THE CYCLICAL NATURE OF RESIDENTIAL HOUSING MARKETS

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Cycles are an integral part of most capitalist societies. They are openly acknowledged and researched in certain real estate segments, such as the commercial office market. Although the 'seven year cycle' is often discussed in regards to residential real estate, there has been relatively little research undertaken in this area. Therefore this paper seeks to fill this void by commencing an investigation into residential housing market cycles. It commences with an overview of established theories in cycle research. An analysis of a large number of Brisbane suburbs over an extended time period was then undertaken using Fourier Analysis. The results suggested cycles were observed in a number of Brisbane suburbs, with consideration also given to differences in spatial patterns and property values.

1.0 Introduction

Cycles have been acknowledged as a common occurrence in most real estate markets. Even with the arrival of the new economy and its associated demographic and cultural shifts, cyclical ups and downs cannot be avoided (Gruen, 2000). Only in certain market types (e.g. the commercial office market) are they closely followed and examined with a relatively high level of detail. Although the status of the residential housing market is of paramount interest to investors, owner/occupiers and tenants, relatively little research has been conducted to understand the nature of long term cycles (Tsolacos & McGough, 1995). Even so, clear evidence suggests that periodic price increases and decreases occur in residential housing markets like Brisbane, as shown in Figure 1. The research was designed as an initial step in this direction and considers the unique characteristics of residential housing markets with regard to cycles.

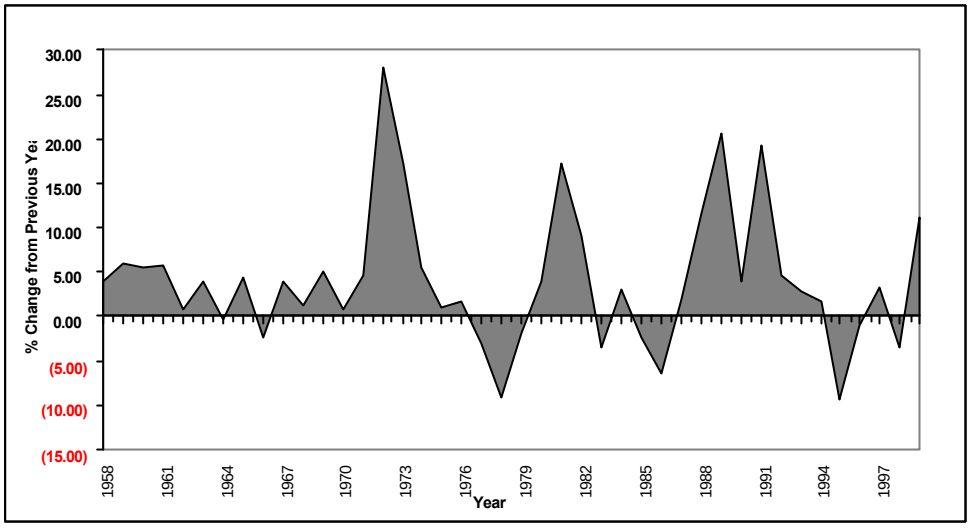

Figure 1 – Volatility of Brisbane House Prices between 1958 – 1999
(deflated and based on relative percentage change)

1.1 Purpose of Paper

This paper assesses the existance of cycles in a residential property market. More precisely, it seeks to answer the following question:

'are seven year residential property cycles a myth or reality?'

It revisits previous research into short and long tem cycles and their different theories. The research process is then outlined, including the methodology selected to address the research question. A case study analysis of the residential housing market in Brisbane then conducted.

2.0 Residential Housing Markets

A residential housing market in an urban city is relatively complex and differs considerably from other market types. For example, segmentation of an office market is usually undertaken using a relatively small number of tiered classifications, such as 'Prime', 'A', 'B', etc. Unfortunately this system is not suitable for a residential market, which is typically segmented using geographical location as the main distinguishing characteristic. In addition, there are numerous other influencing factors (for example, see Figure 2) which can affect supply and demand levels to varying degrees.

A complete model of the residential real estate market is yet to be produced which fully encompasses all of these interactions that occur within. However in other market types (e.g. commercial office market) the separate supply and demand levels can be individually analysed, permitting detailed interpretations of the cycle and its relationship with real estate prices at any one point in time. Unfortunately this type of supply/demand model appears ineffective for a widespread interrelated housing market, with the exact stage of each cycle difficult to interpret due to these additional influencing factors as highlighted in Figure 2. Therefore an alternative approach to identifying cycles is proposed.

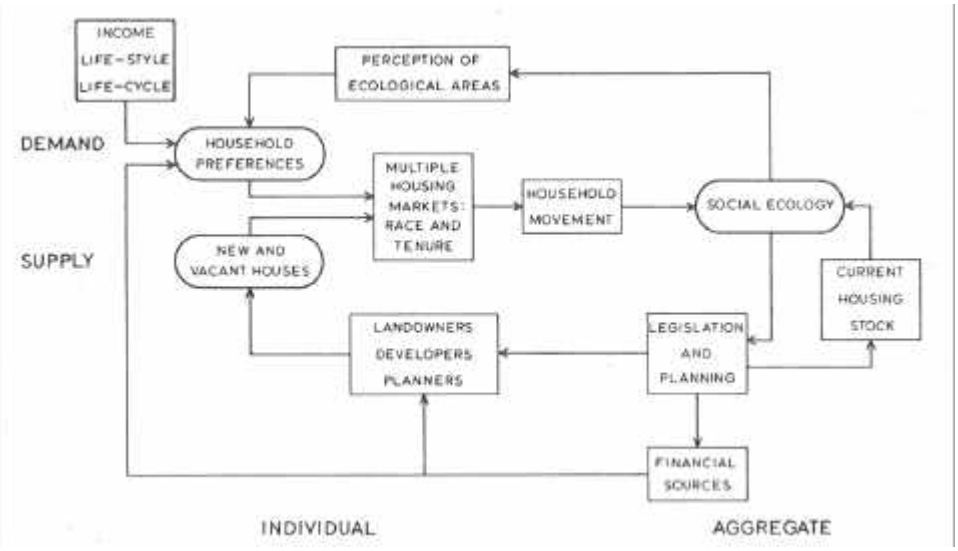

Figure 2 – Aggregate Housing Market Structure (Robson, 1975).

3.0 Overview of Cycles

For the purpose of this study, cycles can be considered as:

'Processes which repeat themselves in regular fashion'

However the question that then arises is:

'If these processes are so regular, why can't we predict them?'

This question is more applicable to some property markets than others. For example, the commercial property market has always been particularly prone to the boom-bust cycle which cause very destabilizing economic effects (Scott & Judge, 2000). Even so, predicting the timing and magnitude of these rises and falls in the marketplace has never been achieved to *absolute perfection* for any property market on a consistent basis.

Surprisingly 'cycles' are traditionally much more complex than first may be anticipated. It has been demonstrated that there is substantial heterogeneity in terms of duration, amplitude and co-movements. Furthermore, the variations can differ substantially across cyclical episodes and recessions are by no means mirror images of expansions (Stanca, 1998). Therefore the perfectly symmetrical example of a cycle presented in Figure 3 would be totally unrealistic, as it does not promote any irregularities or traditionally sharper 'boom' or 'bust' periods.

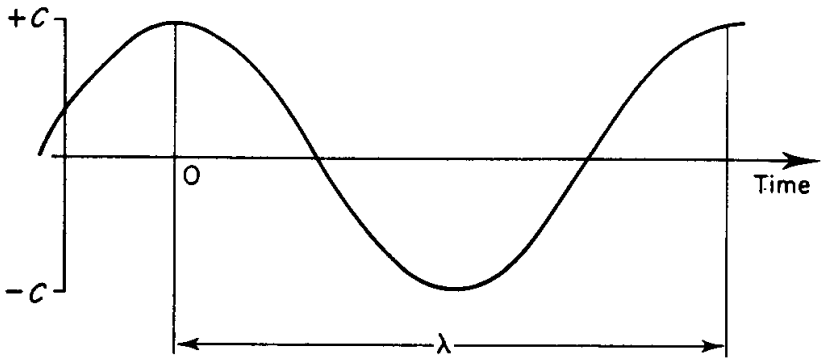

Figure 3 - Characteristics of a Typical Cycle Phase

It must be remembered that the original notion of a 'seven year' cycle was encouraged as a representation of the difference between good and bad harvests (Niehans, 1992). This period was reflected by a medium of seven (7) years, which now appears to be a rudimentary means of allocating such a defined time period.

In general there have always been at least four distinct characteristics of business cycles:

1. can only be found under a capitalist society and not under other systems;
2. not limited to a single firm or industry, but is economy-wide;
3. one cycle follows the other, and marked by a similar sequence of events;
4. cycles differ in length and amplitude (Burns & Mitchell, 1946).

4.0 Background to Cycle Theory

The majority of the high profile research has been conducted on *business* cycles, with four prominent theories widely promoted and acknowledged as listed below.

4.1 Short Term Cycles

Commonly accredited to Clement Juglar (1819-1905), 'short term cycles' refer to a period of between 7 to 11 years and were based on historical financial information. In many circles the Juglar cycle was also known as the fixed investment cycle (Tylecote, 1994). Juglar studied business conditions and confirmed that their actions were not completely random, but generally operated within a number of regular cycles. Importantly Jugular convinced economic science that advanced economies inherently develop in cycles, and persuaded the business world of the existence, persistence and pervasiveness of these cycles (Niehans, 1992). Juglar described three distinct phases in the cycles, namely prosperity, crisis and liquidation. It was also shown that "every cycle in every country is seen to be, to some extent, historically unique, and in its length has to be explained in light of its particular features" (Niehans, 1992, p.554). Juglar was the first person to use time series such as interest rates, prices and central bank balances together to analyse a well-defined economic problem (Tvede, 1997). Furthermore, Juglar was the first person to acknowledge that depressions were adaptations to situations created by the proceeding prosperity.

4.2 Medium Term Cycles

The medium term cycle typically spanned a period of 15 to 25 years and was bought to prominence as the Kuznet cycle. It has strong econometric support and downswings can be triggered by sharemarket crashes (Solomou, 1987). The Kuznet cycle has been explained by the dynamics of investment in building and land, and in other long term assets such as stocks and shares (Tylecote, 1994). For example, the Wall Street crash in 1857 was a clear Kuznet downturn with upswings influenced by changes in immigration and rainfall variations.

4.3 Long Term Cycles

Research by Kondratieff in the early 20th century promoted the existence of long term cycles, with each complete cycle stretching over a period of approximately 45 to 60 years. This theory was based on a number of 'long waves' where there was a serious of oscillations which commenced with an initial over investment in capital. Then this was followed by a recession, until the invention of new technology eventually led to a new spurt of investment (Tvede, 1997).

A summarised long term cycle would be as follows:

1. First cycle commenced with the Industrial Revolution;
2. Second cycle followed with the railroad boom;
3. Third cycle started by the electrical power plants and reinforced by industries such as automobile, steel and textile industries.

4.4 Extremely Long Term Cycles

Although rarely discussed, extremely long term cycles are based on international relations and refer to four generations over a period spanning 100-120 years (Modelski, 1987). Significant events include the timing of global wars and variations in the balance of global power. These four generations can be broken down as follows:

- 1st generation - a global war takes place with the emergence of a new world power controlling world trade and economic relations
- 2nd generation - a period of uncontested leadership;
- 3rd generation - delegitimation occurs;
- 4th generation - a period of deconcentration occurs with a serious challenger emerging. The 1st generation then follows again soonafter (Modelski, 1987).

5.0 Analysis of the Brisbane Housing Market

The process was assisted by a comprehensive and detailed database containing the annual level of median house prices for 117 Brisbane suburbs between 1957 and 1999. Examination of the data was conducted using a statistical technique known as 'Spectral Analysis' or 'Fourier Analysis', highlighting those suburbs with distinctive property cycles and their respective cycle lengths. A common hindrance to most research is the difficulty in obtaining current and reliable primary data, and this is often compounded further when a time series analysis is to be undertaken. Fortunately this research was able to address and overcome these barriers with the data set. Then the results were investigated further in respect to two other variables, namely (a) individual suburb ranking and (b) the spatial distance to general post office in the central business district (CBD).

Brisbane was considered a 'good city' for this research and representative of a modern urban city in a developed western civilisation. Notably a ‘good city’ should contain different types of neighbourhoods and good neighbourhoods of each type (Brower, 1996). Given its undulating urban landscape, relatively close proximity to the Pacific Ocean and dissection by the Brisbane River, the topographical characteristics of Brisbane can be readily compared to most developed cities in western civilisation. The suburbs are evenly spread on both sides of the river (see Figure 2) and the topography is not unduly affected by other natural characteristics. It is known for sub-tropical weather with a lifestyle which can be readily compared to many other global cities. Brisbane's selection for this study was based on these parameters, and importantly will ensure this research is of direct relevance to other cities.

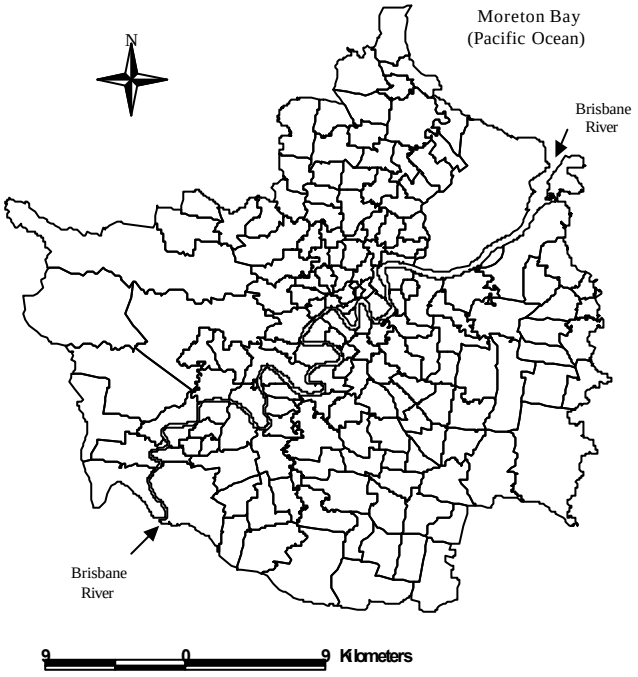

Figure 4 - Overview of Brisbane Suburbs

A comprehensive data set of Brisbane house sales was collected covering an extended time series. This process was undertaken in multiple stages, and commenced with the collection of data from the Department of Natural Resources (DNR), a statutory government authority responsible for the entire state of Queensland. The house sales database related to open market transfers of established dwellings in Brisbane during the period 1959-1994. The information for the first period (1958-1974) was supplied in hardcopy format, and in microfiche format for the second period (1975-1994). For the third and final period (1995-

1999) the established house sales data was sourced from the Real Estate Institute of Queensland (REIQ).

To ensure every transaction retained in the data set was a true indication of 'market value' for an *established residential dwelling* (including land value) for the nominated year, each individual transaction conformed to the following criteria:

- Total sale price exceeded its unimproved land value by at least 20% to ensure the sale was not limited to only vacant land;
- Land area did not exceed 2000m^2, therefore excluded acreage or semi-rural property with a higher than average land content;
- Excluded all family and inter-company transactions to eliminate sales not classified as 'arms length' and reflecting true market value;
- Restricted zoning to 'Residential A' only, referring exclusively to *single detached residential dwellings*.

The data was also deflated to remove the impact of inflation over the data collection period. This was accomplished by indexing all sale values to a common base value, which in this data set was 1999 values. This allowed direct comparisons across the entire time period with variations in property values due to natural prices increases and decreases. Even with inflation removed all suburbs showed an upward trend over this time period.

Data Analysis

The data from 117 Brisbane suburbs taken was analysed using a statistical technique known as 'Spectral Analysis' or 'Fourier Analysis', highlighting those suburbs with distinctive property cycles and their respective cycle lengths. This method is designed to interpret the 'white noise' of the data set and identify the spectral density or cycles that are not clearly visible in the data. In order to successfully complete this task for residential housing data, the sequential steps listed below were completed in order. Note steps 2 through to 7 were assisted by the computer program Statistica (Statsoft, 2000).

Step One.

Data from between 1957 and 1999 was assembled on a suburb-by-suburb basis using median established house values. However not all 117 suburbs in the database were in a fully developed state over the entire time period, with new suburbs added to the database when substantially developed.

Step Two.

The data was detrended to remove any linear trends within the data.

Step Three.

The data for each suburb over the time period were individually entered into the Spectral Analysis, which then produced individual reports for each suburb.

Step Four.

The results from each spectrum analysis were assembled and results from the suburbs were examined and compared.

Results

The results from the analysis of 117 Brisbane suburbs are summarised in Table 1. They confirmed a clear short term cycle was evident in 56 suburbs, equating to almost half of the total suburbs available. All cycles associated with these suburbs were under 15 years and ranged between 7 and 14 years. Notably only one suburb (South Brisbane) was observed with a 7 year cycle. The remaining suburbs were not associated with short-term cycles and were excluded from further analysis.

Table 1 – Results from Property Cycle Analysis of Brisbane Suburbs 1957-1999

Total Suburbs available with complete data records	117
Number of Suburbs with identified short-term cycles	56
Average cycle (years)	9.95
Standard Deviation of Cycles (years)	1.97
Range of Cycles (years)	7 - 14
Suburbs with 7 year cycle	1
Suburbs with 14 year cycle	5

For the next stage the analysis concentrated on those 56 suburbs with identified short-term cycles. Consideration was given to two additional factors which differentiate between the suburbs, namely:

(a) Ranking (based on median sales value out of the total 117 suburbs); and

(b) Distance (measured in radial kilometres from the Brisbane CBD).

Ranking

All suburbs in the original database were ranked from 1 down to 117 based on their median sales value in 1999. For example a ranking of 1 represented the highest value suburb and a ranking of 117 was allocated to the lowest value suburb. These suburbs were separated into four quartiles with each containing twenty-nine suburbs, with the exception of thirty suburbs for the lowest or fourth quartile. Consideration was then given to the performance of each quartile in relation to their short-term property cycles. Refer to Figure 2 for a summary of the results.

As highlighted in Figure 5 only 21% of all suburbs in the top or 1st quartile were associated with a short-term cycle. However at the other end of the spectrum this scenario had reversed, with 70% of lower ranked suburbs linked to distinct cycles.

A closer inspection of results from the highest and lowest ranked suburbs confirmed this trend. In the top ten ranked suburbs only one was associated with a short-term cycle. In direct contrast eight out of the ten lowest ranked suburbs showed clear short-term cycles.

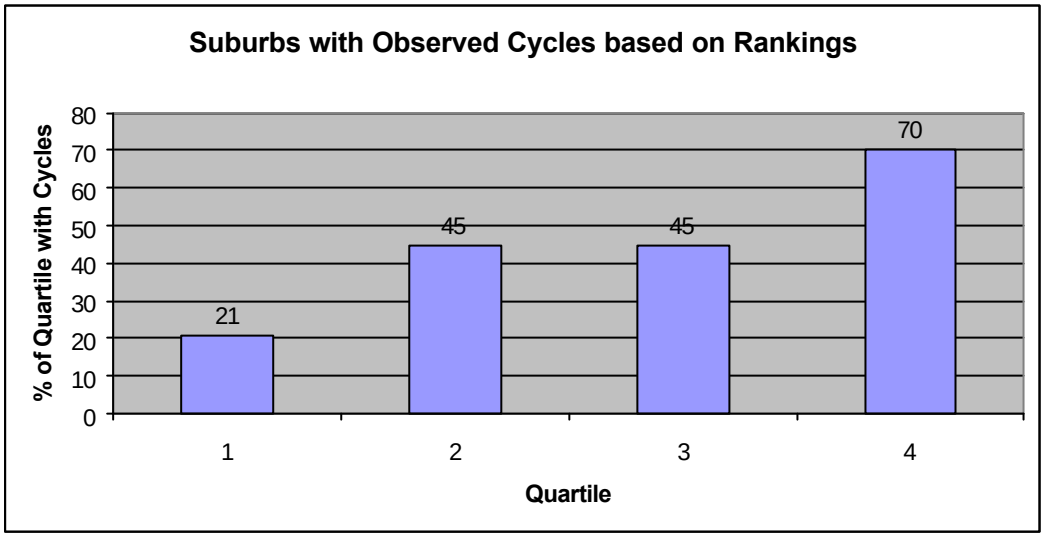

Figure 5 – Suburbs with Observed Cycles based on Rankings

Distance to CBD

The individual spatial location of all 117 suburbs was used to measure the direct radial distance in kilometres from the Brisbane CBD - refer to Figure 4. This ranged in distance from two kilometres up to twenty kilometres, with an average of 8.6 kilometres. Then suburbs were separated into quartiles, with the first quartile representing the top 25% of suburbs located closest to the Brisbane CBD. The results of the analysis with respect to short-term cycles are presented in Figure 3.

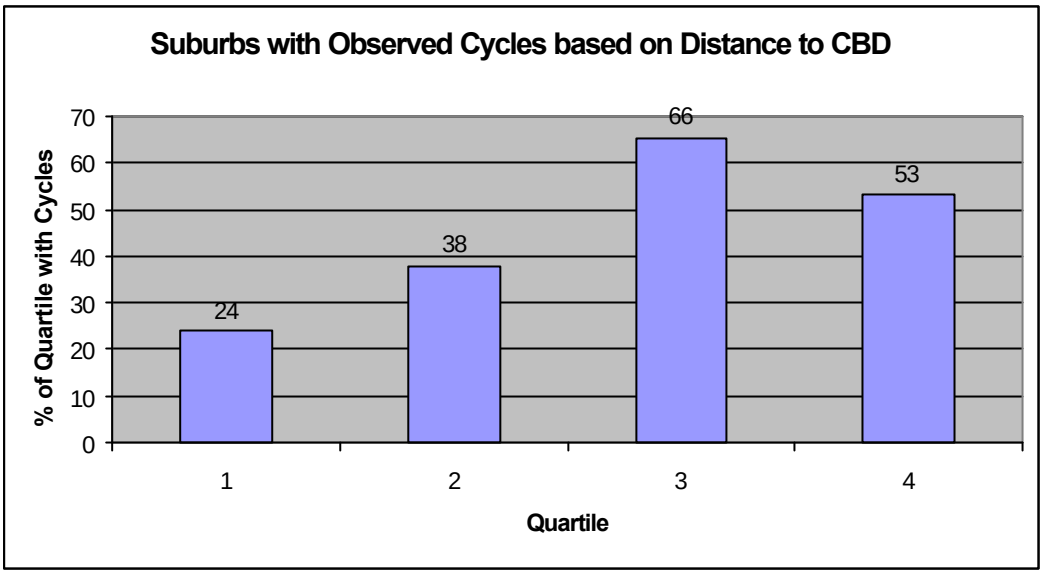

Figure 6 – Suburbs with Observed Cycles based on Distance to CBD

It is clear in Figure 6 that only 24% of all suburbs in the quartile located closest to the Brisbane CBD were associated with short-term cycles. Furthermore, when focussing upon the top 50% of Brisbane suburbs closest to the Brisbane CBD, only 31% of these were linked to short-term cycles. In direct contrast the majority of suburbs located further away displayed distinctive cycles. In other words, 66% or two-thirds of suburbs in the third quartile were linked to short-term cycles. Thes proportion decreased to 53% for suburbs located furtherest away from the Brisbane CBD.

6.0 Conclusion

Short term cycles were observed in almost half of the Brisbane suburbs over the forty-two period between 1957 and 1999. A typical Brisbane suburb that could be described as 'cyclical' was associated with the following characteristics:

- located in the lowest quartile in regards to rankings, indicating lower priced suburbs were more likely to be *cyclical*;
- located in the third quartile as measured by radial distance from the Brisbane CBD, indicating that a suburb located further away from the CBD (but not in the outer commuter zone) was more likely to be *cyclical.*

Note: all observed cycles for the cyclical suburbs were less than fifteen years. Interestingly only one suburb recorded a 'seven year cycle' which represented less than 2% of all Brisbane suburbs with cycles. This also equated to less that 1% of all suburbs entered into the analysis. The results clearly indicated a ten year cycle is a better description of suburbs in the residential housing market in Brisbane, although this statement is only applicable to half of the total suburbs

This research has shown that real estate cycles existed in Brisbane, although only relevant to approximately half of the total suburbs. It appeared that *out-lying lower-priced* suburbs are more likely to be cyclical in nature. Alternatively, suburbs *higher-priced suburbs located closer to the city* with a continued high level of demand are less likely to be cyclical.

6.1 Further Research

The emphasis has to be placed on isolating the cycles for individual suburbs. This will allow the status of the market to be followed along Figure 3 for each suburb, and permit a 'snapshot' at any point in time. The result will clearly assist the timing of transactions, therefore maximising future returns for sellers or avoiding a falling market. The examination of other real estate markets in Australia (eg. Melbourne, Sydney) will also be undertaken to permit a comparison of cycles.

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