# An Examination of Property Cycles in the Office Markets of Selected Australian Capital Cities

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## INTRODUCTION

Over the last decade there has been considerable interest and research into property cycles as property professionals contemplated the downturn of the late 80s and early 90s. Researchers have studied a number of aspects of the property cycle such as its characteristics (Antwi and Henneberry, 1995), its impact on asset performance (Pyhrr, Webb and Born, 1990) or its impact on the valuation process (Born and Pyhrr, 1994). Much of this research has been qualitative in nature due to the lack of extensive, historic data series (which would ideally include property characteristics such as levels of construction and obsolescence, take up rates, vacancy rates - both actual and hidden, prices and effective rental rates and levels of investment). It is only in relatively recent years that the value of collecting such data has been realised. Nevertheless, there has been some quantitative research and modelling of property cycles in office markets, possibly dating back to the work of Barras (1983) to which the recent work on market equilibrium/disequilibrium (Hendershott, 1996) has added.

This paper extends the work presented in MacFarlane (1997) which developed a market cycle model incorporating features of both the Barras and Hendershott models. In the 1997 paper, only the Sydney CBD Office market was examined, The current paper applies the model to selected Australian capital city Office Markets (Sydney, Melbourne and Brisbane) allowing a discussion of differences between the cycles in these markets and the development of forecasts.

## A SIMPLE MODEL OF THE CONSTRUCTION CYCLE

This paper uses the model developed in MacFarlane, 1997. It is derived from work on construction cycles (Barras, 1983) and market equilibrium/disequilibrium (Hendershott, 1996) and is of the general multiplier-accelerator type (Samuelson, 1939; Kuznets, 1930).

The model is as follows:

Demand: $D(t+1) = (1+g)\, D(t)$ $\quad t = 0,1,2.....$ (1)

Supply: $S(t+1) = (1-d)\, S(t) + C\,(t+1)$ $\quad t = 0,1,2.....$ (2)

Construction: $C(t+1) = [k + a\,(Vs - V(t-p))]\, S(t-p)$ $\quad t = p, p+1,....$ (3)

Vacancy: $V(t) = \dfrac{[S(t) - D(t)]}{S(t)}$ $\quad t = 0,1,2...$ (4)

where:

g = rate of growth in demand;

d = rate of demolition of existing stock;

p = development period;

k = underlying (equilibrium) rate of construction;

Vs = level of vacancy to which construction is sensitive (equilibrium vacancy rate); and

a = development multiplier.

The model can be either deterministic or stochastic although the form in which it is presented above is deterministic. To express the model stochastically, either an error structure needs to be incorporated into the above equations and/or one or more of the above parameters could be made stochastic. The critical component of the above model is the construction equation (3) which introduces a fixed development period, p. That is completed construction in the period (t, t+1] is related to the level of supply and vacancy rate at time (t-p) or p period earlier. While development is clearly a continuous process, the model needs to be expressed in a discrete form such as the above due to the availability of data only at fixed intervals.

Fundamental to equation (3) is the multiplier (a>0) which allows for an increased rate of construction when vacancies are low (construction which will emerge as new supply some p periods later) and a lower rate of construction when vacancies are high. Equation (3) indicates that for every 1% increase in vacancy rate, the rate of construction will drop by a%. The aim of this equation is to emulate the behaviour of the development process in which a large amount of planning and construction commences when conditions are favourable but dries up almost completely in an adverse market.

It is emphasised that the above model is an attempt at simplicity. Many criticisms could be leveled at the model such as:

i. it fails to take account of rents;
ii. it fails to segregate the market into its (reasonably) distinct component sub-markets;
iii. it incorporates a fixed development period, p.

While it may be possible to generate more sophisticated models to overcome these problems, it is highly likely that the level of available data is insufficient to estimate the parameters and test the validity of such models. In the case of rents, it might be argued that while they are important to development decisions, they are largely related to vacancy rates which are incorporated into the model.

The model is discussed in some detail in MacFarlane (1997) with a number of exhibits demonstrating the behaviour of the model for selected parameter values. The following are the most important considerations:

i. the length of the cycle is largely determined by the length of the development period;

ii. the development multiplier largely determines if the system converges to a constant vacancy rate (low values of a), a stable cyclical vacancy rate or an unstable cyclical vacancy rate (progressively higher values of a). The development multiplier (a) is also largely responsible for determining the amplitude of the cycle;

iii. When the development period is longer (larger values of p), a lower value of the development multiplier (a) will given rise to cyclic rather than convergent behaviour.

**The Sydney, Melbourne and Brisbane Office Markets**

I am most grateful to Dr. Frank Gelber of BIS Shrapnel for providing the excellent data on which the following analyses are based.

Firstly, the following exhibits show the vacancy rates over the period 1970 to 1997 for the Sydney, Melbourne and Brisbane metropolitan office markets. Each of these markets has seen substantial development over the period being considered and in each location, the dominance of the central CBD market has greatly diminished, moving from 71% to 46% in Sydney, 77% to 56% in Melbourne and 87% to 56% in Brisbane during the period.

Since they still represent a significant proportion of available office space in each location, the pattern of vacancy rates in each of the three CBDs is similar to those given below.

**Exhibit 1: Vacancy Rates in the Sydney Metropolitan Office Market 1970-1996**

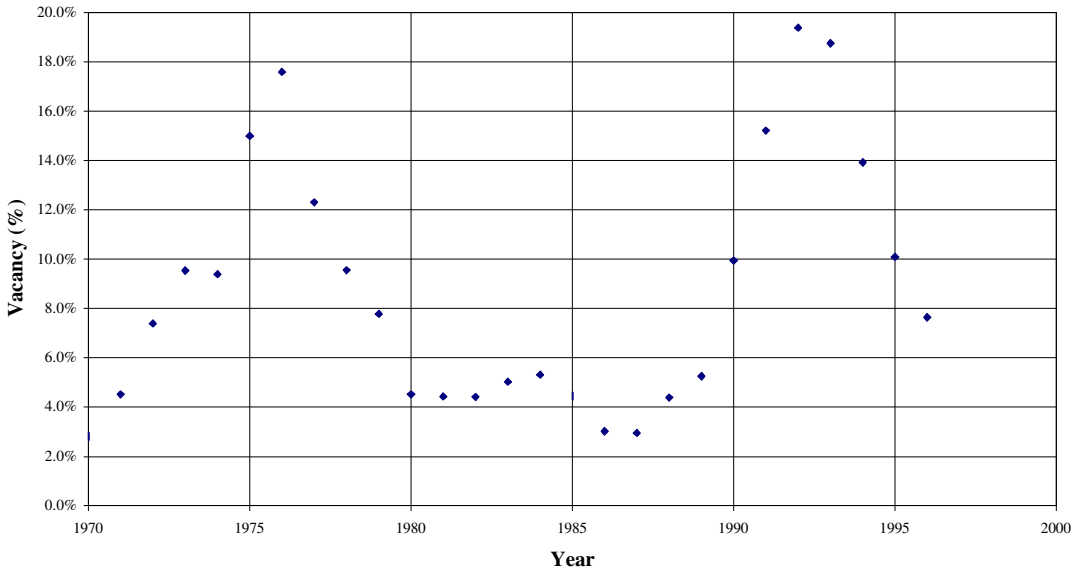



**Exhibit 2: Vacancy Rates in the Melbourne Metropolitan Office Market 1970-1997**

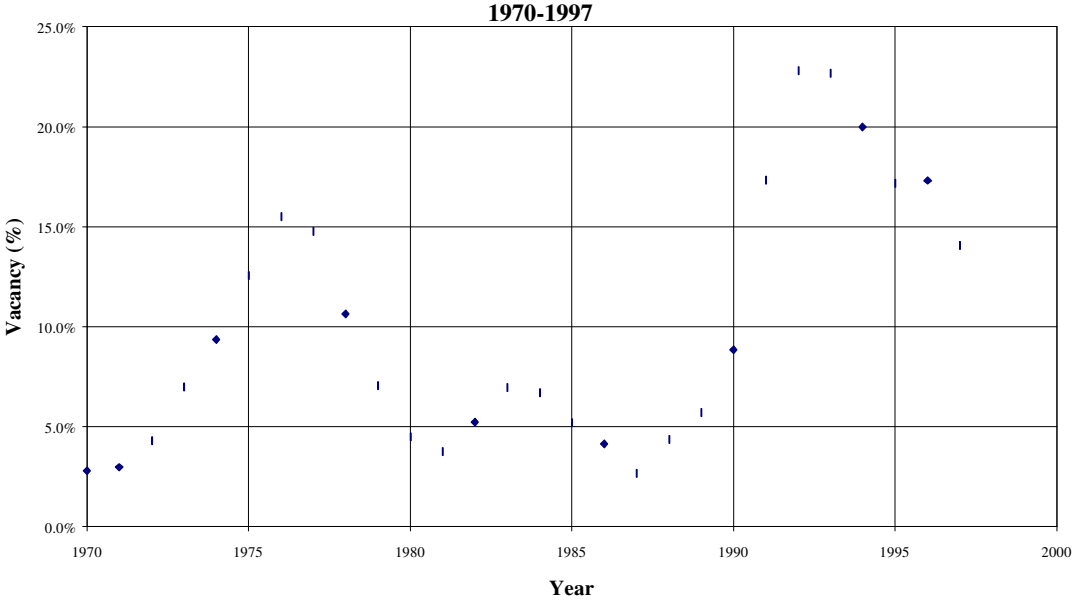
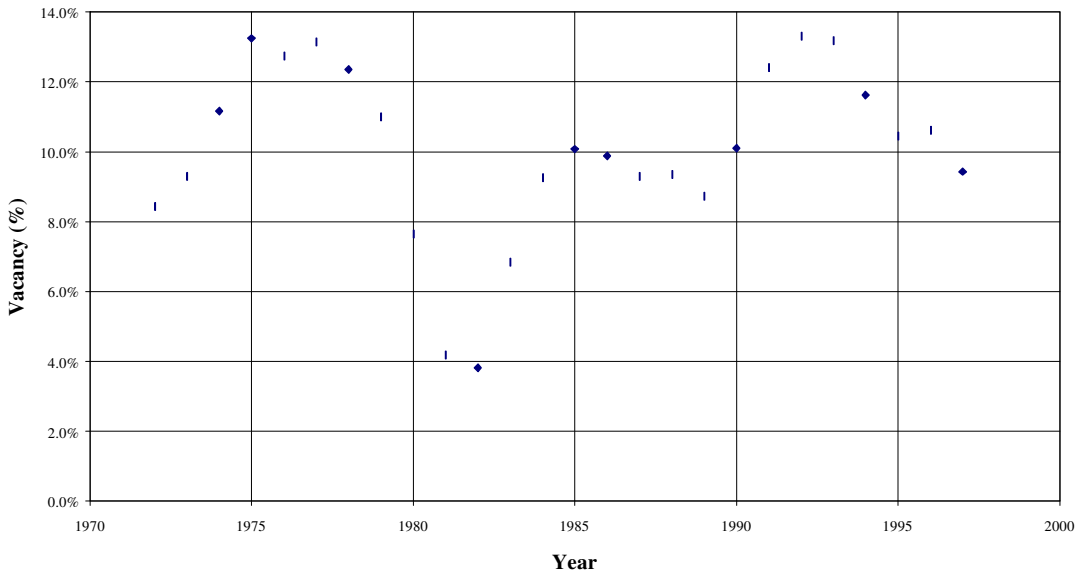


**Exhibit 3: Vacancy Rates in the Brisbane Metropolitan Office Market 1972-1997**




Comparison of Exhibits 1 to 3 reveals a very similar pattern of vacancy rates over the 1970s and early 1980s with each peaking around 1975-76 in the mid-teens (%) and then decreasing fairly smoothly to a low of about 4% around 1981-82 (note that there is no data available for Brisbane in 1970-71). While there are some differences in the images for the 1980s and 1990s, they are similar in that each peaks around 1992-93 (although the magnitude of the peaks differ significantly) and the Sydney and Melbourne graphs both show a "bubble" between 1981 and 1987. The main differences are the dramatic increase in vacancy rates in the Brisbane office market in the early to mid 1980s (due to an enormous level of construction at this time) and the more rapid emergence of the Sydney market from the malaise of the early 1990s. While some of the patterns are common and all of the charts are clearly cyclic in nature, it is hard to conclude from a close scrutiny of any of these graphs that we are dealing with a phenomenon in which the cycles are of a similar duration and of a common amplitude. On the other hand, if the cycles are not of a similar duration and amplitude, it is impossible from the above graphs to detect another relationship.

Analysis of the data reveals the following summary statistics:

**Exhibit 4: Comparison of Summary Statistics, Sydney, Melbourne and Brisbane Office Markets**

| Parameter/Statistic | Sydney Mean ± St. Dev. | Melbourne Mean ± St. Dev. | Brisbane Mean ± St. Dev. |
|---|---|---|---|
| Demand growth , g | 4.4% ± 2.8% | 5.2% ± 3.0% | 7.2% ± 5.5% |
| Demolition Rate, d | 1.7% ± 0.7% | 0.9% ± 0.9% | 0.7% ± 0.7% |
| Vacancy Rate | 8.7% ± 5.1% | 9.9% ± 6.3% | 10.1% ± 2.5 |

Estimation of the other parameters of the model as per MacFarlane (1997) reveals:

**Exhibit 5 Comparison of Model Parameters, Sydney, Melbourne and Brisbane Office Markets**

| Parameter | Sydney | Melbourne | Brisbane |
|---|---|---|---|
| Devt Period, p | 4-5 years | 3-4 years | 3-4 years |
| Equil Const Rate, k | 6.9% | 6.75% | 9.7% |
| Multiplier, a | 0.48 | 0.70 | 2.1 |
| Sensitive Vac Rate, Vs | 7.2% | 10.2% | 9.6% |

These parameter values are roughly similar with the exception of Brisbane with a development multiplier, a, of 2.1 and a higher equilibrium construction rate. This is quite a surprising value for the development multiplier, a, as it indicates an increase in construction of over 2% (eg from 7% to 9% of existing stock) for every 1% decrease in vacancy rate. This could reflect the fact that Brisbane is not as mature a market as Sydney or Melbourne and is certainly due, in part, to the legacy of the legendary Queensland "white shoe" brigade who reigned for a period in the mid 1980s during which time the supply of office space in Brisbane increased by over 15% for each of four consecutive years and reached over 25% per annum increase at its peak. A market with a development multiplier as high as this is highly unstable and will be prone to cataclysmic booms and busts. An analysis of the Brisbane market with these heady days removed indicates a development multiplier of approximately 1.1 and even less for the period since the boom.

**Future Predictions**

Using the model, the following forecasts have been developed for vacancy rates in the three office markets for the period to 2010:

**Exhibit 6: Vacancy Rate 1970-96, Sydney Metro with Forecasts 1997-2010**

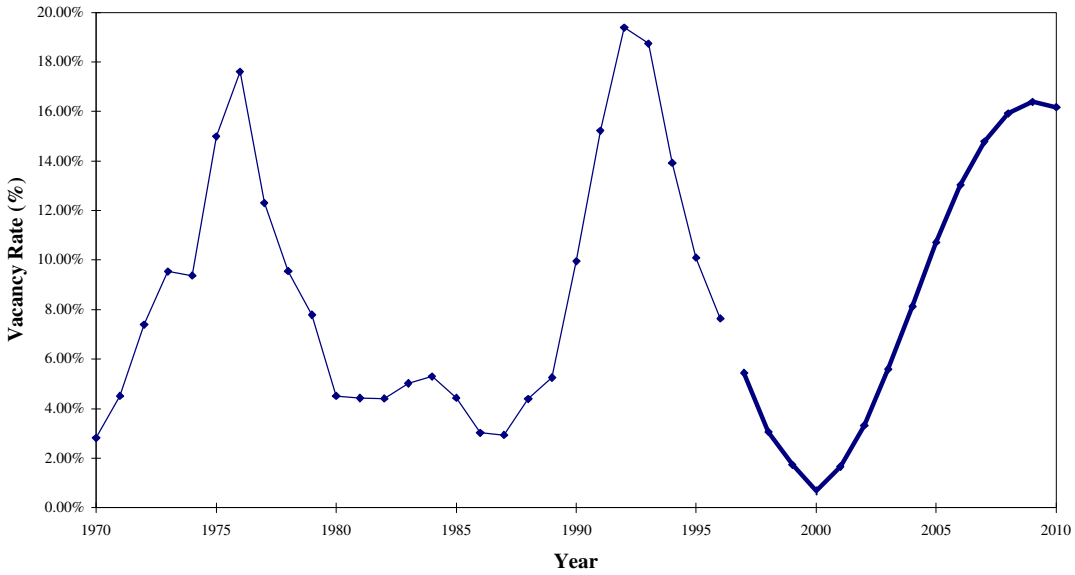



**Exhibit 7: Vacancy Rate 1970-97, Melbourne Metro with Forecasts 1998-2010**

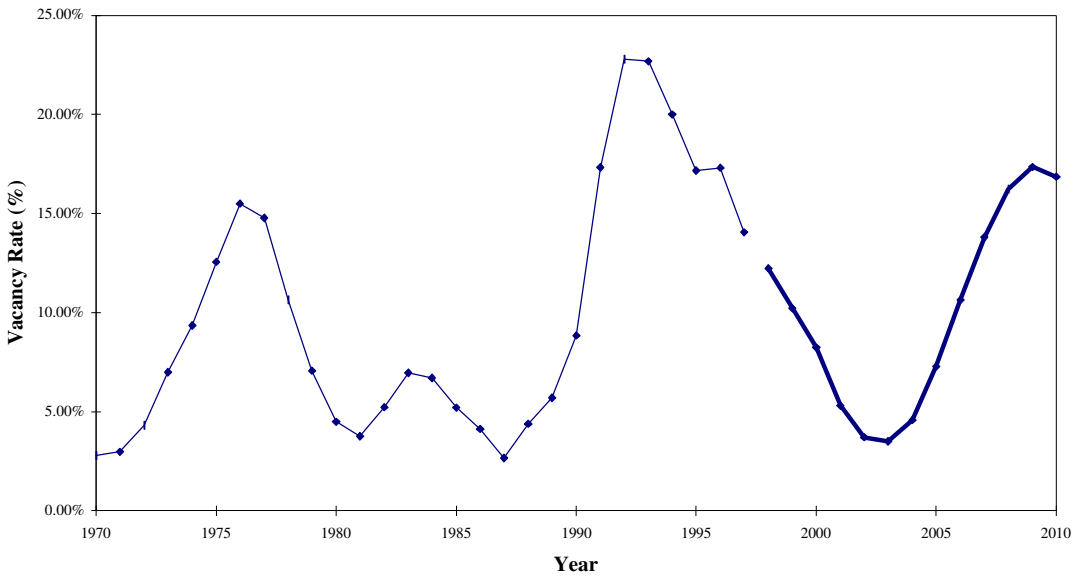
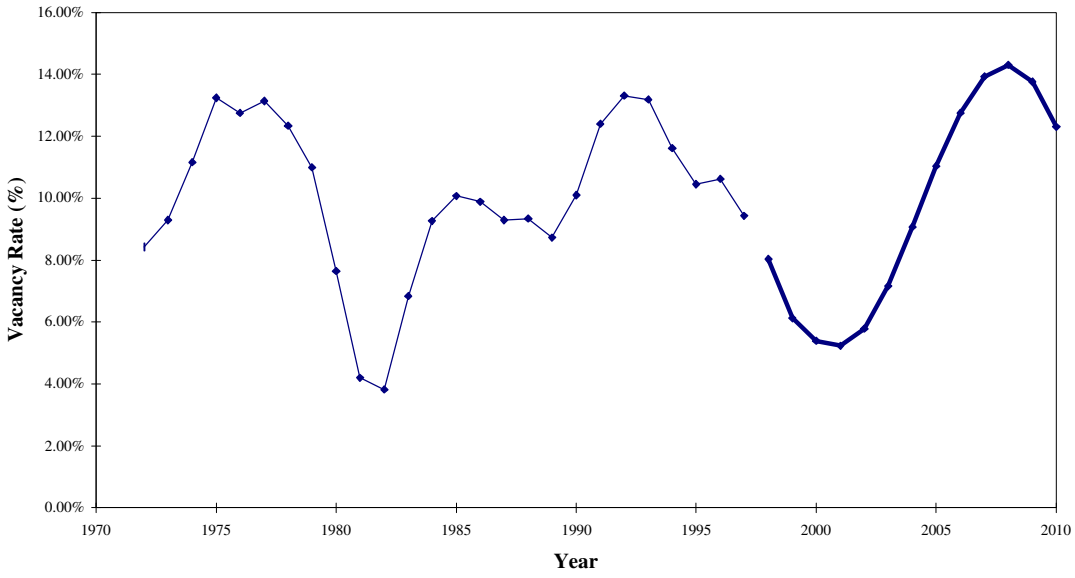


**Exhibit 1: Vacancy Rate 1972-97, Brisbane Metro with Forecasts 1998-2010**




These charts forecast a continued improvement in vacancy rates with Sydney bottoming first in the year 2000 followed by Brisbane in 2001 and Melbourne in 2003. The forecast minimum vacancy rate of about 1% for Sydney seems rather low and is a function of the model producing values in which the peaks and troughs are approximately equally distant above and below the equilibrium (average) vacancy rate. In practice, the peak would be expected to be further above the average vacancy rate than the trough is below it and it may be possible to modify the model to overcome this problem. In each city, the model forecasts a peak in vacancy rates around 2008-2009, with Sydney peaking at 16%, Brisbane at 15% and Melbourne at 17%. Only time will tell the accuracy of these forecasts.

## Conclusion

This paper uses the model developed in MacFarlane (1997) to make some comparisons between the Sydney, Melbourne and Brisbane office markets. The model contains a number of parameters which are interpretable in terms of the office market cycle and the parameters estimated here from data from these three markets are consistent with knowledge of the markets. The model facilitates forecasting the future behaviour of each market (here in terms of its vacancy rate) and, again, the forecasts produced seem consistent with our current knowledge and expectations of each market.

While the model does appear to be quite a reasonable one and has the advantage of simplicity, there are still a number of deficiencies in the model, specifically:

i. that it generates fairly symmetric cycles;

ii. that it incorporates only a single development lag; and

iii. that forms other than linear may be appropriate to relate future levels of construction to the current vacancy rate.

Further research might address these and other issues with a view to improving the level of property forecasting.

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