WHY THE DECLINE IN NEW RESIDENTIAL BUILDING ACTIVITY?

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ABSTRACT

Keywords: Building cycle, housing approvals, housing starts, housing price, housing affordability, GST.

The phenomenon of cycles with peaks and troughs is a normal feature of a market economy and despite similar phases, each specific cycle varies in duration and intensity. In the decade to 2003 - 4 in Australia, housing prices have had a sustained growth in most capital cities but the supply of new dwellings has a downward sloping trendline. At the same time there has been a steady increase in population underlying the need for more dwellings. So why is there a decline in new residential building activity?

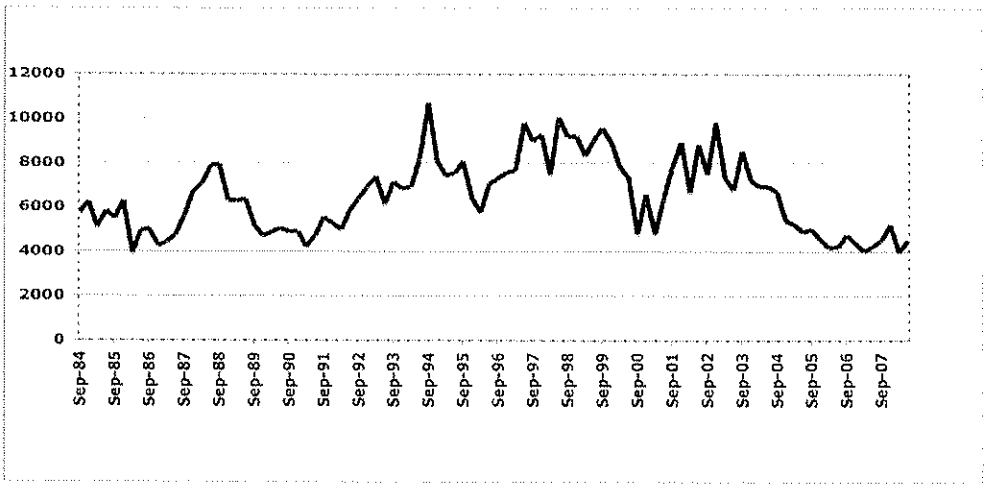
This paper undertakes an empirical study to investigate the factors that influence the residential building cycle and how they applied to the Sydney residential market over the past 25 years. The results show that whilst real price and GDP have some influence in the fluctuation of building approvals, it is the costs of development, in particular GST and BASIX which have influenced the downward movement of residential building activity over the past few years.

INTRODUCTION

The level of new dwelling construction in Sydney has been declining from about 2003 and as reported by BIS Shrapnel (2008a), "new dwelling construction in Sydney *has fallen* to levels not seen since the 1950s". Using Sydney quarterly data from September 1984 to June 2008, Figure 1[1] shows 'new dwelling approvals'.

[1] Note: BIS Shrapnel used new dwelling "starts", whilst Figure 1 uses new dwelling "approvals", as this was the only monthly or quarterly data available.

Figure 1: Sydney - new dwelling approvals

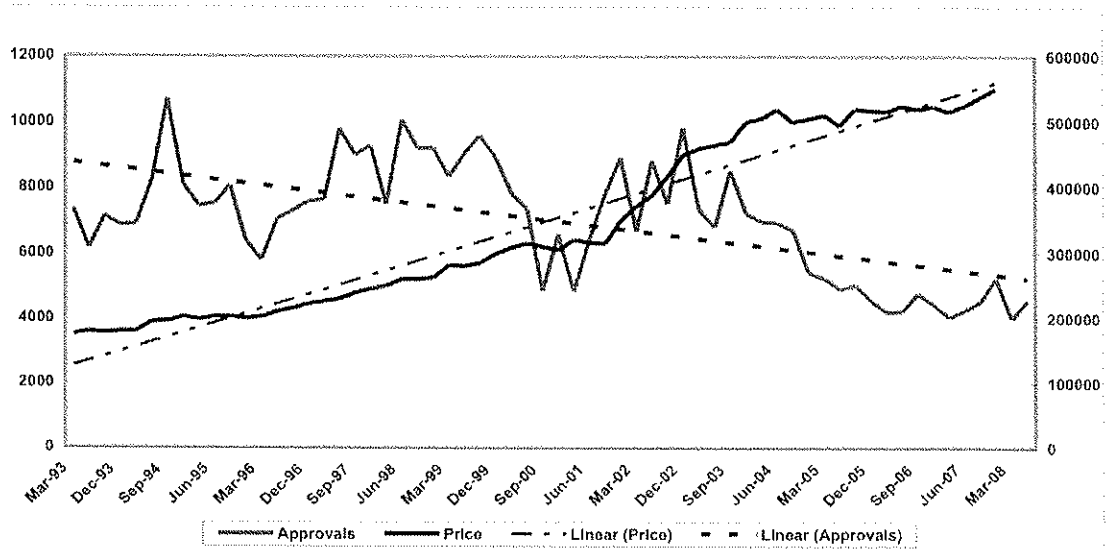


Source: ABS (2008a)

From the Figure we can note that new dwelling approvals fluctuate over the period. After falling from 1988 to 1991, there was a sustained upward to peak in 1994. Since then, there have been three significant periods of a downward trend, with latest being the most sustained, reaching the March 1986 level, the lowest level for the period, before having a slight increase in June 2008.

At the same time, property prices in Sydney were experiencing a strong upward movement. Figure 2 compares the movement of Sydney dwelling prices and dwelling approvals from March 1993 to March 2008. The Figure also shows the 'trendline' for both and as can be noted, their respective trends are moving in the opposite direction.

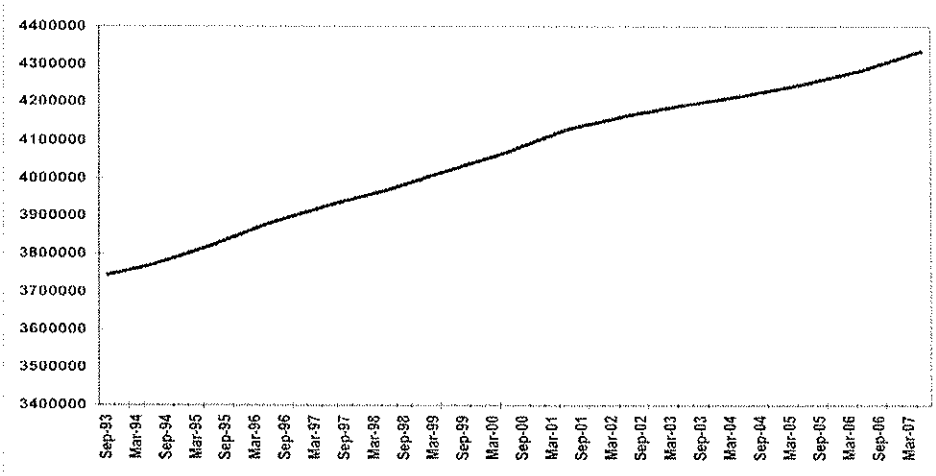
Figure 2: Sydney dwelling approvals vs. Sydney price



Source: ABS (2008a), REI (Various)

In addition, there has been a growing population causing an 'unprecedented' demand for housing (BIS Shrapnel 2008b), be it rental or purchasing. Sydney's population has continued to grow as shown in Figure 3. This would imply that there should be an increase in new dwelling activity, but instead, new dwellings have not kept pace with the growth of population in Sydney. Furthermore, Sydney's population is expected to continue to grow by 23.6 to 26.6 per cent over the next 20 years (ABS, 2008), which means that there needs to be an upturn in the number of new dwellings, otherwise there will be an even shorter supply of accommodation.

Figure 3: Sydney's Population



Source: ABS

This leads to the question, "since property prices have risen significantly and population growth is expected to continue to provide underlying demand for housing, why is new dwelling activity on a downward cycle?"

LITERATURE REVIEW

Examining dwelling commencements is basically the same as examining the 'supply function' of new dwellings.

In a challenging question on housing market literature, DiPasquale (1999) begins by stating that there has been far less literature on the supply side of housing than the demand side and notwithstanding, the empirical evidence on the supply side is less convincing than the demand side. DiPasquale also provided a Table in her paper

showing literature on 'housing supply' (to that date) and notes that 'virtually all the studies analyse aggregate data'. Most studies also focused on reduced form equations, which generally take the form of price as a function of supply and demand factors and are mainly interested in estimating the price elasticity of both demand and supply. Some studies have more structured approaches, where supply 'estimated directly with construction as a function of price and cost shifters' that is the costs of supplying new housing.

Much of the empirical evidence on the supply of dwellings has focused on the 'price elasticity' of supply. Built environment economic textbooks (such as Harvey (1987) and Warren (1994)) have started on the premise of an inelastic supply. Whilst Green et al (2005) note that this presupposition is supported by many researchers, they found that in the USA, the price elasticity varied substantially from 'heavy regulated' cities to 'low regulated' cities. The former has a low price elasticity and the latter a higher elasticity. In essence, their research implicitly identified government as a factor.

In Australia, Government charges are a major contributing factor for the cost of providing new dwelling supply. HIA (2003) noted that state and local government approaches to the supply and funding of infrastructure associated with residential development have impacted negatively on housing affordability. Another industry body, UDIA (2007) proposed a reduction in taxes and charges, in particular, developer contributions (Sect 94 levies), as "regulatory and market conditions are presently unsympathetic to apartment construction". In a case study of residential developments, Karantonis (2007) found that between them, the three tiers of government receive around 60 percent of total income, whilst the developer with all the risk, receives 40 percent. UrbisJHD (2006) found that government levies and compliances now make up for 35 percent of the total cost of homes in Sydney's northwest and 28 percent of the cost of new units. The GST, introduced from 1 July 2000 and BASIX (Building Sustainability Index) introduced from July 2005 by the NSW Government both had an impact on new dwelling. BMT (2008) estimated a cost increase between 3.08 and 4.21 percent in new dwelling construction cost for complying with BASIX.

In another study in USA, DiPasquale and Wheaton (1994) used a structured equation estimating new house starts as a function of house price, cost of construction, interest cost, land price and existing stock of housing. They concluded that whilst "other variables drive short run construction fluctuations, in the longer run, supply is dictated by house price relative to size of the stock".

Barras (2005) determined that cyclical movements of building activity was determined by endogenous factors such as current and expected economic growth rate, real rental levels, vacancy rates and property yields. Whereas, Achour-Fischer (1999) suggests the supply of new property is triggered by the difference between property value and replacement costs.

Hargreaves (2007) in a New Zealand study, found that one major driver for development was the increase in population, particularly migration. He noted that one problem for developers is the time it takes to complete a project and that developers tend to "see the same demand signals ... and compete for first mover advantage". In his study, he showed how new approvals were still rising two years after immigration growth slowed.

In a 'Special Article' on the relationship between interest rates and building approvals in Australia, the ABS (2001) found a correlation coefficient of 0.50 and concluded that it was not possible to say that fluctuations in building approvals are a result of changes in interest rates. Whilst, Berger-Thomson and Ellis (2004) found that interest rates attributed to the construction movements in the 1980s, the movements in construction from around 2000 were "more (as) a result of the introduction of the GST".

Finally, Warren (1994) points out that there is a considerable 'time lag' in the supply of process of getting new dwellings. He also makes the point that existing housing stock is so large that new dwellings are unlikely to be significant in the overall numbers, adding that it is the second hand market that dominates the market. In other words price movements.

METHODOLOGY

As the aim of this paper is to identify the factors that determined the supply of new dwellings in Sydney, a structural approach was adopted. The variables selected are based on previous studies relating to the supply of new dwellings referred to in the literature above. The methodology will test several models using multiple regression techniques and applying the appropriate econometric tests on the results.

Accordingly, using a structured approach, supply of new dwellings will be the dependent variable and the multiple regressions will examine the relationship between the dependent variable and the independent variables. This relationship can be expressed as:

$$Supply = f\ (price, cost, government, economy, population) \qquad Eq\ 1$$

DATA

Time-series data was collected from various sources for the period September 1992 to June 2008. To undertake the analysis, the data was arranged into quarterly time periods and accordingly where data was monthly or annually, the data was manipulated into quarterly time series.

'New dwelling approvals' for Sydney was used to identify building activity, as it was the only monthly or quarterly data available for building new dwellings in Sydney and this data was derived from the Australian Bureau of Statistics (ABS). The Real Estate Institute of NSW (REI) time series was used for the Sydney median dwelling price and the Australian Institute of Quantity Surveyors index was used for the cost of constructing a new dwelling. Housing loan standard interest rates were collected from the Reserve Bank of Australia (RBA), dwelling rentals from NSW Department of Housing and Gross Domestic Product (GDP) and the rate of unemployment from the Australian Bureau of Statistics (ABS).

The net immigration figure for Sydney was derived by using the Australian Bureau of Statistics (ABS) publication, namely Sydney's population growth and applying the

percentage of net immigrants contributing to Australia's population. Although not used directly in the regression, the consumer price index (cpi) from the Australian Bureau of Statistics (ABS) was used to transform some variables into 'real' terms.

An important variable identified in the literature that needed to be considered in the analysis is the government sector's impact on building activity. As it was difficult to gather quantified information, two dummy variables were used. One dummy variable is for GST, which was introduced 1 July 2000 and the other for BASIX, which was introduced in July 2005. In regards to infrastructure levies (known as Section 96 contributions in NSW), aggregate data was not available.

Leads and lags were applied to certain variables, as builders/developers adjust their feasibilities according to information as it becomes known. In addition, dwelling approvals take time to go from the concept stage to the approval stage. Indeed the approval process would take a minimum of 40 days from the time of lodgement of the proposal with the local authority and depending on the development could take several months. The variables selected to have lags applied are the result of previous studies, whilst the leads were based on intuition. In the case of both GST and BASIX a 2-lead period was applied, as legislation was passed prior to its implementation and potential developers/builders would have been aware of their impending commencement.

In the first instance, a correlation test was applied to all the data to ensure no multicollinearity existed in any of the models used. These tests also included the transformation of several of the variables. From these tests, both 'rent' and 'unemployment' were eliminated from any further analysis as both these variables were highly correlated with each other and with 'price' and 'cost'. In addition, neither variable added any significance in the preliminary regressions.

The description of variables employed in the final analysis, their source and their transformed nature are summarised in Table 1.

Table 1: Description of Variables

Name	Definition	Measure	Source	Transform
Approvals	Dwelling Approvals (Sydney)	#s	ABS	
Price	Median Dwelling Prices (Sydney)	% change	REI	Real (2-Lag)
GDP	Real GDP	% change	ABS	Nil
Int	Rate of Interest	%	RBA	Real
Imm	Immigration (Sydney)	#s	ABS	4-Lag
Cost	AIQS Building Index (Sydney)	Index	AIQS	Nil
GST	Goods and Services Tax	Dummy		0,1 (2-Lead)
BASIX	Building sustainability index	Dummy		0,1 (2-Lead)

To test whether the independent variables are correlated, a correlation matrix was used. This produced the coefficients of correlation between all pairs of variables and the results are shown in Table 2.

As can be noted, cost has a strong positive correlation with both GST and BASIX (0.807 and 0.817 respectively) and to eliminate any multicollinearity, regressions tested used either 'cost' or 'GST and BASIX' separately. All other variables do not appear to be correlated and were used in the regressions. Of course, some were eliminated when they produced no relative significance.

Table 2: Correlations between the independent variables

	PRICE	GST	BASIX	GDP	INT	IMM	COST
PRICE	1						
GST	-0.0125	1					
BASIX	-0.2991	0.4635	1				
GDP	-0.1093	-0.4035	-0.1447	1			
INT	-0.2300	-0.3834	0.0680	-0.0427	1		
IMM	0.1517	0.0281	-0.2719	-0.0641	-0.2257	1	
COST	-0.1006	0.8077	0.8174	-0.2943	-0.2425	-0.1421	1

EMPIRICAL RESULTS

Using Eviews, several models were tested with the results of the four most significant models shown in Table 3. For all these models, the dependent variable is 'New dwelling approvals'.

Table 3: Regression results (Dependent variable: Approvals)

Variable	Model 1		Model 2		Model 3		Model 4	
	Coefficient	**t-test**	**Coefficient**	**t-test**	**Coefficient**	**t-test**	**Coefficient**	**t-test**
Intercept	18613	11.0	10345	7.87	11924	12.35	6848	13.2
Price	129	2.87	92	2.04	78	1.74	123	2.57
Cost	-49.6	-9.15						
GST			-1520	-4.18	-1805	-5.51	-889	-2.65
BASIX			-1930	-5.22	--1935	-5.28	-2296	-6.10
Imm			0.03	0.47				
Int	-451.5	-4.06	-383	-3.20	-457	-4.01		
GDP	956	2.31	767	1.81			1182	2.74
R^2	0.7335		0.7628		0.7474		0.7115	
Adj. R^2	0.7130		0.7349		0.7283		0.6897	
D-W	2.03		2.16		2.06		1.95	
F Stat	35.78		27.34		39.2		32.68	
n=	57		58		58		58	

Note: Critical values for the 't' test are: 1.67 (90%); 2.00 (95%); 2.39 (99%)

All four models satisfied the F-test of significance and using the Durbin-Watson (D-W) test all models showed that there is no evidence of autocorrelation in their respective results.

Model 1 tested four variables, namely price, cost, interest rate and GDP and the results indicate that all four variables are statistically significant at 95 percent. The model produced a satisfactory F statistic and an adjusted R^2 of 0.713 which means the model explains 71.3 percent of the variation of dwelling approvals for Sydney.

As discussed above, due to the high correlation between cost and GST and BASIX, Models 2, 3 and 4 eliminated 'cost' and used both 'GST' and BASIX'.

Model 2 tested six variables, price, GST, BASIX, immigration, interest rate and GDP. The additional variables improved the adjusted R^2, explaining 73.5 percent of the variation of dwelling approvals for Sydney. However, GDP was only significant at 90 percent and immigration was very much insignificant.

Model 3 eliminated the two insignificant variables from Model 2, namely, GDP and immigration. This reduced the adjusted R^2 to 0.728 and whilst all other variables are significant at 99 percent, this time price is only statically significant at 90 percent.

Whilst all models produced reasonably good results, Models 1 to 3 had relatively high intercept coefficients with Model 1 producing the highest. Model 2 had two of its variables producing insignificant t statistics (plus price was not significant at 99 percent), whilst Model 3 had an intercept coefficient nearly twice that of Model 4. Interestingly, all the supply models in DiPasquale's paper (1994) also had relatively large intercepts, which the author noted implied a base for new dwelling development. However if we were to interpret Models 1 to 3 in the same way, then the relative bases from the models are greater than any of the quarters in the data.

Notwithstanding, it should be noted that Hill et al (2001, p56) state that in most economic models, "we should be very careful when interpreting the estimate intercept" and that it is included in the model for its completeness and to improve the model's predictive ability. In essence, the models are explaining the variation of building activity and are not explaining the base.

For this reason a fourth model, Model 4 was tested and included GDP instead of interest rate, that is included the four independent variables, price, GST, BASX and GDP. The results show that all four variables are statistically significant at 99 percent. The adjusted R^2 is 0.6897 has been reduced, indicating that the model explains about 69 percent of the variation of dwelling approvals for Sydney. However from the four models, although the lowest adjusted R^2, Models 4 appears to explain the real position better mainly because it had a much lower intercept and all its variables were significant at 99 percent. A model to include real interest to this model did not improve the position and rendered price and GDP to be insignificant.

Accordingly, using Model4, we can now summarise and report three equations.
The result before GST and BASIX is:

$$\mathbf{A = 6648 + 122.7p_{t-2} + 1182g} \qquad \textbf{Eq 3}$$

The result after GST and before BASIX is:

$$\mathbf{A = 5759 + 122.7p_{t-2} + 1182g} \qquad \textbf{Eq 3a}$$

The result after both GST and BASIX is:

$$\mathbf{A = 3463 + 122.7p_{t-2} + 1182g} \qquad \textbf{Eq 3b}$$

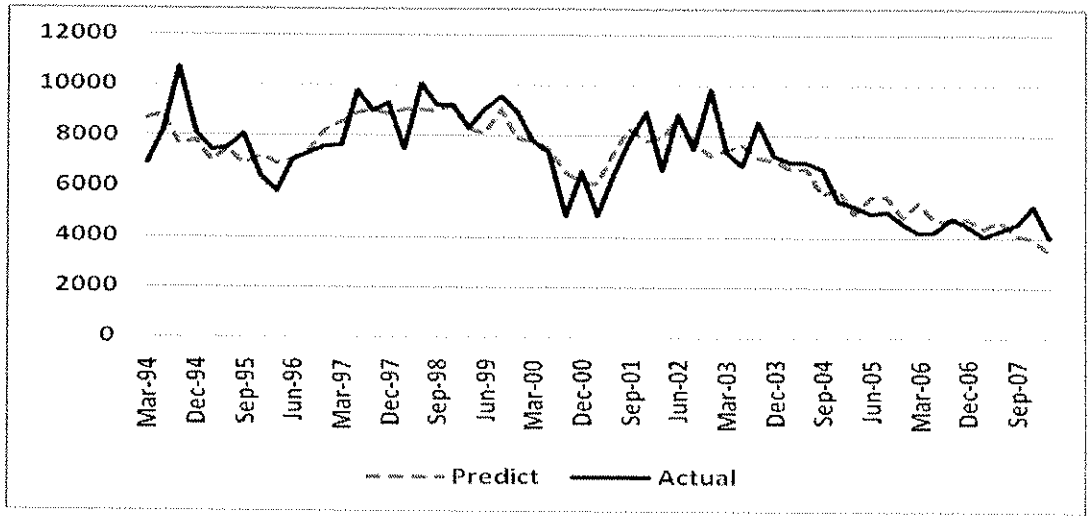
where:

A = New dwelling building approval
p = Percentage change in Sydney real median house price (lagged two period)
i = Real rate of interest
g = Real GDP

As expected both price and GDP have a positive influence on dwelling approvals. A one percent increase in both the real medium price of dwellings and the real GDP will result in an increase of nearly 123 and 1182 new approvals respectively. Accordingly a decrease in either will result in a decrease in new dwelling. Also as expected, both GST and BASIX have a negative impact on new dwelling approvals as their introduction increased the cost of new dwellings.

What Models 2 to 4 are showing is that new dwelling approvals fell with the introduction of both GST and BASIX. This in part explains why there has been a downturn in new dwelling activity over the past few years. This is visually represented in Figure 4, which shows Model 4's predictions against the actual.

Figure 4: Estimated model vs Actual



CONCLUSION

All four models indicate real price and cost, in one way or another are driving forces of new dwelling building activity. Model1 included the construction index, whilst Models 2 to 4 included GST and BASIX as both have an impact on costs to new dwellings. GST impacts on the owner occupier as GST is paid on all the inputs of the development and whereas the developer can claim back the GST on inputs, the developer pays GST on the new dwelling. Generally the developer would use the 'margin scheme', however this is much higher than the GST on inputs and therefore is an additional cost to the developer as well. In addition, complying with BASIX has had an increase in costs and will increase further as the government/s move towards even higher compliances.

Another interesting outcome is that whilst prices rose for the overwhelming majority of the period tested, it was only significant in three of the models at 95 percent and in two at 99 percent.

One disappointing aspect of this paper was the lack of quantitative information regarding developer contributions. Although industry continues to argue regarding Section 94 contributions which intuitively have a major impact on developer's supply of new dwellings, unfortunately no quantitative data is available. Further studies need

to take this into account as governments continue to seek additional contributions from new developments.

REFERENCES

ABS (Australian Bureau of Statistics) (2008) "Australian Demographic Statistics", March, ACT

ABS (Australian Bureau of Statistics) (2008a) "Building Approvals, Australia", Cat. 8731.0, ACT

ABS (Australian Bureau of Statistics) (2001) Special Article – The Relationship between changes in Interest Rates and Building Approvals", Australian Economic Indicators, Cat 1350.0 Nov, ACT,

AIQS (Australian Institute of Quantity Surveyors (2008) "AIQS Building Cost Index", Building Economist, March, Canberra

Achour-Fischer D (1999) "An Integrated Property Market Model: A Pedagogical Tool", Journal of Real Estate Practice and Education, Vol 2 No 1

Barras R (2005) "A Building Cycle Model for an Imperfect World", Journal of Property Research, Vol 22 No. 2&3, pp 63-96, Spon Press

Berger-Thomson L and Ellis L (2004) "Housing construction cycles and interest rates", Research Discussion Paper 2004-08, Economic Group Reserve Bank, Sydney

BIS Shrapnel (2008a) "High land costs and affordability remain a challenge for the new housing market", News Release, 2 Oct, Sydney

BIS Shrapnel (2008b) "Underlying demand for new dwellings at record high", News Release, 4 Aug, Sydney

BMT & Assoc (2008)

http://www.basix.nsw.gov.au/information/common/other/direct_cost_multi_full.rtf

DiPasquale D and Wheaton W (1994) "Housing Market Dynamics and the Future of Housing Prices", Journal of Urban Economics, Vol 35, pp 1-27.
DiPasquale D (1999) "Why don't we know more about housing supply? Journal of Real Estate Finance and Economics, Vol 18 No 1, pp 9-23.

Follain J (1979) "The price elasticity of the long run supply of new housing construction", Land Economics, Vol 55 No 2, pp 190-199

Green R, Malpezzi S and Mayo, S (2005) "Metropolitan-specific estimates of the price elasticity of supply of housing, and their source", The American Economic Review, Vol 95, No 2 pp 334-339

Hargreaves B (2007) "What do rents tell us about house prices?", Pacific Rim Real Estate Society Conference, Freemantle.

Harvey (1987) "Urban Land Economics", MacMillan Education, London

(HIA) Housing Industry Association (2003), "Restoring housing affordability", July, HIA, Sydney.

Karantonis A (2007), "Is property being over taxed – a NSW study", Australian and New Zealand Property Journal, September, Vol1 No 3

(REI) Real Estate Institute of NSW (Various) "Property Market Facts", REI, NSW

(UDIA) Urban Development Institute of Australia (2007), "City Centres – Submission of the Urban Development Institute of Australia NSW to the Department of Planning", August, UDIA, Sydney.

UrbisJHD (2006) "Residential Development Cost Benchmarking Study", Property Council of Australia.

Warren M (1994) "Economics for the Built Environment", Butterworth-Heinemann, London.

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