

# ESRI Special Article

*Bubble, Bubble Toil and Trouble? An Assessment  
of the Current State of the Irish Housing Market*

---

Kieran McQuinn



# Bubble, Bubble Toil and Trouble?<sup>1</sup> An Assessment of the Current State of the Irish Housing Market

---

Kieran McQuinn<sup>2</sup>

## Abstract

Following the substantial pre-2007 housing bubble experienced in the domestic economy, Irish house prices continued to fall for almost seven years up to the mid-point of 2013. Since 2013 the rate of price increases observed, particularly in the Dublin area, has prompted concerns of another price bubble emerging. In this paper, the results from an earlier analysis of Irish house prices are updated and supplemented with cross-country indicators of housing market conditions. The results suggest that Irish house prices, as of December 2013, were still somewhat undervalued and, in the absence of a significant housing supply response, are likely to continue to increase in the coming years.

## Introduction

Assessing the current state of the Irish property market in terms of price developments has arguably never been more important. For example, Central Bank estimates, following on work by Duffy (2010), suggest that between 40 to 50 per cent of the total stock of Irish mortgages was, at end-2012, in negative equity (McCarthy and McQuinn (2014)). Understanding future developments in the equity position of these households is essential in estimating the implications of housing developments for general economic growth. Recent research (McCarthy and McQuinn (2013)) demonstrates the presence of a relatively strong wealth effect out of housing in an Irish context. Therefore, house price movements have a particular relevance for Irish economic performance through the consumption channel.

The future path of Irish house prices is also of considerable importance from a financial stability perspective. In late 2014 Irish financial institutions will be the subject of a European wide stress-test conducted jointly by the European Banking Authority (EBA) and the Single Supervisory Mechanism (SSM) of the European

---

<sup>1</sup> With apologies to Mr. William Shakespeare.

<sup>2</sup> Thanks to Frances Ruane, John FitzGerald, David Duffy (ESRI), Trevor Fitzpatrick (University of Southampton) and Diarmaid Smyth (Irish Fiscal Council) for comments on an earlier draft. Any errors are the responsibility of the author.

Central Bank (ECB). A key variable in the stress-test framework will be future house price levels. In particular, future house price levels will determine the loss given default confronting Irish credit institutions in the face of possible future mortgage defaults.

The scale of the persistent increase in Irish house prices over the period 1995 to 2007 was unparalleled across western economies and unsurprisingly led to a disproportionate degree of economic activity concentrating in the residential and commercial real estate sectors. The subsequent decline in prices exposed significant vulnerabilities across the household and financial sectors. Indeed the resulting difficulties exposed in the Irish financial sector were one of the main reasons for the programme of support entered into by Irish authorities in November 2010 with the European Central Bank (ECB), the European Commission (EC) and the International Monetary Fund (IMF) or “Troika”. The dramatic decline in prices post 2007, coupled with the large number<sup>3</sup> of households which had taken out a mortgage during the 2005-2007 period, meant that most of the Irish financial institutions were exposed to substantial mortgage arrears and negative equity crisis. When international wholesale money markets dried up following the global financial crisis of 2007/08, Irish institutions were, by international standards, especially susceptible to funding difficulties owing to their perceived property-related exposures.

After the significant post-2007 decline in prices, recent developments in the housing market have seen Irish house prices, particularly in Dublin, increase again. In 2013, national house prices increased annually by 6.4 per cent, with prices in Dublin, over the same period, increasing by 15.7 per cent. Figure 1 plots year-on-year and quarter-on-quarter changes in nominal house prices<sup>4</sup> from 2002 to the present. The graph shows when growth rates in Irish house prices became negative and subsequently positive again.

On a quarter-on-quarter basis, it would appear Irish prices first registered a decline in Q4 2007 with annual rates declining first in Q1 2008. Thereafter, price declines were substantial with the single largest annual decline (23 per cent) being observed in Q3 2009. Year on year changes were not positive again until Q2 2013, thus constituting 21 quarters of negative year-on-year growth. The total peak to trough fall was almost 51 per cent.<sup>5</sup> While the pre-2007 house price

---

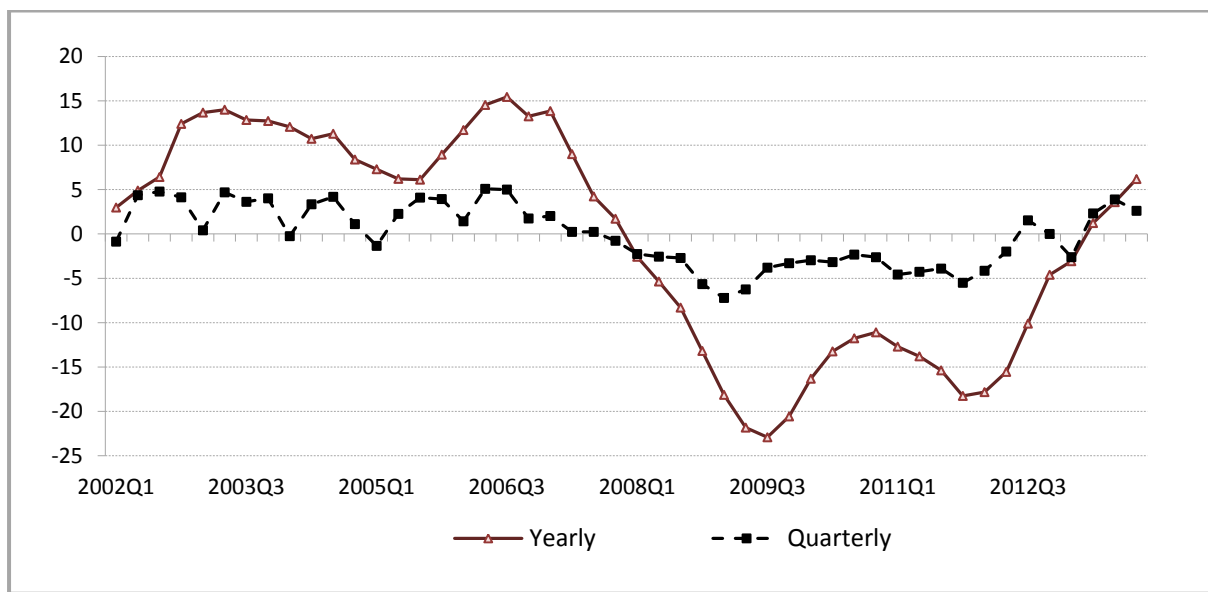
<sup>3</sup> Approximately 30 per cent of the total stock of mortgages were issued during this period.

<sup>4</sup> Apart from the next section, Irish house prices are the official CSO series post-2005 with prices pre-2005 backcast using the Department of the Environment second-hand house price series.

<sup>5</sup> This is measured between 2007 quarter 3 and 2013 quarter 1. This peak to trough fall can be compared with similar cross-country estimates presented in Table 2 (page 7) of Kennedy and McQuinn (2011).

boom was significant, this consistent period of house price declines does constitute a substantial correction.

**FIGURE 1** Year-on-Year and Quarter-on-Quarter Changes in Irish House Prices (Nominal) 2002: 1 -2013:4



Source: Central Statistics Office.

With house prices increasing recently, almost inevitably given previous difficulties experienced, some commentary has already focused on the possibility of another “bubble” in Irish house prices. By bubble we mean house price increases which are not warranted by market fundamentals and which consequently may be regarded as being determined by some form of irrational exuberance on the part of market investors.

In this paper, we update previous analysis conducted by Kennedy and McQuinn (2012) and assess the present relationship between actual and “fundamental” Irish house prices as of December 2013. In analysing property markets, a fundamental house price is a frequently used concept and constitutes the price which would be suggested by fundamental economic variables in the economy such as interest rates, income levels, unemployment rates, demography and housing supply. We also avail of recent research to forecast house prices over the period 2014 to 2017.

Our results here echo the earlier findings of Kennedy and McQuinn (2012) in that Irish house prices at end-December 2013 were still significantly undervalued. Thus, the housing market would appear to have *overcorrected* in the post-2007 period. This result, as noted by Kennedy and McQuinn (2012), is not uncommon

across markets which experienced similar type booms and busts. Kennedy and McQuinn (2011) present evidence of similar type of overcorrection in the UK, Finnish and Swedish housing markets. Our forecast model suggests that Irish house prices will grow in real terms by an annual average of 6.5 per cent from December 2013 to 2017.

The rest of the paper is structured as follows; in the next section we benchmark recent developments in the Irish property market against developments across countries. We then present the suite of models used to determine the “fundamental house price” with a subsequent section detailing the forecast model and results. A final section offers some concluding comments.

### **A Cross-Country Perspective**

One of the few benefits of an international house price boom and bust is the significant increase in research and databases that have been generated for the housing area. One such resource is the international house price database maintained at the Federal Reserve Bank of Dallas,<sup>6</sup> which compiles and maintains quarterly house price information for 22 advanced economies from 1975 onwards. The database also contains information on household disposable income for the same period.<sup>7</sup> The disposable income series is a per capita series using working age population as the relevant denominator (Mack and Martínez-García (2011) contain country by country information on the calculation of both the house price and income series).

It is useful to benchmark the Irish property market against foreign comparators over the period 1995 to 2013, separating this period into the boom (1995 to 2007) and the bust (2008 to the present) phases. Table 1 summarises the average growth rates over these periods and orders countries by the largest changes for the respective periods.

What is apparent from an Irish perspective is that domestic house price movements were largest across all the countries in question in both the boom and subsequent bust period. Between 1995 and 2007 Irish price increases were also substantially greater than those experienced by other European and Euro Area countries. The sharp decline in prices post 2007 is also somewhat larger than other countries experiencing a fall in prices. Only Spain experienced comparable price movements over the period.

---

<sup>6</sup> For more information on this see <http://www.dallasfed.org/institute/houseprice/>

<sup>7</sup> The author acknowledges use of the dataset described in Mack and Martínez-García (2011).

More generally, as Kennedy and McQuinn (2012) also point out, the negative house price movements in both Germany and, particularly, Japan during the former period were atypical by international standards while the Japanese market continued to witness price falls after 2007.

**TABLE 1** Percentage Change in Nominal Cross-Country House Prices 1995-2013

Country	1995:1-2007:1	Country	2007:2-2013:4
Ireland	174.5	Australia	28.5
South Africa	166.2	South Africa	26.4
Spain	115.1	Norway	26.4
United Kingdom	114.5	Switzerland	26.2
Denmark	107.6	Canada	24.5
The Netherlands	100.1	Belgium	19.0
New Zealand	94.9	Sweden	18.2
Norway	93.3	Luxembourg	17.4
Finland	92.9	South Korea	14.9
Australia	91.5	Germany	14.2
Luxembourg	90.6	New Zealand	13.3
Sweden	89.7	Finland	9.5
France	89.5	United Kingdom	4.8
Croatia	79.5	France	2.2
Belgium	77.8	United States	-13.1
United States	72.7	Italy	-14.9
Canada	65.2	Japan	-17.5
Italy	60.8	Denmark	-18.1
South Korea	38.1	The Netherlands	-19.1
Switzerland	5.8	Croatia	-31.4
Germany	-2.78	Spain	-35.6
Japan	-42.5	Ireland	-59.4

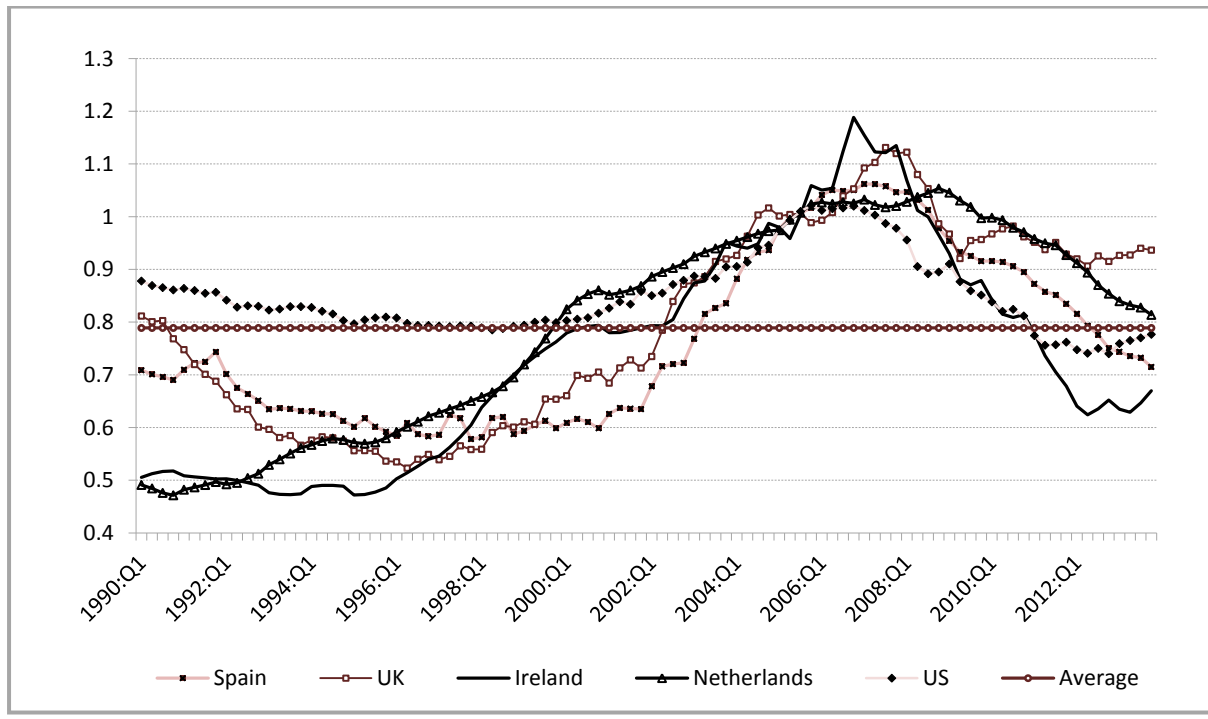
Source: <http://www.dallasfed.org/institute/houseprice/>

Next we generate a house price to economic fundamental ratio by combining the house price series with that on personal disposable income.<sup>8</sup> This follows earlier work, using the same data, by Grossman, Mack, Pavlidis, Paya, Peel and Yusupova (2013) and provides an indication of the trend in the relative affordability of house prices across countries. In Figure 2 we plot the ratio of house prices to disposable income (PI) over the period 1990 to 2013 for a select sub-sample of countries: Ireland, the United Kingdom (UK), the United States (US), the Netherlands and Spain.<sup>9</sup>

<sup>8</sup> Note both series are in index form with 2005 = 100, therefore, the house price to disposable income series is a ratio of indices.

<sup>9</sup> The sub-sample was chosen on the basis that the countries concerned had price movements which appeared closest to that of the Irish case.

**FIGURE 2** Ratio of House Prices to Disposable Income for a Select Sub-sample of Countries 1990:1-2013:4



Source: Own estimates.

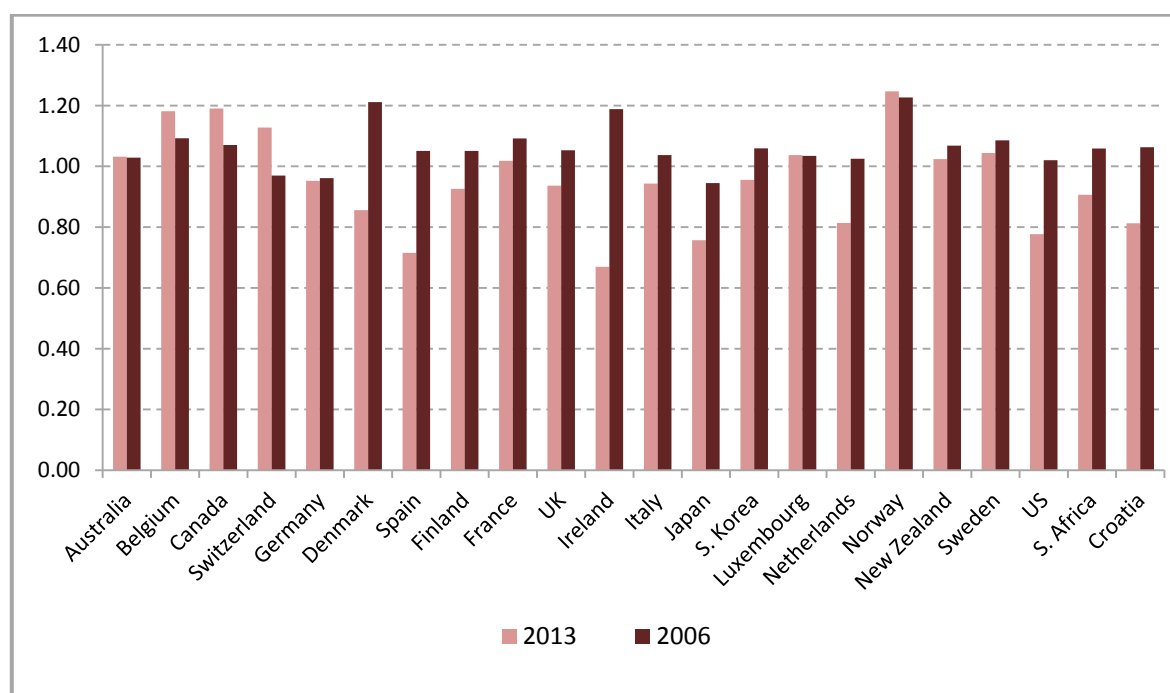
Over the period all countries register significant fluctuations in the ratio denoting that house prices became significantly less and then more affordable through time. We include an average of the ratio of both indices, which is the average across all the countries (in Table 1) over the period in question (0.789). If we assume this constitutes some long-run equilibrium rate, then it is clear that all of the housing markets in question have experienced periods of both under and over valuation since 1990 with the Irish market experiencing particularly strong fluctuations. Up to 1995 the Irish ratio was the lowest across the countries included and thereafter began to rise sharply as house prices increased. By 2007 both Spain and the UK had ratios which were broadly in line with the Irish rate; however, the Irish rate fell by a greater degree up to 2012 suggesting that Irish house prices became increasingly affordable by international standards.

To compare the position at the height of the Irish property boom with 2013, Figure 3 plots the respective ratios across the entire sample for the periods Q4 2006 and Q4 2013. The change in relative affordability from an Irish perspective is readily apparent. In 2006:4, by cross country standards, house price levels relative to income in Ireland were particularly high – third only to Norway and Denmark in the sample. However, by the end of 2013, Irish house prices had become more affordable than in any other country. Spain and the US also experienced a similar re-alignment over this time, while Japan’s ratio continued



its long decline. This cross-country evidence would suggest that Irish house prices, based on disposable income levels, were somewhat undervalued at end 2013.<sup>10</sup> These results are broadly similar to those in Demographia (2014).

**FIGURE 3** Cross-Country Ratio of House Prices to Disposable Income for 2006:4 and 2013:4



Source: Own estimates.

In the next section we examine the relationship between Irish house prices and market fundamentals in a more formal manner.

### Estimates of Market (Dis)equilibrium

To get a greater understanding of where Irish house prices are vis-à-vis key market fundamentals we now present the results of four different models of the fundamental house price and compare the estimates with the actual house price level. The models used are the same as those applied in Kennedy and McQuinn (2012) and are relatively standard in the house price literature. The models are a form of inverted demand function where house prices are specified as a function of key market fundamentals. The models may be summarised as follows:

*Model 1:* The standard reduced-form approach where prices are a function of income levels, real interest rates, population levels and the total housing stock.

<sup>10</sup> Of course the price to income ratio does not capture the significant build-up in household indebtedness which is likely to have occurred in a number of these housing markets.

See McQuinn (2004) for a detailed review of the literature in terms of the reduced form, inverted demand approach.

*Model 2:* A related approach specifies house prices in terms of income levels, the capital stock per person and the user cost of capital (see Murphy, 2005). In the user cost of capital variable we incorporate house price expectations through the expected capital appreciation term. For house price expectations we follow Kelly and McQuinn (2014), Himmelberg, Mayer and Sinai (2005) and Duca, Muellbauer and Murphy (2011) in using lagged house price appreciation over the previous four years.

*Model 3:* The affordability specification used in McQuinn and O'Reilly (2007) and (2008), which combines income levels and interest rates. This specification uses a mortgage annuity formula to combine interest rates and disposable income to calculate the average amount that households are able to borrow. By combining interest rates and income levels in a nonlinear manner, the model places a significant emphasis on interest rate changes.

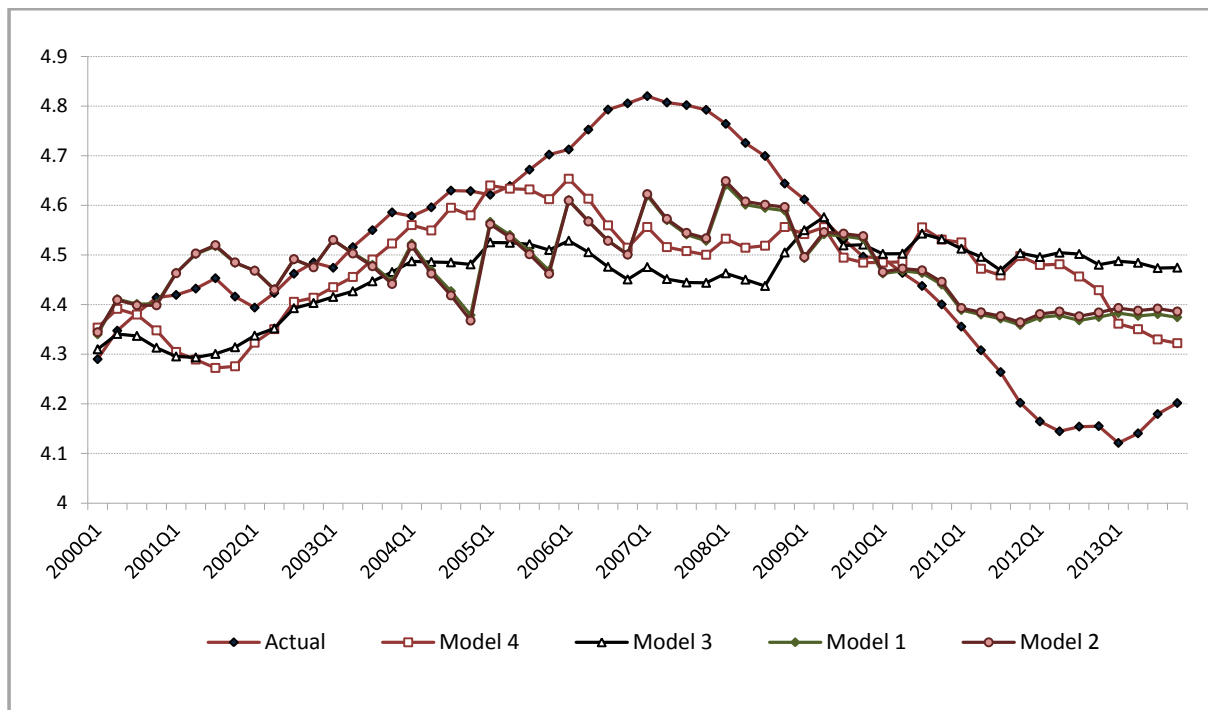
*Model 4:* A related version of the affordability model which explicitly allows for the role of credit (Addison-Smyth, McQuinn and O'Reilly (2009)). In particular, the model includes the funding gap of Irish financial institutions, that is the difference between their deposit based funding and their total lending. This is in order to gauge the impact on house prices of the significant increase in wholesale funding experienced by Irish financial institutions from 2003 onwards.

The models are all estimated over the period 1982 quarter 4 to 2013 quarter 4.<sup>11</sup> In Figure 4 we present the results of the models along with the actual house price over the period Q1 2000 to Q4 2013, while in Figure 5 we chart the deviation between the respective actual and fundamental prices.

---

<sup>11</sup> Detailed econometric results along with the RATS program used to generate the findings are available, upon request, from the author.

**FIGURE 4** Actual and Fundamental Real House Prices 2000:1-2013:4 (Logs)



Source: Own estimates.

**FIGURE 5** Percentage Difference between Actual and Fundamental Prices 2000:1-2013:4

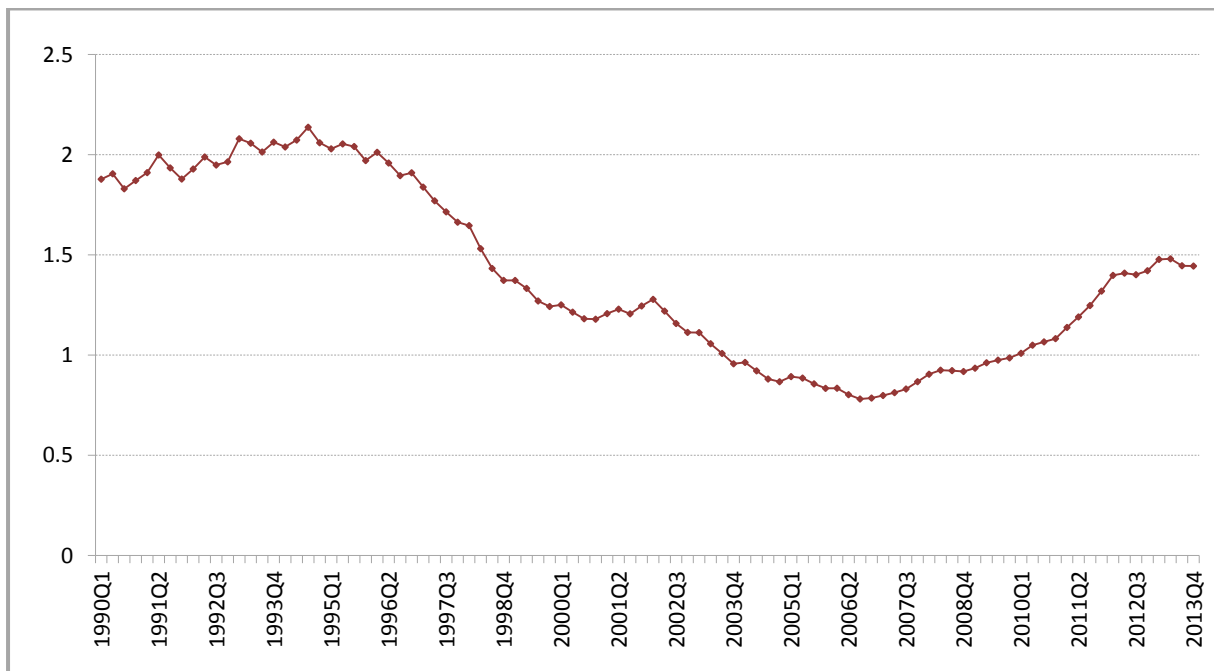


Source: Own estimates.

The results suggest that, in accordance with the earlier analysis of Kennedy and McQuinn (2012) and notwithstanding the price increases since then, Irish house prices still appeared to be undervalued at end-2013 with estimates of the undervaluation varying between 12 and 27 per cent. The latter result is estimated with Model 3 which places a significant emphasis on nominal interest rates. Excluding this specification suggests that the current rate of undervaluation at end 2013 in the market is in the range of 12 to 18 per cent. These results indicate that any reference to the recent increases in house prices as constituting a housing bubble in the Irish market is, at present, misplaced.

Another indicator frequently used to assess the stability of the housing market is the relationship between house prices and rental levels in the economy. If rents are assumed to reflect the long-run equilibrium value of housing services then the house price to rent ratio can also be observed as an indicator of market equilibrium. Gallin (2004) and Himmelberg, Mayer and Sinai (2005) are examples of studies which have examined the relationship between house prices and rents and use the ratio as a means of assessing developments in housing markets. In Figure 6 we plot this ratio for the Irish market over the period 1990 to 2013.<sup>12</sup>

**FIGURE 6** Irish House Price to Rent Ratio 1990-2013



Source: Own estimates.

<sup>12</sup> Rental values are those reported by the Central Statistics Office (CSO).

The ratio clearly declined from the mid-1990s before reaching a minimum rate in mid-2006. Thereafter, as prices declined and rents started to increase, the ratio increased steadily and is presently at a rate comparable to that which prevailed in 1998.

### **Regional Differences in Prices**

As noted by Fitzpatrick and McQuinn (2014), the Irish housing and mortgage market is becoming increasingly fragmented. For example, presently much market commentary concerning developments in the Dublin housing market cite the need for greater housing supply,<sup>13</sup> whereas in many rural areas the post 2007 phenomena of “ghost estates” is a telling reminder of the planning failures of the Celtic Tiger era. This regional heterogeneity is particularly reflected in price movements. Figure 7 charts nominal house prices for Dublin, Cork, Limerick Galway and Waterford for the period 2000 to the present.<sup>14</sup> During the boom period there was a sizeable margin between Dublin prices and the rest of the country; however, prices became much more aligned during the downturn. Since 2011 prices have begun to diverge again with Dublin prices in early 2014 experiencing a year-on-year increase of over 13 per cent set compared with a comparable 4 per cent for the rest of the country excluding Dublin. One possible reason for the growing disparity in prices is the different regional-wide rates of economic recovery. Morgenroth (2012) discusses the differences in labour market conditions on a regional basis for the Irish economy in the aftermath of the financial crisis. Additionally, with supply constraints likely to be more binding for large cities such as Dublin, once prices begin to improve generally, the increase may be greater in areas where housing shortages are more pressing. As the estimates of market equilibrium presented here are for the national average, prices in the Dublin market are likely to be less undervalued than in the rest of the country.<sup>15</sup>

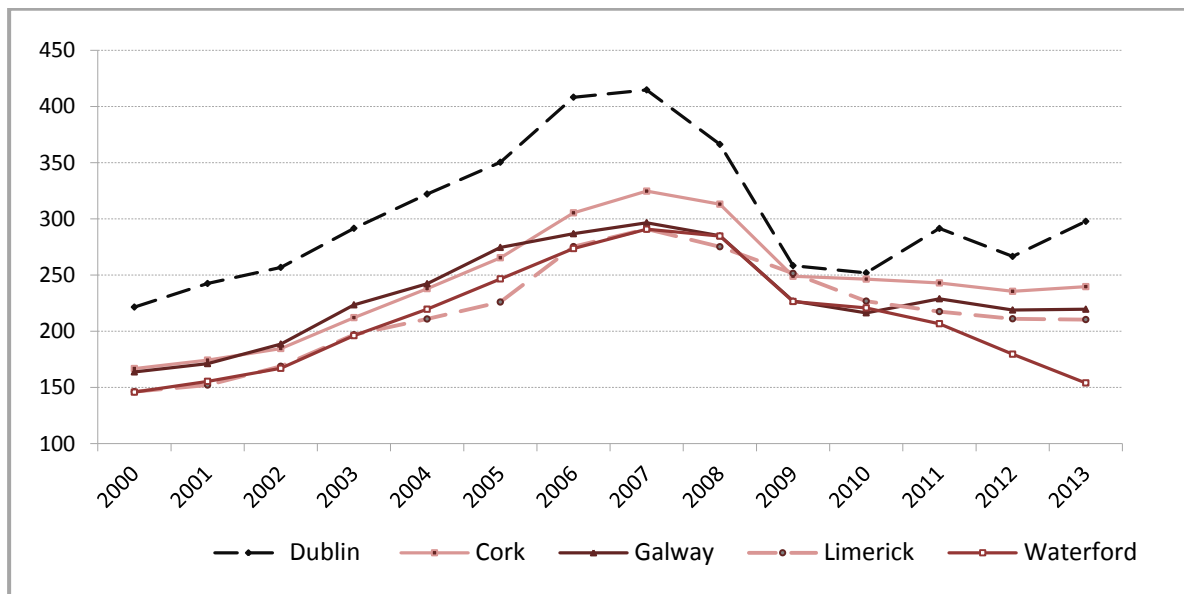
---

<sup>13</sup> For example, see [www.daft.ie](http://www.daft.ie) October 1st 2013, [www.examiner.ie](http://www.examiner.ie) November 28th 2013 and [www.independent.ie](http://www.independent.ie) January 2nd 2014.

<sup>14</sup> These house prices are from the Irish Department of the Environment.

<sup>15</sup> However, the fundamental price is also likely to be higher in Dublin than the rest of the country.

**FIGURE 7** Regional Irish House Prices 2000-2013

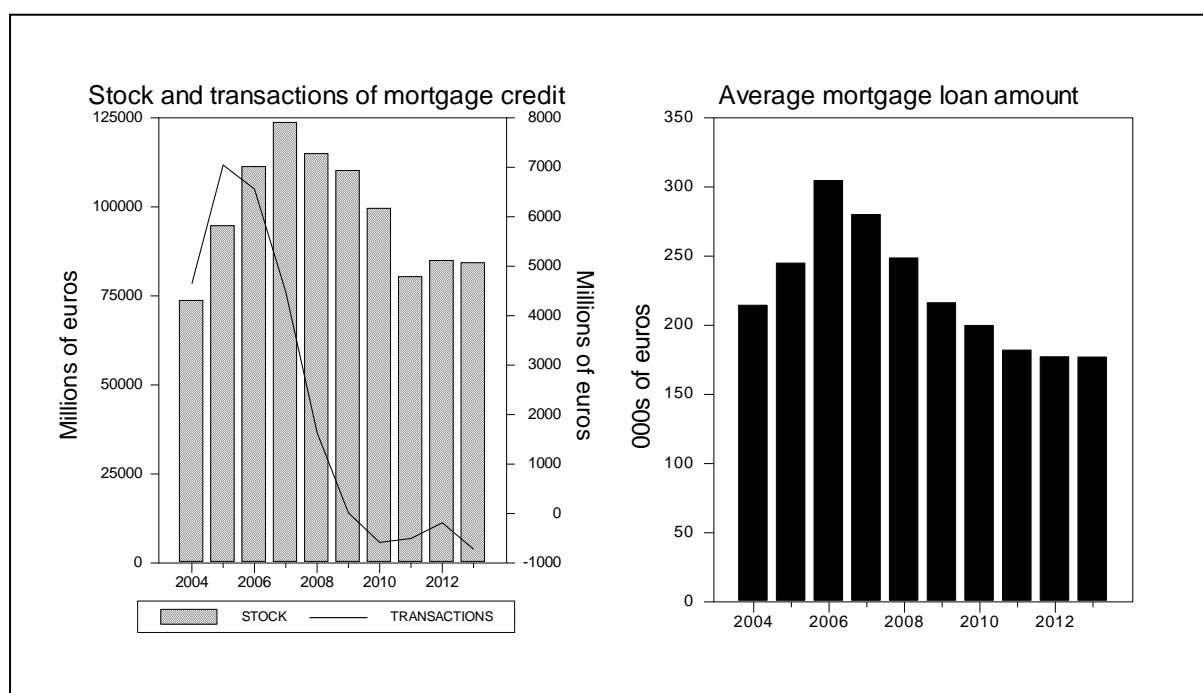


Source: Own estimates.

### Credit and the Irish Housing Market

One of the main causes of *overvaluation* in a housing market is the presence of excess mortgage credit; in instances where financial institutions are able to increase the level of lending in an unconstrained manner, this, in of itself, may lead to further house price increases. In such a case, housing inflation is no longer closely associated with the movements in market fundamentals. Fitzpatrick and McQuinn (2007) examined this issue in detail for the Irish housing market and they suggested the presence of a “mutually reinforcing relationship” between credit and house prices by 2004. Increases in the provision of mortgage credit were fuelling house price growth, which, in turn, was leading to greater mortgage lending. Therefore, in any appraisal of the stability of the housing market, it is essential to review mortgage lending patterns.

**FIGURE 8** Mortgage Credit in the Irish Market 2004-2013



Source: Own estimates.

Inspection of Figure 8 indicates that the Irish mortgage market, if anything, would appear to be credit constrained at present; the stock of credit fell consistently between 2007 and 2011, with actual transactions<sup>16</sup> in the market being negative since 2010. Furthermore, the average loan amount issued in the market is presently about 68 per cent of what it was at the peak of the housing boom. Thus, it appears Irish financial institutions are still deleveraging after the excesses of the pre-2007 financial boom.

This gives rise to a number of observations: If house price inflation is picking up in a situation where credit appears to be quite constrained, what are the implications for the market when credit markets are functioning in a less constrained fashion? Housing bubbles can often emerge after a period of strong house price growth which are, initially, explained by movements in fundamental variables. Such a period of sustained, fundamental based growth can result in credit conditions being eventually eased and excess lending itself becoming the chief reason for further price increases. Indeed, it can be argued that this was the case with the Irish price boom over the period 1995-2007, with price increases up to 2003/04 determined by underlying developments in the economy and thereafter more a function of issues to do with financial market liberalisation. This underscores the need to monitor consistently and analyse the level of credit

<sup>16</sup> Transactions are differences in outstanding amounts which are adjusted for reclassifications, other revaluations, exchange rate variations and any other changes which do not arise from transactions.

in the housing market and the importance of macro-prudential policy levers to control developments in the market when credit becomes more freely available.

### **Future Likely Moves in Irish House Prices**

What then of the future for Irish house prices? In this section we avail of a recently developed forecasting model of Irish house prices presented in Kelly and McQuinn (2014). Note some models are more appropriate for gauging the present sustainability of the housing market (such as those used in the previous section), while some are better from a forecasting point of view. The model used in this section mainly relates house prices to unemployment and finds a very close relationship between these variables in an Irish context over the period 1980 to 2013.

While Kelly and McQuinn (2014) note that unemployment has been found to be a key determinant of house prices across a wide number of countries,<sup>17</sup> the particular significance of unemployment in the Irish property market may be due to a combination of factors. Very often, where unemployment is included in housing studies it is used not just as a proxy for business cycle developments, but as an indicator of market expectations and consumer confidence (see Gerlach and Peng (2007) and Andrews (2010) for example) while in Muellbauer and Murphy (1997) and Fernandez-Corguedo and Muellbauer (2006), it is included, among other variables, as an indicator of the related concept of market risk.

In Ireland the confidence factor is highly relevant, particularly, given the emergence of the “Celtic Tiger” in the mid-1990s. The persistent decline in unemployment throughout the mid-1990s from a stubbornly high level in the 1980s was evidence that the pick-up in Irish economic activity earlier in the decade was now feeding into higher living standards for the domestic population. As a measure of potential credit risk, unemployment is especially relevant in the Irish case, where the post-2007 escalation in the rate of those out of work has gone hand-in-hand with the growing mortgage arrears problem.

The forecast house price model is in error correction format and can be summarised as follows:

---

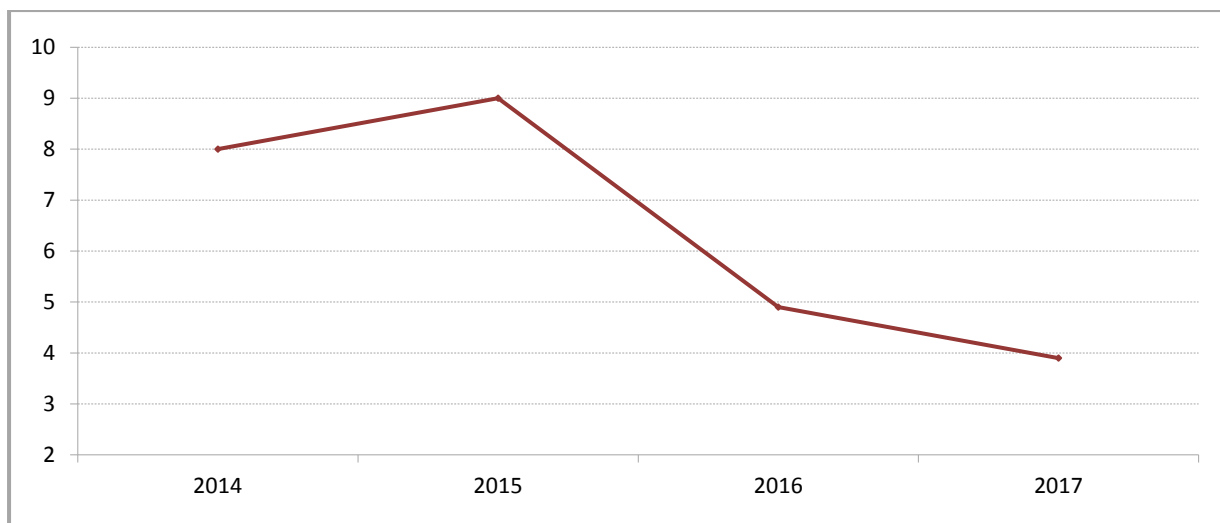
<sup>17</sup> See Kelly and McQuinn (2014) for a literature review.



$$\Delta p_t = (p_{t-1} - \alpha_0 - \alpha_1 u_{t-1} - \alpha_2 y_{t-1} - \alpha_3 d_{t-1}) + \sum_{k=1}^4 \Delta p_{t-k} + \sum_{j=0}^4 \Delta u_{t-j} + \sum_{j=0}^4 \Delta y_{t-j} + \sum_{j=0}^4 \Delta d_{t-j}$$

where  $p$  refers to real house prices,  $u$  is unemployment,  $y$  is income per capita and  $d$  is population.<sup>18</sup> Forecast rates for unemployment and income are taken from the latest forecasts in Byrne, Duffy, Fitzgerald and Timoney (2014), while population forecasts are taken from Bergin *et al.* (2013). The growth in house prices based on the model for the period 2014 to 2017 is presented in Figure 9. The results suggests that, conditional on the expected future path of the exogenous variables, real Irish house prices will grow by 8 per cent in 2014, 9 per cent in 2015 before falling back to increases of 4.9 and 3.9 per cent in 2016 and 2017 respectively. The increases in 2014 and 2015 reflect both the envisaged improvement in key macroeconomic variables and the degree to which prices are responding to current undervaluation. Importantly, the model does not assume any significant change in supply.

**FIGURE 9** Forecast Percentage Increase in Real Irish House Prices 2014-2017



Source: Own estimates.

### Conclusion

The results presented here emphasise the long lasting implications of the house price bubble experienced in the Irish market up to 2007. Given the considerable difference which emerged between actual and fundamental prices over the period 2005 to 2007, it is not surprising that the market would subsequently experience significant house price falls. However, it is worth noting that the

<sup>18</sup> Full regression results are available from the author upon request.

economy has sustained a prolonged correction since then with prices falling dramatically and housing construction coming to a near complete halt over the period 2007 to 2012. Almost inevitably, prices have overcorrected and recent developments in the Irish housing market must be seen in that context.

This is not to say that increasing house prices are either inevitable or desirable. Indeed as the economy continues to emerge from the recent recession, keeping key cost of living factors such as housing affordable is imperative as the economy seeks to maintain the competitiveness advantage that has been gained in recent times. One clear way in which actual and fundamental prices can be aligned without future price increases is through significant increases in housing supply in the locations where there is market demand. Recent supply levels fall well below the long-run structural demand within the economy which is typically estimated to be between 25 to 30 thousand units on an annual basis (see Duffy, Byrne and Fitzgerald, 2014 for example).<sup>19</sup>

It is not just increasing prices which have potentially adverse implications for future economic performance, the variability of prices is also an issue. Developments in the Irish market have resulted in a particularly acute boom bust cycle with prices changing to a considerable degree by international standards. This, of course, has implications for more general economic activity; McCarthy and McQuinn (2013) present microeconomic evidence of a sizeable wealth effect out of housing amongst mortgaged Irish households. Thus, the highly cyclical developments in the Irish housing market are likely to register a relatively large, varying impact on the broader economy if left unchecked.

It would appear that policymakers are confronted with two key challenges as far as monitoring the housing market is concerned:

- (i) Ensuring that developments in key housing indicators are as closely aligned with market fundamentals as is possible and
- (ii) Smoothing the cycle in the market particularly given the close relationship in an Irish context between the sector and the real economy and financial sector.

One way in which both of these can be achieved is through establishing a comprehensive macro-prudential policy framework which clearly sets out the regulatory position on the levels of credit in the residential mortgage market. In addressing this issue, Galati and Moessner (2012) argue both the academic literature and the experience of policy practioners point towards the necessity

---

<sup>19</sup> Assuming that these units are the right type and in the right geographical location.

for rules for accountability, transparency and efficacy of policy implementation in this area. To inform such a process, it is essential to continually update and improve the range of empirical models used to assess the market.

## References

- Addison-Smyth, D., K. McQuinn and G. O'Reilly (2009). "Modelling credit in the Irish mortgage market". *The Economic and Social Review*, Vol. 40, No. 4, pp. 371-392.
- Andrews, D. (2010). "Real house prices in OECD Countries: The role of demand shocks and structural and policy factors", OECD Economics Department Working Papers, No. 831, Paris: OECD.
- Bergin, A., T. Conefrey, D. Duffy, J. FitzGerald, I. Kearney, K. Timoney and N. Žnuderl (2013). *Medium Term Review 2013-2020*. Dublin: The Economic and Social Research Institute, Dublin.
- Byrne, D., D. Duffy, J. FitzGerald and K. Timoney (2014). *Quarterly Economic Commentary*, Spring, Dublin: The Economic and Social Research Institute.
- Demographia (2014). The 10<sup>th</sup> annual demographia international housing affordability survey: 2014. Available online at: [www.demographia.com/dhi.pdf](http://www.demographia.com/dhi.pdf)
- Duca, J.V., J. Muellbauer and A. Murphy (2011). "House prices and credit constraints: Making sense of the U.S. experience", *Economic Journal*, Vol. 121, pp. 533-551.
- Duffy, D. (2010). "Negative equity in the Irish housing market," *The Economic and Social Review*, Vol. 41, No. 1, pp. 109-132.
- Duffy D., D. Byrne and J. FitzGerald (2014). Alternative scenarios for household formation in Ireland, Special article, *Quarterly Economic Commentary*, Dublin: The Economic and Social Research Institute.
- Fernandez-Corugedo, E. and J. Muellbauer (2006). Consumer credit conditions in the UK", Bank of England working paper 314.
- Fitzpatrick, T. and K. McQuinn (2007). "House prices and mortgage credit: Empirical evidence for Ireland", *The Manchester School*, Vol. 75, No. 1, pp.82-103.
- Fitzpatrick, T. and K. McQuinn (2014). "Unemployment and the crisis in the Irish mortgage market: A regional perspective", paper presented at the 'Coping with recession: A regional perspective' conference, University College Cork, May.
- Gallin, J. (2004). "The long-run relationship between house prices and rents", Finance and Economics Discussion Series 2004-50, Board of Governors of the Federal Reserve System.
- Galati, G. and R. Moessner (2012). "Macroprudential policy - A literature review," *Journal of Economic Surveys*, published online May 11.
- Gerlach, S. and W. Peng (2005). "Bank lending and property prices in Hong Kong," *Journal of Banking and Finance*, Vol. 29, pp. 461-481.

- Grossman, V., A. Mack, E. Martínez-García, E. Pavlidis, I. Paya, D. Peel and A. Yusupova (2013). "Monitoring housing markets for episodes of exuberance: An application of the Philips *et al.* (2012, 2013) GSADF test on the Dallas fed international house price database", Federal Reserve Bank of Dallas Globalisation and Monetary Policy Institute Working Paper No. 165.
- Himmelberg, C., C. Mayer and T. Sinai (2005). "Assessing high house prices: Bubbles, fundamentals and misperceptions," *Journal of Economic Perspectives*, Vol. 19, Winter, pp. 67-92.
- Kelly, R. and K. McQuinn (2014). "On the hook for impaired bank lending: Do sovereign-bank inter-linkages affect the net cost of a fiscal stimulus?" *International Journal of Central Banking*, Forthcoming September 2014.
- Kennedy, G. and K. McQuinn (2011). "Scenarios for Irish house prices". Central Bank of Ireland *Economic Letter*, Number 2.
- Kennedy, G. and K. McQuinn (2012). "Why are Irish house prices still falling?" Central Bank of Ireland *Economic Letter*, Number 5.
- Mack A. and E. Martínez-García (2014). "A cross-country quarterly database of real house prices: A methodological note". Globalisation and Monetary Policy Institute Working Paper no. 99 (Federal Reserve Bank of Dallas, December).
- McCarthy, Y. and K. McQuinn (2013). "Price expectations, distressed mortgage markets and the housing wealth effect", Central Bank of Ireland Research Technical Paper 6/RT/13.
- McCarthy, Y. and K. McQuinn (2014). "Deleveraging in a highly indebted property market: Who does it and are there implications for household consumption?" Central Bank of Ireland Research Technical Paper 5/RT/14.
- McQuinn, K. (2004). "A model of the Irish housing sector", Central Bank of Ireland Research Technical Paper 1/RT/04, 2004.
- McQuinn, K. and G. O'Reilly (2008). "A model of cross-country house prices," Central Bank of Ireland Research Technical Paper 5/RT/07.
- McQuinn, K. and G. O'Reilly (2007). "Assessing the role of income and interest rates in determining house prices", *Economic Modelling*, Vol. 25, pp. 377-390.
- Morgenroth E. (2012). The regional dimension of the unemployment crisis, Dublin: The Economic and Social Research Institute, *Quarterly Economic Commentary*, Winter.
- Muellbauer, J. and A. Murphy (1997). "Booms and busts in the UK housing market," *Economic Journal*, Vol. 107, pp. 1701-1727.
- Murphy, A. (2005). Modelling Irish house prices: A review and some new results", Nuffield College Oxford. Mimeo <http://www.nuff.ox.ac.uk/Users/MurphyA/Irish%20House%20Prices.zip>