

Box 2.1. What Explains the Recent Run-Up in House Prices?

Over the past eight years, house prices have risen very rapidly in many industrial countries. While some observers argue that the run-up in house prices reflects strong fundamentals—such as income growth and low interest rates—others argue that house prices have been exuberant and divorced from market fundamentals. This box seeks to assess the extent to which fundamentals explain the recent run-up in house prices, building on and extending a dynamic panel model developed by Lamont and Stein (1999). This model is estimated for a sample of 18 countries during 1971–2003.

The model postulates that the growth rate of real house prices, in any given country and period, is explained by the following factors.

- **Past growth rates of real house prices.** If the growth rate of house prices is persistent, then the current growth rate must be serially correlated with the past growth rate. Higher values of this correlation coefficient imply higher persistence.¹
- **Past housing affordability ratio.** If the growth rate of house prices shows long-run reversion to fundamentals, this implies that prices would tend to fall when they are out of line relative to income levels. Hence, the coefficient of the housing affordability ratio—the ratio of real house prices to (per capita) real income—must be negative.
- **Economic fundamentals.** The growth rate of house prices is positively affected by (per capita) real income growth—as this increases households' purchasing power and borrowing capacity—and negatively affected by interest rates (lower rates increase households' capacity to borrow). Other fundamentals influencing house prices include the growth rate of real credit, a proxy for mortgage debt, as this indicates that households are less credit rationed; the past growth rate of real stock prices—which captures households' efforts to

Note: The main author of this box is Marco Terrones.

¹If the absolute value of this coefficient exceeds one, the growth rate of real house prices would be explosive.

Table B2.1. What Determines House Prices in Industrial Countries?

(Summary of empirical results, 1971–2003)

Explanatory Variables	Dependent Variable
	Real house price (growth)
Lagged dependent variable	
Lagged real house price (growth)	0.521 [0.030]*
Reversion	
Lagged housing affordability ratio	–0.144 [0.021]*
Fundamentals	
Real disposable income (per capita, growth)	0.530 [0.119]*
Short-term interest rate (percent)	–0.507 [0.109]*
Real credit (growth)	0.109 [0.036]*
Lagged real stock price (growth)	0.033 [0.009]*
Population growth	1.754 [0.623]*
Bank crisis	–2.426 [0.952]*
<i>Memorandum</i>	
Number of observations	524
Sargan test ¹	
p-value	0.211
Arellano-Bond test ²	
p-value	0.200

Sources: IMF, *International Financial Statistics*; Haver Analytics; OECD; national sources; World Bank, *World Development Indicators*; and IMF staff calculations.

Note: Country dummies are included in the regression but not reported here. The symbol * denotes significance at the 1 percent level. Significance is based on robust standard errors. Estimated using the Generalized Method of Moments estimator as suggested by Arellano and Bond (1991).

¹Test of the validity of overidentifying restrictions.

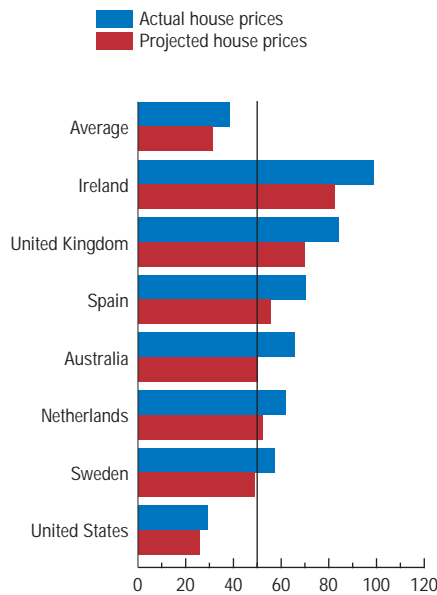
²Test of no second-order autocorrelation.

rotate their portfolio in favor of housing; population growth, as this proxies for the growth rate of households; and a bank crisis dummy (a bank crisis is typically associated with a drop in house prices).

The econometric results confirm that real house prices in industrial countries show high persistence, long-run reversion to fundamentals, and dependence on economic fundamentals (see the table). The growth rate of real house prices in industrial countries is very persistent—with a serial correlation coefficient of 0.5—

Current House Price Boom

(1997–2003; cumulative growth rate; constant prices)



Sources: Haver Analytics; IMF, *International Financial Statistics*; national sources; OECD; and IMF staff calculations.

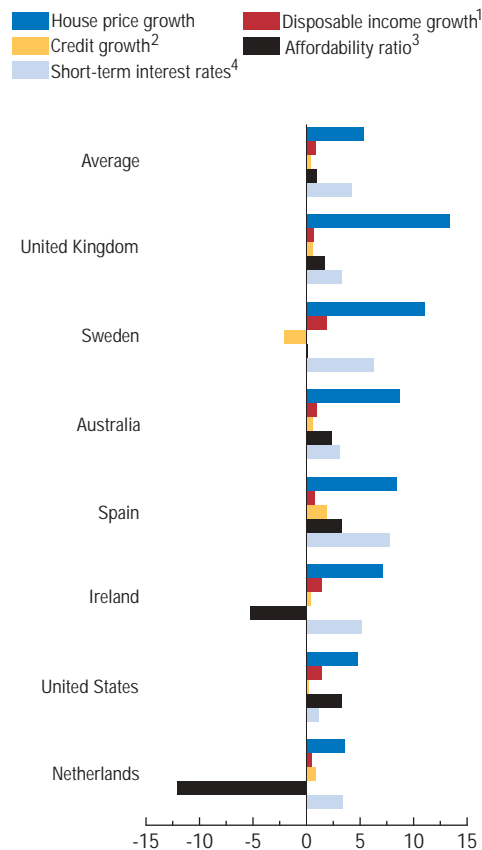
meaning that there is a strong tendency for real house prices to rise tomorrow if they rise today.² In addition, the growth rates of real house prices show fundamental reversion: if house prices are out of line with income, there is a gradual tendency for this misalignment to be corrected (about 15 percent every year). All of the economic fundamentals have the expected sign and are highly significant. Improvements in these fundamentals—such as higher income growth and lower interest rates³—lead to

²Lamont and Stein (1999) find a similar result for house prices at the city level in the United States.

³Some have argued that the relevant interest rate affecting house prices is the real after-tax rate. This rate, however, is not readily available. When this variable was proxied by real ex post interest rates, the coefficient had the wrong sign and was statistically insignificant.

Explaining House Price Movements Between 1997–2003 and 1990–96

(Change of period averages; constant prices unless otherwise noted)



Sources: Haver Analytics; IMF, *International Financial Statistics*; national sources; OECD; and IMF staff calculations.

- ¹Per capita.
- ²Credit to the private sector from banks and other official financial institutions.
- ³Ratio of house prices to disposable income.
- ⁴Interest rates are in nominal terms.

increases in the growth rate of real house prices over time. For instance, an increase in income growth by 1 percent would over time imply an increase of $1\frac{1}{10}$ percentage points in the growth rate of real house prices. Likewise, a reduction in interest rates by 1 percent would over time imply an increase of 1 percent in real house

Box 2.1 (concluded)

price inflation.⁴ Demographic factors do also have an effect on house prices; for example, an increase in the population growth rate by ¼ percent would over time lead to an increase of about 1 percent in real house price inflation.

How does the increase in house prices during 1997–2003 compare with the model's prediction? The first figure shows that, on average, the model is able to explain most of the increase in house prices during this period. There are, however, important differences across countries. For instance, house prices in Australia, Ireland, Spain, and the United Kingdom exceed their predicted values by 10 to 20 percent—thus suggesting that the sharp increase in prices observed in these countries over the past seven years can not be explained by movements in fundamentals alone.⁵ In the case of other countries, including the United States, the differences between observed and predicted values are below 10 percent.

To understand the extent to which market fundamentals explain the run-up in house prices in the past seven years, compared, say, with the previous seven years, the IMF staff has

⁴Short-term interest rates fell by 320 basis points in the United Kingdom and by 450 basis points in the United States during 1997–2003.

⁵The house price increases in France and Italy also appear out of line with fundamentals.

made use of the above-described model. The second figure shows the rate of growth of real house prices and the contributions of the main fundamentals to this growth—between 1997–2003 and 1990–96 across countries. In particular, the following results stand out.

- The fall in average short-term interest rates explains the bulk of the house price increases across industrial countries. This is particularly true in Ireland and Spain, where real interest rates fell since the launch of European Monetary Union, reflecting nominal interest rate convergence and the relatively high inflation rates in these countries. Conversely, this suggests that real house price growth will slow down as interest rates rise.
- The increases in the average growth rate of disposable income and credit have also contributed to the current buoyancy in houses prices relative to the early to mid-1990s.
- In contrast, the rapid increase in the affordability ratio (house prices relative to income per capita) in Ireland and the Netherlands may have contained the pace of increase in real house prices in these countries.

All in all, the model explains most of the increase in real house prices in industrial countries; however, an important portion of the increase in some countries (Australia, Ireland, Spain, and the United Kingdom) remains unexplained.

price indexes and mortgage debt. In addition, in most countries the house price indexes do not correct for changes in housing quality over time. Given the importance of the housing sector in modern industrial economies, improvements in the statistics in this area should be a priority for statistical agencies.

³Although there is an extensive literature in real estate cycles (surveyed by Pyhrr, Roulac, and Born, 1999), the cyclical behavior of real house prices in industrial countries has not been, to our knowledge, systematically examined. Henley and Morley (2001) and European Central Bank (2003) examine the volatility and co-movement of house prices in countries of the European Union.

⁴Davis and Heathcote (2004) develop a growth model with housing and find that, because land enters in the production of new housing, the relative price of houses will trend upward.

House Prices: The Stylized Facts³

Over the past three decades, real house prices in industrial countries have grown at an average rate of 1¼ percent a year, broadly similar to the growth of both per capita output and consumption.⁴ Real house prices, however, have fluctuated over time—with the current boom standing