

ESRI Special Article

Irish house prices: Déjà vu all over again?

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IRISH HOUSE PRICES: DÉJÀ VU ALL OVER AGAIN?

Kieran McQuinn ¹

ABSTRACT

The pace at which Irish house prices have grown since 2013 has surprised many observers. The Irish housing market was one of the most affected across the OECD after the international financial downturn of 2007/2008, with prices falling by 54 per cent in nominal values between 2007 and 2013. However since 2013 prices have increased by 50 per cent with recent house price inflation showing no signs of abating. The performance of the housing market currently very much reflects developments in the real economy with Ireland's strong recovery in macroeconomic terms post-2013 resulting in falling unemployment and growing income levels, all set against the backdrop of persistently low Euro Area interest rates. In this paper, using a variety of approaches, recent developments in house prices are appraised; in particular, the sustainability or otherwise of current prices is evaluated and cross-country comparisons are also drawn. The unifying conclusion which emerges is that, given Ireland's expected strong economic performance over the next five years, the domestic market, in the absence of a significant supply response, looks set to experience consistently rising house prices over the medium term.

1. INTRODUCTION

One of the most notable aspects of Irish economic resurgence post-2013 has been the rapid manner in which housing demand has recovered. Inevitably, in considering the Celtic Tiger era, general economic growth and the housing market became inextricably intertwined with highly adverse consequences for Irish social and economic life. The scale and impact of the post-2008 Irish downturn were profound; substantial levels of household debt had been incurred due to the increase in house prices, thousands of households experienced mortgage arrears and near irreparable damage was done to the entire Irish financial system. The economic and financial independence of the State was threatened by the systemic nature of the mortgage market crisis.

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Understanding the linkages between housing demand and key economic variables (often labelled ‘fundamentals’ in a housing context) is essential in evaluating the sustainability, or otherwise, of house price movements. This is particularly important in the context of a market experiencing significant price increases. In instances where house price growth does not appear to be justified by movements in underlying variables such as income levels, interest rates and demographics, then a ‘bubble’ or irrational exuberance is said to exist. A number of studies estimate that a bubble of approximately 30 to 40 per cent existed in the Irish property market by 2007 (McQuinn, 2014). When the global downturn occurred, the domestic mortgage market was particularly susceptible to its impact. As unemployment soared between 2008 and 2010 with a resulting contractionary impact on both affordability and market sentiment, Irish property prices went into free-fall with prices experiencing one of the largest corrections across the OECD.

In this paper, following earlier studies, we evaluate the present level of house prices in the Irish market. To ensure that the analysis and consequently the policy implications drawn are not ‘model specific’, a variety of approaches are adopted; well established econometric models estimating fundamental prices, cross-country comparisons of relative housing affordability and standard house price-to-rent ratios are all examined to see whether the current level of house prices is warranted on the basis of market fundamentals. The results are unambiguous; the Irish market does not yet display any signs of overheating. By international comparisons, Irish prices would appear to be quite affordable. The results suggest that prices, barring some unexpected significant shock or a substantial increase in housing supply, are set to increase over the medium term.

At present it would appear the Irish residential sector can be characterised as a market where prices have almost fully recovered from the substantial declines experienced between 2007 and 2013. However, the fundamental level to which prices normally tend to converge is itself increasing due to factors such as strengthening labour markets. Increased housing demand can also be observed in the significant increase in rents observed in the Irish market. Indeed, since 2007, the recovery in rents predated that of house prices.²

The rapid recovery in housing demand contrasts sharply with developments on the supply side of the market. The Irish market was to the fore in international terms in simultaneously experiencing persistent increases in both supply and demand from the early 2000s to 2007. Housing supply averaged 84,000 units per

² The Rental Tenancies Board Rent Index would suggest that rents started to increase on a consistent basis since Quarter 1, 2012.

annum between 2005 and 2007. However, in the aftermath of the financial crisis, housing supply totalled just over 80,000 between 2010 and 2016. The collapse of the Irish construction sector post-2008 and related ongoing difficulties in the financial sector have all contributed to the present sluggish supply response in the Irish market and is consequently another contributing factor to house price inflation. It is estimated, for example, that annual long-run housing demand in the Irish mortgage market is approximately 30,000 to 35,000 units (see Duffy et al., 2016), whereas total supply in 2017 is forecast to be around 19,000 units.

Most of the developments observed since 2013 in the domestic market have occurred in the absence of any significant increases in mortgage credit; indeed, one could argue that in terms of both the general economy and the housing market in particular, the recovery has been a ‘credit-less’ one. Coates et al. (2016) estimate that by 2014 up to 60 per cent of housing market transactions were accounted for by cash-only buyers. Since 2016 the provision of mortgage approval is increasing. While a normal, functioning credit market is essential for an economy generally, it does raise the possibility that credit growth in itself could start to become an engine of house price increases as it did in the Irish market post-2002/2003. This would result in prices growing at a greater pace than the underlying fundamental factors in the economy would suggest, inevitably resulting in overheating. As noted in McQuinn (2014), credit bubbles often emerge after periods of sustained improvements in fundamental factors in the economy. Therefore, policymakers must be particularly alert to this possibility. In that context, the presence of the macroprudential policy regime introduced by the Central Bank is the most efficient manner to prevent such a credit bubble emerging.

The remainder of the paper is organised as follows; in the next section we compare house prices and affordability in the Irish property market with developments across countries. A series of econometric models is then used to estimate a ‘fundamental house price’ with the associated results presented. A subsequent section focusses on the role that credit provision plays in influencing Irish house prices. A final section discusses the policy implications of the results and offers some concluding comments.

2. A CROSS-COUNTRY PERSPECTIVE

2.1 House price-to-income ratios

Given the turbulent nature of house price movements in the Irish market in the recent past, it is useful to benchmark domestic developments within an international context. The greater availability of cross-country data on housing-

related issues enables useful and informative cross-country comparisons to be drawn in terms of housing affordability. While residential markets can differ significantly in terms of traditional tenure preferences, planning and regulatory regimes and demographic profiles, it is useful to benchmark developments in key ratios such as house prices to disposable income. The International Monetary Fund, for example, regularly publishes such ratios in its evaluation of global house price trends.³

Similar to McQuinn (2014) we examine trends using the international house price database maintained at the Federal Reserve Bank of Dallas,⁴ 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.

TABLE 1 **PERCENTAGE CHANGE IN NOMINAL CROSS-COUNTRY HOUSE PRICES 1995 - 2017**

Country	Q1 1995 - Q1 2007	Q2 2007 - Q1 2013	Q2 2013 - Q1 2017
Australia	150	23	40
Belgium	116	18	5
Canada	93	21	40
Switzerland	6	26	7
Germany	-4	11	19
Denmark	193	-18	15
Spain	199	-26	2
Finland	153	15	-1
France	145	3	-1
UK	222	-8	28
Ireland	474	-53	52
Italy	84	-11	-8
Japan	-36	-15	-2
South Korea	46	16	9
Luxembourg	148	14	21
The Netherlands	176	-15	14
Norway	155	30	18
New Zealand	159	6	43
Sweden	145	16	37
US	107	-17	21
South Africa	427	23	27
Croatia	121	-14	-1
Israel	27	77	25

Source: www.dallasfed.org/institute/houseprice.

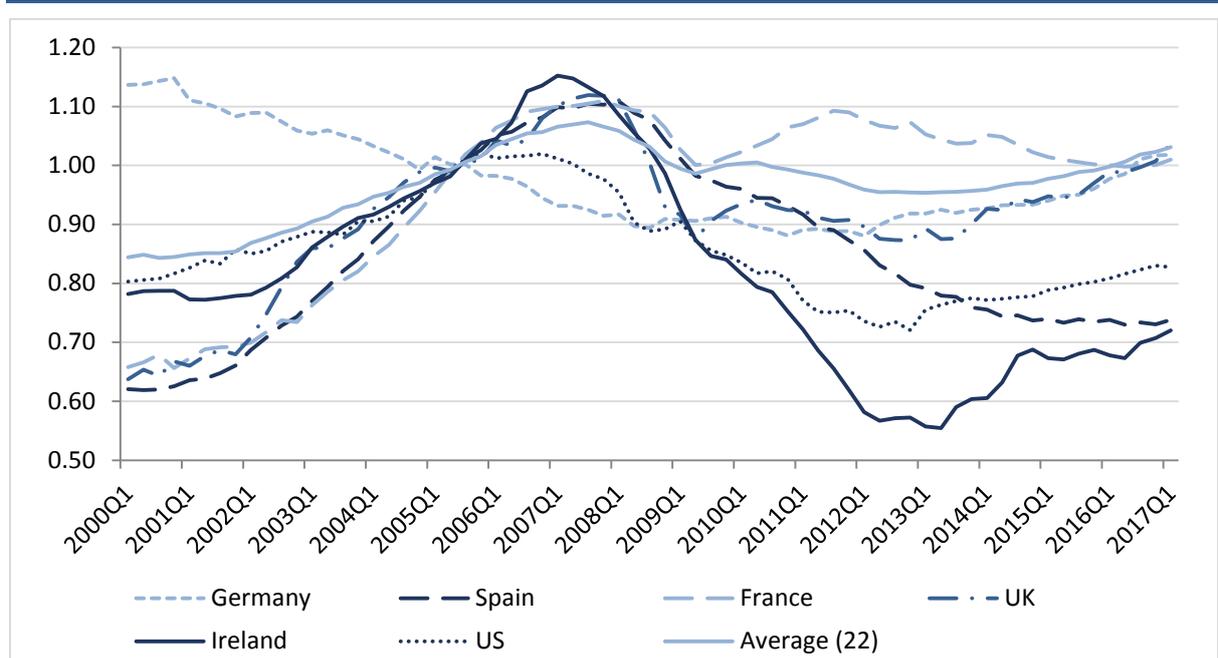
³ See www.imf.org/external/research/housing/index.htm.

⁴ For more information on this see www.dallasfed.org/institute/houseprice.

In Table 1 international house price growth across the period 1995 to 2017 is presented. The period is split into three periods; (i) 1995 to 2007, where house prices increased significantly across the OECD, (ii) 2007 to 2013, where house prices fell substantially across a number of countries and (iii) the recovery period 2013 to the present. From the table, the significant performance of the Irish market is evident across all three sub-periods. Amongst all the countries, Ireland registered the largest increase in prices up to 2007; it subsequently experienced the largest decline post-2007 and has had the most robust recovery in the latest sub-period.

Using data on disposable income from the same database, it is possible to create house price-to-income ratios (P_t/I_t).⁵ Both McQuinn (2014) and Grossman et al. (2013) have generated the same ratios to track trends in affordability across countries and time.

FIGURE 1 RATIO OF HOUSE PRICES TO DISPOSABLE INCOME FOR A SELECT SUB-SAMPLE OF COUNTRIES Q1 2000 - Q1 2017



Source: Author's analysis.

⁵ The house price index used in the database is consistent with the US FHFA Quarterly Nationwide House Price Index for existing single-family houses (formerly called OFHEO house price index). Each house price index is seasonally-adjusted and then rebased to 2005=100. The house price indexes are expressed in nominal terms, and also in real terms using the personal consumption expenditure (PCE) deflator of the corresponding country with the same base year of 2005=100. The disposable income series is quoted in per capita terms using working age population of the corresponding country and similarly expressed in nominal and real terms (the latter with the PCE deflator).

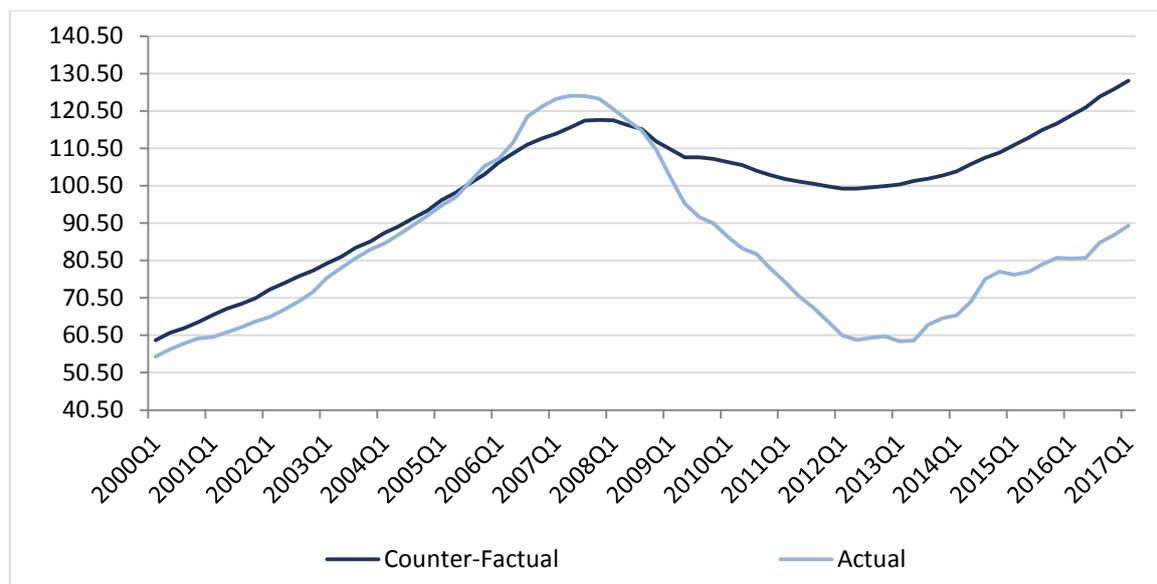
Figure 1 plots the ratio for a select sample of countries. From the graph, it is clear that the significant increase in Irish house prices up to 2007 caused the ratio of price to income to increase sharply even at a time when Irish income levels were also rising quite strongly. However post-2008, the Irish ratio fell quite dramatically before stabilising around 2013 and increasing thereafter. However, even with the significant recovery in house prices post-2013, the data suggest that according to international standards, Irish house price-to-income affordability is currently quite low. For example the average ratio across the 22 countries is just over 1 in 2017 compared with an Irish score of just over 0.7. It is worth noting that the index is based on the movement from a common base of 100 in 2005.

It is interesting to examine, given Irish disposable income levels, what a counter-factual Irish house price would look like given an average house price-to-income ratio. Therefore, we generate an alternative Irish house price for the period 2000 to the present. We take the average cross-country ratio of house prices to disposable income $\left[\frac{P_t}{I_t}\right]^A$ plotted in Figure 1 and multiply it by the Irish index of disposable income:

$$P_{It}^{CF} = I_{It} \times \left[\frac{P_t}{I_t}\right]^A \quad (1)$$

The resulting price is compared with actual Irish house prices in Figure 2 for the period in question.

FIGURE 2 ACTUAL AND COUNTER-FACTUAL IRISH HOUSE PRICES: Q1 2000 - Q1 2017



Source: Author's analysis.

As can be seen, up to 2006 the actual and counter-factual prices are closely aligned. After that, the actual price increases to a greater extent than the counter-factual; however when both prices start to fall in early 2008, the actual price falls significantly more than the counter-factual. For example, the counter-factual falls by a maximum of 16 per cent from its peak, whereas the actual price falls by 53 per cent. Both sets of prices start to rise from 2012/2013 onwards, however the counter-factual price in 2017 is now 9 per cent above its peak 2007 level, whereas the actual price is still 28 per cent below its equivalent peak.

What this suggests is that based on actual Irish disposable income and a cross-country average of the relationship between disposable income and house prices, Irish house prices over the period 2000 to 2017 experienced overvaluation in the 2006/2007 period and significant undervaluation in the post-2008 timeframe. It suggests the market is still somewhat undervalued in 2017.

2.2 House price-to-rent ratios

Another way of evaluating the sustainability of house prices is to use a more finance-based approach like the house price-to-rent ratio. In studies such as Gallin (2004) and Himmelberg et al. (2005) rents are assumed to reflect the long-run equilibrium value of housing services. Consequently, movements in the house price-to-rent ratio can indicate whether the housing market is in equilibrium or not. In Figures 3 and 4 we plot aggregate rents for the Irish market and the price-to-rent ratio over the period 1990 to 2017.⁶

Reflecting the strong growth in the economy from the mid-1990s onwards, rent levels escalated consistently until 2007. Like house prices, rents declined significantly post-2008; however they appeared to reach their trough levels in mid-2010 almost three years before house prices did. Since 2011, rents have increased consistently.

The corresponding house price-to-rent ratio (plotted in Figure 4) indicates a discrete change in the ratio from about 1997 onwards. The ratio reached a peak in 2007 before declining sharply afterwards until 2012. It has remained static for most of the period since then. While rents are rising significantly, reflecting the strong underlying performance of the economy, the fact that the ratio is both relatively stable and at 11.5, the lowest it has been since 1998, would again

⁶ Rental values are those reported by the Central Statistics Office (CSO).

suggest that no bubble or overvaluation is apparent in the Irish property market at present.

Again, given the volatile nature of the Irish market it is informative to put this in an international context. In Figure 5, the current Irish ratio is compared with similar ratios for a select set of US cities for 2017. From the chart it is evident that the vast majority of the cities covered have ratios which are greater than that of the Irish market – of the 81 cities only three have ratios that are less than 11.

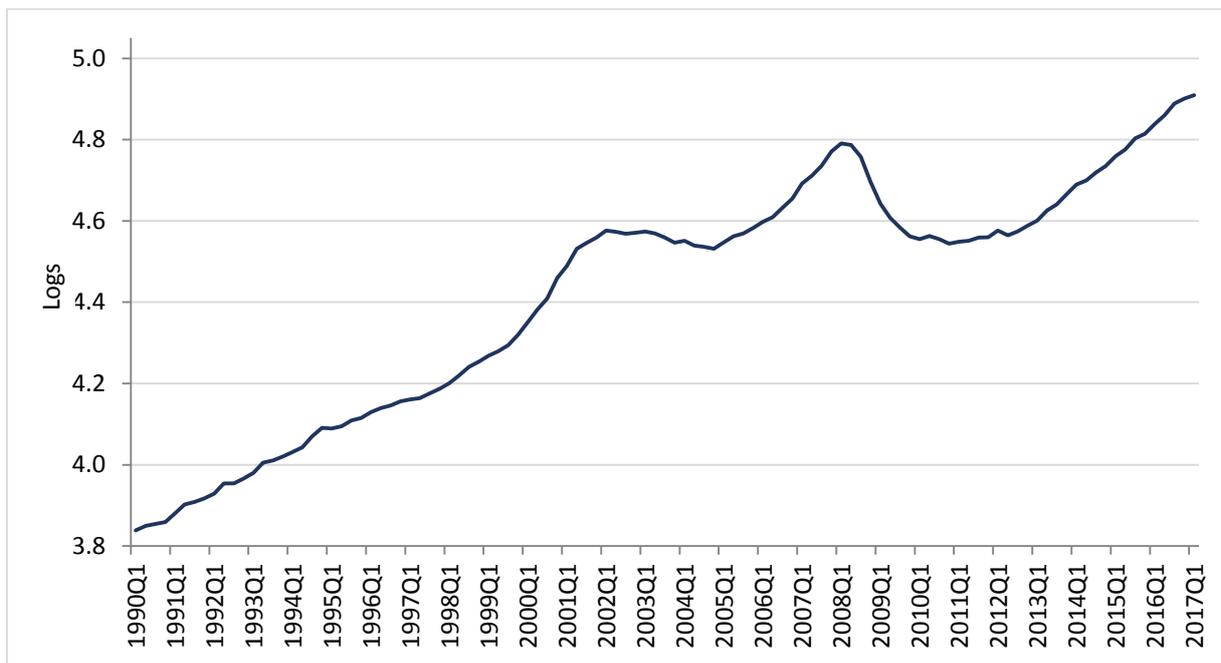
Of course the house price-to-rent ratio may vary somewhat within the Irish market. For example the house price-to-rent ratio for Dublin may differ from the rest of the country. To that end in Figure 6, we present the house price-to-rent ratio for Dublin and the country as a whole. The underlying rental level used is now that estimated by the ESRI for the Rental Tenancies Board (see Lawless et al. (2017) for details).⁷ From the graph it is evident that while there is some difference in the levels between the different ratios, the trends are very similar.⁸ While the ratio is clearly higher for the Dublin area, it is worth noting that the current level of just under 15 would still place Dublin at the lower end of the distribution in Figure 5.

More generally, it is worth noting that equating house prices with rents is not above criticism in the literature. For example, Sinai and Souleles (2003) have noted that such an assumed relationship essentially ignores potential transaction costs and certain risks involved in both renting and owning a property.

⁷ The reason for using the different rental index is that unlike the rent index provided by the CSO, the ESRI/RTB index allows for a breakdown between Dublin and the rest of the country.

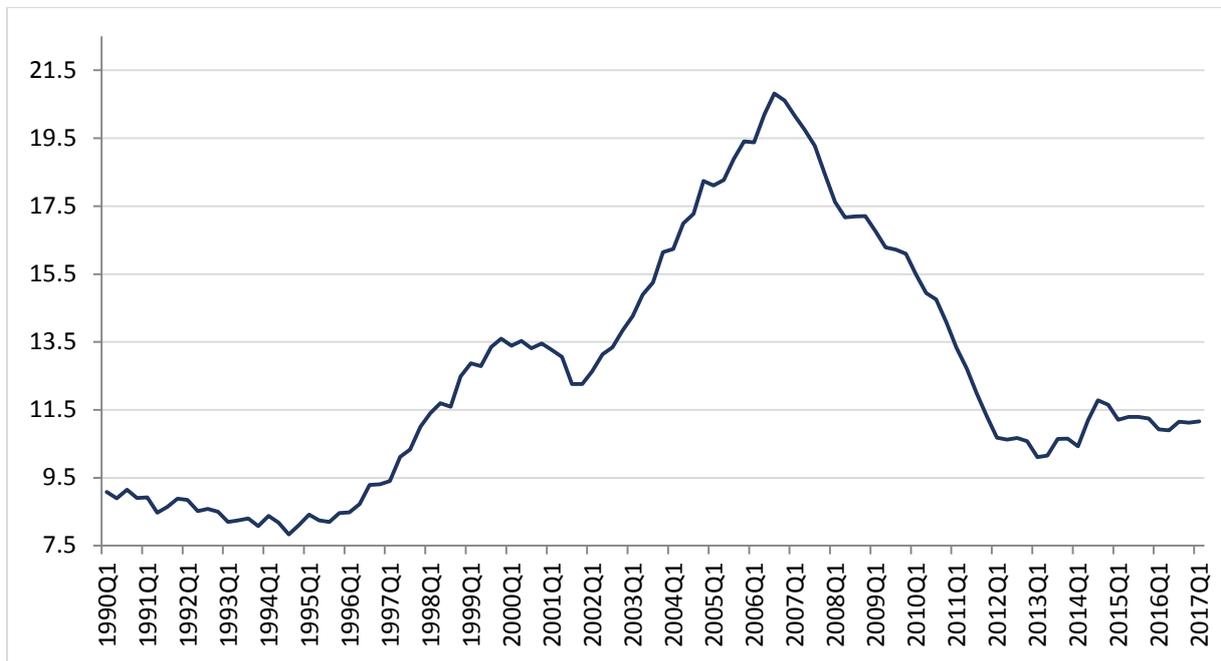
⁸ The difference between the CSO and RTB index at the national level may be attributed to compositional issues. Also, the RTB index covers only new rental agreements.

FIGURE 3 AGGREGATE IRISH RENTAL LEVELS: Q1 1990 - Q1 2017



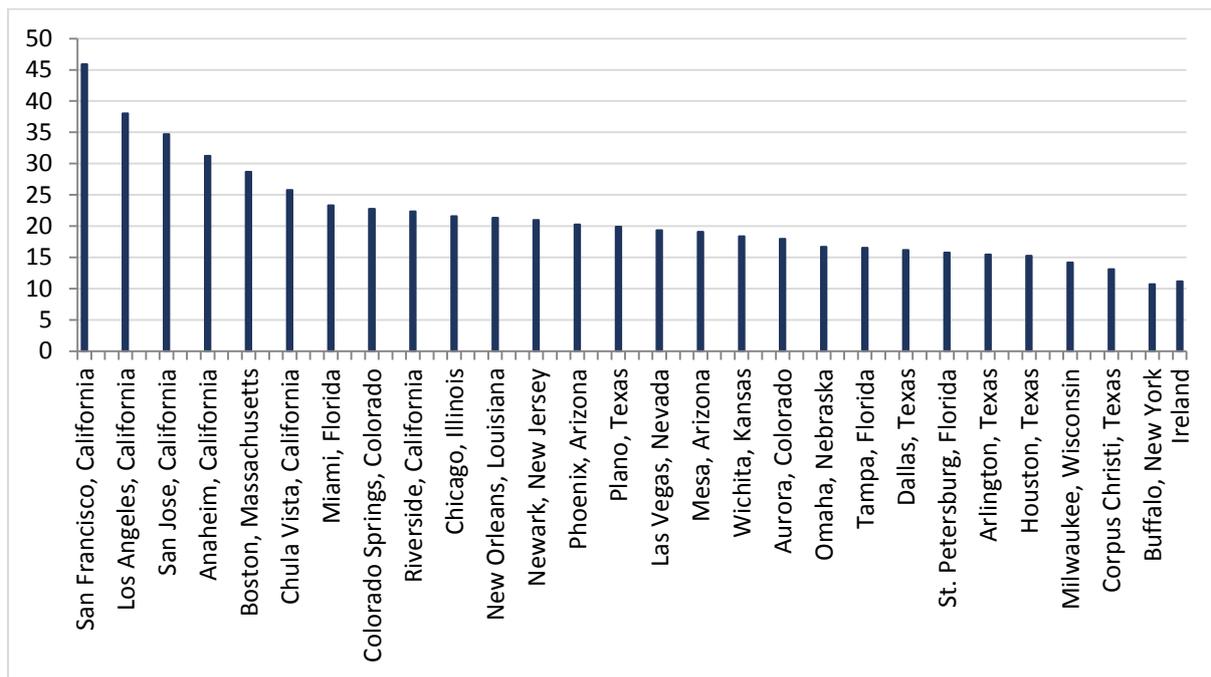
Source: Author's analysis.

FIGURE 4 IRISH HOUSE PRICE-TO-RENT RATIO: Q1 1990 - Q1 2017



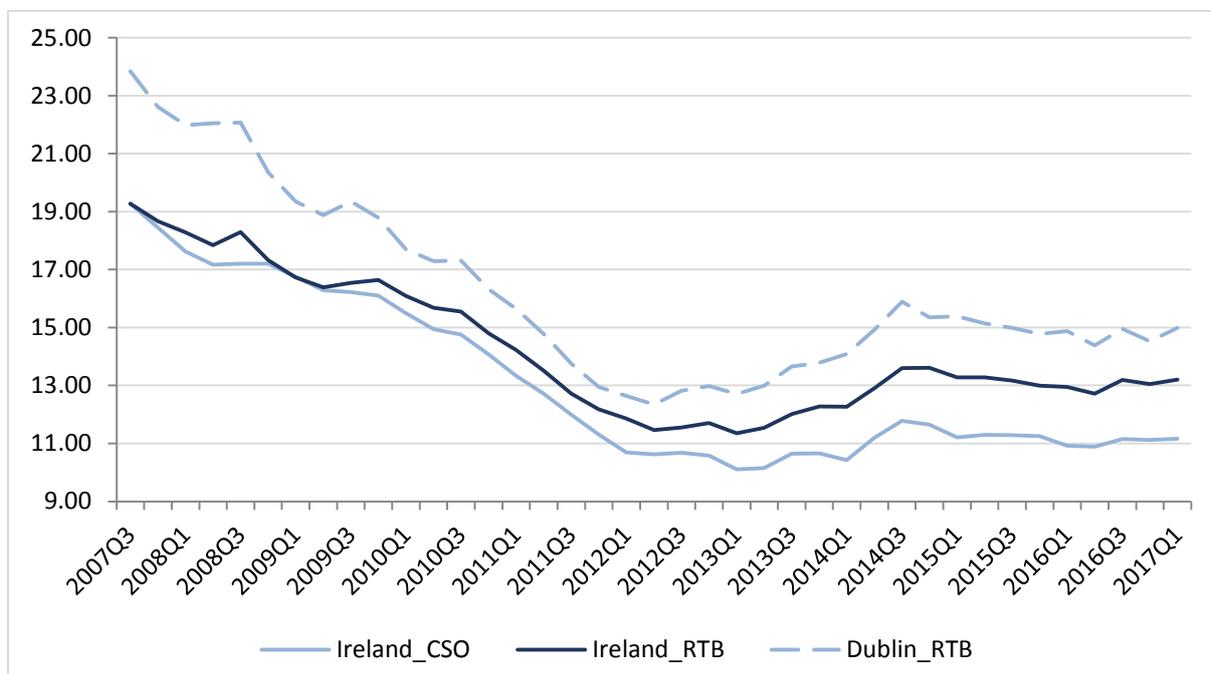
Source: Author's analysis.

FIGURE 5 HOUSE PRICE-TO-RENT RATIOS FOR IRELAND AND SELECT US CITIES, 2017



Source: Author's analysis and Smartasset; <https://smartasset.com>.

FIGURE 6 HOUSE PRICE-TO-RENT RATIOS FOR DUBLIN AND IRELAND USING THE RTB AND CSO RENTAL INDICES Q3 2007 - Q1 2017



Source: Author's analysis.

3. ECONOMETRIC MODELS

In this section we use a suite of econometric models to determine a fundamental Irish house price. This approach is particularly popular in the international house price literature and has been used extensively in an Irish context over the past 20 years to evaluate the performance of the market. Examples include Murphy (2005), Roche (2001; 2003), McQuinn and O'Reilly (2007), Kelly and McQuinn (2014) and McQuinn (2014). The attraction of the econometric approach is that, while finance based approaches assume a relatively narrow specification of house price determinants, econometric models enable house prices to be influenced by a broader set of variables. Furthermore, using a suite of models reduces the possibility that any policy conclusion derived on the basis of the results is 'model-specific'.

Three different econometric specifications are used in this approach:

1. House prices are assumed to be a function of demographics, disposable income and unemployment rates,

This model is a variant of that specified and estimated in Kelly and McQuinn (2014). They discuss how unemployment, in particular, appears to be strongly related to movements in Irish house prices.

2. House prices are assumed to be a function of affordability (a mortgage annuity combination of income and interest rates) and the ratio of the housing stock to population. This is a variant of the affordability model specified and estimated in McQuinn and O'Reilly (2007). The affordability model uses the following annuity formula where A_t is defined as follows:⁹

$$A_t = \omega Y_t \left(\frac{1 - (1 + R_t)^{-\tau}}{R_t} \right) \quad (2)$$

The annuity is the fraction of current disposable income (ωY_t) that goes toward mortgage repayments and is discounted at the current mortgage interest rate (R_t) for a horizon equal to the term of the mortgage τ .¹⁰ The model assumes that the demand for housing is mainly a function of the amount that prospective house purchasers can borrow from financial institutions and this, in turn, is dependent on current disposable income and the existing mortgage interest rate.

⁹ This does assume that on average all housing transactions have some degree of mortgage credit.

¹⁰ Details surrounding the assumptions in (2) are discussed in Technical Appendix 2 of the paper.

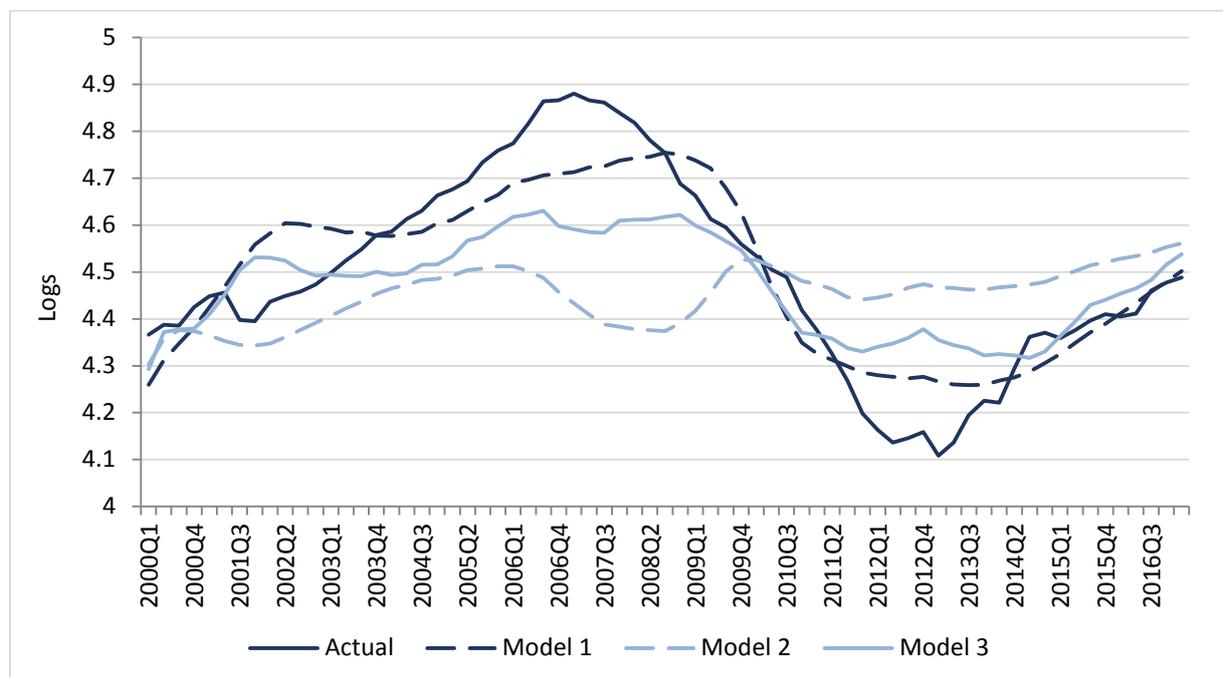
3. House prices are assumed to be a function of disposable income per capita, the user cost of capital and the housing stock per capita.¹¹

This is the standard inverted demand function which has been applied in the housing literature in applications such as Peek and Wilcox (1991), Muellbauer and Murphy (1994; 1997), Meen (1996; 2000), and Cameron et al. (2006).

The models presented here are not an exhaustive list of those used in the literature. For example, hedonic price models, as outlined in Rosen (1974), employ regression techniques to control for various sources of heterogeneity in prices using observations on covariates and dummy variables that reflect implicit structural and locational prices.

Details of the econometric estimation are presented in the Appendix.¹² In Figure 7 the fundamental house prices from the three models are compared with actual house prices, while in Figure 8 the deviation between each fundamental model and actual price is shown.

FIGURE 7 ACTUAL AND FUNDAMENTAL REAL HOUSE PRICES Q1 2000 - Q1 2017

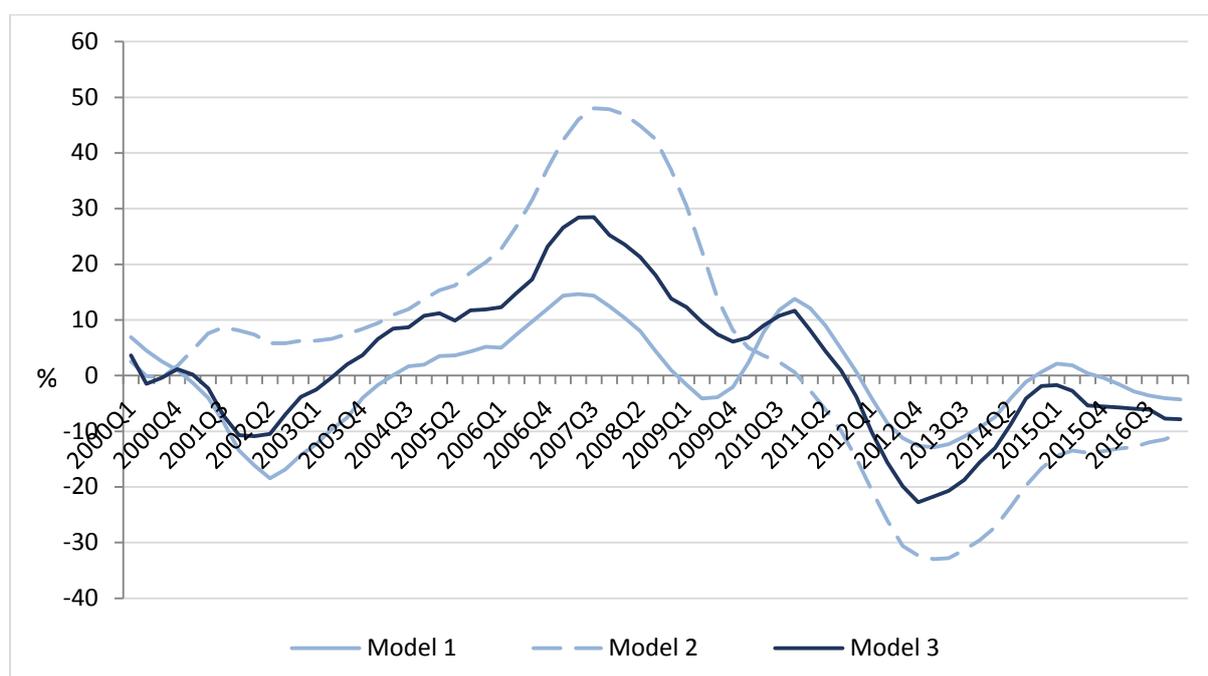


Source: Author's analysis.

¹¹ In the estimation of the model we find the user cost of capital is not significant.

¹² The RATS code along with the data used in all estimation is available, upon request, from the author.

FIGURE 8 PERCENTAGE DIFFERENCE BETWEEN ACTUAL AND FUNDAMENTAL PRICES Q1 2000 – Q1 2017



Source: Author's analysis.

The results show that while the fundamental prices can differ somewhat from each other over the period, at present the results are broadly similar. Namely, while fundamental and actual prices have converged significantly over the past few years, actual prices are still very much explained by key economic and demographic factors in the Irish economy. Indeed, technically there is still some undervaluation in the Irish market, however this is now less than 10 per cent. In McQuinn (2014), which estimated fundamental prices up to the end of 2013, the degree of undervaluation was somewhere in the region of 12 to 20 per cent.

Overall, the results of the econometric models suggest, along with the earlier analysis, that house prices are still explained by fundamental factors within the Irish economy. While the absence, currently, of a bubble in house prices is somewhat reassuring, it is worth noting that house prices can vary significantly due to changes in fundamental variables. Nonetheless, the expected robust performance of the Irish economy generally over the next couple of years is likely to result in continued upward pressure on prices.

3.1 Future Irish house prices: an affordability scenario

To explore the future implications for the housing market, we use the results of one of the models above to generate forecasts of Irish prices over the period

2018 to 2020. In particular we use Model 2 which enables us to examine the implications of future trends in affordability, the housing stock and population levels on house prices. The forecast house price model is in error correction format. Using the error-correction format allows for any deviation between actual house prices and the long-run level to impact on the manner in which house prices evolve into the future. So, for example, if house prices are currently below their long-run level, this would, ceteris paribus, cause future house prices to increase. Using an error correction model in such a way is very common in the literature and has been applied in an Irish case in Kelly and McQuinn (2014) and McQuinn (2014). The full details of the model are summarised in Technical Appendix 2 of the paper.

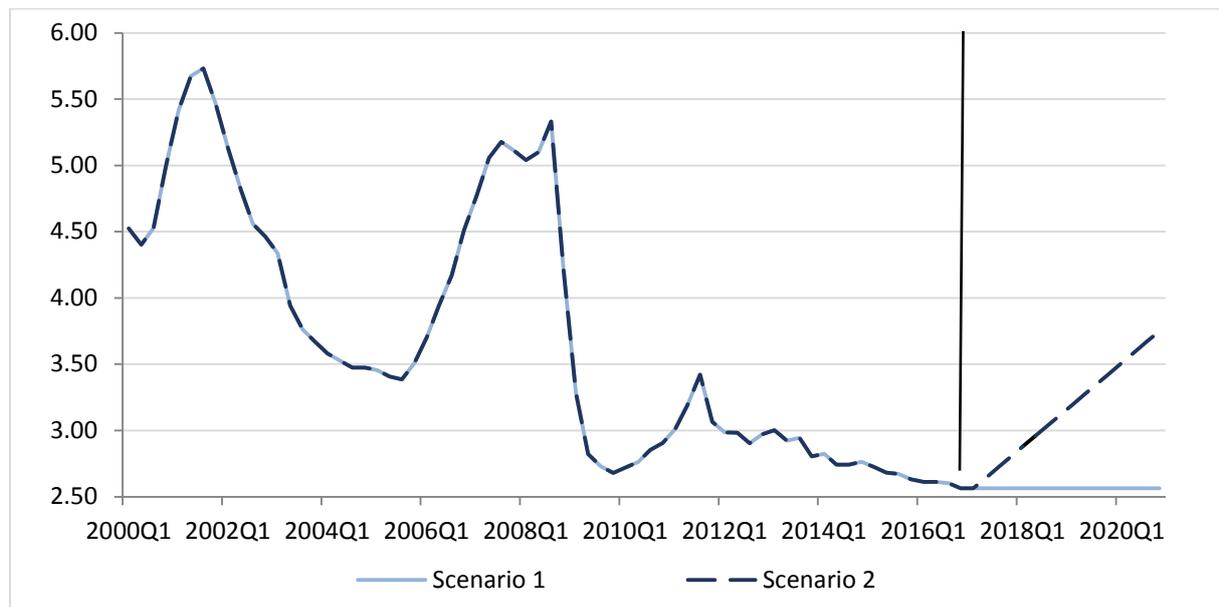
To generate forecasts, future values for 2017 to 2020 are required for the capital stock, population levels, interest rates and disposable income. Following the latest *Quarterly Economic Commentary* (QEC) forecasts (McQuinn and O'Toole, 2017), housing supply is assumed to increase to 18,500 in 2017 and 23,400 in 2018. For 2019 and 2020, housing supply is assumed to increase to 29,700 and 36,700 respectively. Population growth is assumed to increase by the same rate as the historical average over the period 2012-2016.¹³ Disposable income is also assumed to increase in line with the most recent QEC forecasts as is the personal consumption deflator.¹⁴

Recently, there has been some commentary about the possibility of future interest rate increases across the Euro Area (see Claeys and Efstathiou (2017) for example). To illustrate the impact of changes in interest rates on prices, two interest rate paths are assumed for the forecasting exercise. One scenario leaves interest rates constant over the forecast period, while a second scenario assumes a gradual tightening of future monetary policy with mortgage interest rates increasing as a result. The two paths are presented in Figure 9.

¹³ This is approximately 0.009882 per cent per annum.

¹⁴ In nominal terms disposable income is assumed to grow by 7.2 per cent, 5 per cent, 4 per cent and 4 per cent for 2017, 2018, 2019 and 2020 respectively.

FIGURE 9 HISTORICAL AND FUTURE ASSUMED MORTGAGE INTEREST RATES (%): Q1 2000 – Q4 2020

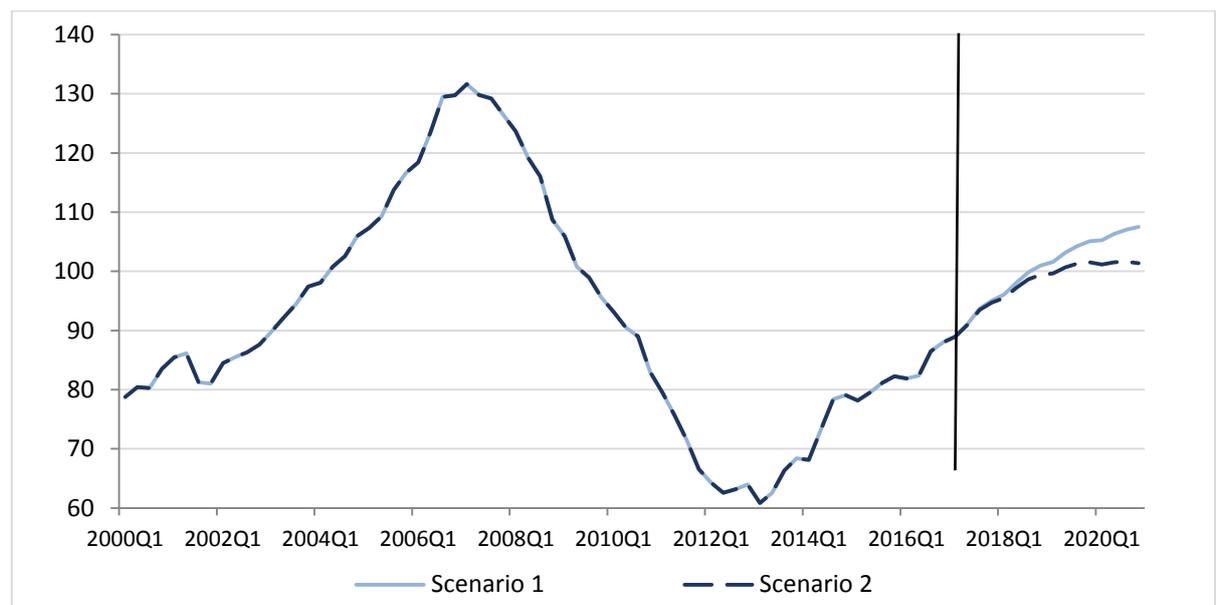


Source: Author's analysis.

The second scenario assumes that by the end of 2020, mortgage interest rates will have increased to 3.75 per cent from 2.56 per cent at present.

The corresponding real house price forecasts are presented in Figure 10.

FIGURE 10 HISTORICAL AND FUTURE FORECAST REAL IRISH HOUSE PRICES (INDEX): Q1 2000 – Q4 2020



Source: Author's analysis.

From the graph it is evident that under both scenarios, Irish house prices are expected to increase over the next four years. In real terms, under Scenario 1, prices are forecast to grow by 20 per cent over the period, while under the higher interest rate path, the model indicates that prices will increase by 14 per cent.¹⁵

4. CREDIT AND THE IRISH HOUSING MARKET

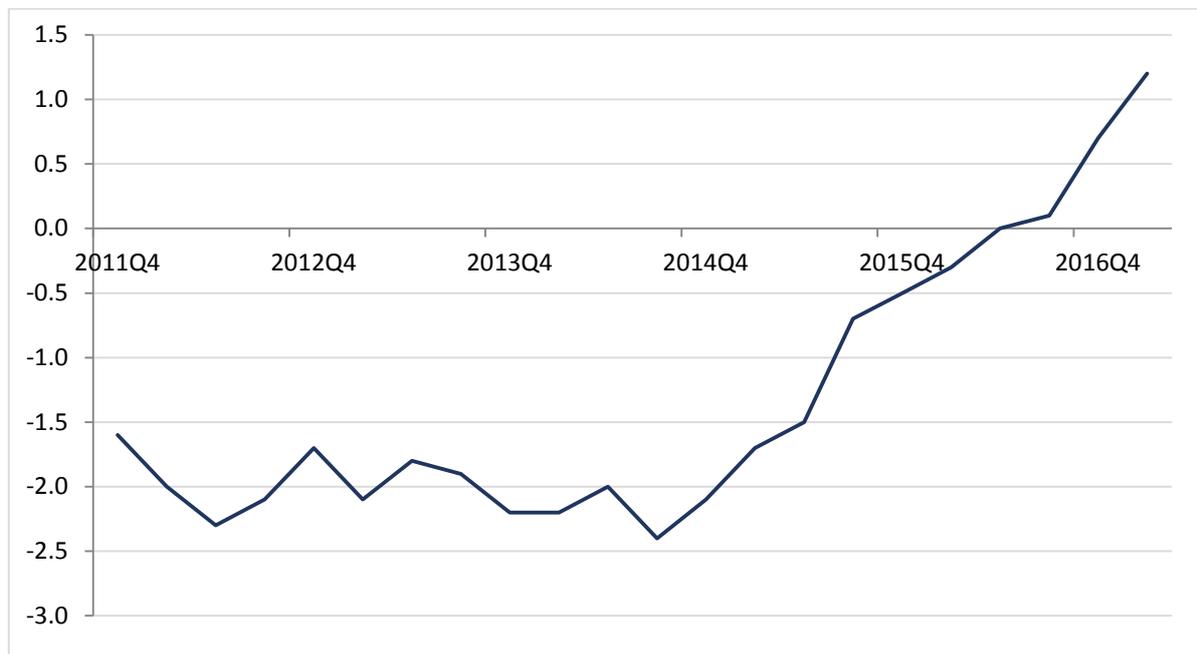
The scenario above assumes that prices will grow in line with changes in fundamental variables in the economy. Underpinning this is the assumption that there is some steady-state relationship between credit provision and these fundamental variables. However, as evidenced by developments in the Irish residential market, changes in mortgage credit can also have a key impact on house prices. A number of studies, such as Fitzpatrick and McQuinn (2007), Addison-Smyth et al. (2009) and McCarthy and McQuinn (2017), have examined the role that changes in credit conditions played in Irish house price inflation up to 2007. As a result, it is important to assess the implications that credit conditions can have for future Irish house prices.

To relax the assumption about a steady-state level of credit provision, we augment the standard inverted house price equation used in the previous section (Model 3) to include an indicator of credit supply in the Irish mortgage market. The model, which was originally specified and estimated in Duca et al. (2011), has also been estimated in an Irish context by Kelly and McQuinn (2014). The indicator is created by taking the observed aggregate loan-to-value ratio and ‘filtering’ out demand-side factors. By this we mean the observed loan-to-value is regressed on a series of demand-side variables such as income levels and the unemployment rate. The ‘adjusted’ loan-to-value variable is then the observed ratio with the demand-side components subtracted or netted off and represents an indicator of changes purely in credit supply conditions.

When the indicator is added to the house price equation we get a coefficient estimate of 0.42 (see Table A5 in the Appendix for details). As the equation is in log-log form, this coefficient can be interpreted as an elasticity, i.e. a 1 per cent increase in the credit supply indicator results in house prices increasing by over 0.4 per cent. While changes in the supply of residential mortgage credit have been negative through most of the recovery, positive growth rates have been in evidence since the mid-point of 2016 (see Figure 11). Any significant increase in credit will have an additional impact on house price growth above and beyond that of economic fundamentals.

¹⁵ As a further sensitivity analysis, we hold the housing supply level fixed over the period 2017-2020 at 18,500 units per annum. This results in house prices being 0.5 per cent higher at the end of the period than under the baseline case.

FIGURE 11 ANNUAL GROWTH RATES (%) IN CREDIT FOR HOUSE PURCHASING: Q4 2011 – Q1 2017



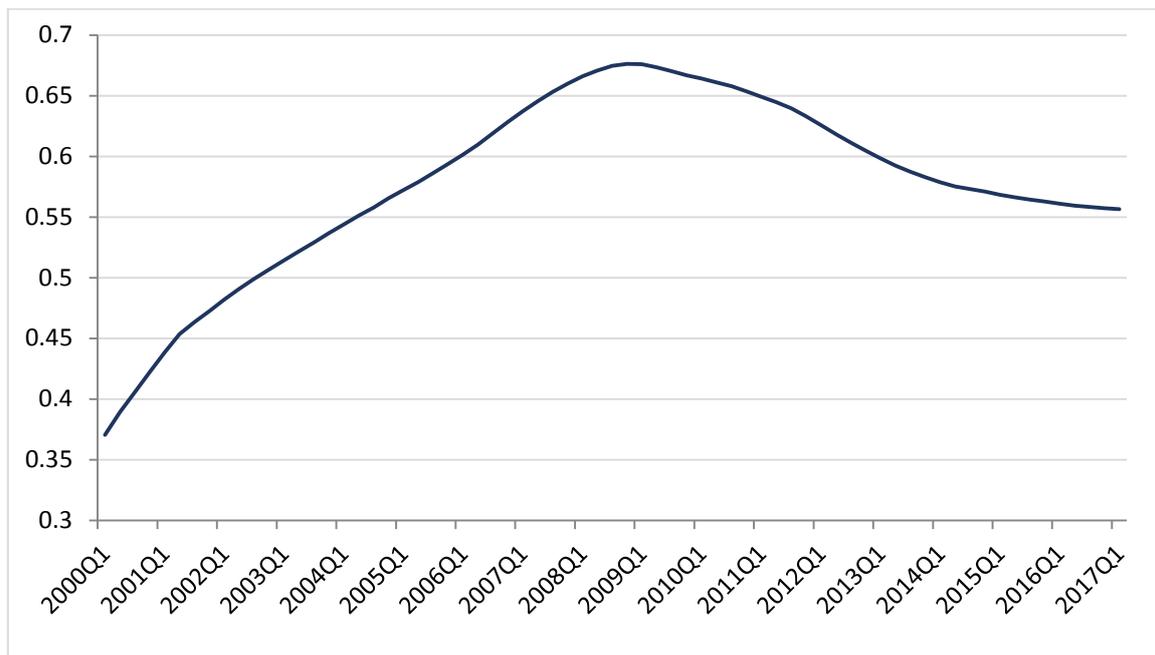
Source: Author's analysis.

Recent work has also sought to provide an alternative indicator of mortgage credit provision in an international context (McQuinn, 2017). The basic idea behind this approach is to provide time-varying estimates of the relationship between the affordability variable (A_t) and house prices in Model 2 estimated earlier. The standard model is

$$p_t = \alpha + \beta a_t \quad (3)$$

where p_t is the log of real house prices and a_t is the log of the annuity formula in Equation (2). In the original application β is fixed or does not vary through time. In the subsequent McQuinn (2017) application β is now allowed to time vary. As this is again a log-log equation the coefficient on the affordability variable may be considered the elasticity of house prices with respect to affordability. By allowing the coefficient to change over time, this is recognising that the elasticity of house prices with respect to affordability will vary through time, mainly as a result of changing credit conditions. The elasticity can vary due to changing loan-to-value and debt-to-income ratios in the market. In Figure 12, the changing elasticity in an Irish context is presented.

FIGURE 12 ELASTICITY OF HOUSE PRICES WITH RESPECT TO AFFORDABILITY: Q1 2000 – Q1 2017



Source: Author's analysis.

The clear increase in the elasticity in the period up to 2008 is evident; changing credit conditions enabled Irish households to secure larger mortgages for given income levels and interest rates. Thereafter, the elasticity declined sharply as credit conditions contracted due to the implications of the financial crisis. What this demonstrates is that over a relatively short period of time, changing credit conditions – by increasing this elasticity – can have significant implications for housing demand.

5. POLICY IMPLICATIONS AND CONCLUDING COMMENTS

The close relationship observed since the mid-1990s between general economic activity and the Irish housing market is also a characteristic of the recent recovery. Housing demand has increased significantly since 2013 with prices growing in a persistent manner. The reason for this increase are twofold (i) prices overcorrected in the 2008-2013 period and (ii) fundamental economic variables have improved substantially over the recent period. Therefore, actual prices are converging on a fundamental price which itself is increasing.

This conclusion is arrived at using both models of economic fundamentals in the Irish market and cross-country comparisons. Indeed some of the cross-country indicators would actually suggest that the Irish market is still undervalued.

Although in converging to their fundamental levels, prices are still set to witness significant increases over the medium term. This is mainly due to the expected strong growth envisaged in the Irish economy over this period and the continued likely accommodative nature of Euro Area monetary policy. Both of these developments will fuel increased levels of affordability amongst prospective homeowners, in turn leading to greater demand.

Given the strong price growth envisaged, any Government policy applied to the Irish market clearly needs to focus on increasing housing supply. Unfortunately, as noted in a cross-country assessment of housing supply policies (Morley et al., 2015), there are relatively few options available. The recent Budgetary announcement concerning the introduction of the proposed site tax is a welcome development. Certainly, given the expected strong growth of prices, the Government should avoid any policies which would further increase housing demand.

One issue which will require ongoing, critical assessment is likely future developments in the provision of credit. Much of the persistent increases in house prices observed since 2013 have occurred in the absence of any credit growth. Consequently, as the Irish banking sector slowly heals itself and economic growth continues, credit conditions are likely to become more expansive over the medium term. The danger is that similar to the 2003-2007 period, credit growth, itself, will fuel greater house price inflation. In that regard the new macroprudential policy framework adopted by the Irish Central Bank will be hugely important. As suggested in Duffy and McQuinn (2014), an integral component of this framework should be an evaluation of house prices vis-à-vis fundamental levels and an assessment of the growth of the stock of mortgage credit. Based on the analysis conducted here, any future changes in macroprudential policy should not serve to increase affordability, i.e. by easing loan-to-value or loan-to-income restrictions. Furthermore, over the medium term, if any imminent overvaluation is detected in the housing market, macroprudential policy should act in a counter-cyclical manner and actively seek to restrict housing demand due to the extent that is fuelled by credit growth and hence price growth.

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(4), pp.371-392, 2009.
- Cameron G., J. Muellbauer, and A. Murphy. 2006. 'Was There a British House Price Bubble? Evidence from a Regional Panel.' CEPR Discussion Paper No. 5619.
- Claeys G. and K. Efstathiou (2017). 'Is the recent increase in long-term interest rates a threat to euro-area recovery?' Bruegel Policy Contribution Issue No.14, May.
- Coates D., J. McNeill and B. Williams (2016). 'Estimating cash buyers and transaction volumes in the residential property sector in Ireland'. Central Bank of Ireland Quarterly Bulletin signed article, QB3.
- 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. and K. McQuinn (2014). 'Assessment of proposed macro-prudential policy measures', Appendix, *Quarterly Economic Commentary*, Summer, Dublin: The Economic and Social Research Institute, October.
- Duffy, D., McQuinn K. and N. McNerney (2016). 'Macroprudential policy in a recovering property market: Too much too soon?' *International Journal of Housing Policy*, Vol. 16, No. 4 pp.491 - 523.
- Fitzpatrick, T. and K. McQuinn (2007). 'House prices and mortgage credit: Empirical evidence for Ireland', *The Manchester School*, Vol. 75, Number 1, pp.82-103, 2007.
- 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.
- Grossman, V., A. Mack, E. Martinez-Gracia, E. Pavliffis, 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.
- Hendry, D. F. (1995) 'Econometrics and Business Cycle Empirics', *Economic Journal*, 105, 433, 1622-1636.
- 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.
- Lawless M., McQuinn K. and J. Walsh (2017) 'Identifying rent pressures in your neighbourhood: A new model of Irish regional rent indicators'. *Economic and Social Research Institute (ESRI) Working Paper 567*, 2017.

- McCarthy Y. and K. McQuinn (2017). 'Credit conditions in a boom and bust property market: Insights for macro-prudential policy' *The Quarterly Review of Economics and Finance*, Volume 64, pp. 171-182, May.
- Meen, G. (1996). 'Ten Propositions in UK Housing Macroeconomics: An Overview of the 1980s and Early 1990s.' *Urban Studies* 33 (3): 425-44.
- Meen, G. (2000). 'Housing Cycles and Efficiency.' *Scottish Journal of Political Economy* 47 (2): 114-40.
- McQuinn, K. (2014). 'Bubble, bubble, toil and trouble?' An assessment of the current state of the Irish housing market, special article, *Quarterly Economic Commentary*, Summer, Dublin: The Economic and Social Research Institute, August.
- McQuinn K. (2017). The changing relationship between affordability and house prices: A cross-country examination. *Economic and Social Research Institute (ESRI) Working Paper* 560.
- McQuinn K. and C. O'Toole (2017). *Quarterly Economic Commentary*, Autumn, Dublin: The Economic and Social Research Institute, October.
- McQuinn, K. and G. O'Reilly (2007). 'A model of cross-country house prices'. Central Bank of Ireland Research Technical Paper 5/RT/07, 2007.
- 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.
- Morley C., Duffy D. and K. McQuinn (2015). 'A review of housing supply policies, Research article, *Quarterly Economic Commentary*, Winter, Dublin: The Economic and Social Research Institute, December 2015.
- Muellbauer, J. and A. Murphy (1994). 'Explaining Regional House Prices in the UK', University College Dublin, Department of Economics Working Paper No. 94/29.
- Muellbauer, J. and A. Murphy (1997). 'Booms and busts in the UK housing market', *Economic Journal*, 107, 1701-1727.
- Murphy, A. (2005). Modelling Irish house prices: A review and some new results', Nuffield College Oxford. Mimeo www.nuff.ox.ac.uk/Users/MurphyA/Irish%20House%20Prices.zip.
- Peek, J. and J. A. Wilcox. 1991. 'The Measurement and Determinants of Single-Family House Prices', Federal Reserve Bank of Boston Working Paper No. 91-7 (December).
- Roche M. (2003). 'Will there be a crash in Irish house prices?' *Quarterly Economic Commentary: Special Article*, Economic and Social Research Institute (ESRI), Vol. 2003(4-Winter), pp.1-16.
- Roche M. (2001). 'The rise in house prices in Dublin: Bubble, fad or just fundamentals', *Economic Modelling*, Elsevier, Vol. 18(2), pp.281-295, April.
- Rosen S. (1974). 'Hedonic prices and implicit markets: Product differentiation in pure competition', *Journal of Political Economy* 82.1, pp. 34-55.
- Sinai T. and N.S. Soules (2003). 'Owner-occupied housing as a hedge against rent risk', NBER working paper No. 9462, January.

TECHNICAL APPENDIX 1

TABLE A1 LOG OF REAL HOUSE PRICES – MODEL 1

Variable	Coefficient	T-Stat	P-Value
Log (Population)	0.835	5.58	0.00
Log (disposable income per capita)	0.642	9.91	0.00
Log (unemployment rate)	-0.376	-21.22	0.00
$\overline{R^2}$	0.97		

Source: Author's analysis.

Note: Model estimated over the period: 1981:1 – 2017:1.

TABLE A2 LOG OF REAL HOUSE PRICES – MODEL 2

Variable	Coefficient	T-Stat	P-Value
Log (Affordability)	0.756	7.021	0.00
Log (Capital stock per capita)	-1.003	-1.907	0.0584
$\overline{R^2}$	0.77		

Source: Author's analysis.

Note: Model estimated over the period: Q1 1980 – Q1 2017.

TABLE A3 LOG OF REAL HOUSE PRICES – MODEL 3

Variable	Coefficient	T-Stat	P-Value
Log (disposable income per capita)	2.539	14.816	0.00
Log (Capital stock per capita)	-2.704	-7.428	0.00
User Cost of Capital	0.002	0.491	0.624
$\overline{R^2}$	0.91		

Source: Author's analysis.

Note: Model estimated over the period: Q1 1981 – Q1 2017.

TABLE A4 CHANGE IN THE LOG OF REAL HOUSE PRICES – ERROR CORRECTION FORECAST MODEL

Variable	Coefficient	T-Stat	P-Value
Error Correction Term (t-1)	-0.046	-4.181	0.00
Change in the log of House Prices (t-3)	0.300	4.133	0.00
Change in the log of House Prices (t-4)	0.374	5.165	0.000
Change in the log of Affordability	0.121	2.209	0.029
$\overline{R^2}$	0.38		

Source: Author's analysis.

Note: Model estimated over the period: Q2 1981 – Q1 2017.

TABLE A5 LOG OF REAL HOUSE PRICES – MODEL 3 AUGMENTED TO INCLUDE CREDIT SUPPLY

Variable	Coefficient	T-Stat	P-Value
Log (disposable income per capita)	2.549	14.920	0.00
Log (Capital stock per capita)	-2.917	-7.726	0.00
User Cost of Capital	0.0001	0.127	0.898
Log (Adjusted LTV)	0.417	1.849	0.066
$\overline{R^2}$	0.91		

Source: Author's analysis.

Note: Model estimated over the period: Q1 1981 – Q1 2017.

TECHNICAL APPENDIX 2

In this appendix, the error correction model used to generate the house price forecasts in Section 3.1 is described. The model can formally be summarised as follows:

$$\Delta p_t = \left(p_{t-1} - \beta_0 - \beta_{t-1} A_{t-1} - \beta_{t-2} \frac{CAP}{POP}_{t-1} \right) + \sum_{k=1}^4 \Delta p_{t-k} + \sum_{j=0}^4 \Delta a_{t-j} + \sum_{j=0}^4 \Delta \frac{CAP}{POP}_{t-j} \quad (A1)$$

where p refers to the log of real house prices, $\frac{CAP}{POP}$ is the log of the ratio of capital stock to population. For the short-run variables we specify a four-quarter lag length, given that the data are quarterly. a_t is the log of A_t the annuity formula used in McQuinn and O'Reilly (2008) and defined as equation (2) in the text:¹⁶

$$A_t = \omega Y_t \left(\frac{1 - (1 + R_t)^{-\tau}}{R_t} \right) \quad (A.2)$$

For the parameters, we assume a 25-year structure for the term while we assume 28 per cent of income (ω) goes on the mortgage repayment. Both of these assumptions follow from the in depth analysis of Irish loan-level data in McCarthy and McQuinn (2017). The interest rate used is obtained by weighting the mortgage interest rates on loans for less than one year, between one and five years and for over five years by the corresponding volume of loans as published by Central Bank of Ireland.¹⁷

The results of the model are presented in Table A4. The Hendry (1995) 'general to specific' approach is adopted in that variables which are not significant at the 5 per cent level are dropped from the final model. This results in three short-run variables remaining; the change in house prices at lag length 3 and 4 and the contemporaneous change in affordability. All three variables have positive coefficients denoting that any increases in these variables will put upward pressure on house price inflation. The error correction term itself is 4.6 per cent; this indicates that where there is a deviation between the actual and long-run house price, 4.6 per cent of this gap is corrected for each quarter. This equates to an annual error correction term of almost 20 per cent, which is common in the literature. The t-statistic on the error correction term is also significant indicating that the specification of an error correction model is warranted.

¹⁶ This does assume that on average all housing transactions have some degree of mortgage credit.
¹⁷ www.centralbank.ie/statistics/data-and-analysis/credit-and-banking-statistics/retail-interest-rates.