prices in 2013, under different scenarios of evolution of the main determinants. The validity of the scenarios is then assessed against alternative approaches and actual price developments. Second, by assessing the potential impact of these calibrated 2013 scenarios on economic activity and banks' balance sheets, we single out the effect of housing market corrections amongst other concurrent economic shocks.

■ *A fundamental model of house prices is used to construct scenarios*

Scenarios for house price developments

House prices and market fundamentals

Housing can be considered as a consumption good, the price of which is determined by supply and demand. A natural way to model house prices is thus by relating them to factors of housing demand (income, demographic pressures, credit developments) and supply (existing stock of housing, housing permits, unsold houses, land availability or construction costs). Error correction models⁶ generally serve this purpose by providing estimates of the fundamental or equilibrium value of house prices. Actual price levels above these estimates can be seen as signs of irrational expectations or bubble phenomena. Results from these models should be interpreted with caution as they are subject to important endogeneity issues linked to the identification of supply and demand contributors to equilibrium prices. Moreover, house prices can be in line with fundamentals in a boom period yet still be unsustainable if the fundamentals themselves are cyclically buoyed. In any case, estimations of equilibrium prices are useful in providing simulated scenarios according to the evolution of their determinants.

Bearing this in mind, we estimate the relationship between Spanish relative house prices and the main demand and supply determinants: household credit developments, the stock of housing, urban population and real disposable income per capita⁷. As expected, there is a stable relationship (cointegration) between all the variables in the long run. This model yields an estimated fundamental (i.e. sustainable in the long run) value for house prices (graph 3) against which we can compare actual prices. House prices consistently exceeded their fundamental value between 2003 and the onset of the crisis. The estimated overvaluation reached 10 per cent⁸ between 2004 and 2005. This gap was closed once the bubble burst as expectations adjusted rapidly. The initial worsening in expectations that drove prices down was soon reinforced by deteriorating fundamentals, as can be seen in graph 3. Since 2008 most of the fundamental determinants have been on a sharp adjustment path, confirming that even the so-called "fundamental value" of house prices was not sustainable in the long run and that the current adjustment might not be over yet.

We simulate house price scenarios for 2013 using the impulse-response functions (IRF) of the estimated model, cumulating percentage change responses in real house prices to variations in their main fundamentals. All four fundamental variables appear relevant for house prices, but demographics and the housing stock are particularly noticeable. Given two possible paths for the determinants, we use these sensitivities to construct a baseline and an adverse scenario for house prices. The main caveat of our exercise lies in its ceteris paribus nature, as we abstract from any other relevant forces not captured by the model, such as confidence effects re-establishing private credit flows. Moreover, scenarios are defined on the basis of projections of the determinants, which are themselves subject to considerable uncertainty at the current juncture.

In the baseline scenario, real disposable income per capita evolves according to the European Commission's 2013 Spring Forecasts (-3.2 per cent). The baseline scenario for urban population employs short-term population growth assumptions from the Spanish Statistical Institute for 2013 (-0.8 per cent) adjusted for the observed gap between total and urban population growth in 2011 (yielding an increase of 0.1 per cent). According to the 2013Q2 Bank Lending Survey results, credit conditions in 2013 are expected to remain tight in Spain and demand for credit will stay weak, especially due to uncertain economic prospects and the anticipation effect in house purchases that took place in 2012Q4 as a result of the phasing out of tax benefits since January 2013. The baseline assumption for credit flows to the private sector in 2013 will thus be based on the average growth rate of total bank credit to the private sector over the four quarters up to 2012Q4 (-3.2 per cent, according to the Bank of Spain). Finally, moderation in housing stock growth following the stagnation in the construction sector can be expected for the next few years as the overhang of unsold stock is absorbed. The adverse scenario retains the same assumptions for demographics and the housing stock, as these variables tend to move in longer cycles. However, it imposes harsher conditions on the evolution of real disposable income and credit; -5.6 per cent and -5.1 per cent respectively, assuming that the accelerated deterioration observed in 2012Q4 is maintained throughout 2013).⁹

According to these assumptions, in the baseline case the model projects a year-on-year drop of 12.5 per cent in relative house prices between 2012 Q4 and 2013 Q4, and the adverse path results in a 24 per cent drop. In nominal terms, our scenarios imply a nominal year on year fall of 10.6 and 21.9 per cent in 2013 Q4, assuming an increase in the final consumption expenditure deflator of 1.7 per cent in 2013 as in the European Commission Spring 2013 forecast.

Where do these results stand in relation to complementary approaches and the assumptions used in the 2012 banking sector stress-test exercises?

House purchase decisions can also be looked at from an investment perspective, considering house prices against the cost of alternative investment decisions. In equilibrium, agents should be indifferent between owning and renting. Thus, movements in the price-to-rent ratio could be interpreted as a sign of overheating (higher ratio) or cooling (lower ratio) markets. The user cost of owning a house, or the imputed rental cost (a function of mortgage payments, opportunity cost and other costs like taxes, maintenance costs), is offset by a number of benefits that accrue from owning a house (e.g., tax deductibility as well as potential capital gains). In equilibrium, the imputed and the actual rental paid for one unit of housing should be equal (no-arbitrage condition).

Following the asset pricing literature, house price changes are expected to derive from changes in dividends or future housing services (rental yields). Following the methodology in European Commission (2012), imputed rents are taken as a starting point from where equilibrium or fundamental prices can be derived by imposing the no-arbitrage condition.¹⁰ The gap between estimated equilibrium prices and actual ones (see graph 4) reflects potential over- or undervaluations in the Spanish housing market. The average relative house price overvaluation for 2012 was 9.2 per cent (5.8 per cent in 2012Q4). These figures are on the lower side compared to the error correction model projections. However, past behaviour of the gap suggests that house prices could undershoot equilibrium levels and thus come closer to our baseline scenario. Indeed, house prices track sign changes in the estimated valuation gap relatively well (see graph 4). The latter usually coincides with peaks/troughs in house price growth rates. The closure of the valuation gap would thus imply the beginning of the recovery with a deceleration in the adjustment, with house price growth progressively returning to positive territory. The recent acceleration in the house price adjustment would therefore suggest that the Spanish housing market is approaching its inflection point.

When conducting their bottom-up stress test for Spanish banks in September 2012, Oliver Wyman (OW) assumed for 2013 a -2.8 and -4.5 per cent annual growth in nominal house prices under the base and the stress scenario, respectively. Transforming our year-on-year nominal growth rates for 2013 Q4 (-10.6 and -21.9 per cent) into their annual equivalent (-9.7 per cent and -15.0 per cent), our calibrated scenarios suggest a stronger decline than the OW assumptions. However, several qualifications can help to reconcile both sets of

■ *The model suggests a drop of 12.5% (baseline) and 24% (adverse) in relative house prices over the four quarters of 2013*

results. First, our models benefit from more up-to-date data as the OW exercise was based on 2012Q2 macroeconomic scenarios. Second, our indicators are based on transactions, while OW uses appraisal-based prices from the Ministerio de Fomento (MdF). Appraisal values usually underestimate the variability in property indices as, on the one hand, appraisers generally rely on past and current information, generating serial correlation in their valuation process and, on the other hand, the sluggish adjustment of individual appraisals that are aggregated into the overall index also generates smoothness compared to transaction-based indicators. Third, OW's stress scenario implied a cumulated fall of 23.5 per cent over the 2012-2013 period with an initial -19.9 per cent growth in 2012, much larger than the actual 2012 adjustment of -8.6 per cent. Given the latter, an additional 16 per cent fall would be necessary in 2013 to match OW's cumulated fall. Table 1 presents, for comparison purposes, the calibrated scenarios for nominal annual growth rates together with OW assumptions and actual price growth according to various sources.

Graph 3: Fundamental model of relative house prices

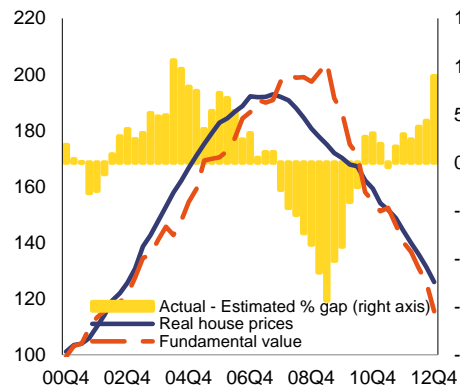


Table 1: Comparison of house price nominal developments, 2013

		2013 Annualized nominal growth rate (%)	
Calibrated Scenarios*	Baseline		-9.7
	Adverse		-15
OW assumptions**	Baseline		-2.8
	Stress		-4.5
Actual Developments annualized***	MdF (appraisal-based)		-3.1
	Fotocasa (asking prices)		-9.2
	INE (transaction-based)		-14.1

■ The two scenarios remain in line with the Oliver Wyman stress test scenarios, after taking into account methodological differences

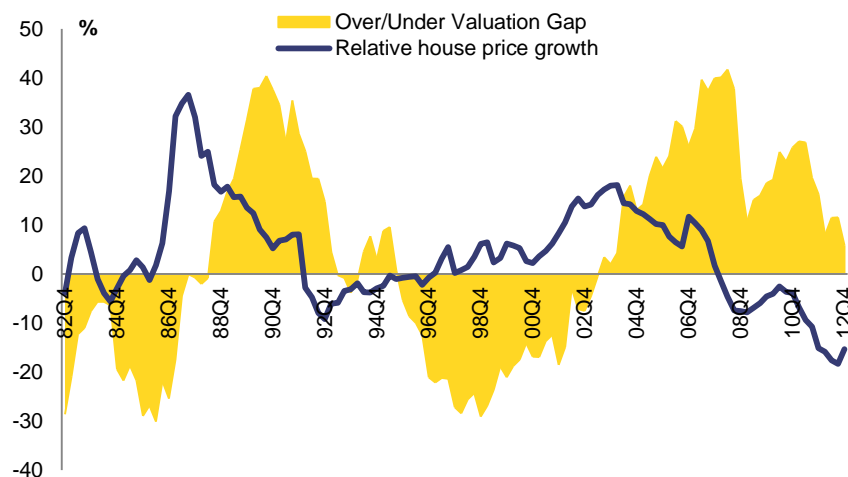
Source: Own calculations

Estimation sample: 1989Q1-2012Q4

Source: Own calculations

* Source: INE. ** Source: MdF

Graph 4: Relative house price valuation and yoy growth rates, Spain



Source: Own calculations

Estimation sample: 1981Q2-2012Q4

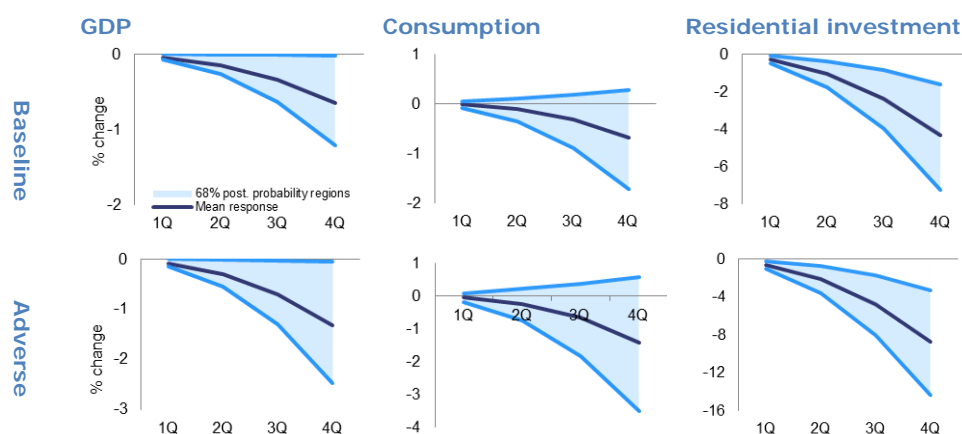
Effects on the real economy

There are different channels that contribute to the propagation of effects stemming from house price developments to the rest of the economy. The way they function varies across countries, depending on national institutional and regulatory features of housing and mortgage markets. First, rising real estate prices can affect household consumption spending through a wealth effect, in the form of real estate valuations.

Some empirical analyses suggest that the impact of a significant fall in real estate prices may be even more important than an equivalent decline in stock prices, though this finding is not unchallenged.¹¹ Second, rising real estate prices relative to construction costs can stimulate housing construction through higher expected profitability. The reverse is true for falling house prices. A sudden decline in property prices renders housing investment less attractive and reduces expected profitability of the construction sector. As a result, investment may dry up and contribute to an economic slowdown. Both channels are reinforced via a financial accelerator effect. As lenders' willingness to supply credit increases, investment and consumer durable expenditure increases, often reinforcing the cycle through further rises in house prices and stronger credit growth. Conversely, in the bust period, the drop in house prices reduces household and firm collateral, contributing to write-downs and/or write-offs by banks, and leading to a sharp deceleration of credit flows in the economy.

■ *The impact of the simulated house price falls on economic activity is significant*

Graph 5: Response to a relative house price shock, mean response and confidence intervals



Source: Own calculations

Estimation sample: 1989Q1-2011Q4

In order to capture such channels, we model the main macroeconomic aggregates (GDP, Consumption, Residential Investment, Current Account, GDP deflator, interest rate spread and the relative house price deflator) in a Bayesian VAR framework with a priori information on the steady state of the endogenous variables (see Villani (2009) for an in-depth explanation of the model and Jarocinski and Smets (2008) for a similar application). We estimate the model in first differences over the sample covering quarterly data from 1989 to 2011. Drawing on the impulse-response functions of a house price shock, preliminary results for GDP, consumption and residential investment under the two scenarios are built. This impact should *not* be interpreted as applying additionally on top of the European Commission official forecasts. The mean GDP response to an unexpected one-off house price shock is about one tenth (in pps.) of the initial shock to house prices, in line with previous results (see IMF 2011). However, considering a more realistic timing, house price baseline (-12.5 per cent) and adverse (-24 per cent) shocks are spread over four quarters. Mean GDP, consumption and residential investment responses are shown in graph 5, together with the 68 per cent posterior probability regions. The cumulated drop in GDP after one year amounts to 0.7 and 1.3. per cent, respectively under the two setups. As could be expected, the effect on consumption is of the same order of magnitude (-0.7 per cent and -1.4 in both scenarios), while residential investment is affected more heavily, falling around 4.3 per cent during the first year in the baseline and 8.7 per cent under the adverse scenario. The adjustment in the housing market thus constitutes a significant drag on growth.

Effects on non-performing loans

As discussed in the previous section, the effect of house prices on aggregate economic activity is amplified by feedback loops affecting the financial sector. In particular, in periods of falling house prices, lending is reduced due to the collateral effect of real estate assets (financial accelerator effect). Moreover, the fall in aggregate activity leads

to an increase in non-performing loans (NPL) and, in turn, to higher loan-loss provision needs, eroding bank equity. Insufficiently capitalised banks generally tend to tighten credit supply, further fuelling the adverse shock. It is thus worth investigating the link between house price scenarios and changes in NPLs.

The NPL rate is commonly used to measure the quality of a banks' loan portfolio. For our analysis we use the broader concept of doubtful loans as a proxy of the NPL.¹² As of 2013 Q1 the NPL rate in Spanish banks stood at 10.5 per cent of total loans, after reaching a peak of 10.7 in 2012 Q3. The total loan loss allowances stood at 11.8 per cent of total loans in 2013 Q1, with a peak of 12 per cent in the preceding quarter. Roughly 39 per cent of these allowances were specific provisions for identified bad loans to the private sector, leaving the remaining part as a general loan loss provision. These developments need to be interpreted in the context of the ongoing restructuring of the Spanish banking system. In December 2012 the Asset Management Company SAREB proceeded to a first wave of acquisitions of problem assets of the Group 1 banks. The transaction led to a decrease of the nominal amount of loans held by the banking sector by about EUR 54 billion, and a decrease of the overall NPL rate by 1 pp. The transfers from Group 2 banks, completed in February 2013, led to a further decrease of loans held by banks by EUR 20 billion and a decrease of 0.4 pp. of the overall NPL rate. Beyond the mechanical effect on the overall NPL rate, its future dynamics will also be affected by these transfers. In effect, transferred assets, essentially related to real estate developers, were by far the main contributor to the recent increase in the overall NPL rate due to their rapid quality deterioration.

Real estate prices will likely be one of the main drivers of NPL developments in 2013. For modelling purposes we use the house price index to proxy the evolution of the overall real estate market. We formulate an econometric model where the log of the overall NPL rate is a function of its own lagged value, the log of the house price index, the unemployment rate, and the lagged ratio of private debt to GDP. Similar variables and specification were used by Henn et al. (2009) in the context of Spain, while a somewhat broader set of variables was used by Rinaldi and Sanchis-Arellano (2006) on a European panel with a focus on household NPL. We estimate the model in first differences over the sample period 1989 Q1-2012 Q1 that covers the two most recent boom-bust cycles but excludes the most recent quarters where regulatory changes and bank restructuring started to affect the developments of the NPL rate. We obtain an elasticity of the NPL rate to nominal house prices of about -0.7 and the model signals a high persistence of NPL changes with an autoregressive coefficient of about 0.57.

We then estimate the effect of the two house price shocks on the evolution of banks' overall NPL rate in 2013. In the baseline case of a nominal fall of house prices of 10.6 per cent over the four quarters of 2013, ceteris paribus, the NPL rate rises up to 13.9 per cent in 2013 Q4. In the adverse scenario of a nominal house price fall of 21.9 per cent, the NPL rate reaches 16.6 per cent in 2013 Q4. However, these estimates need to be corrected for the effects of the asset transfers to SAREB, which take the form of a mechanical level effect on NPLs and at the same time have a smoothing impact on NPLs' on-going deterioration. After the adjustment, the overall NPL rate in banks' remaining portfolio could reach 12.1 and 14.4 per cent in 2013 Q4 under the baseline and adverse scenario, respectively. This mitigating effect of SAREB transfers on the dynamics of outstanding NPLs should help to minimise the feedback loop between banks' balance sheets, credit supply, and overall economic activity.

Conclusion

We presented in this country focus a comprehensive look at the house price adjustment process in Spain. Based on two sets of assumptions on housing fundamentals and using information up to 2012Q4 we estimated a baseline and an adverse scenario for relative house price developments over 2013 of -12.5 per cent and -24 per cent, respectively.

The estimated implications for economic activity across our two scenarios suggest a cumulative loss of GDP of 0.7 and 1.3 per cent over 2013, respectively. This impact does not apply additionally on top of the European Commission official forecasts. Uncertainty about the future evolution of house prices, together with negative wealth

■ *The adjustment of house price would lead to a rise in NPLs, but the effect has been considerably mitigated by the SAREB transfers*

effects and lower expected profitability in the construction sector would defer consumption and investment activities and thus reduce the domestic demand contribution to GDP growth. The pace and the extent of the correction in the Spanish housing market will equally have a first-order impact on banks' balance sheets. Reduced household collateral combined with a private sector debt overhang might decrease households' ability to repay their loans, thus increasing the rate of non-performing loans and ultimately affecting bank's capacity to supply credit to the economy. To assess these feedback loops, we estimated the effect of the house price scenarios on NPLs over the four quarters of 2013. Owing to recent asset transfers to SAREB, the increase in the NPL rate of the loans remaining on banks' balance sheets is significantly reduced, reaching 12.1 and 14.4 per cent at end 2013, respectively.

Overall, our baseline scenario for house price falls in 2013 seems in line with actual developments, particularly when taking account of 2013Q3 figures. Moreover, the model, which is estimated with data up to 2012Q4, also yields figures comparable to the OW stress test assumptions of 2012, especially when discounting methodological and statistical differences. Alternative modelling strategies also suggest a similar order of magnitude in terms of the remaining correction, pointing towards the future closure of the valuation gap that would bring the Spanish housing market closer to its inflection point. Looking ahead, the absorption of existing excess supply (including SAREB's portfolio) and the evolution of demand (credit flows and employment conditions mainly) will be key in confirming the early stabilisation signals, avoiding undershooting and ensuring the sustainability of this process.

References

- Adalid, R. and Detken, C. (2007), "Liquidity shocks and asset price boom/bust cycles", ECB Working Paper Series, NO 732.
- André, C. and Girouard, N. (2008), "Housing markets, business cycles and economic policies", Austrian National Bank Workshop on Housing Market Challenges in Europe and the US.
- Bolt, W., Demertzis, M., Dijks, C. and Van der Leij, M. (2011), 'Complex methods in economics: An example of behavioural heterogeneity in house prices', DNB Working Paper, No 329.
- Buiter, W. H. (2010), "Housing wealth isn't wealth", *Economics - The Open-Access, Open-Assessment Journal*, Kiel Institute for the World Economy, vol. 4(22), pp. 1-29.
- Case, K., Shiller, R. J., and Quigley, J. M. (2001), "Comparing Wealth Effects: The Stock Market versus the Housing Market", NBER Working Papers 8606, National Bureau of Economic Research.
- Cuerpo, C. and Mordonu, A. (2011) "Functioning of the real estate market in Spain: assessment under the EIP", mimeo.
- European Commission (2011), "House price imbalances and structural features of housing markets", *Quarterly Report on the Euro Area*, Vol. 10 (3).
- European Commission (2012), "Assessing the dynamics of house prices in the euro area", *Quarterly Report on the Euro Area*, Vol. 11 (4).
- Gattini, L. and Hiebert, P. (2010). "Forecasting and assessing euro area house prices through the lens of key fundamentals," *European Central Bank Working Papers Series No. 1249*, October.
- Henn, C., Honjo, K., Moreno-Badia, M., and Giustinian, A. (2009) "Spain: Selected Issues", IMF Country Report No. 09/129.
- Jarocinski, M. and Smets, F.R. (2008). "House prices and the stance of monetary policy," *Review*, Federal Reserve Bank of St. Louis, issue Jul.
- Villani, M. (2009). "Steady-state priors for vector autoregressions," *Journal of Applied Econometrics*, John Wiley & Sons, Ltd., vol. 24(4).
- Ministerio de economía y competitividad (2012) 'Spain's path towards stability and

growth', <http://www.thespanisheconomy.com/SiteCollectionDocuments/en-gb/Financial%20Sector/Spains%20path%20towards%20stability%20and%20growth.pdf> (accessed Aug 2012).

Reinhart, C. and K. Rogoff (2009) "The aftermath of financial crises", American Economic Review May.

Rinaldi, L., and Sanchis-Arellano, A. (2006) 'What explains household non-performing loans? An empirical analysis', ECB Working paper 570.

¹ Therefore approximately going back to the starting point.

² See European Commission (2011).

³ Nominal house prices deflated by the households' (HH) and non-profit institutions serving households' (NPISH) final consumption expenditure deflator.

⁴ The cumulated adjustment varies according to the source of the information: (i) 28 per cent nominal and 35 per cent relative adjustment with appraisal-based data; (ii) 37 per cent nominal and 44 per cent relative with transactional data; and (iii) 40 per cent nominal and 47 per cent relative according to asking prices.

⁵ All three of them witnessed cumulated increases in relative house prices of more than 150 per cent over a similar period of time, followed by cumulated corrections exceeding 50 per cent for 16 quarters since the peak. Adjusting for the increase in the boom period, the corresponding figures for Spain rank similarly (i.e. cumulated increase of 139 per cent and cumulated adjustment of 44 per cent).

⁶ See for example Gattini and Hiebert (2010).

⁷ The model was estimated for the sample 1989Q1-2012Q4 as there was a clear structural break in the late 80s with the entry in the European Community and a process of financial deepening and liberalization. Nominal data was deflated by the private consumption deflator and seasonally adjusted (using TRAMO-SEATS software) when needed. All variables were found to be non-stationary. The Johansen cointegration tests signalled the presence of one stable long-run relationship between the variables, following the trace statistic, giving therefore room for an ECM specification. The following long-run equation was specified, with a normally distributed white noise error term: $rhp_t = -16.58 + 0.66 crd_t - 7.5 stock_t + 12.09 upop_t + 2.72 rdi_t + \epsilon_t$. All coefficients are in line with most of the empirical research on Spanish house prices, and have the expected sign, following theoretical prescriptions. Likewise, the estimation of the short-run equation in differences yields a significant value for the speed of adjustment of -0.12 (i.e. the gap between the short and the long-term value is closed at an average speed of 12 per cent every quarter). More details are available from the authors upon request.

⁸ Our estimate is clearly in the lower range of previous results (some of them reaching up to 25-30 per cent of overvaluation in the peak period). This result is heavily influenced by the impact of including a monetary variable in the equation. Credit flows yield relevant information with respect to housing prices and thus provide a better fit of the equilibrium value to the actual data. Models missing credit as an explanatory variable might assign part of the overvaluation that is due to credit developments simply to expectations and thus overestimate its extent. The importance of credit is also reflected in the delayed correction of the fundamental value after 2007 as deleveraging and negative credit flows for housing purchases only started in 2010.

⁹ That is, the adverse scenario is obtained by taking the 2012Q4 year on year growth rate as a reference point, instead of the average of the last four quarters.

¹⁰ See European Commission (2012) for an explanation on how this equilibrium condition makes it possible to estimate an equilibrium price for houses and Bolt et al. 2011 for more details on the methodology.

¹¹ See Buiters (2010) for an example.

¹² Loans qualify as doubtful whenever there is reasonable doubt about their full repayment (principal and interest payments included) according to the contractual terms. They include delinquent loans, which present at least 3 months in arrears with respect to principal or interest payments.