The Relationship between Dwelling Prices and Housing Turnover

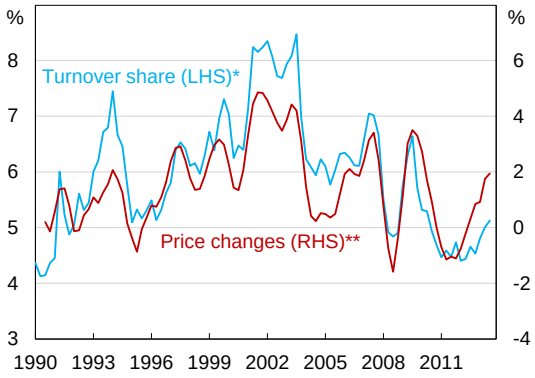
Cadet Note

Housing markets typically display a positive correlation between prices and turnover volumes, with the academic literature providing a range of possible explanations for this. We investigate the relationship for Australia and find that turnover tends to lead dwelling prices; this is consistent with incomplete information models of household behaviour, and with demand, rather than supply, driving housing market dynamics. We also develop a simple model to forecast turnover based on its relationship with the value of loan approvals.

Introduction

Housing markets in developed economies are typically characterised by a positive relationship between dwelling prices and turnover volumes: as trading activity in the established housing market increases prices also generally rise (Graph 1). In an efficient market where buyers and sellers have the same information, this need not be the case; as such, the positive correlation suggests that information asymmetries and/or other market imperfections exist. This relationship, and housing market dynamics more generally, is important in the transmission of monetary policy to the real economy – growth in house prices increases the wealth and spending of homeowners and creates an incentive for new housing construction, while an increase in turnover supports growth in housing-related industries such as real estate services.

Graph 1
Dwelling Prices and Turnover



* Share of dwelling stock; annualised
** Hedonic measure; 3-quarter centred moving average
Sources: ABS; APM; RBA; RP Data-Rismark

In this note we investigate the relationship between housing prices and turnover. Our aim is to uncover the mechanism driving this correlation, and in doing so gain a better understanding of Australia's housing market.

Theoretical explanations of house prices and turnover

The literature on dwelling prices and turnover volumes provides three main explanations for the positive relationship between prices and turnover.

One strand of literature emphasises the search nature of housing markets, where buyers and sellers are mismatched due to incomplete and asymmetric information (Wheaton 1990). Neither party has a complete overview of the market, but buyers are better informed than sellers as they visit many properties and so can better observe market conditions. In this model a positive demand shock results in an increase in the volume of transactions as a greater number of buyers enter the market and adjust their valuations more quickly, purchasing properties at current (too low) offer prices. This is followed by a gradual adjustment in prices as sellers slowly become aware of the demand shock and revise up their reservation prices until a new equilibrium is reached. Overall, this strand of literature suggests that changes in turnover lead changes in prices.

Another explanation of the positive relationship between prices and turnover assumes that financing constraints affect owner-occupiers' ability to participate in the market (Stein 1995). In this model, an initial rise in prices increases demand from previously credit constrained trade-up buyers as the equity in their home increases, leading to higher turnover volumes as they trade-up and sell their previous homes. In contrast, a fall in house prices leaves homeowners less able to overcome financing constraints which weighs on turnover. This strand of literature suggests that changes in prices lead changes in turnover.

A third explanation suggests that owners are averse to nominal losses on their property (Genesove and Mayer 2001). When dwelling prices fall, sellers' reserve prices remain above buyers' expectations, as sellers resist nominal losses. This results in lower trading volumes as buyers and sellers remain mismatched in the market. Eventually a downward adjustment of sellers' price expectations is likely to occur, resulting in an increased level of matched participants in the housing market. Again, this model suggests that prices lead turnover.

While these explanations imply different market dynamics, they should not be viewed as mutually exclusive, but instead as complementary, with existing research supporting each of the explanations across a range of international housing markets (Wit et al 2013).

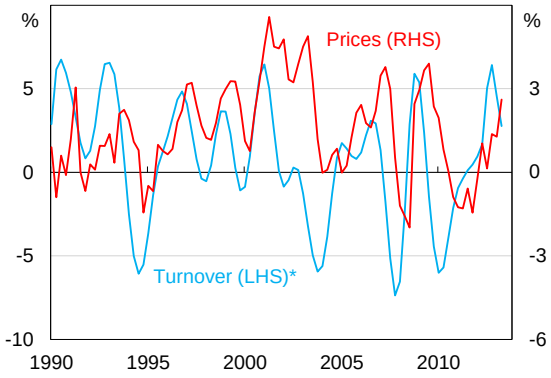
Descriptive analysis of the Australian housing market

There have been a number of cycles in the housing market over the past two decades, all of which displayed a positive relationship between turnover and dwelling prices (Graph 2). Most of these cycles have been relatively short and prices have rarely fallen in nominal terms, while housing turnover has been more volatile, declining more often and more sharply than prices in downturns. In the most recent cycle turnover growth fell sharply, reaching a trough in June 2010, while price growth troughed around one year later. Since then a recovery in the housing market has been underway, with turnover increasing around twice as fast as prices over the past year.

Graph 2

Dwelling Prices and Turnover

Quarterly changes

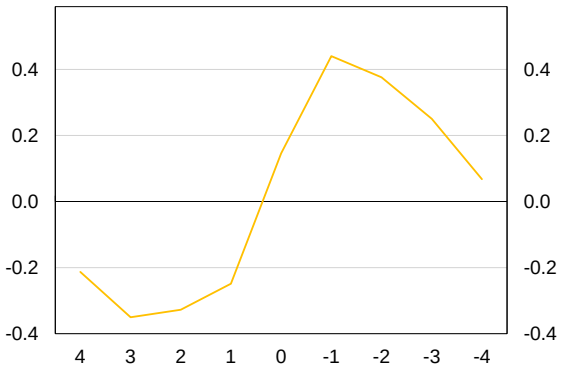


*13-period Henderson Trend
Sources: ABS; APM; RBA; RP Data-Rismark

Graph 3

Dwelling Prices and Turnover*

Correlation**



* 13-period Henderson trend, quarterly changes
** Prices are 3-quarter moving average
Sources: ABS; APM; RBA; RP Data-Rismark

The positive relationship between turnover and dwelling prices appears to be strongest when changes in turnover lead price growth by one to two quarters (Graph 3).[1] There

[1] The relationship appears to be relatively symmetric during upswings and downswings.

also appears to be a negative correlation when changes in turnover lag price growth by two to three quarters. This suggests that activity in Australia's housing market may be best characterised by the first theoretical model described in the previous section, which emphasises incomplete information and the search nature of the housing market.[2]

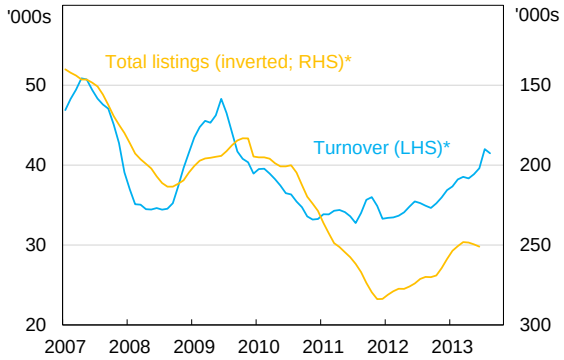
The flow of new supply is also potentially important in explaining housing market dynamics. Total listings represent the available supply of houses for sale, while new listings represent the flow of additional supply into the existing pool of dwellings on the market.

Turnover appears to be inversely related to total listings: as turnover increases, the total number of listings declines (Graph 4). Conversely, new listings appear to be positively related, with a lag, to prices and turnover, consistent with the literature (including the financing constraint literature mentioned above) suggesting that a nominal price increase induces potential sellers to list their property (Blackley 1999; Graph 5). Since new listings lag prices, and prices lag turnover, it appears that new listings follow changes in the market rather than drive developments. This is consistent with movements in the housing market being driven by changes in demand rather than supply.

Graph 4

Turnover and Listings

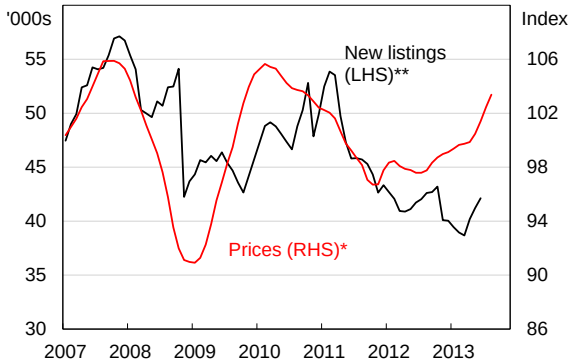
Seasonally adjusted



* Three-month moving average
Sources: ABS; RBA; RP Data-Rismark

Graph 5

Dwelling Prices and Listings



* Deviation from trend
** Three-month centred moving average
Sources: ABS; APM; RBA; RP Data-Rismark

Empirical relationship between prices and turnover

To further understand the relationship between dwelling prices and turnover, we construct a vector autoregressive (VAR) model.[3] This approach is in line with existing literature and allows us to more thoroughly investigate the direction of causality between turnover and prices. We specify the first model as including just the two endogenous variables, turnover (*to*) and dwelling prices (*dp*), in log differences (Equation 1).[4]

Equation 1:

$$\Delta \begin{pmatrix} dp_t \\ to_t \end{pmatrix} = \begin{pmatrix} \alpha_0 \\ \beta_0 \end{pmatrix} + c_1 \Delta \begin{pmatrix} dp_{t-1} \\ to_{t-1} \end{pmatrix} + \begin{pmatrix} \varepsilon_t^{dp} \\ \varepsilon_t^{to} \end{pmatrix}.$$

[2] This theoretical model can also explain the close positive relationship between auction clearance rates and housing price growth (see Gill & Turner (2007)).
[3] Lag length was chosen based on statistical information criteria. Variables were tested for co-integration but the tests were negative; all variables in changes were tested for stationarity.
[4] Nominal prices are used as the literature suggests that individuals base their decisions on nominal prices rather than real prices. Nonetheless, results were similar when real prices were used. Note that the data on new and total listings are relatively short, so these supply-side factors could not be included in the model.

We also specify a second model with exogenous variables that reflect conditions in the labour and mortgage markets (Equation 2). An increase in the unemployment rate is expected to have a negative effect on prices as households' willingness and capacity to pay for housing is diminished. The relationship between turnover and unemployment is less clear; unemployment may reduce turnover as fewer individuals are able to purchase a house, but it could also increase turnover as individuals relocate for new jobs, downsize or default on their loan. It is expected that a lower level of borrowing costs would increase turnover and prices and vice versa. Equation 2 includes the lagged unemployment rate and standard variable mortgage lending rate in levels and changes as exogenous variables.

Equation 2:
$$\Delta\begin{pmatrix} dp_t \\ to_t \end{pmatrix} = \begin{pmatrix} \alpha_0 \\ \beta_0 \end{pmatrix} + c_1\Delta\begin{pmatrix} dp_{t-1} \\ to_{t-1} \end{pmatrix} + c_2(unemp_{t-1}) + c_3\Delta(unemp_{t-1}) + c_4(mortgage_{t-1}) + c_5\Delta(mortgage_{t-1}) + \begin{pmatrix} \varepsilon_t^{dp} \\ \varepsilon_t^{to} \end{pmatrix}.$$

The results of the models are largely in line with the stylised facts presented in the previous section: there is a positive relationship between price growth and lagged changes in turnover, while changes in turnover are negatively related to price movements in the previous quarter (Table 1).[5]

Table 1: VAR of Nominal Dwelling Prices and Turnover

1990:Q1 to 2013:Q3

Dependent Variable:	**Prices**	**Turnover**	**Prices**	**Turnover**
Constant	0.36***	2.39**	1.48***	5.25
Prices (t-1)	0.74***	-1.25***	0.73***	-1.03**
Turnover (t-1)	0.08***	0.18*	0.05***	-0.1
Unemployment rate (t-1)			-0.02	0.68
Δ Unemployment rate (t-1)			-0.25	8.5***
Mortgage rate (t-1)			-0.13**	-0.99**
Δ Mortgage rate (t-1)			-0.86***	-4.38**
Adjusted Rsq	0.72	0.08	0.78	0.25

***,** and * indicate significance at the 1%, 5% and 10% level respectively

From the second model, borrowing costs (both level and change) appear to be significant in explaining dwelling prices and turnover, with higher costs associated with lower growth for each. The positive effect of an increase in unemployment on turnover is somewhat surprising, and suggests that a rise in unemployment may lead to higher geographical mobility or defaults (or both).

Further information on the relationship between prices and turnover is given by Granger causality tests. A change in turnover is found to Granger-cause dwelling price growth, while price changes are found to (negatively) Granger-cause movements in turnover, although this finding is weaker (Appendix, Table A2). Again this suggests that the search/incomplete information model provides the best description of the market.

[5] Additionally, a time fixed effects model was estimated using data on all capital cities. The coefficients indicate the same relationship as found above (see Appendix, Table A1).

Forecasting turnover

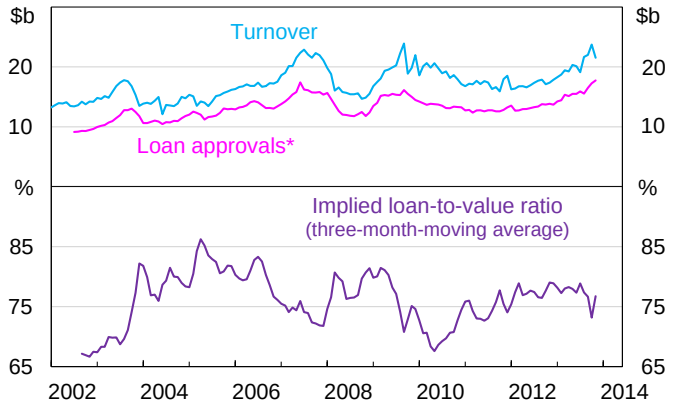
The previous section provides some insight into the dynamics of the housing market, and suggests that turnover leads, and is useful in explaining, dwelling prices. As such, and because turnover is reported with a significant delay, forecasting near-term turnover volumes would be beneficial, both in relation to forecasting prices and since turnover is important in driving credit growth and housing-related areas of economic activity.

The VAR models from the previous section do not explain turnover very well, and so are not likely to be useful for forecasting. Previous work, however, has shown that there is a strong relationship between the value of loan approvals and turnover (Lancaster & Pillar (2013) and Pickering (2009)). Based on this earlier work, two models are used to forecast turnover.

First, a simple identity is constructed using dwelling prices, the value of loan approvals, and an assumption about the implied loan-to-value-ratio (LVR) to estimate turnover volumes in the current quarter (Equation 3).[6] Dividing the total value of loan approvals by the assumed LVR gives an estimate of the total value of dwellings turned over; the volume of turnover is then estimated by dividing by average dwelling prices. Lancaster and Pillar (2013) find that the value of loan approvals moves very closely with the value of turnover, while data on loan approvals and dwelling prices are timely (Graph 6).

Graph 6

Value of Turnover and Loan Approvals



* Excludes refinancing and construction loans by owner occupiers and investors, and loans for alterations and additions by owner occupiers
Sources: ABS; APRA; RBA; RP Data-Rismark

Equation 3: $$to_t = \frac{loanapp_t \ / LVR_{t-1}}{dp_t}.$$

The second model is based on previous work which suggests that turnover volumes can be explained by loan approvals and prices in a simple autoregressive distributed lag (ADL) model (Equation 4, Pickering (2009)).

Equation 4: $$\Delta to_t = \alpha_0 + \beta \Delta to_{t-1} + \sum_{i=1}^{I} \gamma_j \Delta dp_{t-i} + \delta \Delta loanapp_t + \theta \Delta loanapp_{t-1} + \varepsilon_t.$$

To determine which model is most useful for estimating turnover volumes, we compare root mean squared errors (RMSE) of recursive out-of-sample forecasts, where the sample period runs from March quarter 2000 until the latest available data (Graph 7). The simple identity outperforms the ADL model when forecasting one-quarter ahead, but cannot be used to forecast further ahead (Table 2).

[6] Three approaches were taken to estimate the implied LVR: an AR(2) model, a two-period average and a random walk. The random walk was found to have the lowest RMSE and so is used.

Table 2: Out-of-Sample Forecast RMSEs

Forecast period: from 2000:1 to current

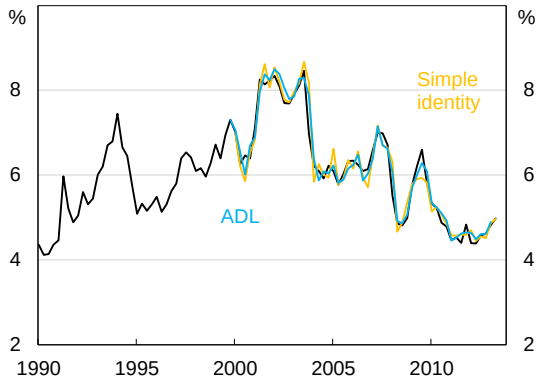
	one quarter ahead	four quarters ahead
Simple identity	0.25	
ADL	0.74	1.71

Estimates for turnover in the December quarter 2013 suggest further growth. The simple identity forecasts turnover as a share of the dwelling stock to increase to just below the decade average (Graph 8).

Graph 7

Turnover Share*

One quarter out-of-sample forecasts, 2000:1 to 2013:3

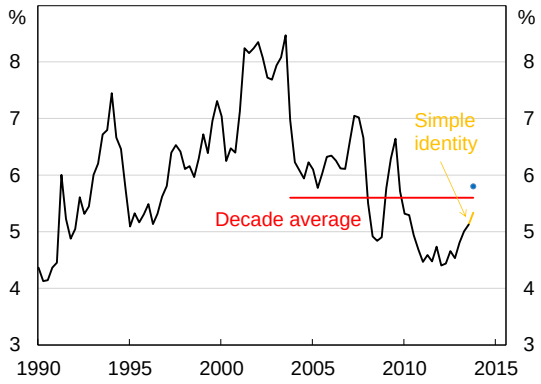


* Share of dwelling stock; annualised
Sources: ABS; RBA; RP Data-Rismark

Graph 8

Turnover Share*

Beyond-sample forecast **



* Share of dwelling stock; annualised
** Dot is forecast for December quarter based on October data
Sources: ABS; RBA; RP Data-Rismark

Conclusion

A positive relationship between dwelling prices and turnover volumes exists in the Australian housing market when turnover leads prices. While a number of dynamics are likely to be present in the market, the search/incomplete information explanation appears to best describe the market. We employ two approaches in order to forecast turnover: a simple identity and an ADL model, with both using loan approvals as an important explanatory variable. The simple identity performs best and suggests an increase in turnover in the December quarter.

Lena Höck
Household & National Accounts
Economic Analysis Department
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Appendix

Table A1: Nominal Dwelling Prices and Turnover

Panel model with time fixed effects

Dependent Variable:	**Prices**	**Turnover**
Constant	-0.002***	-0.04
Prices t-1	0.72***	-0.57**
Turnover t-1	0.01***	-0.44***
Adjusted Rsq	0.74	0.36

*** and ** indicate significance at the 1% and 5% level respectively

Table A2: Granger Causality Tests

Quarterly dwelling price and turnover growth

	H_o: Turnover growth does not Granger cause price growth	H_o: Price growth does not Granger cause turnover growth
F-stat	15.92	4.8
Probability	0.000001	0.01