ESRI
www.esri.ie

Working Paper No. 291

April 2009

Measuring House Price Change

David Duffy[1]

Corresponding Author: david.duffy@esri.ie

[1] I am grateful to Ronan Lyons, daft.ie, Siobhan Moloney, Sherry FitzGerald, Alan Barrett and Pete Lunn, ESRI for comments on earlier drafts.

Measuring House Price Change

1. Introduction

With house prices falling in countries such as the US, the UK and Ireland, the issue of house price measurement has emerged as a key issue for these and other economies. A number of approaches exist but this can result in different information being provided on both the timing of house price declines and on the extent of these declines. Such differences can add to the overall uncertainty surrounding housing markets, thereby leading to a further dampening in demand in the short run as risk-averse potential buyers stay on the fringes of the market.

As with many economic statistics, the measurement of house prices is challenging. No two dwellings are identical. It can be difficult to observe reliably a price unless the dwelling is actually sold. Generally, houses are only sold infrequently and so in any time period prices are not observed for most houses. House sales usually are the result of negotiation and so the eventual sale price may differ considerably from the advertised price.

Measuring the direction of house price change is important. Housing contributes to individual wealth and so may influence consumer confidence and spending. The construction sector is an important source of employment. House prices have a key role to play in the measurement of the affordability of home ownership. House price change also influences the decision to build new houses (supply) as well as the decision to either trade up or down or to decide to become a homeowner (demand).

A number of different house price measures now exist. Probably the simplest approach to measuring house prices is to use the average or the median of all house prices observed in a particular period. An alternative approach is the repeat sales methodology. Finally, there are measures using hedonic regression to control for differences in the mix of properties transacted in each period. A number of existing papers have examined the performance of alternative measures, for example Case, Pollakowski and Wachter (1991), and Crone and Voith (1993), amongst others. Alternative methodologies have been reviewed in an Irish context by Conniffe and Duffy (1999). In general, these papers do not find in favour of the simple average approach but instead prefer a methodology that attempts to take account of the changing mix of properties transacted in each period.

More recently the changing fortune of housing markets has prompted interest in why alternative measures can give different results. An example of this in the context of the UK market is Thwaites and Wood (2003). In this paper, we explore the issue of different approaches to house price measurement with reference to the Irish situation. We show what a number of measures have reported in recent years on changes in house prices and assess the relative merits of the approaches. This allows us to compare the results and to assess the extent to which different approaches produce different impressions of dynamics in the housing market.

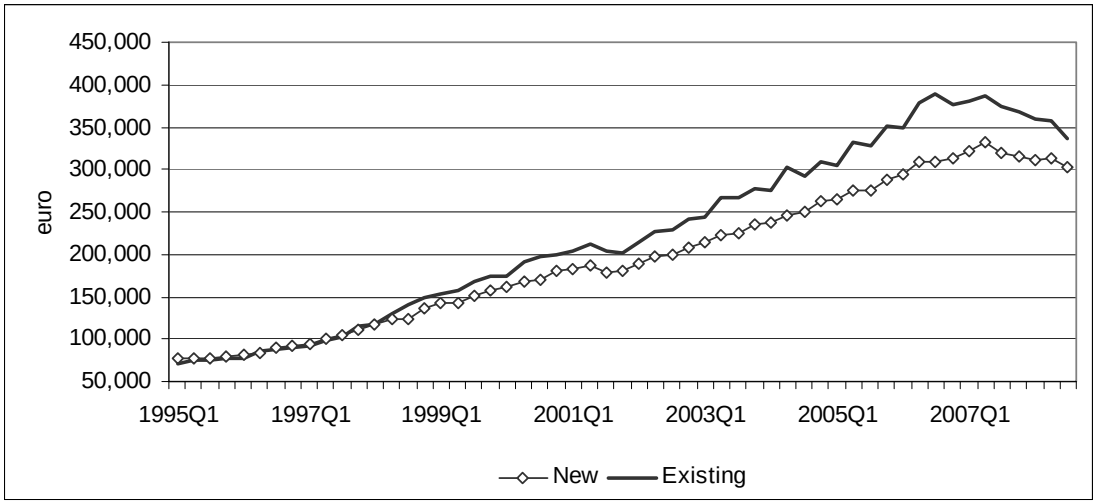
2. Average Price Measure

The Department of Environment, Heritage and Local Government (DOEHLG) produces an average price measure for the Irish housing market based on new and existing house prices at the loan approval stage, the data for which is returned by the mortgage lending institutions. House prices are observed either due to a sale or a re-mortgaging. Use of the average price ignores the impact of changes in the mix of houses between periods. Given that the measure is based on returns from all the mortgage lenders it is hoped that with a large number of transactions the sample composition of houses will be sufficiently similar across time to give a reasonably accurate measure of price changes.

Figure 1 shows the quarterly average price for new and existing houses provided by the Department of Environment. The estimated average price of a new house rises from €77,700 in Quarter 1, 1995 to €301,680 in Quarter 3, 2008, an increase of 288 per cent. The average price of an existing house rose from €70,700 to €356,600 over the same period, an increase of 375 per cent. At their peak average new house prices were 327 per cent higher than quarter 1, 1995, while the average price of an existing dwelling was 451 per cent higher.

Even though the average price has risen substantially there are a number of downward segments. This is especially the case in the series for existing houses. Even though the general trend in the average price of existing houses was upward, the estimates suggest that there also were short periods of decline. While seasonal factors may play a role, the data is not seasonally adjusted by the Department, it is also likely that the downward segments reflect some changes in the mix of properties sold in each period. Finally, the need to collate the data from all the mortgage lenders results in a lag before publication of the average price. However, one of the benefits of the average price series from the Department of Environment is that it provides data on house prices since the early 1970s.

Figure 1: New and Existing Houses, Average Price, Department of Environment

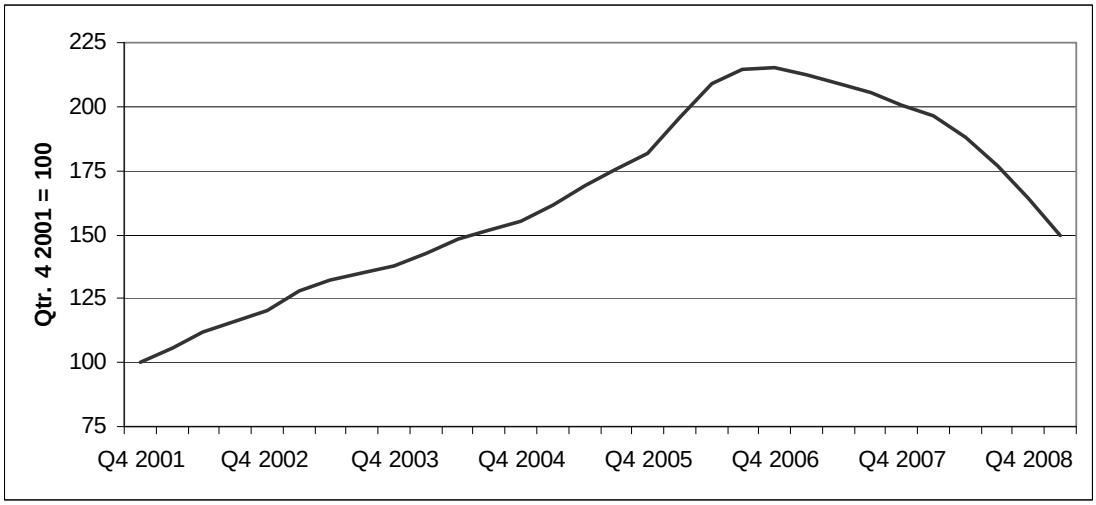


Source: Department of Environment, Heritage and Local Government, *Housing Bulletin*

3. Repeat Valuation Measure

One of the main problems using average price as a measure is its inability to control for the changing quality or changing mix of properties that are sold in each period. An attempt to avoid these problems in an Irish context is the Sherry FitzGerald barometer of house prices. The price of a sample of properties that sold in a particular period is re-valued each quarter and these valuations are used to construct a house price index for existing houses. An implicit assumption underlying this approach is that a house's quality remains broadly the same over time and so any change in a house's price or valuation is due to change in market prices. Figure 2 shows the index values for the Sherry Fitzgerald which shows that house prices have increased substantially between quarter 4 2001 and the peak in quarter 3 2006.

Figure 2: Existing Houses, National, Sherry FitzGerald, Repeat Valuation



Source: Sherry FitzGerald

Repeat valuation of a fixed sample of properties ensures that the mix does not change between time periods. However, the requirement of constant quality is more difficult. Over time, houses age and can become run down. Alternatively, homeowners spend money on repair, maintenance and improvement. If this investment maintains the quality of the dwelling it serves to aid the accuracy of the repeat valuation measure. If the money spent on home improvement increases the quality of their home then this methodology may not capture the full extent of the price change. Statistics show that in 2008 it is estimated that €5,088.2 million was spent on repair, maintenance and improvement (CSO, 2008). Given that the prices are based on a valuation there may also be a subjective element to the values recorded. Despite the limitations the repeat valuation measure produced for the Irish housing market does have the advantage of timeliness.

4. Hedonic Regression Measures

This approach is widely used in house price research and is the methodology adopted for both the Halifax and Nationwide house price indices in the UK. These series are

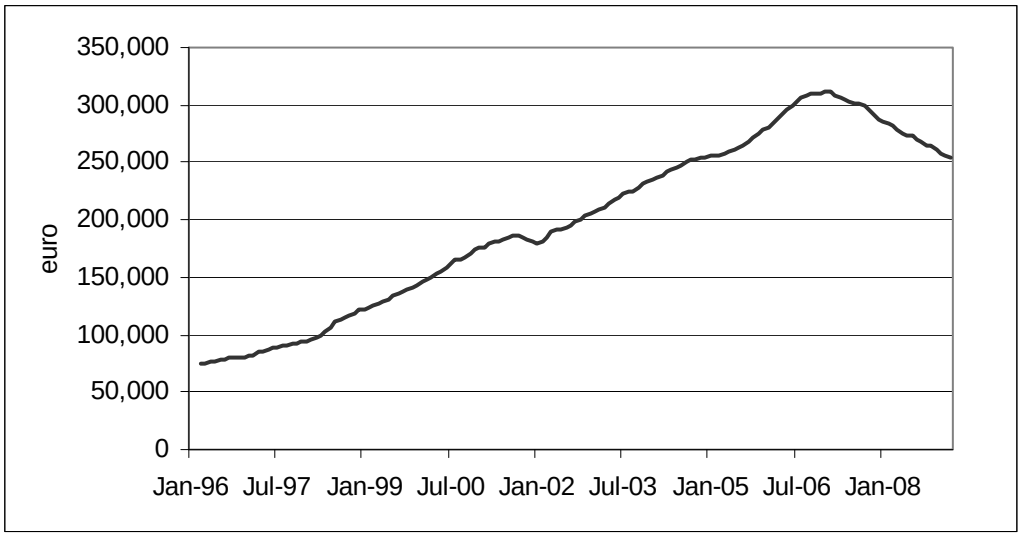
well established and now provide data on the UK housing market from the early 1980s.[2]

The hedonic methodology is characterised by valuing goods for the attributes they possess. In the case of housing, prices will reflect the valuation placed by a purchaser on the particular set of physical and locational attributes possessed by the property they wish to buy. Prices are disaggregated into their constituent parts using multivariate regression analysis. This permits the estimation of the change in average price from one period to another on a standardised basis. Standardisation allows for the varying mix of characteristics between different time periods and is achieved by applying a representative set of weights corresponding to the numbers of each characteristic observed in a base period. For the *permanent tsb* House Price Index the original base period was 1996, although the index has since been updated using 2003 weights. The index numbers represent the movement in average prices for houses possessing the same characteristics as those bought in the base period and are calculated by comparing the weighted (i.e mix-adjusted) prices in each current period with the weighted average price in the base period.

A challenge to establishing a price measure using the hedonic methodology is that it has very onerous data requirements. Not only does it require a high number of transactions but it requires data on the individual characteristics of each dwelling.
The permanent tsb index is based on the 'hedonic' approach to price measurement. On a monthly basis hedonic regressions are run to estimate the individual price of the dwelling characteristics included in the regression equation[3]. A regression equation is run separately for each of the main indices produced by permanent tsb – Dublin, Outside Dublin, National, New, Existing, First-Time Buyer, and Repeat Buyer. For each of these a price is calculated based on the base characteristics and the currently estimated characteristic prices. Data is available from the start of 1996.

[2] For details on the Halifax index see Fleming and Nellis (1984) or Fleming and Nellis (1985).
[3] In the case of the permanent tsb the regression equation is a series of dummy variables taking the value of 1 for the following: first-time buyer, semi-detached, terraced, new dwelling, has a garage, solid fuel heating, located in an urban high, medium or low price area, located in a rural high, or low price area. The property size, measured by square footage, is entered as a continuous variable.

Figure 3: National House Price, Constant Quality, permanent tsb

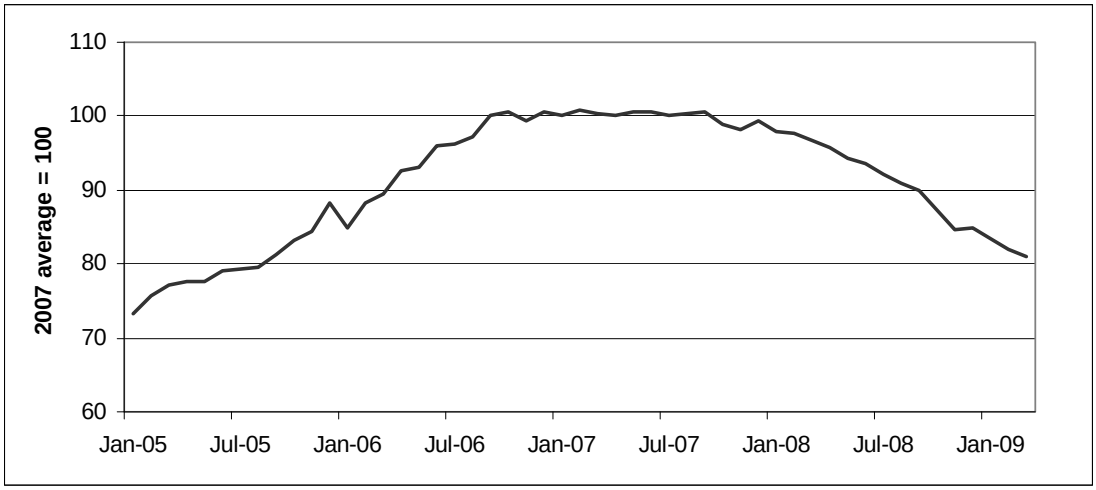


Source: permanent tsb

Figure 3 shows national house prices as estimated by the permanent tsb house price index between 1996 and 2008. As outlined, the bundle of characteristics is weighted by values in 2003. The results show that the price of a house rose from €75,000 in March 1996 to €253,000 in March 2009, an increase of 237 per cent. At their peak house prices as measured by permanent tsb were 314 per cent higher than March 1996.

The hedonic regression methodology is also used by the property website daft.ie to produce a measure of house prices based on the asking price of properties that are advertised on their website which have between 1 and 5 bedrooms. The index is calculated using information on property type, number of bedrooms and bathrooms, as well as location identifiers and a series of location and property type interactions, location and number of bedroom interactions, and number of bedroom and bathrooms interactions. The location identifiers include a number of Dublin region and city identifiers, the other main cities and separate location variables for the rest of the country. The weight of each county and local authority area in Census 2006, as measured by the number of households, determines its weight in the daft.ie index. The annual average of 2007 is used as the base. The annual sample for 2008 was just under 150,000 properties, a monthly average sample size of 12,500. Asking prices in March 2009 were 16.3 per cent lower than the same month a year previously.

Figure 4: Asking Price, Residential Sales, Constant Quality, daft.ie



Source: daft.ie

5. What do the Alternative Irish House Price Measures Show?

This section compares examples of each of the types of measures. Figure 5 shows the level of house prices in Ireland as measured by the alternative methods. Over the longer term the different measures show a similar trend – rising prices until around the beginning of 2007. In the short-term some differences emerge. The Sherry FitzGerald Barometer indicates that prices peaked in quarter 3, 2006 and also indicates a higher peak for house prices, while the daft.ie index indicates that asking prices were slower to adjust to the downturn in the market.

Figure 5: Trends in Irish House Prices, 2005 = 100

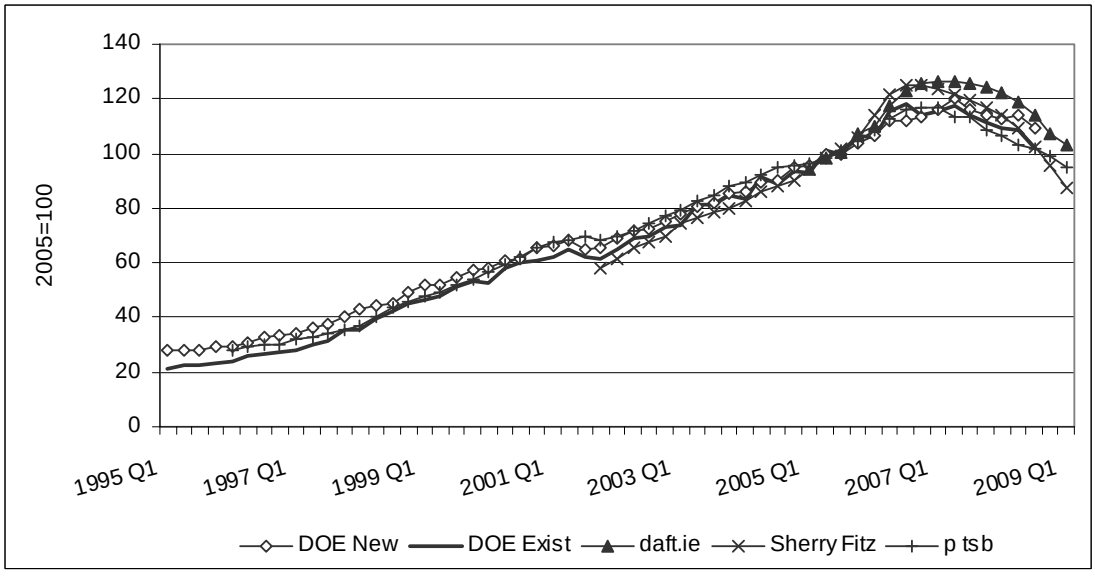


Figure 6 shows house price inflation as measured by these alternative methods. Estimates of the annual decline in quarter 3 2008 range from -5.5 per cent for the average price of new houses to -14 per cent based on the repeat valuation of existing properties. Data from permanent tsb, daft.ie and Sherry FitzGerald for quarter 1, 2009 show that the downward trend continued, although the estimates range from -11 per cent to -23.8 per cent. While this comparison shows trends over time it is hampered

by the fact that the different measures use different prices. The Department of Environment uses the price at loan approval stage, daft.ie is based on asking price, Sherry FitzGerald is an estimate of the selling price, while permanent tsb data uses the agreed sale price.

Figure 6: Irish House Price Inflation

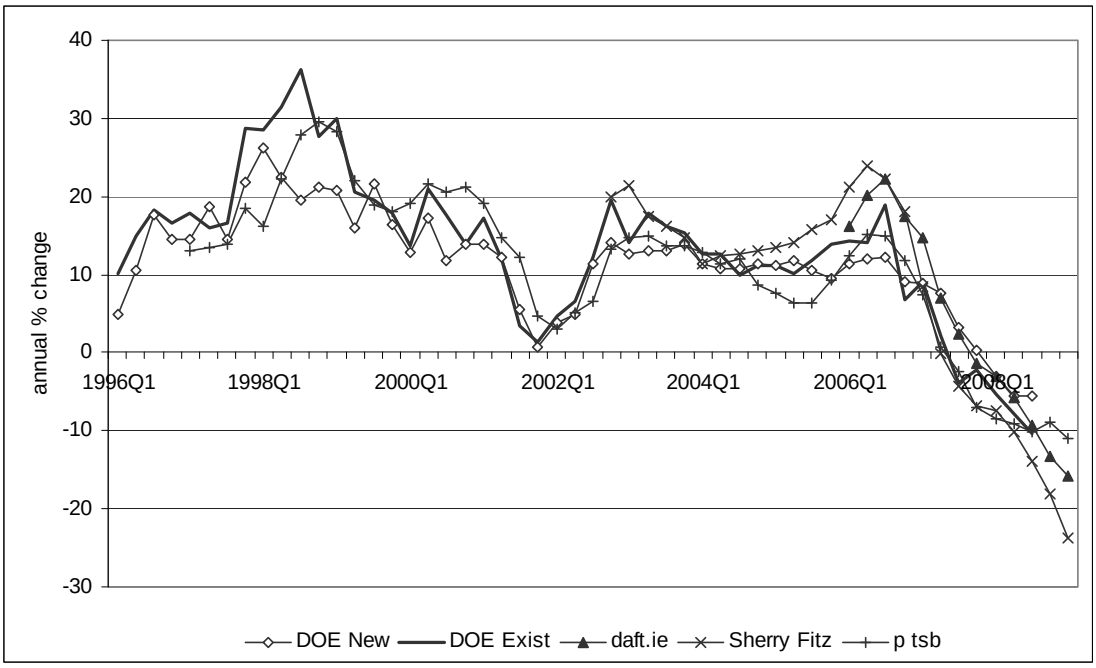


Table 1: Alternative house prices measures, changes from peak

Methodology	Source	Peak	Decline from peak to date	Latest data
			%	
Average Price - New	DoE	Q2 2007	-9.1	Q3 2008
Average Price - Existing	DoE	Q3 2006	-13.9	Q3 2008
Hedonic Agreed Price	permanent tsb	January 2007	-18.5	March 2009
Hedonic Asking Price	daft.ie	February 2007	-19.7	March 2009
Repeat Valuation	Sherry FitzGerald	Q4 2006	-30.2	Q1 2009

6. Why might the measures differ?

Although the measures show similar trends there are differences in the reported performance of the Irish housing market and these have given rise to some concerns. Some of the difference results from the fact the methodologies are not the same and the point in the transaction cycle at which the house price is measured also varies. A number of other explanations may also be put forward and the contribution of these is outlined below.

The permanent tsb index value that is published is a 3 month moving average, and is based on the price paid for the dwelling. A transaction features in the index when the mortgage is drawn down. Thus, there is a lag between agreement of the sale price and when that sale price enters the index. It is possible that this lag has lengthened as the

market has slowed. While use of price at the loan approval stage might serve to reduce this lag such an approach is not without its own difficulties. Data collected at the loan approval stage may not proceed to completion or may ultimately proceed with another lender. While approval may be sought for a particular property the final transaction may be on a different property.

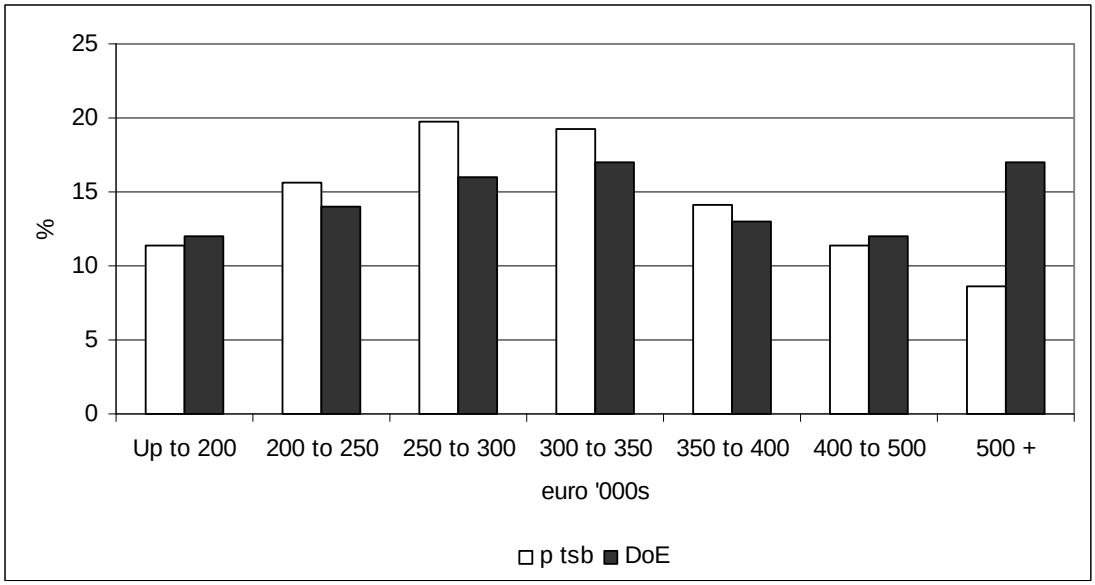
The daft.ie index is calculated using asking price. However, one of the difficulties measuring house price is that in many cases the final agreed price may differ, sometimes substantially, from the advertised sale price. If the transaction is a private treaty sale the final price may not be made public. During the Irish market boom period many media reports highlighted the extent to which the advertised sale price was exceeded at auction. It now seems likely that the reverse is occurring during the downturn.

Any of the methodologies may be biased if estimated using unrepresentative samples. Indices based on mortgage datasets may be subject to some sample selection bias as they are dependent on the lenders' mortgage book and so may depend on how competitive that lender is. With regard to permanent tsb they are a sizeable lender and account for over 20 per cent of mortgages in the Irish market. Indices that are based on mortgage data will exclude cash transactions from their datasets. It is difficult to obtain numbers for such transactions. DKM Economic Consultants (2001) estimated that 29 per cent of transactions were non-mortgage based. This would be important if the samples used to construct indices do not include dwellings that have similar characteristics to dwellings purchased without a mortgage.

As a first step we look at how representative the permanent tsb sample is and how the weights used for the hedonic regressions have changed in recent times. We can compare some aspects of the *permanent tsb* data set to the annual data from the Department of the Environment. The Department's data is based on mortgage loan approvals, while the permanent tsb dataset is based on house prices for which mortgages have been drawn down. The Annual Housing Bulletin represents the main data source against which we can compare the dataset for the index. The analysis shows that Munster and the "Rest of Leinster" are somewhat over-represented in the sample of new houses, while Dublin is under-represented. New houses account for a smaller proportion of *permanent tsb* transactions than of the Department of the Environment total. Despite this the average price of new houses, both nationally and in Dublin, is very similar. The *permanent tsb* average price for existing houses is significantly lower than the Department's average, possibly reflecting some underrepresentation of very expensive transactions in the *permanent tsb* sample.

We can also compare the distribution of prices. This confirms the suspicion that the difference in the price of existing houses is at least partly due to underrepresentation in the permanent tsb sample of very expensive transactions. This may also account for some of the criticisms of the index – what happens to the price of expensive properties may attract disproportionate coverage.

Figure 7: Second-Hand House Price distribution, 2007 data



The *permanent tsb* index is currently weighted using 2003 proportions or absolute values for the different variables in the regression equation. If major changes in buying patterns had occurred since the base period then this would mean that the index did not fully reflect what is happening in the market. A comparison of the 2003 weights with weights for 2007 shows that although there have been some changes in buying patterns for the most part there has not been major changes. That having been said there is a noticeable change in the square footage and dwellings located in the urban high price band which would make a smaller contribution to the index if the index were rebased.

If we examine the distribution of dwelling size we see that the distribution shifts towards the right with the year 2007 having more properties with a square footage over 4,000. Data for other years suggests that although the average for 2007 is unusually high the average house size has trended upwards.

Figure 8: House size distribution, permanent tsb data, 2003 and 2007

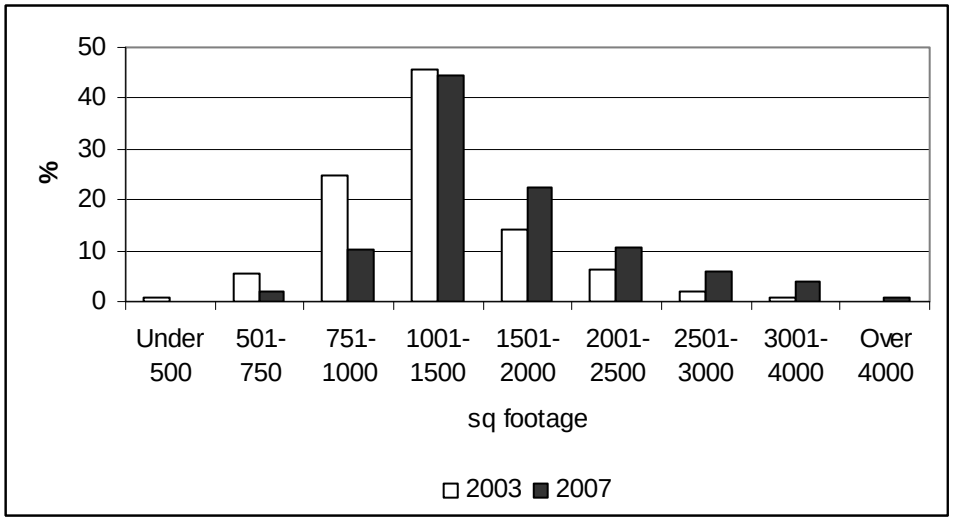
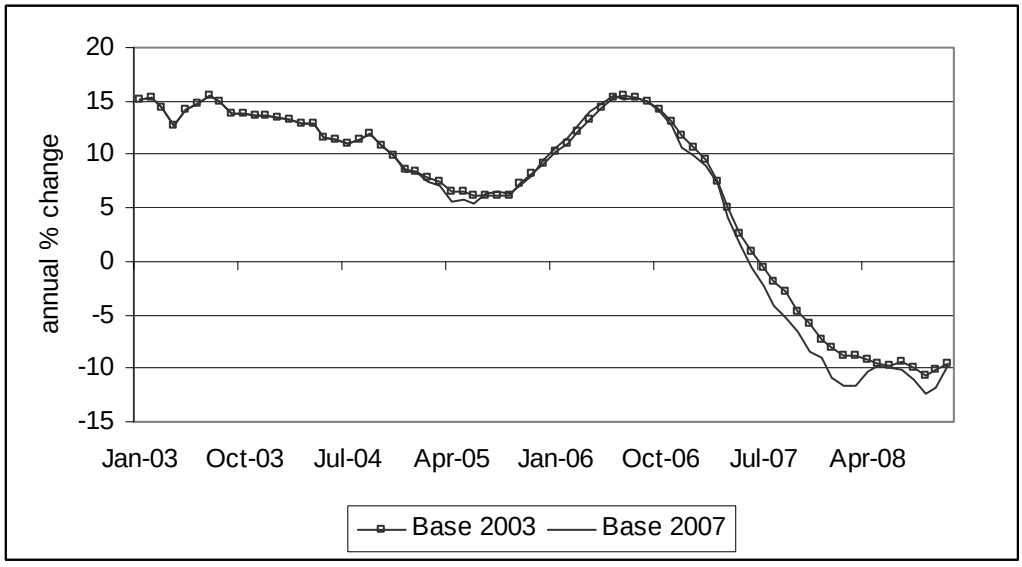


Figure 9 shows the impact of rebasing the national index to base year 2007. As is evident rebasing does have an effect and would have produced a sharper fall in prices. This is most noticeable in early 2008 at a time when criticism of the permanent tsb index began to mount.

Figure 9: House Price inflation, Alternative bases



The number of characteristics included in the hedonic function underlying the house price index is fairly small. An implication is that while the index appropriately adjusts for changes in major characteristics, such as house size or presence of a garage, it may not be able to adjust for changes in unobserved characteristics, such as improvements or declines in the quality of materials used in construction or in construction techniques. For example, as the property market started to slow in Ireland there were increasing reports of incentives to attract buyers, such as fitted kitchens. The index does not record fitted kitchens as a major characteristic and so house price growth as measured by the index may not have slowed as quickly as the market.

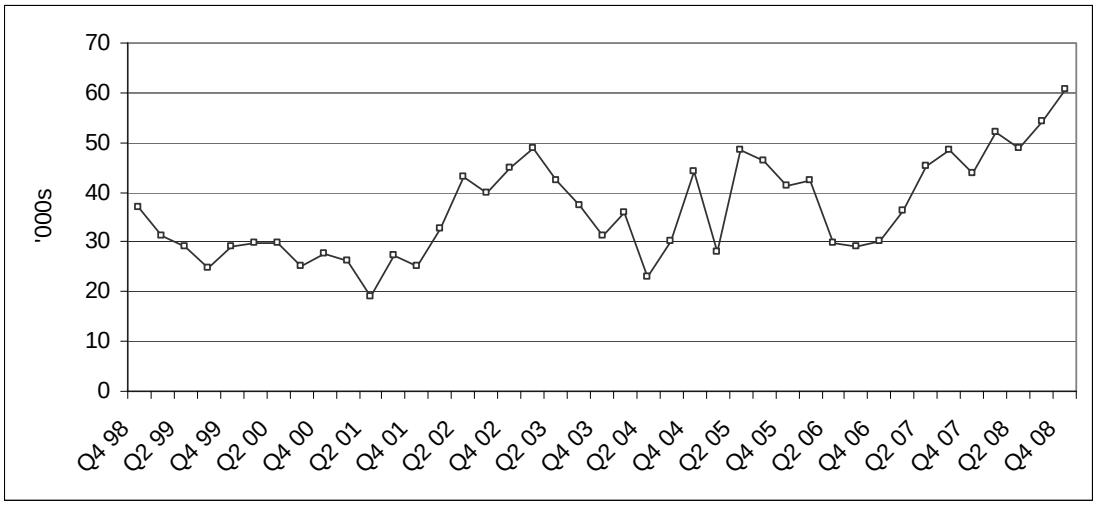
It is also true that many hedonic indices record the presence of an attribute but do not record the quality of this attribute. In keeping with the example above a fitted kitchen could cost €10,000 or could cost €50,000. This difference is not measured in many cases. If such unobserved characteristics were more common in dwellings that sell at certain phases of the price cycle then house price inflation may be over or under stated. In a difficult market it could be argued that those houses that sell will be of higher quality. If this higher quality is in unobservable characteristics (i.e. fitted kitchen) then this will contribute to the perception that prices are falling faster than the index is estimating.

The above focuses on reasons related to the methodologies. Other possible explanations also exists at an aggregate level. The belief that the measures are somehow underestimating the true extent of the decline in house prices to date may reflect a change in base when switching from calculating a price increase to calculating a price decrease. It is possible that this change in base leads people to misinterpret the current scale of decline relative to the increases reported in previous years. A move in prices from €250,000 to €300,000 represents an increase of 20 per

cent. However, if prices were to fall from €300,000 to €250,000, then this is a smaller change of -16.7 per cent.

A quarterly estimate of the number of households is calculated by the CSO based on the Quarterly National Household Survey. Figure 10 shows the annual change in the number of households based on these estimates. The CSO data suggests that household formation rose steadily. The most recent data shows that the number of households in quarter 4, 2008 was approximately 60,000 new households higher than the same period in 2007. This suggests that households are still being formed even though house prices are declining.

Figure 10: Change in number of households



7. Conclusions

There exist a number of different methodologies for measuring house price change. Each is valid as there are different concepts of house price, such as average price or the price of a typical house. Some of the differences in measured prices or rates of change reflect the fact that the alternative measures use different methodologies, different datasets and measure the price at a different point in the transaction cycle. Indeed, as much of the research on the issue recognises that the different measures provide results that are different for valid reasons a shift is occurring towards identifying the right measure for a particular set of circumstances. An example of this in a UK context is Pryce and Mason (2006) who examine UK house price measures in the context of land planning and housing supply decisions.

Each methodology has advantages and disadvantages. The simple average has the advantage of being easy to construct and easy to understand. In an Irish context it provides the longest time series for house price data. The repeat valuation approach and the asking price index are not constrained by the need for a transaction to occur. The hedonic methodology has the advantage of adjusting for changes in the composition of properties that sell. The measures differ in a variety of ways including approach and when the price is measured. Despite the differences in how they are compiled the paper shows that the different measures tend to follow the same trends over the long run. The main conclusion would be that observers of the housing market should be careful not to over interpret the results of one single measure.

References:

Case, B., H.O. Pollakowski and S.M. Wachter, (1991) On Choosing Among House Price Index Methodologies, AREUEA Journal, Vol. 19, No. 3.

Central Statistics Office (2008) Construction and Housing in Ireland, 2008 Edition, December.

Conniffe, D. and D. Duffy (1999), "Irish House Price Indices: Methodological Issues" *Economic and Social Review*, Vol.30, No.4, October.

Crone, T.M. and R.P. Voith, (1992), Estimating House Price Appreciation: A Comparison of Methods, Journal of Housing Economics, Vol. 2.

DKM Economic Consultants, (2001), Study of House Price Statistics, Report to Dept. of the Environment and Local Government, July.

Fleming M. C. and J. G. Nellis, (1984), *The Halifax House Price Index - Technical Details*, Halifax: Halifax Building Society.

Fleming M. C. and J. G. Nellis, (1985), "The Application of Hedonic Indexing Methods: A Study of House Prices in the United Kingdom", *Statistical Journal of the United Nations*, ECE 3, pp. 249-270.

Pryce, G. and P. Mason (2006), New Horizons programme – Which House Price? Finding the Right measure of House PRICE Inflation for Housing Policy, Technical report, Office of the Deputy Prime Minister, London, April.

Thwaites, G., and R. Wood, (2003), The Measurement of House Prices, Bank of England Quarterly Bulletin, Spring.

Year	Number	Title/Author(s) ESRI Authors/Co-authors *Italicised*
2009		
	290	Intra-and Extra-Union Flexibility in Meeting the European Union's Emission Reduction Targets *Richard S.J. Tol*
	289	The Determinants and Effects of Training at Work: Bringing the Workplace Back In *Philip J. O'Connell* and *Delma Byrne*
	288	Climate Feedbacks on the Terrestrial Biosphere and the Economics of Climate Policy: An Application of *FUND* *Richard S.J. Tol*
	287	The Behaviour of the Irish Economy: Insights from the HERMES macro-economic model *Adele Bergin, Thomas Conefrey, John FitzGerald* and *Ide Kearney*
	286	Mapping Patterns of Multiple Deprivation Using Self-Organising Maps: An Application to EU-SILC Data for Ireland Maurizio Pisati, *Christopher T. Whelan*, Mario Lucchini and *Bertrand Maître*
	285	The Feasibility of Low Concentration Targets: An Application of FUND *Richard S.J. Tol*
	284	Policy Options to Reduce Ireland's GHG Emissions Instrument choice: the pros and cons of alternative policy instruments Thomas Legge and *Sue Scott*
	283	Accounting for Taste: An Examination of Socioeconomic Gradients in Attendance at Arts Events *Pete Lunn* and *Elish Kelly*
	282	The Economic Impact of Ocean Acidification on Coral Reefs Luke M. Brander, Katrin Rehdanz, *Richard S.J. Tol*, and Pieter J.H. van Beukering
	281	Assessing the impact of biodiversity on tourism flows: A model for tourist behaviour and its policy implications Giulia Macagno, Maria Loureiro, Paulo A.L.D. Nunes and *Richard S.J. Tol*

280 Advertising to boost energy efficiency: the Power of One campaign and natural gas consumption
Seán Diffney, Seán Lyons and *Laura Malaguzzi Valeri*

279 International Transmission of Business Cycles Between Ireland and its Trading Partners
Jean Goggin and *Iulia Siedschlag*

278 Optimal Global Dynamic Carbon Taxation
David Anthoff

277 Energy Use and Appliance Ownership in Ireland
Eimear Leahy and *Seán Lyons*

276 Discounting for Climate Change
David Anthoff, Richard S.J. Tol and Gary W. Yohe

275 Projecting the Future Numbers of Migrant Workers in the Health and Social Care Sectors in Ireland
Alan Barrett and Anna Rust

274 Economic Costs of Extratropical Storms under Climate Change: An application of FUND
Daiju Narita*, Richard S.J. Tol, David Anthoff*

273 The Macro-Economic Impact of Changing the Rate of Corporation Tax
Thomas Conefrey and *John D. Fitz Gerald*

272 The Games We Used to Play
An Application of Survival Analysis to the Sporting Life-course
Pete Lunn

2008

271 Exploring the Economic Geography of Ireland
Edgar Morgenroth

270 Benchmarking, Social Partnership and Higher Remuneration: Wage Settling Institutions and the Public-Private Sector Wage Gap in Ireland
Elish Kelly, Seamus McGuinness, Philip O'Connell

269 A Dynamic Analysis of Household Car Ownership in Ireland
Anne Nolan

268 The Determinants of Mode of Transport to Work in the Greater Dublin Area
Nicola Commins and *Anne Nolan*

267 Resonances from *Economic Development* for Current Economic Policymaking
Frances Ruane

266 The Impact of Wage Bargaining Regime on Firm-Level Competitiveness and Wage Inequality: The Case of Ireland
Seamus McGuinness, Elish Kelly and *Philip O'Connell*

265 Poverty in Ireland in Comparative European Perspective
Christopher T. Whelan and *Bertrand Maître*

264 A Hedonic Analysis of the Value of Rail Transport in the Greater Dublin Area
Karen Mayor, Seán Lyons, David Duffy and *Richard S.J. Tol*

263 Comparing Poverty Indicators in an Enlarged EU
Christopher T. Whelan and *Bertrand Maître*

262 Fuel Poverty in Ireland: Extent,
Affected Groups and Policy Issues
Sue Scott, Seán Lyons, Claire Keane, Donal McCarthy and *Richard S.J. Tol*

261 The Misperception of Inflation by Irish Consumers
David Duffy and *Pete Lunn*

260 The Direct Impact of Climate Change on Regional Labour Productivity
Tord Kjellstrom, R Sari Kovats, Simon J. Lloyd, Tom Holt, *Richard S.J. Tol*

259 Damage Costs of Climate Change through Intensification of Tropical Cyclone Activities:
An Application of FUND
Daiju Narita, *Richard S. J. Tol* and *David Anthoff*

258 Are Over-educated People Insiders or Outsiders?
A Case of Job Search Methods and Over-education in UK
Aleksander Kucel, *Delma Byrne*

257 Metrics for Aggregating the Climate Effect of Different Emissions: A Unifying Framework
Richard S.J. Tol, Terje K. Berntsen, Brian C. O'Neill, Jan S. Fuglestvedt, Keith P. Shine, Yves Balkanski and Laszlo Makra

256 Intra-Union Flexibility of Non-ETS Emission Reduction Obligations in the European Union
Richard S.J. Tol

255 The Economic Impact of Climate Change
Richard S.J. Tol

254 Measuring International Inequity Aversion
Richard S.J. Tol

253 Using a Census to Assess the Reliability of a National Household Survey for Migration Research: The Case of Ireland
Alan Barrett and *Elish Kelly*

252 Risk Aversion, Time Preference, and the Social Cost of Carbon
David Anthoff, Richard S.J. Tol and Gary W. Yohe

251 The Impact of a Carbon Tax on Economic Growth and Carbon Dioxide Emissions in Ireland
Thomas Conefrey, John D. Fitz Gerald, Laura Malaguzzi Valeri and *Richard S.J. Tol*

250 The Distributional Implications of a Carbon Tax in Ireland
Tim Callan, Sean Lyons, Susan Scott, Richard S.J. Tol and Stefano Verde

249 Measuring Material Deprivation in the Enlarged EU
Christopher T. Whelan, Brian Nolan and *Bertrand Maître*

248 Marginal Abatement Costs on Carbon-Dioxide Emissions: A Meta-Analysis
Onno Kuik, Luke Brander and *Richard S.J. Tol*

247 Incorporating GHG Emission Costs in the Economic Appraisal of Projects Supported by State Development Agencies
Richard S.J. Tol and *Seán Lyons*

246 A Carton Tax for Ireland
Richard S.J. Tol, Tim Callan, Thomas Conefrey, John D. Fitz Gerald, Seán Lyons, Laura Malaguzzi Valeri and *Susan Scott*

245 Non-cash Benefits and the Distribution of Economic Welfare
Tim Callan and *Claire Keane*

244 Scenarios of Carbon Dioxide Emissions from Aviation
Karen Mayor and *Richard S.J. Tol*

243 The Effect of the Euro on Export Patterns: Empirical Evidence from Industry Data
Gavin Murphy and *Iulia Siedschlag*

242 The Economic Returns to Field of Study and Competencies Among Higher Education Graduates in Ireland
Elish Kelly, Philip O'Connell and *Emer Smyth*

241 European Climate Policy and Aviation Emissions
Karen Mayor and *Richard S.J. Tol*

240 Aviation and the Environment in the Context of the EU-US Open Skies Agreement
Karen Mayor and *Richard S.J. Tol*

239 Yuppie Kvetch? Work-life Conflict and Social Class in Western Europe
Frances McGinnity and *Emma Calvert*

238 Immigrants and Welfare Programmes: Exploring the Interactions between Immigrant Characteristics, Immigrant Welfare Dependence and Welfare Policy
Alan Barrett and Yvonne McCarthy

237 How Local is Hospital Treatment? An Exploratory Analysis of Public/Private Variation in Location of Treatment in Irish Acute Public Hospitals
Jacqueline O'Reilly and *Miriam M. Wiley*

236 The Immigrant Earnings Disadvantage Across the Earnings and Skills Distributions: The Case of Immigrants from the EU's New Member States in Ireland
Alan Barrett, *Seamus McGuinness* and *Martin O'Brien*

235 Europeanisation of Inequality and European Reference Groups
Christopher T. Whelan and *Bertrand Maître*

234 Managing Capital Flows: Experiences from Central and Eastern Europe
Jürgen von Hagen and *Iulia Siedschlag*

233 ICT Diffusion, Innovation Systems, Globalisation and Regional Economic Dynamics: Theory and Empirical Evidence
Charlie Karlsson, Gunther Maier, Michaela Trippl, *Iulia Siedschlag,* Robert Owen and *Gavin Murphy*

232 Welfare and Competition Effects of Electricity Interconnection between Great Britain and Ireland
Laura Malaguzzi Valeri

231 Is FDI into China Crowding Out the FDI into the European Union?

Laura Resmini and *Iulia Siedschlag*

230 Estimating the Economic Cost of Disability in Ireland
John Cullinan, Brenda Gannon and *Seán Lyons*

229 Controlling the Cost of Controlling the Climate: The Irish Government's Climate Change Strategy
Colm McCarthy, *Sue Scott*

228 The Impact of Climate Change on the Balanced-Growth-Equivalent: An Application of *FUND*
David Anthoff, *Richard S.J. Tol*

227 Changing Returns to Education During a Boom? The Case of Ireland
Seamus McGuinness, *Frances McGinnity, Philip O'Connell*

226 'New' and 'Old' Social Risks: Life Cycle and Social Class Perspectives on Social Exclusion in Ireland
Christopher T. Whelan and *Bertrand Maître*

225 The Climate Preferences of Irish Tourists by Purpose of Travel
Seán Lyons, Karen Mayor and *Richard S.J. Tol*

224 A Hirsch Measure for the Quality of Research Supervision, and an Illustration with Trade Economists
Frances P. Ruane and *Richard S.J. Tol*

223 Environmental Accounts for the Republic of Ireland: 1990-2005
Seán Lyons, Karen Mayor and *Richard S.J. Tol*

2007

222 Assessing Vulnerability of Selected Sectors under Environmental Tax Reform: The issue of pricing power
J. Fitz Gerald, M. Keeney and *S. Scott*

221 Climate Policy Versus Development Aid
Richard S.J. Tol

220 Exports and Productivity – Comparable Evidence for 14 Countries
The International Study Group on Exports and Productivity

219 Energy-Using Appliances and Energy-Saving Features: Determinants of Ownership in Ireland
Joe O'Doherty, *Seán Lyons* and *Richard S.J. Tol*

218 The Public/Private Mix in Irish Acute Public Hospitals: Trends and Implications
Jacqueline O'Reilly and *Miriam M. Wiley*

217 Regret About the Timing of First Sexual Intercourse: The Role of Age and Context
Richard Layte, Hannah McGee

216 Determinants of Water Connection Type and Ownership of Water-Using Appliances in Ireland
Joe O'Doherty, *Seán Lyons* and *Richard S.J. Tol*

215 Unemployment – Stage or Stigma? Being Unemployed During an Economic Boom
Emer Smyth

214 The Value of Lost Load
Richard S.J. Tol

213 Adolescents' Educational Attainment and School Experiences in Contemporary Ireland
Merike Darmody, Selina McCoy, Emer Smyth

212 Acting Up or Opting Out? Truancy in Irish Secondary Schools
Merike Darmody, Emer Smyth and *Selina McCoy*

211 Where do MNEs Expand Production: Location Choices of the Pharmaceutical Industry in Europe after 1992
Frances P. Ruane, Xiaoheng Zhang

210 Holiday Destinations: Understanding the Travel Choices of Irish Tourists
Seán Lyons, Karen Mayor and *Richard S.J. Tol*

209 The Effectiveness of Competition Policy and the Price-Cost Margin: Evidence from Panel Data
Patrick McCloughan, *Seán Lyons* and William Batt

208 Tax Structure and Female Labour Market Participation: Evidence from Ireland
Tim Callan, A. Van Soest, *J.R. Walsh*

207 Distributional Effects of Public Education Transfers in Seven European Countries
Tim Callan, Tim Smeeding and Panos Tsakloglou