Price signals in illiquid markets: The case of residential property in Ireland, 2006-2012

Ronan C. Lyons

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Abstract How do list and sale prices relate to each other over the market cycle? Using a dataset of over 650,000 Irish property listings and transactions between 2006 and 2012, this research examines the relationship between list and sale prices. It applies hedonic methods and exploits information on time-to-sell and time-to-drawdown to decompose the gap between list and sale prices into four spreads: the selection spread, capturing the price difference between properties that sell and all listings; the matching spread, which reflects time-to-sell and is countercyclical; the drawdown spread, reflecting administrative costs; and the counteroffer spread, which is the closest counterpart to a bid-ask spread in the housing market and is procyclical.

Keywords: Housing markets; Search and match; Valuation accuracy.

JEL Classification Numbers: R3, G12, D12, D83.

*Department of Economics, Trinity College Dublin (ronan.lyons@tcd.ie), Balliol College, Oxford and Spatial Economics Research Centre (LSE). This is a draft working paper and thus is subject to revisions, so please contact the author if you intend to cite this. The research presented here would not be possible without the extensive work carried out by, and cooperation of, members of the Financial Stability Unit at the Central Bank of Ireland, in particular Tara McIndoe-Calder, in constructing the CBI dataset, and also to Paul Conroy (Distilled Media) for maintaining the daft.ie dataset. Sincere thanks are also due to John Muellbauer for his advice, and I would like to thank three anonymous referees and participants at the following conferences for helpful comments: AREUEA National Conference (May 2013), European Real Estate Society (July 2013), and the Irish Economic Association (May 2013). The usual disclaimer applies.

1 Introduction

Trends in residential house prices matter. They are of interest not only to economists, but also to policymakers and consumers, given the dominant role of housing both as a consumption good and as a vehicle for household investment. The Global Financial Crisis starting in 2007 underscores the importance of understanding housing markets, in particular if macro-prudential policy hopes to identify when conditions in the housing market change and bubbles emerge.

Unlike other financial markets, the matching process in housing is a process that can take months and can fail entirely, particularly during market downturns. The lack of fungibility and liquidity in housing means that statistics relating to the market are patchy and rarely comparable across countries (Malpezzi, 2003; Warnock and Warnock, 2012).[1] This makes it all the more difficult for economists, policymakers and consumers to identify when the housing market may be overheating.

Despite its potential significance, the relationship between list and sale prices for housing has been the focus of only a handful of studies to date. In the very first issue of the Journal of Real Estate Research, Miller and Sklarz (1986) highlight the gap between the two as one of five leading indicators in the housing market. However, their analysis – and their call for future research – has largely gone unheeded. The contribution here is an attempt to belatedly answer their call.

Of all developed countries, Ireland has probably witnessed the most severe housing market bubble of the last two decades, with prices rising four-fold in the decade to 2007, before falling 50%. This research uses two population-level datasets of the Irish housing market, over the period 2006-2012, to investigate in detail the relationship between aggregate list and sale prices. It takes as its starting point two pieces of conventional wisdom about the housing market, which would appear to conflict in a market downturn. Firstly, it is expected that in a downturn sale prices will be below list prices, while secondly, it is often asserted that list prices are a lead indicator of sale prices.

The analysis here shows that both were true for Ireland during the period 2006-2012. This somewhat contradictory finding is explained by disentangling the relationship between the two series into four main components, the bulk of the analysis undertaken here. The first of the four is the selection spread, where properties that ultimately go on to find a seller

[1] In the EU, even the introduction of residential house prices – typically the largest single component in a national basket of consumer goods – into the harmonised index of consumer prices (HICP) is a twenty-year project due to come to fruition in 2018 (O'Hanlon, 2011).

are listed at lower prices. The matching spread, secondly, reflects how much house prices change between when a property is listed and it is sale agreed. The third component is the counteroffer spread, reflecting whether the sale price achieved is higher or lower than the list price, focusing only on those listings that result in a sale and adjusting for time-to-sell. This is the closest to a bid-ask spread in housing. The final component is the drawdown spread, reflecting how prices change between when a property is sale agreed and when the mortgage is actually drawn down; this is largely an administrative cost.

The paper is structured as follows. The next section presents a more formal discussion of these spread, while Section 3 discusses some of the related literature on this topic. Section 4 describes the two datasets used here, Central Bank of Ireland (CBI) and daft.ie, and Section 5 describes the empirical specifications employed. Section 6 presents the results of the analysis, showing estimates for each of the four spreads for the Irish housing market 2006-2012, while the final section concludes.

2 Theory

Housing is in effect a very high-dimension composite good, comprising a bundle of property-specific attributes and location-specific amenities. Not only can each property vary in each composite good, but so too can consumer tastes. The fact that only bundles of these composite goods are available leads to frictions, which mean that it may take a property a significant period of time to sell. This is contrast to most other financial markets and indeed consumer markets.

Suppose there are two datasets: the first contains all properties listed for sale and their list price (p_L), while the second contains all properties sold and their (mortgage-backed) transaction price (p_M). A stylised transaction from the housing market might be as follows. In month 1, a property is listed by its seller. At this point, a list price is revealed. A list price index would use such information, and in that index, this property enters into the list price index in month 1. In month 4, the property has found a buyer whose offer is accepted. The status of the property is changed to "sale agreed". At this time, the bank makes its valuation, upon which the mortgage amount is based. In month 6, the transaction is completed, when the mortgage is drawn down. This property thus enters into any sales price index in month 6.

The issue in assessing valuation accuracy is immediately apparent, as this typically involves comparing the valuation from month 1 with the transaction in month 6. What is

needed instead is a comparison of what the seller's valuation would have been in month 4 with the buyer's valuation at the same time. Where the goal is to make like-for-like comparisons of seller and buyer valuations, neither a published list price index, in which the property described above will enter in month 1, nor a sales price index, in which it enters in month 6, is using the correct information at the correct time.

More formally, there are four distinct market processes that take place over three time periods, the time of listing ($t = 0$), the time when a sale and price are agreed ($t = \upsilon$), and the time when the mortgage is drawn down ($t = \tau$). List prices are denoted by p_L while mortgage-based transaction prices are denoted by p_M, where $\bar{L}$ refers to only those listings that result in a transaction (and hence a mortgage being drawn down). A price spread can be described for each of the four steps:

1. the "selection spread", $p_L(0)/p_{\bar{L}}(0)$: what is the point-in-time list-price difference between all properties that are listed and those that subsequently are sale-agreed?

2. the "matching spread", $p_{\bar{L}}(0)/p_{\bar{L}}(\upsilon)$: what is the point-in-time list-price difference between newly listed properties that go on to be sale-agreed and those are that are sale-agreed?

3. the "counteroffer spread", $p_{\bar{L}}(\upsilon)/p_M(\upsilon)$: what is the point-in-time difference between the list-price of properties that are sale-agreed and the transaction-price of properties at the time of their valuation?

4. the "drawdown spread", $p_M(\upsilon)/p_M(\tau)$: what is the point-in-time transaction-price difference between properties that are being valued and those whose mortgage is being drawn down?

The counteroffer spread is the closest equivalent to a bid-ask spread in the housing market, due to the frictions involved. It is also the only comparison of the four that uses both datasets.

3 Literature

A number of papers examine the accuracy of valuations in the commercial real estate sector; see Crosby (2000) and Dunse et al. (2010) and references therein. However, the literature comparing list and sale prices in residential housing is small. To our knowledge, there is no paper for either sector that decomposes the gap between list and sale prices into various

components, as is done here. Nonetheless, a number of papers touch on issues related to the spreads outlined in the introduction (and explained in more detail in Section 2); these are described below.

Adjusting valuations to take account of time-to-sell is an issue that has been highlighted by a number of authors on commercial real estate. Matysiak and Wang (1995) suggests some tentative findings in relation to how valuations and sale prices are related across the market cycle, namely that valuers undervalue in rising markets and overvalue in falling markets. Complicating this analysis, however, is the fact that valuations took place between three and six months prior to the sale. As Crosby (2000) notes, this affects the comparability of valuations and sale prices. The analysis presented here exploits information on listing and sale-agreed dates to adjust valuations for time-to-sell.

The selection spread presented here is related to a point raised by Jud and Seaks (1994) among others, namely that a house price index based on sales will not be representative of housing values more generally, where a sample selection bias exists in properties that are sold. Using a Heckman-style two-stage model, they document such a selection bias, using a decade of sales and property tax returns for Greensboro, North Carolina. The comparison in Jud and Seaks (1994) is between all properties and those that successfully sell, while in this research, the selection spread refers instead to all listings versus those that successfully sell.

The earliest paper that structurally compares both list and sale prices of residential property is Genesove and Mayer (2001), which examines the gap between the two for a sample of just under 6,000 downtown Boston condominiums, during the period 1990-1997. Their focus is not directly on the gap between the two; rather they examine the relationship between list price, sale price and loss aversion. Their principal finding is that a 10% increase in a prospective loss leads a seller to set a list price roughly 3% higher, everything else being equal. Related to this, they find evidence that "list prices do not immediately adjust to changes in market prices".

In comparing the Swiss National Bank's median-based house price index using listings (both newspaper and online) with a hedonic index based on sale prices over the period 1985-2006, Bourassa et al. (2008) outline some concerns relating to the use of datasets of list prices. One of these is that the spread between list and sale prices is likely to vary depending on the state of the housing market. This is the issue addressed in this research.

Shimizu et al. (2012) compare the distribution of properties across different datasets for Japan and conclude that – once like-for-like comparisons are being made across the datasets

– there are no substantial differences between list prices and price registers. This appears to follow from a stylised fact of the literature on constructing house price indices: hedonic techniques are needed (Knight et al., 1995; Wallace and Meese, 1997).[2]

More recently, a paper by Haurin et al. (2013) examines the relationship between list and sale prices over the market cycle in Belfast (Northern Ireland), 2002-2009. They find that, contrary to standard assumptions made regarding the selling process, when the housing market is strong, properties sell for more than their list price. (In down or normal markets the list price generally exceeds the sales price.) This is also a feature of the data presented here. The authors conclude that the selling mechanism must switch during boom markets, with the list price acting as a floor, rather than a ceiling. Of relevance for this study is their finding that the list to sale price ratio is "unusually high" during the downturn in Northern Ireland, a finding they attribute to seller loss aversion.

4 Data

The property market in the Republic of Ireland is reasonably well developed and Anglo-Saxon in nature. The vast majority of transactions are facilitated by an estate agent, almost always working on behalf of the seller, although it is not a legal requirement to have an agent. Neither list prices nor bids are in any way legally privileged or officially recorded. A seller may state that they require offers "in excess of" or "in the region of" the list price, but typically the list price is for information only and set after agreement between the seller and their estate agent. The presence of "in excess of" list prices runs somewhat counter to the assumption made in much of the (typically North American) literature, that the list price represents a ceiling on offers. Since late 2012, prices for individual transactions have been freely available to the public through a Property Price Register.

4.1 daft.ie dataset

List price information used for analysis here was collated by online accommodation portal, Daft.ie. The dataset comprises all properties advertised online between 1 January 2006 and

[2]For a fuller treatment of hedonic pricing methods, see Malpezzi (2003). The finding from Japan also tallies with published house price indices for Ireland. Two hedonic indices, the mortgage-based CSO index and the listings-based daft.ie index, showed house prices falling at 12-14% year-on-year in early 2011; in contrast, a simple unweighted average (produced by the Dept of the Environment) showed prices 9% *higher*.

31 December 2012.[3] The dataset contains the following information:

- **Price**: For each property, the list price is known.[4]
- **Location**: Location is known, both generally (all listings are assigned to one of 4,000 areas in the country) and specifically (all listings are assigned latitude and longitude coordinates, and a degree of precision for those coordinates). For comparability with the CBI dataset, the principal information on location used refers to broad region (of which there are four: Dublin, Leinster, Munster and Connacht-Ulster) and county (or postcode within Dublin).
- **Type & Size**: There is information on the property's type, as with the CBI dataset (apartment, terraced, semi-detached or detached dwelling). Information is also known about the property's size, measured in terms of bedrooms, and bathrooms relative to bedrooms, while for a subset of properties size in square metres is available.
- **Date**: Information is available for properties within the daft.ie dataset on when they were originally listed, when marked as "sale agreed" (if relevant) and when withdrawn from the market. The time between listing and sale-agreed status is central to estimation of the counteroffer spread in housing, as explained in Section 2.

Summary statistics on the key variables, for both the full set of listings [daft.ie 1] and the set of listings that subsequently went to be sale-agreed [daft.ie 2] are given in Table 1.

4.2 CBI dataset

Sale price information comes from the Central Bank of Ireland (CBI) dataset, itself a product of the Prudential Capital Assessment Review (PCAR) process, also known as the "stress tests" of the Irish banking system that followed its collapse in 2009-10. Under PCAR, Irish banks covered by a government guarantee were recapitalized by CBI in return for equity. Such action required loan-level analysis, including of the mortgage portfolio, which involved detailed information for over 600,000 loans on 475,000 properties being made available to CBI.

[3]The vast majority of listings in the dataset refer to ads posted on the Daft.ie site. The remainder (about 3%) refer to the small fraction of online listings in Ireland that were not advertised on the Daft.ie portal. Most of these date from 2006-2007.

[4]The full daft.ie dataset includes repeat listings, where a property has its list price changed, as separate observations. Due to the focus here on the sale process in its entirety, from first listing to ultimate sale, these observations are omitted from the analysis.

The analysis here is of loans associated with a housing market transaction (i.e. first-time buyer, mover-purchaser or "buy-to-let" investment) and where certain information criteria are met. The dataset includes all observations from 2006Q1 (when the daft.ie dataset starts) until 2011Q4 (the date of the PCAR process) and contains the following information:

- **Price**: Price information is available in the form of the bank's valuation as part of the mortgage drawdown process, a valuation that corresponds to the transaction price.
- **Location**: Information on location is known only to county level, of which there are 26 in the Republic of Ireland. However, for two of the four financial institutions covered by PCAR, information is available for Dublin postal districts, of which there are 22 in the most built-up parts of the capital (this dataset is referred to as CBI-2).
- **Type & Size**: Property type relates to whether the property is a semi-detached, detached or terraced house, a bungalow or an apartment. No further information on a property's size is available for all properties.
- **Date**: For all observations, the dataset contains information on when the mortgage was drawn down. For most observations, there is also information on when the property was valued, information that can be used to estimate the counteroffer spread.[5]

Some summary statistics of the CBI PCAR dataset across all three main dimensions (location, type and date) are given in Table 1. For more on the CBI PCAR dataset, the interested reader is directed to Kennedy and McIndoe-Calder (2011).

Omitted variables An obvious omitted variable from the CBI dataset is a detailed measure of size. Standard in the housing economics literature is size in square metres, with number of rooms (or number of bedrooms, available in the case of the daft.ie dataset) also widely used. Appendix A examines briefly the extent to which a property's type captures high level differences in size, using information from the daft.ie dataset can give insights into this.

Ideally, other factors, such as year of construction, quality of finish, site size and energy efficiency, would also be included in the analysis. Unfortunately, this quality of information is not available for the Irish housing market during this crucial period in its history. Future analysis should be able to combine information from the Property Price Register with

[5]Only mortgage loans with complete information were included. Roughly 36,000 loans referred to properties where the valuation date was not known and these were thus excluded.

Dataset	daft.ie 1	daft.ie 2	CBI
Total	420,691	76,647	216,685
Av price	€281,478	€269,628	€323,796
Dublin	84,018	23,886	57,074
Leinster	121,052	21,212	59,498
Munster	126,186	19,980	61,542
Conn-Ulster	89,435	11,389	37,571
Terraced	63,916	15,603	36,417
Semi-detached	111,405	24,427	68,424
Detached	199,671	29,038	85,656
Apartments	45,699	7,399	25,188
2006	76,435	3,381	63,016
2007	113,763	17,675	58,763
2008	73,320	12,648	42,460
2009	46,105	8,940	24,704
2010	40,571	10,150	17,603
2011	37,433	9,830	9,139
2012	33,064	13,843	0

Table 1: *Summary statistics of the daft.ie and CBI datasets*

detailed property-level characteristics contained in the Building Energy Rating database. Nonetheless, the necessarily parsimonious models employed here explain large proportions of the variation and can thus be viewed as a solid foundation for analysis.

5 Model

The empirical strategy adopted is, per the recommendation of the literature, the hedonic regression, i.e. controlling for the characteristics of the properties traded, to ensure a like-for-like comparison over time. As with O'Hanlon (2011), outliers are excluded from final figures by adopting a two-stage process, and filtering out excessively influential observations by using Cook's Distance (Cook, 2000). Similar to the vast bulk of the housing literature, a log-linear model is applied, allowing coefficients to be interpreted, to an approximation, as percentage differentials.

Time The principal options in relation to the treatment of time are monthly or quarterly fixed effects. Due to the long period under investigation, it is not obvious what benefit monthly variables would bring, thus quarterly variables are chosen instead. (An alternative

– quite separate from the house price index literature – would be to impose a polynomial on the time-span, although it is not obvious *a priori* what order polynomial would apply. Thus this would become a fitting exercise and effectively tend in the limit to a model with monthly or quarterly fixed effects.)

Location While specific location is known for the daft.ie dataset, there is limited information on location in the CBI dataset. Thus, county-specific fixed effects are used in all specifications. The treatment of location here is very similar to the official CSO Residential Property Price Index (O'Hanlon, 2011).[6]

Type and size As discussed above, very limited information is available on the property's size in the CBI dataset. That information is limited to property type, which is correlated with size. Type-specific fixed effects are included, relative to semi-detached properties as a control. Premiums or discounts associated with particular property types may vary by region. Therefore, type interactions with four broad regions are included. Those four regions are: Dublin, the rest of the Leinster province, the Munster province, and Connacht-Ulster.

In equation form, the empirical model is given below, where each vector of Q, X and Y omits one category as control (Q12007, County Louth and semi-detached properties, respectively), and where s refers to the quarter within the year, t to the year (with no $t = 2012$ for the CBI dataset), c to county c of $C = 25$, r to regions 1-5 and n to the property type ($N = 4$).

$$ln(hp)_i = \alpha_0 + \sum_{t=2006}^{2012} \sum_{s=1}^{4} \alpha_{ts} Q_i^{ts} + \sum_{c=1}^{C} \beta_c X_i^c + \sum_{n=1}^{N} \sum_{r=1}^{4} \beta_{nr} Y_i^{nr} + \epsilon_i \quad (1)$$

This model is applied to five datasets, in order to calculate the four spreads outlined above:

1. The first dataset is the population of listings, where the date refers to the initial date of listing. This uses the daft.ie dataset in full.

2. The second dataset is the set of listings that subsequently go on to be "sale agreed", where the date refers to the date of listing. This uses a proportion of the daft.ie dataset.

[6]For a subset of the CBI dataset (two of the four lenders), as well as for the entire daft.ie dataset, information is available on postal district for Dublin city properties. Robustness checks were carried out using this subsample, i.e. excluding lenders with no information on postal district. The results were substantively similar, with the bulk of the difference stemming from variations between the lenders included and excluded, rather than the impact of additional location controls.

3. The third dataset is also the set of listings that are "sale agreed" before being withdrawn, but where the date refers to the date the property was marked sale agreed. This uses the same proportion of the daft.ie dataset.

4. The fourth dataset is the population of mortgage-backed transactions, where the date refers to the date at which the property is valued. This uses the CBI dataset in full.

5. The final dataset is the population of mortgage-backed transactions, where this time the date refers to the date of the transaction. This also uses the CBI dataset in full.

5.1 Calculation of averages

As individual properties cannot be matched across datasets, due to the lack of specific information on location in the CBI dataset of transactions, the analysis here uses comparable hedonically-adjusted weighted average prices. The empirical model given above is used to generate regression output in the form of coefficients, while the CBI dataset of transactions is used to give weights for each of the four property types for each of the counties, as well as for each county within the country.

With four property types and one control, there are three type coefficients for each county. Each type coefficient, which takes into account any region-specific type effects, is then multiplied by the weights within that area for each property type. These three numbers are then added to the generic county coefficient to give a county-specific type-weighted coefficient. Coefficients from regression output given the like-for-like differences in prices between areas; these adjusted coefficients reflect the mix of property types and sizes in an area. Thus, counties where apartments and terraced properties are more common will have this reflected in the adjusted coefficients.

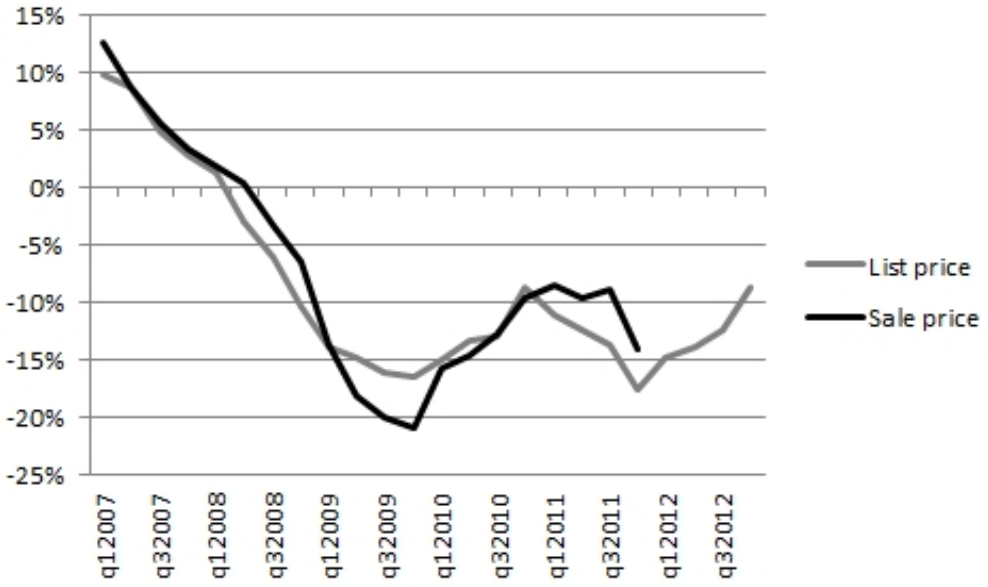
These county-specific adjustment coefficients can be used, along with the constant, to calculate a county-specific average price for the control period (2007Q1). The weighted sum of all these county-specific average prices gives a national average price for 2007Q1. Quarter-specific coefficients are then used to generate a series for the period 2006Q1-2012Q4 (2011Q4 for the CBI dataset). The output for each dataset is thus a national average price that reflects the mix of properties within and across counties.

Initial overview The introduction made reference to two pieces of conventional wisdom about the housing market. The first is that it is expected that in a downturn, sale prices will be below list prices. (Indeed, until recently, it was assumed that the list price was an upper

bound, but recent research shows that this is not the case Haurin et al. (2013).) Secondly, it is often asserted that list prices are a lead indicator of sale prices. These two appear to be in conflict when the market turns from a rising market to a falling one.

Datasets (1) and (5) above are what would be used to generate indices of list prices and sale prices. Applying the method described above, it is possible to compare trends in both. Figure 1 shows the year-on-year change in list and sale prices. What is particularly noteworthy is that list prices appear to lead sale prices throughout: the year-on-year change turns negative earlier, falls in prices abate earlier in 2009 and accelerate earlier in 2010/11.

Figure 1: *Year-on-year change in sale and list prices, 2007-2012*



Thus, in the recent Irish housing market downturn, list prices were above sale prices – but they also led sale prices from boom to bust and throughout the bust. The next section reconciles these two findings, by decomposing the gap between the two series into its constituent components.

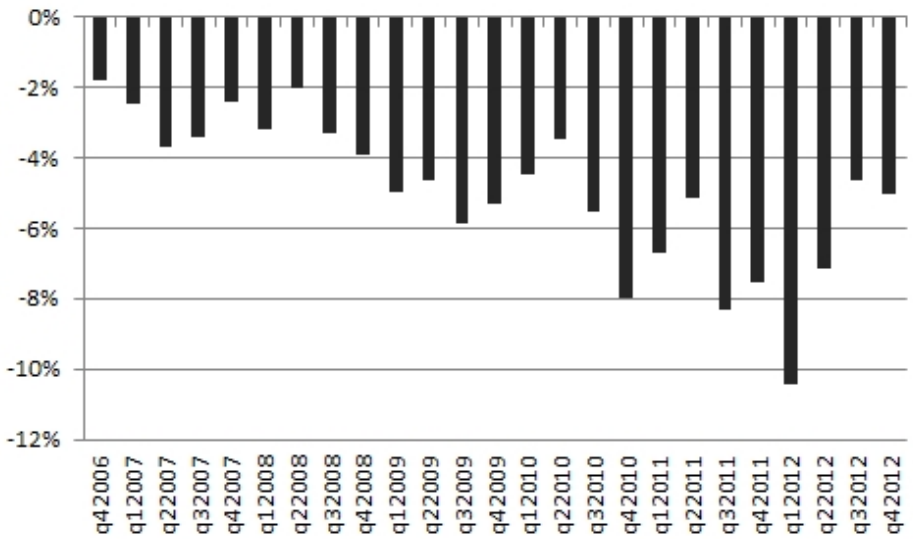
6 Results

6.1 Selection spread

Figure 2 shows the estimated quarterly "selection spread" among listed properties. The gap shown is the percentage gap in list price between those properies that go on to find a

buyer (i.e. are marked as sale agreed) and the full complement of properties listed in a given month. As a buyer is not known at time of listing, this is only able to be calculated ex-post by the researcher (not in real time, by the analyst).

Figure 2: *The "selection spread", daft.ie dataset, 2006-2012*



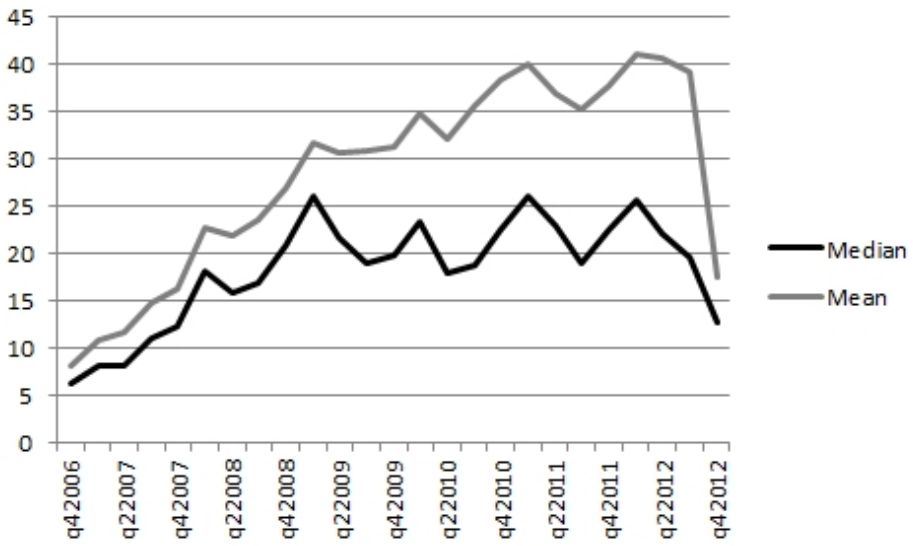
A positive number could indicate the importance of unobserved factors (which in this analysis include any factors other than quarter, property type or county). However, the selection spread is negative throughout, indicates that those properties that subsequently find buyers are listed at systematically cheaper prices than those that do not. The fact that the selection spread is cyclical (a larger negative number when prices are falling faster) indicates that, in a downturn, properties priced more realistically are more likely to sell. An alternative explanation is that, as quality differences not included as regressors, lower-quality properties are more likely to sell; however initial evidence suggests demand has shifted in the crash period to higher quality properties, not lower quality ones (Lyons, 2013).

6.2 Matching spread

The second component of the gap between list and sale prices is the matching spread, reflecting time-to-sell: how have prices changed between when the property was initially listed and when a buyer is found? This will reflect information available to the buyer at the time the property is sale agreed but not to the seller when the property was listed. Figure 3 shows average time to sell nationwide (from initial listing until the property is sale agreed).

Both median and mean series indicate a dramatic increase in TTS between late 2006, when it took typically two months to find a buyer, and early 2009, when it took over six months on average. After that, the mean drifted higher, to closer to nine months, while the median largely remained between five and six months for most of the period 2009-2012.

Figure 3: *Median and mean time-to-sell (in weeks), daft.ie dataset, 2006-2012*

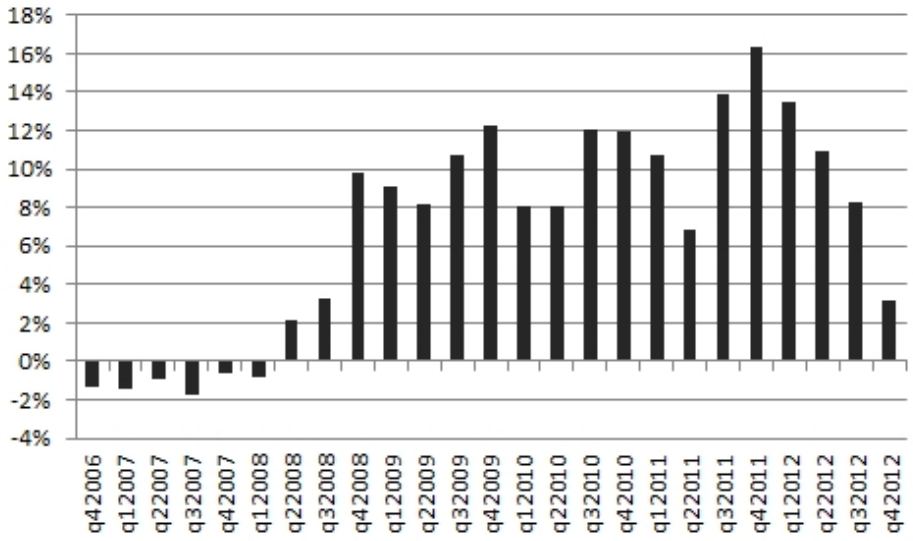


As property prices were falling at more than 10% a year from 2008 until 2011, the fact that it took half a year on average – and significantly longer in many cases – for properties to find a buyer means the time-to-sell spread will be quantitatively significant in explaining the gap between list and sale prices. This gap is shown in Figure 4. A positive number – as occurs throughout the period from mid-2008 on – indicates that properties that turned sale-agreed in a given quarter had a higher listed price than properties listed for the first time in that quarter that would ultimately go on to find a buyer.

6.3 Counteroffer spread

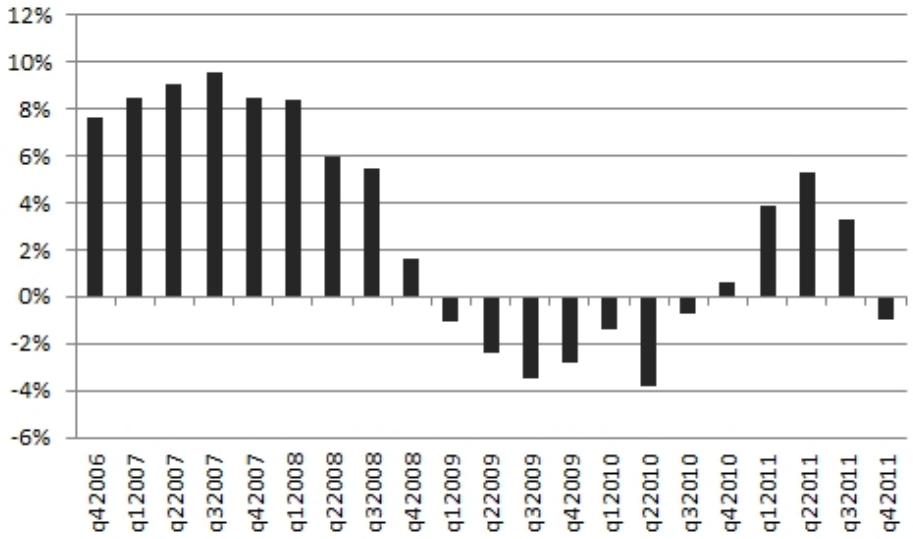
The third stage in the decomposition of the gap between list and sale price is the counteroffer spread, i.e. comparing suitably adjusted list and sale prices, at the time the property was sale-agreed and valued by the mortgage issuer. This is shown in Figure 5. It suggests that during 2007, allowing for prices to have changed between the time of listing and the time the sale was agreed, the offer was typically 8% above the list price. This is supportive of the finding from Haurin et al. (2013) that list prices do not act as a ceiling on offers in booming

Figure 4: *The "matching spread", daft.ie dataset, 2006-2012*



markets.

Figure 5: *The "counteroffer spread", daft.ie and CBI datasets, 2006-2012*



During the market downturn, in particular in 2009 and 2010, buyer offers were typically 2-4% below the list prices of properties that would ultimately find a buyer, even when those list prices were adjusted by how much prices had fallen since their initial listing. However, by 2011, the counteroffer spread was positive again: adjusted list prices were surpassed on average by sale prices. At first, this may seem counterintuitive, particularly given that

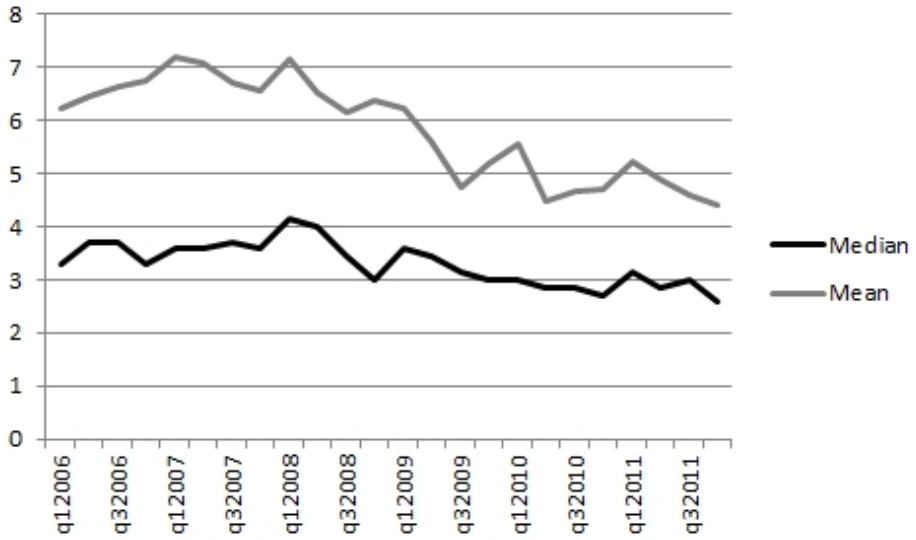
Ireland became reliant on IMF-EU financing in late 2010. The answer appears to lie in the collective decision of sellers to aggressively cut list prices in 2011: list prices fell 18% that year, compared to 9% in 2010 (see Figure 1).

It is worth noting that unlike the other stages, which involve within-dataset comparison, this stage involves comparing price levels across the two datasets. As such, this may be sensitive to the samples underpinning both datasets and any differences in categorization.

6.4 Drawdown spread

The final stage in the housing transaction is the drawdown spread, i.e. reflecting changes in prices in the period between when a property is valued (typically when the sale is agreed) and when the mortgage is actually processed (typically when the new owner moves in). Figure 6 shows the median and mean time between valuation and mortgage drawdown. While there are fluctuations, and the gap between median and mean points to a long tail, the time-to-drawdown is remarkably stable throughout what are very turbulent market conditions. Over the 2006-2011 period as a whole, the time taken between agreement of sale and the ultimate transaction falls slightly when measured by both mean and median, but this is a small change compared to time-to-sell. While time-to-sell reflects market conditions and the matching process, time-to-drawdown appears to reflect administrative time-costs.

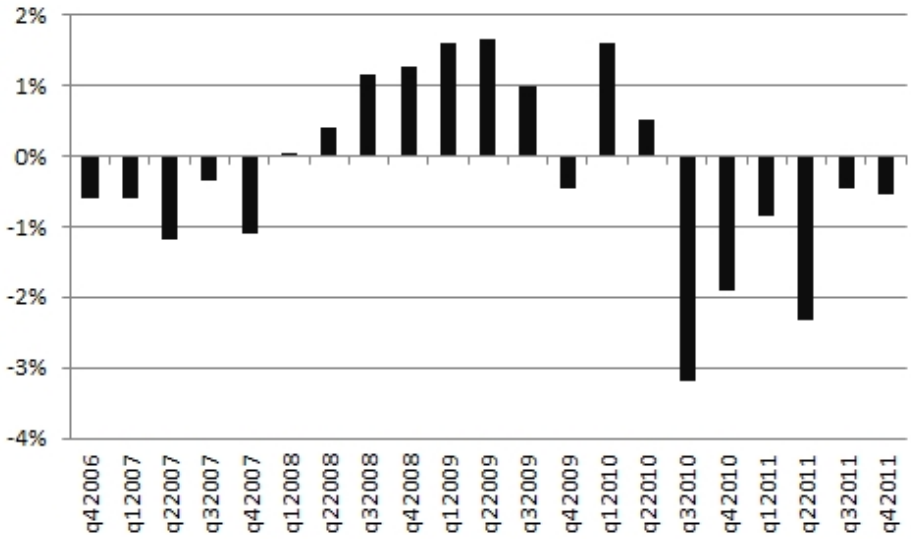
Figure 6: *Median and mean time-to-drawdown, CBI dataset, 2006-2011*



As a consequence of the relatively stable and short time-to-drawdown, its effect on prices

is typically small. When prices are rising early in the period, properties having their mortgage drawn down are worth less than those just being valued (typically by no more than 1%). As prices start to fall in 2008-2009, the opposite is the case – properties having their mortgage drawn down in mid-2009 were valued at roughly 1.5% more than those just being valued. By late 2010, the drawdown spread had turned negative again, although this was close to zero by the end of 2011. Overall, quantitatively, the effect on prices is the smallest of all the spreads.

Figure 7: *The "drawdown spread", CBI dataset, 2006-2011*



6.5 Summary

To summarize, a sample period is shown in Figure 8. The gap between the first two columns shows a selection spread of 3.4%: compared to all listings, properties that ultimately sold were listed at systematically lower prices when initially listed (€254,000 compared to €254,000). The gap between the second and third columns shows a matching spread of 8.0%: in 2010Q2, properties that being marked as sale-agreed had an average list price 8% higher than those properties newly listed that quarter which would go on to find a buyer.

The difference between the third and fourth columns is what is termed here the counteroffer spread: comparing list and sale prices on a like-for-like basis, successful bids were on average 3.8% below list prices. The gap between the fourth and final columns is the drawdown spread, reflecting the fact that the average price of properties whose mortgage was drawn down in 2010Q2 was 0.5% than those being valued at that point.

Figure 8: *Four spreads for sample period (2010Q2)*

7 Conclusion

The aim of this research was to decompose the gap between list and sale prices into its constituent processes. The results overcome some of the obstacles to assessing valuation accuracy, reconcile two pieces of conventional wisdom about the housing market and also present a number of metrics that may yield insights into market conditions.

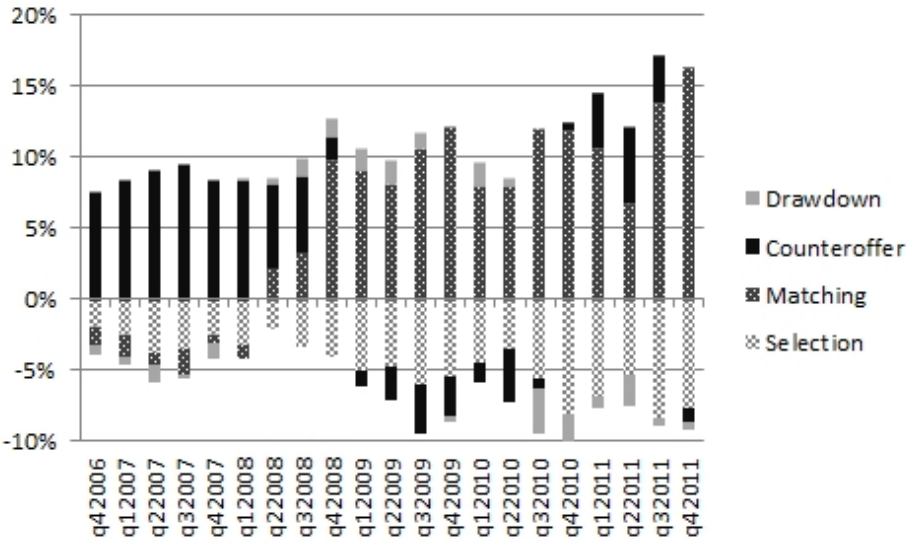
In relation to valuation accuracy, previous studies have shown that listings and assessor valuations at the start of the process can lag the ultimate transaction price over the market cycle – but also that these are not like-for-like comparisons, as valuations are not contemporaneous to transactions. By using hedonic analysis on two population-level datasets, the research undertaken here overcomes these limitations, presenting like-for-like comaprisons of list and sale prices.

It is often said that list prices lead sale prices, as seller expectations can respond instantly, whereas the transaction process means that it can take time for final sale prices to reflect the same news. This was evident for the two datasets presented here, with the year-on-year change in list prices leading that in sale prices throughout the period studied. However, in a falling market in particular, it is typically assumed that the average sale price will be below the average list price, as weak demand means sellers have to accept lower-than-expected outcomes.

The research here reconciles those two statements by decomposing the gap between list

and sale prices into four spreads: the selection spread, the matching spread, the counteroffer spread, and the drawdown spread. An overview of trends in these over time, and their relative importance, is given in Figure 9. The selection spread, capturing the extent to which properties that sell systematically list for less, exists throughout the period but is particularly pronounced during the market downturn: properties that list for less, ceteris paribus, are more likely to find a buyer – a finding that accords with basic economic theory.

Figure 9: *Estimated bid-ask spreads, 2006-2011*



The matching spread reflects how long it takes to find a buyer and also what happened prices. Given the speed with which prices fell in Ireland during much of the period covered, and the length of the typical time-to-sell, this is quantitatively important in explaining the gap between the two. For most of the period 2008-2011, the list price of properties being sale agreed was 10% or more higher than newly listed properties. While the exact role of nominal price rigidities is a topic for further research, this highlights the limitations of comparisons using valuations and transactions from different time periods. The drawdown spread, reflecting the time gap between valuations for mortgages and their ultimate drawdown, was similar in nature but much smaller in significance.

The counteroffer spread, finally, is the closest counterpart in the housing market, which lacks liquidity and fungibility, to the bid-ask spread in other financial markets. It reflects how list prices and sale prices compare, when adjusted to time-to-sell and time-to-drawdown, as well as for the fact that some listings will not result in a transaction. Early in the period, the counteroffer spread was large and positive, suggesting that buyers had tough competition

in securing a property and thus they offered more than the list price. This idea of the sale price in boom-times "breaking the price ceiling" offered by the list price concords with the findings of Haurin et al. (2013).

During the down market, the counteroffer spread was negative for much of 2009 and 2010. However, the entry of Ireland into the IMF-EU program in late 2010 appears to have had an impact on seller expectations, as the fall in list prices in 2011 was twice that of 2010. This greater realism on the part of sellers might explain the return of a positive counteroffer spread in early 2011, although as sale price falls accelerated in late 2011, the spread turned negative again.

Regarding insights into market conditions, the selection effect is likely to persist, even in market in equilibrium, as sellers' expectations will not uniform and those with excessive expectations need to meet the market for those to change. The matching spread is a product of two other process: the matching function itself (time-to-sell) and trends in house prices. Thus, it is likely to be strongly countercyclical as measured here (a large positive number in a falling market).

The counteroffer spread presented here appears broadly procyclical and may offer useful insights into market conditions. While the research presented here relies on aggregate prices from two population-level datasets, future research for Ireland may be able to utilize the Property Price Register, which dates from 2010, to construct a micro-level dataset in real-time of the matching and counteroffer spreads. Similarly, detailed datasets in other countries may allow the calculation of equivalent series to inform policymakers.

Such segment-by-segment analysis should aid policymakers greatly in understanding not only conditions in the housing market generally, which are crucial in determining broader economic conditions, but also conditions in different sub-markets. This will be of use not just for macro-prudential policy but also in understanding housing demand and thus future development policy.

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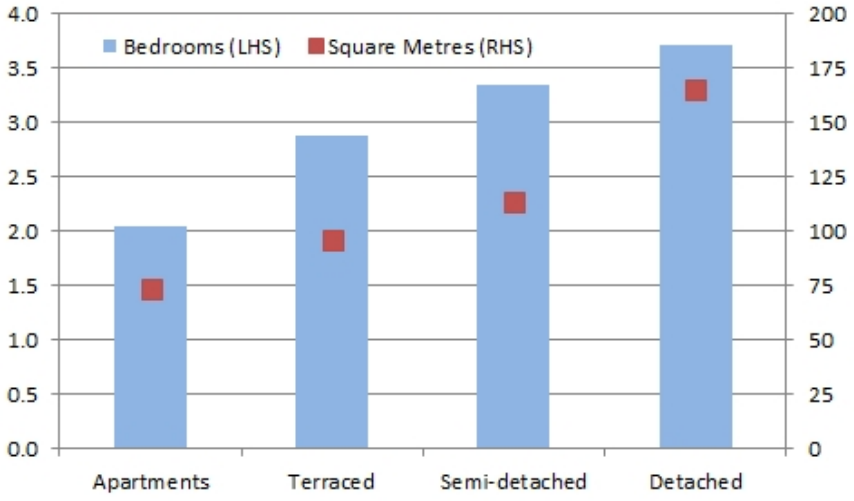
A Appendix: Size as an omitted variable

As discussed in the text, the lack of information on property size in the CBI dataset raises the question of omitted variables. Using information from the daft.ie dataset, Figure 10 shows the average number of bedrooms by property type, together with average square metres for those properties for which it is available. It is apparent that there is a clear correlation between property type and size (measured either way), meaning that type will act as a rough proxy for size in the analysis carried out.

Figure 10: *Average number of bedrooms, by property type, daft.ie dataset*



B Appendix: Regression output

Table 2 presents the regression output associated with the models and empirical specification presented in Section 5 above. The variables *terr*, *det* and *apart*/*apt* refer to the following house types respectively, where semi-detached is the control: terraced, detached and apartment. Regions 2, 3 and 4 refer to Leinster (ex-Dublin), Munster and Connacht-Ulster repectively.

Table 2: *Regression output: datasets underpinning four spreads*

	Listings		Listings (SA)		Sale-ageed		Valuations		Drawdowns	
	Coeff	p-value	Coeff	p-value	Coeff	p-value	Coeff	p-value	Coeff	p-value
Dublin	0.465	0	0.462	0	0.441	0	0.463	0	0.462	0
Meath	0.085	0	0.105	0	0.1	0	0.066	0	0.065	0
Kildare	0.121	0	0.157	0	0.145	0	0.121	0	0.121	0
Wicklow	0.289	0	0.293	0	0.293	0	0.259	0	0.259	0
Longford	−0.371	0	−0.412	0	−0.401	0	−0.401	0	−0.399	0
Offaly	−0.161	0	−0.198	0	−0.183	0	−0.209	0	−0.208	0
Westmeath	−0.163	0	−0.187	0	−0.19	0	−0.18	0	−0.175	0
Laois	−0.245	0	−0.26	0	−0.265	0	−0.235	0	−0.236	0
Carlow	−0.187	0	−0.189	0	−0.187	0	−0.219	0	−0.219	0
Kilkenny	−0.118	0	−0.12	0	−0.127	0	−0.15	0	−0.151	0
Waterford	−0.071	0	−0.102	0	−0.114	0	−0.121	0	−0.12	0
Wexford	−0.14	0	−0.191	0	−0.185	0	−0.192	0	−0.194	0
Kerry	−0.14	0	−0.147	0	−0.135	0	−0.166	0	−0.166	0
Cork	0.056	0	0.13	0	0.115	0	0.085	0	0.084	0
Clare	−0.127	0	−0.123	0	−0.129	0	−0.152	0	−0.154	0
Limerick	−0.136	0	−0.091	0	−0.096	0	−0.184	0	−0.184	0
Tipperary	−0.241	0	−0.254	0	−0.248	0	−0.258	0	−0.258	0
Galway	−0.062	0	0.04	0	0.04	0	−0.048	0	−0.05	0
Mayo	−0.321	0	−0.319	0	−0.311	0	−0.309	0	−0.308	0
Roscommon	−0.412	0	−0.433	0	−0.434	0	−0.349	0	−0.348	0
Sligo	−0.25	0	−0.219	0	−0.213	0	−0.235	0	−0.236	0
Leitrim	−0.396	0	−0.425	0	−0.41	0	−0.363	0	−0.365	0
Donegal	−0.324	0	−0.389	0	−0.387	0	−0.379	0	−0.378	0
Cavan	−0.277	0	−0.284	0	−0.273	0	−0.295	0	−0.293	0
Monaghan	−0.183	0	−0.163	0	−0.14	0	−0.187	0	−0.188	0
q12006	−0.094	0					−0.12	0	−0.126	0
q22006	−0.065	0					−0.067	0	−0.074	0
q32006	−0.027	0					−0.038	0	−0.035	0
q42006	−0.014	0	−0.007	0.192	−0.006	0.378	−0.016	0	−0.015	0
q22007	0.019	0	0.006	0.259	0.012	0.069	0.014	0	0.009	0.008
q32007	0.021	0	0.012	0.033	0.009	0.186	0.016	0	0.02	0
q42007	0.014	0	0.015	0.017	0.024	0.001	0.023	0	0.02	0
q12008	0.014	0	0.007	0.275	0.013	0.066	0.014	0	0.019	0
q22008	−0.012	0	−0.007	0.228	0.029	0	0.003	0.309	0.015	0
q32008	−0.041	0	−0.05	0	−0.002	0.783	−0.028	0	−0.007	0.054
q42008	−0.096	0	−0.111	0	−0.002	0.799	−0.062	0	−0.039	0
q12009	−0.136	0	−0.162	0	−0.059	0	−0.144	0	−0.112	0
q22009	−0.173	0	−0.195	0	−0.101	0	−0.194	0	−0.16	0
q32009	−0.218	0	−0.253	0	−0.137	0	−0.238	0	−0.209	0
q42009	−0.276	0	−0.306	0	−0.175	0	−0.269	0	−0.256	0
q12010	−0.299	0	−0.32	0	−0.228	0	−0.302	0	−0.271	0
q22010	−0.317	0	−0.327	0	−0.235	0	−0.334	0	−0.317	0
q32010	−0.358	0	−0.389	0	−0.261	0	−0.335	0	−0.354	0
q42010	−0.367	0	−0.425	0	−0.298	0	−0.352	0	−0.359	0

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	Listings		Listings (SA)		Sale-ageed		Valuations		Drawdowns	
	Coeff	p-value	Coeff	p-value	Coeff	p-value	Coeff	p-value	Coeff	p-value
q12011	−0.418	0	−0.462	0	−0.345	0	−0.371	0	−0.339	0
q22011	−0.451	0	−0.479	0	−0.398	0	−0.424	0	−0.418	0
q32011	−0.505	0	−0.567	0	−0.422	0	−0.458	0	−0.447	0
q42011	−0.561	0	−0.615	0	−0.449	0	−0.531	0	−0.52	0
q12012	−0.578	0	−0.662	0	−0.521	0				
q22012	−0.6	0	−0.649	0	−0.53	0				
q32012	−0.637	0	−0.659	0	−0.565	0				
q42012	−0.653	0	−0.68	0	−0.634	0				
terr	−0.216	0	−0.216	0	−0.211	0	−0.195	0	−0.196	0
det	0.291	0	0.271	0	0.271	0	0.342	0	0.333	0
apart	−0.313	0	−0.353	0	−0.341	0	−0.251	0	−0.257	0
reg2_ter	0.044	0	0.009	0.29	0.004	0.637	0.061	0	0.062	0
reg2_det	0.027	0	−0.003	0.755	0.001	0.887	0.053	0	0.057	0
reg2_apt	0.113	0	0.098	0	0.093	0	0.093	0	0.097	0
reg3_ter	0.011	0.005	−0.057	0	−0.052	0	0.065	0	0.065	0
reg3_det	−0.034	0	−0.073	0	−0.052	0	0.004	0.377	0.005	0.269
reg3_apt	0.149	0	0.104	0	0.107	0	0.191	0	0.196	0
reg4_ter	0.122	0	0.099	0	0.089	0	0.137	0	0.138	0
reg4_det	−0.007	0.097	−0.066	0	−0.05	0	0.013	0.013	0.013	0.011
reg4_apt	0.268	0	0.23	0	0.215	0	0.258	0	0.262	0
cons	12.611	0	12.604	0	12.592	0	12.632	0	12.626	0
R-squared	0.531		0.561		0.522		0.479		0.473	
No. of observations	395,850		71,657		71,749		246,217		246,427	