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# The Significance of Debt, Human Nature and the Nature of Land on Real Estate Cycles.

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***Abstract***

*This study proposes a review of the current methodology of cycles research. The shortcomings of regression analysis for cycles research are summarised and an alternate quantitative algorithm suggested. The behaviour of a common electronic oscillator is used as a superior mathematical metaphor for regular financial flactuations. It is argued that the behavioural functions that underlie market actions can be more successfully interpreted through non-linear decision functions analogous to the electronic circuit considered and that theory should be drawn from actual causality relationships, contrary to the prescriptions of the dominant methodology.*

*The methodological propositions are applied to real estate cycles. Supply, demand and rents are explored as market participant behaviours and a behavioural model is developed which includes debt leverage. From this model three critical hypotheses are extracted and tested against data sets. The data supports the hypotheses and therefore the causal, non-linear behavioural interpretation.*

*The theoretical model suggests that a significant factor in the dynamics of real estate cycles is interaction of yields, interest rates, growth rates and rental levels over time. The empirical relationship between interest rates and value is shown to necessarily influence yields in the short term, resulting in longer term pressures for rental movements. However, the effect includes delays and an asymmetry between rising and falling rates. Combined with market psychology and political interventions, the result is a permanent instability paced by the market's ability to absorb rental increases and transmitted to the wider economy.*

*The paper concludes that the behaviour of rent, especially when pre-emptively taken through speculative acquisitions lubricated by debt, may be core issue in the operation of economic fluctuations. The model serves as an initial test of the methodological approach and directions for further research are suggested.*

**Keywords:** Property cycles, real estate fluctuations, forecasting, regression analysis, economic methodology, non-linear behavioural functions, electronic cycle analogies.

## INTRODUCTION

The purpose of this paper is to demonstrate the advantages of a behavioural-causality methodology in the analysis of real estate fluctuations. The dominant quantitative modelling methodology is multiple regression analysis. However, this methodology is flawed in several major respects.

Multiple regression analysis assumes orthogonal variables that are not auto-correlated. Neither of these assumptions can be reliably applied to the time series data usually adopted for cycle analysis. In addition, multiple regression analysis has difficulty with cycle turning points, asymmetry and non-linear functions. While most of these problems have been addressed to some degree individually, their residual significance remains substantial. This can be gauged from the fact that the levels of success considered academically sufficient for acceptance are considerably less than that appropriate for making commercial decisions.

Regression analysis is itself an outgrowth of methodological positivism. This popular methodology assumes that nothing can be known that is not observed. Positivism's shortcomings cannot be fully listed in this paper, but one is particuarly relevent to this topic. This is the positivist belief that theory must follow observation. Theory in this context means an abstract causal interpretation capable of predicting future events. Many difficulties follow from this position, beginning with the impossibility of making the first inference from observation. Without some theory, the scientist cannot marshall observations in a meaningful way capable of facilitating the consequent theoretical abstraction that is new knowledge. Hume (1777/1975) recognised that modern thought (empiricism) could not provide genuinely causal explanations. Hume believed that causality could not be known, but was content with this conclusion because of some of its strategic advantages in dealing with Classical Realism. The difficulty for modern science is the common belief that causes can be known, and scientists are expected to understand them.

Friedman (1953) adopted Hume's position and directed economic methodology away from any interest in causality. Friedman's approach was to direct economists to search for theories that generated tolerable predictions, with no necessary connection to the actual causal linkages. This is apparent in many currently adopted components of economic theory. Perhaps the most apparent and fundamental are the market functions of supply and demand. The supply curve is supposedly explained by marginalist theory applied to the production decisions within the firm. Boland (1992) thoroughly critiqued the marginalist theory of the firm and even Jones (1976) an avid supporter of the market, demonstrated its theoretical and empirical shortcomings. Altman (1999) further explored the errors that positivism admits into economic theory through Friedman's advice to ignore actual causality.

One outcome of the Friedmanite methodology is the application of any analytic tool to economic problems with scant interest to the actual causal mechanisms. Regression analysis is one case in point. Many causal mechanisms cannot be well understood using regression methods, despite highly orderly operation. Appendix 1 presents a simple electronic oscillator that is in widespread use. The oscillator produces three oscillating volatages, $V_0$, $V_1$ and $V_2$. The first two follow a square wave with $V_1$ being a constant fraction of $V_0$, and $V_2$ produces a triangular waveform whose shape depends on the values of the passive components. The oscillator may be set to produce asymmetrical wave forms.

Although the oscillator is highly ordered, a regression analysis of the waveforms $V_1$ and $V_2$ does not produce any reliable output. The Appendix also demonstrates how similar functions can be derived from bidder behaviour. These produce wave-forms that appear more consistant with actual market patterns.

This paper will apply this approach by examining simple non-linear hypotheses derived from expectations of the behaviour of market participants. The testing of mathematical, though non-linear, behavioural functions is suggested to be methodologically superior, despite the present analysis being only a starting point.

This study seeks to explore mechanisms that will give rise to regular fluctuations, without asserting that the period or amplitude can be known precisely, despite lying between identifiable limits or probability distributions. Despite the expression *regular fluctuations* being more precise, the loose term *cycle* will be occasionally used, especially with regard to its occurrence in the literature. If it does eventually prove more reasonable to consider property market fluctuations as chaotic rather than cyclical, it will alter the type of analysis that is appropriate. In particular, regression analysis assumes a degree of regularity and repeatability that is not appropriate to chaotic systems. Hence regression analysis may be of only limited use and the empirical indeterminacy it may identify, while correctly failing to identify precise cycles, may obscure the existence of real, though chaotic, relationships. Some evidence of this is surfacing in the financial literature in the form of findings that link dependent variable behaviour to the transition of independent variables across thresholds in highly non-linear ways.

Recurring economic fluctuations have been a part of western economics since the Renaissance. In earlier centuries economic fluctuations could often be correlated with natural, political, or structural events. Strictly considered, these exogenous factors should not be included with purely economic cycles for analytical purposes as their origins lie outside the economy. This raises the problem of boundaries, because natural events do affect production, hence the economy. Likewise, economics is a species of social science, and is grounded in assumptions about human nature, how humans do and should behave. This would appear to validate enquiry into behavioural realms in the search for explanations to economic processes.

## CONCEPTUAL FRAMEWORK

Prices are set by the market, through the interaction of supply and demand. Supply and demand are themselves the result of a psychological calculus carried out by each market participant that influences both their decision to enter the market (offer assets for sale, or participate in bidding for them) and their price thresholds (reserve price and maximum bids). While a certain amount can be learnt from observing volumes and prices (the market), an understanding of the rationale behind what has brought assets to the market and why particular bids are made for them offers considerably more explanatory power. Exploration of these causes are more in the tradition of Boulding's approach to economics that began by considering macro-economics as the result of a mass of individual decisions (Wray 1997). In this way the market is correctly recognised as the behavioural outcome of individuals, evident at a societal level.

In the case of demand, an individual must subjectively attach a positive net value to making a particular bid. This will be the result of comparing the various costs, benefits and uncertainties that attach to the bid and may include items such as the following:

Costs: financing opportunity costs

interest cost on borrowings
transfer costs

Benefits: enjoyment of the property
investment profits
status
subjective value of ownership
perceived market movements
security
owning vs. renting for own residence

Uncertainties: future rates of capital growth
vacancies
possible unemployment (loan servicing difficulties)
interest rate movements (on variable rate loans)
"confidence" issues

Rigourous determination of the various significance of these various factors is correctly the domain of psychology, though some authors, such as (Goodman 1995), have already pointed to the appropriateness of including them in economic analysis. The point here is that the meaning of "rational" when applied to market behaviour, is more complex than economic theory may suggest, and includes apparently *irrational* variables. This is implicitly validated in marketing, where the successful methodology is drawn from psychological and sociological sources. Because the bid decision may be influenced by highly subjective variables, the traditional assumption of economic rationality may be questionable. At the least, more variables would deserve inclusion in the causal determination of price and turnover than market variables alone would suggest. Supply could be analysed similarly.

In the case of property, there is a widespread belief that demand is negatively affected by interest rates. This is often seen in the work of forecasters (Waxman 1995) and valuation modellers (Lo 1995) and also indirectly in turnover modelling (Bange and DeBondt 1996) and demand studies (Bourassa 1995). It has been argued previously (Small 1989) that although it is possible for purchasers to use rational economic analysis to assess the net benefits of leverage, it is beyond the means of the majority of investors. Lusht has argued that even when analysis is attempted, there is a high probability that it will be the erroneously optimistic analysis that will drive the winning bid (Lusht 1994). Lusht's observation implies that the assumption of rational economic behaviour is even further from adequate, and the psychological variable of *trust* (in one's own financial analysis) may be a rogue variable that pushes up prices when applied to faulty analysis.

The conclusion here is that the psychological (behavioural) bidder function described above appears to offer the more realistic explanation to a phenomenon that is generally widely accepted. Simply put, these sources suggest that if credit becomes more available, say through a widespread improved credit status or reduced interest rates, demand will rise, and this will be evident in turnover and prices. Price is therefore a negative function of interest rates, amongst other things, as expressed in equation (1) below:

$$P = f(-i, x_j) \qquad (1)$$

where: P = Price
i = mortgage interest rate
$x_j$ = other determining factors

Conceptualising the mechanism that links liberalised credit to demand and price is straightforward. When the funding available to purchasers is increased, prices will be bid up, especially where there is expectation of on going market growth. This is especially evident in residential real estate where prices are not primarily yield driven. Variations in the availability of debt can have a substantial impact on the level of funds available for real estate investment.

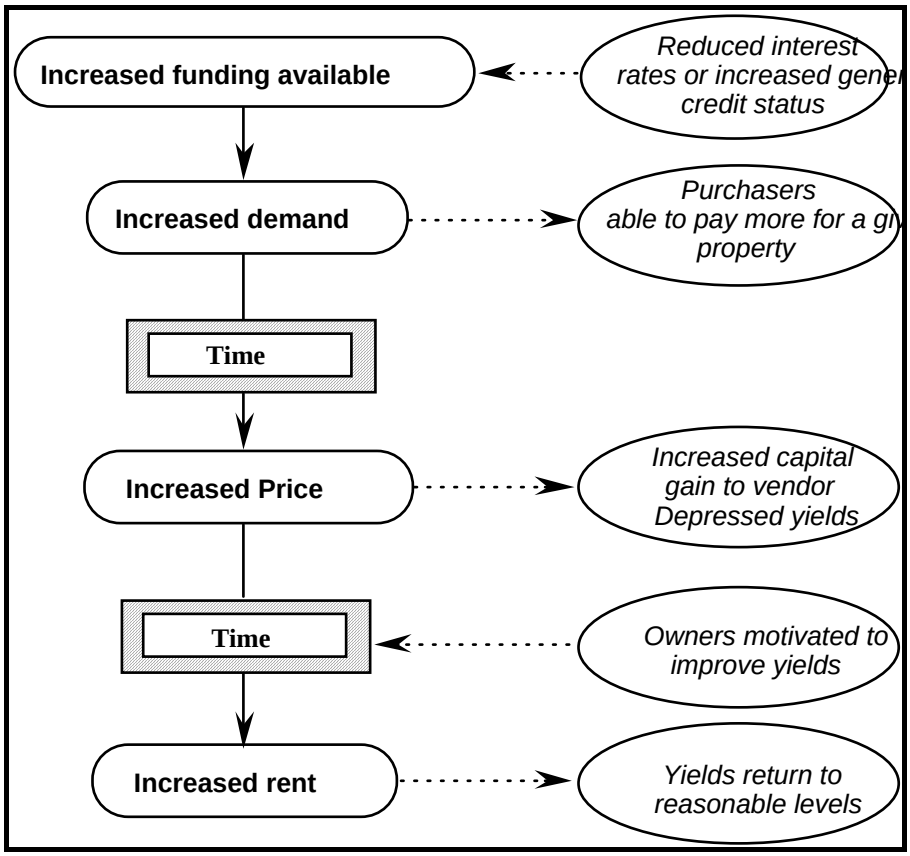
When the availability of debt funds changes as the result of either a policy change by banks, or a general social change, they apply not to specific individuals but to all prospective purchasers. If increased debt funds become available they translate into a shift in purchasers' demand. Consider for example an auction situation for a desirable property where three interested bidders see themselves as able to just afford the property. Consider the further situation where the major banks have revised their credit rating system, with the result that, for borrowing purposes, each bidder's debt servicing potential is increased by twenty percent. This could be due to falling interest rates or to a change in bank policy such as the recognition of dual family incomes for debt servicing assessment. Whereas the bidders previously had a maximum bid determined by their financial resources and their estimation of the value of the property, the lifting of their borrowing limit leaves only their value estimation to restrain them from bidding up to their new financial limits.

The auction will show stronger bidding up to the previously expected price as the three bidders know that they are still well within their financial limits. This will provide a psychological stimulus to push through that expected price, fuelled by the apparent willingness of others to show support for the property at higher bids. Lusht has examined the psychology of the auction room and concluded that restraint is rare but necessary (Lusht 1994).

There is very strong probability of seeing the hammer fall some distance into the additional loan facility. While the sale may only use part of the new facility and may only move the price to the edge of the five or ten percent band of uncertainty that is typical in real estate, it will send signals into the market that demand is firm. This will influence expectations in future sales, causing a shift to a higher set of price levels that will absorb the additional debt funds. This is shown in Exhibit 1 as the beginning of a causal chain that first affects prices, hence yields, but lastly produces a motivation for rental increases.

## Exhibit 1

## Effect of Liberalised Access to Debt on Real Estate




Given some level of market confidence, the liberal availability of credit will result in an increase in general price levels. The additional borrowing power effectively ends up with the vendors as increased capital gains. Purchasers validate the wisdom of their investments on the belief that in the long term real estate prices only go one way. So long as lending levels are maintained, the market will firm at a new plateau of broadly accepted values.

While the property may have included land and buildings, the capital gain actually accrues to the land alone. This can be understood through the Developer Equation which values vacant land by deducting development (construction) costs from the estimated developed value. In the current example, if a nearby vacant block was to be auctioned, it could be expected to sell for the price set by the sales for developed property less development cost.

As the market prices and turnover begin their upward trend they send reinforcing signals back to speculative investors, thereby creating a self-reinforcing loop. This loop continues to push prices and stimulates turnover. These early financial signals also stimulate construction, however the delay between the commitment to construct and completion is long compared to the upswing phase in property prices (boom). For this reason, construction can be ignored and stock considered fixed during this phase. Construction becomes critical as it is translated into supply, effecting the upper turning point and intensifying the downward correction.

If credit is abundant, then consumer spending and production will also be stimulated, creating some degree of demand for all property sectors. Increased business activity means greater demand for space and hence the demand driven upswing of Mueller's physical cycle (Mueller, 1997) which is more correctly a rental cycle. Clayton confirmed this when he observed that during periods of property price growth, rents tended to grow as well, but at a lower rate (Clayton 1996). Mueller's interaction between financial and physical cycles is therefore supported, however his analysis did not attempt to explore the source of space demand and its reliance on financial variables.

Despite rental increases concurrent with land price booms, rentals are driven by different market forces to land prices. Demand for rental space is a function of need and perceived as a cost. Demand for property, particularly in boom periods, is driven by what is in effect financial speculation, and is perceived as an opportunity. If price growth outstrips rental growth during price booms there will be a part of the rental growth that must be accomplished after the boom has passed in order to maintain long term average yields.

Overall, the higher prices resulting from abundant credit have the net effect of depressing yields. Although the prices are the result of that small part of the real estate stock that actually changes hands, they set the values for all properties in the sector. This causes the relationship between rent and price (i.e. yield) for all properties to appear poor, even though it is still quite sound historically.

This is a phenomenon that appears to be almost unique to real estate, and is certainly not shared by most other physical assets. Consider machines, if the cost of a type of new machine increases without an increase in its output, the financial productivity (yield, return on investment, income over value, etc.) of existing machines of the same type is not believed to fall. Barlow has shown that since new machines tend to be more efficient than existing ones, prices are actually set by the *least* productive machines in use. New technology justifies its development cost by earning an economic rent due to its marginal productivity compared to the oldest technology in use (Barlow, 1958). It is the value of the underlying land, and hence the property's ground rent yield, that is being revised to give the poor apparent yields, and also the unique nature of land that enables yields to be rebuilt during the recovery phase of the cycle.

In the short term the total quantity of real estate available is fixed. During price booms this is evident as a shortage, further stimulating price growth and following the correction it is evident as over-supply, causing vacancies. Likewise, tenants have only limited flexibility over their space use and must occupy space on a site somewhere in order to operate. Both supply and demand are inelastic in the short term.

Following the correction phase, landlords as a group are conscious of low yields, but unable to push rents higher due to elevated vacancies. This means that vacancies are the only protection tenants have against rising rents. As the general economy recovers, space demands increase, and this translates into rental growth.

Hence the tendency for landlords to press for increased rentals is set in place during price booms but will take time to realise. On the other side of the rental market, eventually the resistance of tenants will be diminished as they are forced to recognise that property values across the market have risen and they are effectively renting a more expensive property at a low rate. The dominant factor here is attitude, firstly on the part of rental supply, and secondly on the part of rental demand. The translation of these competing psychological variables into visible rental growth will take time and will be

conditional on many other factors. Depressed yields serve as one trigger to rental increases and will be further conditional on other economic and attitudinal triggers before it is realised.

Exhibit 1 suggests a causal ordering that can be expressed in the following hypotheses:

H1: Price increases follow credit liberalisation
H2: Rent increases lag price increases

With the null hypotheses:

H1n: Price increases do not follow credit liberalisation
H2n: Rent increases do not lag price increases

Within the financial market, the demand for credit resulting from a booming property market stimulates rises in interest rates. A point is reached where yields are driven so far down that interest costs swamp rental income and credit dries up, thereby stalling the market. Negative signals from the market accelerate a downward correction, without interest rates necessarily following at the same rate. Market optimism is quickly replaced with caution and dominated by a re-awakened risk aversion. Bidder behaviour is dominated by the more rational theory of price i.e. capitalised rent, as shown in equation (2). Rent is that share of the tenant's revenue (income) that the tenant is prepared to surrender for the use of a particular site, shown in equation (3). It is generally accepted that rent is determined relatively from the marginal productivity between sites. The capitalisation equation derives price from the marginal product of land as shown in equation (4) below:

$$P = r \div y \qquad (2)$$

$$r = g(p_m) \qquad (3)$$

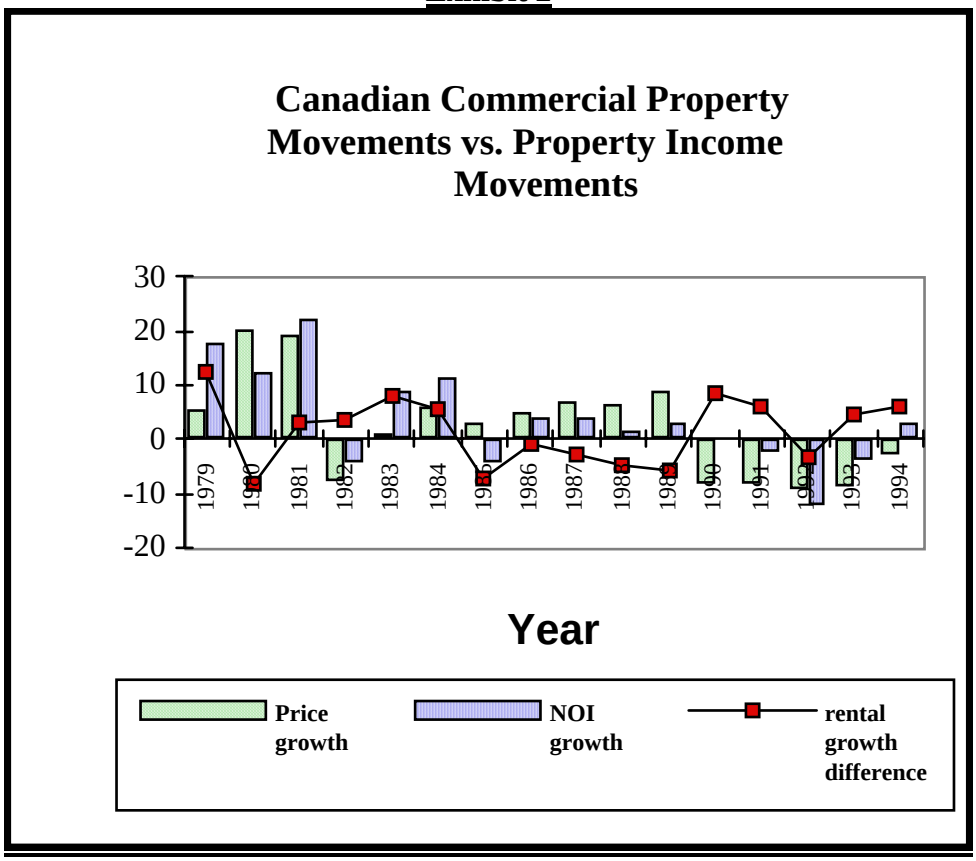
$$P = g(p_m) \div y \qquad (4)$$

where: r= rent
y = yield (rate of return or discount rate)
$p_m$= marginal product

The combination equations (1) and (4) appears to give two competing price theories. Price is either a function of mortgage interest, or a function of the capitalised marginal product, i.e. a function of productivity. But in a rational economic model, interest rates and marginal product cannot both be causes of price, and it would seem unlikely that one could be the cause of the other, hence the connection appears to produce a dilemma.

This apparent conflict has been used as a proof of the inadequacy of Ricardo's law of rent, on which rent theory (equation 4) is based. While this may be an attractive way out of the dilemma, it is not convincing. A second, and apparently common, approach is to accept that both interest rates and productivity affect prices, but that the actual price level is set by such a complex set of forces that no one theory can be adopted. This may be closer to the truth but only fogs the issue.

**Exhibit 2**




**Derived from data presented by Clayton (1996)**

The more realistic approach is to consider the psychological calculus that a potential bidder will complete before bidding. While capitalised rent provides the fundamental basis for price, and hence its rational computation, it does not constitute the whole of the variables that a bidder considers. The mere desire to own a property itself creates a psychological value in addition to the property's rational value. Also, beliefs about future capital gain outcomes, especially in a rising market, incline bidders to offer prices at apparently unacceptable yields. It is therefore not surprising that when armed with confidence in a positive investment outcome and ample credit, bidders will leave the *'market fundamentals'* behind.

On the other hand, those fundamentals do not disappear. While it is suggested that ample credit (and confidence) are sufficient to produce a rising market, once the market passes its peak it will have difficulty rising again until yields are rebuilt. In this way the two price theories may dominate pricing behaviour at different parts of the cycle.

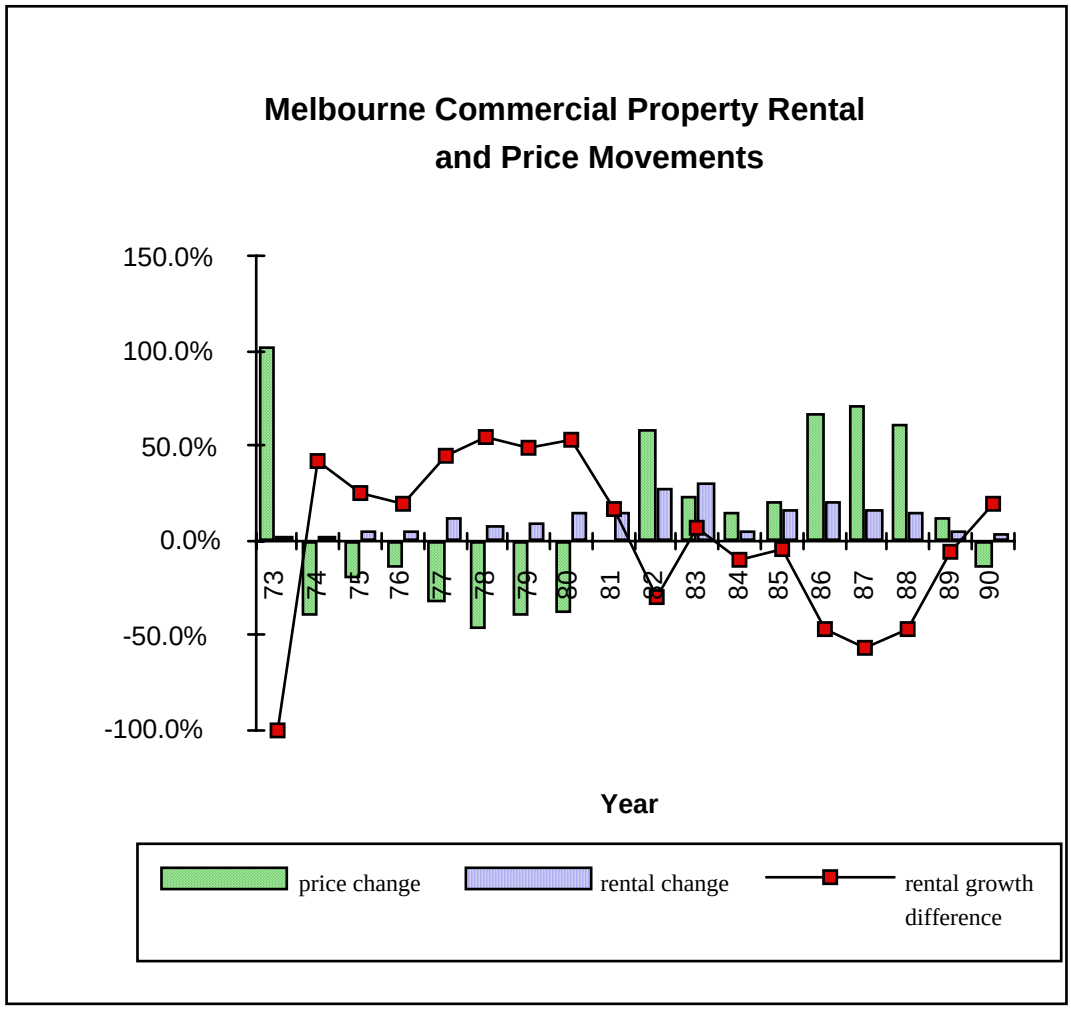
Validation of this explanation of the property cycle relies on evidence of temporal relationships between interest rates, prices and rentals to test H1 and H2. H1 appears to be accepted as a truism, being found in the various presentations of the "Property Cycle Clock" that are to be found in the literature since it was apparently first published in the the London *Evening Standard* in 1937 (EIS 1998; Pyhrr and others 1989; QPN 1998).

Goodman appears to adopt H1 and goes some distance to explaining the failure of interest rates to drive prices in the US as rates fell 1993-95 (Goodman 1995). He noted that other factors, largely affecting confidence, swamped the stimulating effect of low interest rates. Other factors affect credit worthiness, such as real wage changes and

expanded borrowing limits due to dual family income recognition which also complicate the simple link between interest rates and purchasing behaviour.

Bange found a correlation between term spreads (the gap in interest rates between short and long term interest rates) (Bange and DeBondt 1996). This correlation supports the psychological bidder behaviour hypothesis, given that term spreads communicate long term expectations to the market, hence affecting confidence.

**Exhibit 3**




**Derived from data presented by Watson (1995)**

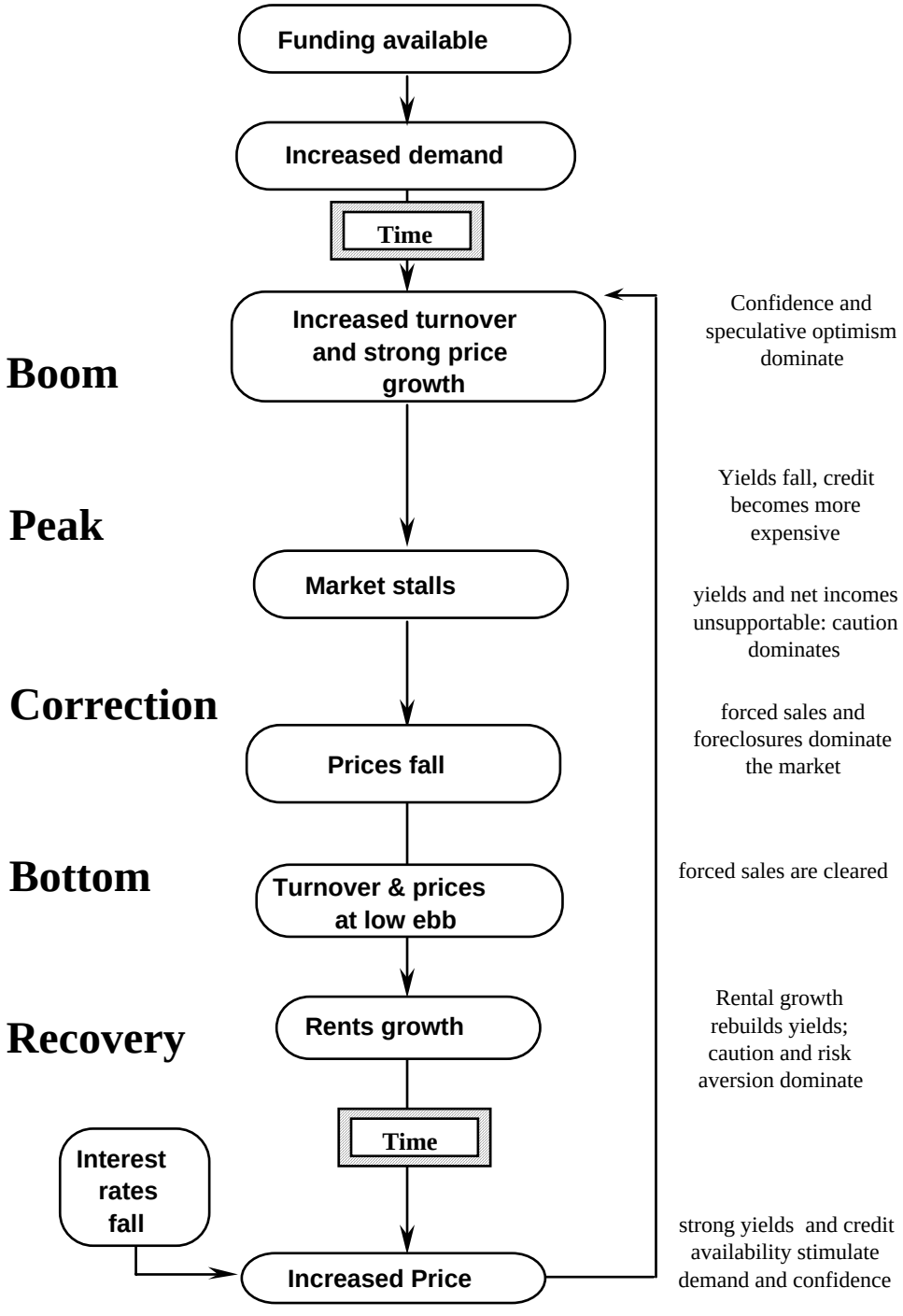
Bange found a significant correlation between interest rates and construction starts Australia, despite failing to find it in other non-US economies of the OECD. This suggests that perhaps the Australian market was different in some way. Australia has a tradition of variable rate lending. Even loans termed 'fixed rate' in Australia are usually adjusted to the market rate of interest after one, three or five years. This is significant because it means that changes in financial markets are quickly transmitted to both new and existing borrowers. This intensifies difficulties for investors in the down turn phase of the cycle compared to markets where fixed rate lending is the norm.

H2 is supported by Clayton's study of the Canadian commercial property market (Clayton 1996). Part of his study examined price and rental (net operating income) movements that provided evidence of the lag between price growth and rents. His data shows that while price and rental growth followed broadly similar trends, in the years

following a substantial price boom, rents moved forward faster than prices, indicating the lag suggested by H2. This is shown in Exhibit 2 by the line representing the difference between rent and price growth. Price change and rental changes were derived from Clayton's data and plotted as columns. The difference between the rental change and the price change was computed and plotted as the line labelled rental growth difference. This line shows to cyclic difference in price and rental movements. In particular it shows that rental growth out-performs price growth in the half-cycle following a boom. Clayton concluded that the market did not appear to follow real estate fundamentals in setting price and proceeded to explore discount rates as more explanatory. The fact that discount rates are closely tied to interest rates aligns his conclusions in support of H1.

**Exhibit 4**

**The land price cycle driven by credit availability, rental yield and bidder attitude**




Watson's study of the Melbourne Commercial market from 1975 -1990 displayed similar characteristics, though it was not discussed in her text (Watson 1995). This is graphed in Exhibit 3 using a similar approach to that applied to Clayton's data. Rental growth between 1974 and 1990 appeared to lag price growth, often running counter to it.

Over-speculation in land is an old explanation for property cycles[1]. Kavanagh provided data to indicate its magnitude and its capacity to send shocks into the wider economy (Kavanagh 1994). While it may operate in the absence of debt finance, the availability of debt funding can be seen to magnify its upswings through providing additional speculative funds. The advent of negative leveraging further inclines speculators to accept high levels of relatively expensive debt, freed from the traditional dampener of operating cash-flow requirements. Assuming debt finance has the capacity to enhance property price upswings, and given the progressive increase in leveraging over the past four decades, the property market could be expected to be increasingly influenced by interest rate movements. Given the significance of land as a component of national wealth, property price booms are sufficient to influence finance markets, causing interest rate changes that in turn affect the entire economy.

Once interest rates have risen in response to a property price boom, they will present a drain on the rest of the economy. Productive activities that rely on short-term debt to fund operations will suffer reduced profitability leading to diminished demand for space. Rental demand will therefore contract in response to the financial tightening.

New buildings coming into the market as a result of construction decisions locked in during the upswing exacerbate the downward spiral. Sales tend to be the result of over-speculations and foreclosures. The market reaches its low point when necessary sales have been cleared. Many more landowners may be inclined to want to clear their land holdings, but will try to hold out until the market improves. The accepted correlation between turnover and price is evident here at its lower extremity. This process is shown in Exhibit 4.

The lower turning point in the cycle can also be explained as a combination of financial pressure and psychological attitude. Fear and foreclosure oppose self-preservation and the belief that if the market can be ridden out losses may be avoided. Obviously, investors caught with variable rate loans are the most vulnerable. The lag between prices and interest rates means that some investors will be caught in impossible short-term situations, forcing them to sell, despite it being against their probable long-term better interests.

## RISING INTEREST RATES AND REAL ESTATE

High interest rates tend to characterise the recession phase of the property cycle, at least in recent cycles. To understand the behaviour of the market in the case of increased interest rates, consider a market with no specific interest rate/price history, where most real estate is significantly debt leveraged. The use of debt to acquire real estate effectively causes the rent to be split between the landowner and the financier.

For the debt funded portion of the land, part of the rental return is diverted to the creditor as interest. The relative returns to the financier (money) and the landowner are a function of the relationship between yield and interest. Where yield exceeds interest, there will remain a margin for the landowner.

In recent times interest rates have exceeded yields, i.e. negative leveraging (negative gearing), resulting in negative immediate returns to the landowner. Such a situation cannot be stable, either owners will sell, pushing prices down, or exert upward pressure on rents. Both strengthen yields, though the former is little comfort to owners and is

[1] See (George 1992, 1879; Harrison 1983)

understandably resisted. Firmer yields provide the foundation for the future price growth, which the investor needs in order to compensate for early operating losses. The success and popularity of the negative leveraging real estate investment strategy is based on the fact that real estate has behaved in precisely this fashion for most of the last thirty years.

In markets where there is a broad use of debt, especially using variable rate loans, increased interest rates therefore incline landowners *as a group* to press for higher rents. This acts in a parallel manner to depressed yields, by operating simultaneously on all individual landowners inclining them toward higher rental supply price expectations, restrained only by elevated vacancies.

On the demand side, tenants are relatively less able to escape renting. Physical space requirements are inelastic. Because property purchase is perceived as risky and borrowing is more expensive, tenants are less likely to consider that option. When credit is tight, vacancies will be higher. Gordon found that *the availability of capital had the strongest effect on the volatility of office vacancy rates* (Gordon and others 1996), which would appear to suggest that instability is related to speculative capital. For property, capital is usually influenced by credit availability.

The Capital Asset Pricing Model (CAPM) suggests that when interest rates are high, debt-free landlords will be frustrated by low yields because the relativity between property returns and other investment returns is not financially balanced. As investors, they expect returns on their land holdings sufficient maintain relative investment performance against fixed interest securities, otherwise they will migrate into that investment area. This will incline both leveraged and unleveraged landowners alike to be motivated to press for higher rents.

Such a behavioural interpretation of supply leads into a difficult area of market theory. The supply function conceptually is the set of points representing the prices at which suppliers would be willing to offer various quantities of their goods. It is under-pinned by the theory of the firm, and especially the marginalist theory of price. This suggests that supply price is constrained by production factors. Jones was a keen supporter of the market, but when he explored supply in market theory he was forced to cast strong doubt on its foundations in the theory of the firm and marginal pricing (Jones 1976). About a third of his text is devoted to a careful analysis of the flaws and impracticality of marginalist pricing. Boland was more thorough in his critique of market theory and represents a body of literature (the methodologists) that appears to be well grounded in neo-classical theory and method but are using it to explore its own inconsistencies (Boland 1992).

Without following this line of theory too far, two points can be safely adopted. Firstly, supply and demand as identifiable contributors to trade and price must be acknowledged, but secondly, their causal origins (especially supply) are difficult to defend within the current rational economic paradigm.

Earlier Wicksteed had made a similar point believing *(*t*)here is no such thing* (as a supply function). *When we are speaking of a marketable commodity, what is usually called the supply curve is in reality the demand curve for those who possess the commodity* (Wicksteed 1914). The inference here is that market price is the result of two opposed demands more of a political balance than a rational optimization of utilities, and definitely not the product of detailed marginal analysis. For land there can be no marginal pricing mechanism because land has no cost and therefore no marginal cost to balance with marginal revenue. The supply function for land must conform to

Wicksteed's implicit suggestion that it is ultimately a behavioural/political function. This admits the possibility that its elasticity, or for that matter the entire profile of how suppliers meet the market, could include factors in addition to the impersonal volume variables normally associated with market theory.

These issues are finding their way into contemporary property cycle literature such as when Watson concluded that the *"(*e*)merging factors in the operation of the* (property) *industry and hence the cycles..*(included) *...the balance of negotiating power between landlord and the tenant"* (Watson 1995). A balance of power is more a political variable than an economic one. It suggests that if landlords are broadly motivated to raise rents, say through depressed yields or high debt servicing costs, the uniqueness of their factor will afford them considerable negotiating power.

These effects are consistent with Smith's ancient observation that land is a monopoly. Where a large proportion of the rental market is owned using debt, the translation of increases in interest rates into rental growth could be expected to be stronger. This is consistent with the finding, supported by several studies, that property growth exceeds general price level and results from the fixed supply of land versus the expansion of the economy.

The additional rent will cover the higher interest cost and strengthen yields. Because rents are being pushed by the desire of landlords to cover debt costs, the higher the interest rate and leverage, the stronger rents will be pushed. In this way high interest rates will encourage the rebuilding of firm yields, providing one of the key foundations for the next price boom.

Critical to this mechanism is the proposition that rental growth can proceed despite high interest rates. This is expressed in the third hypothesis as follows:

**H3:** Strong rental growth is not discouraged by, and may be positively related to, periods of high interest rates

Which has the null hypothesis:

**H3n:** Strong rental growth is discouraged during periods of high interest rates

Watson's data on the Melbourne office market is rather clear in its support of H3 (Watson 1995). An inspection of her data, shown in Exhibit 5, reveals that rental growth consistently peaked either with, or in the year immediately following, peaks in interest rates (1977,1983, & 1986). The Melbourne Commercial market illustrates that rental growth can comfortably co-exist with high interest rates.

## Exhibit 5

### Melbourne Commercial Property 1974 - 90

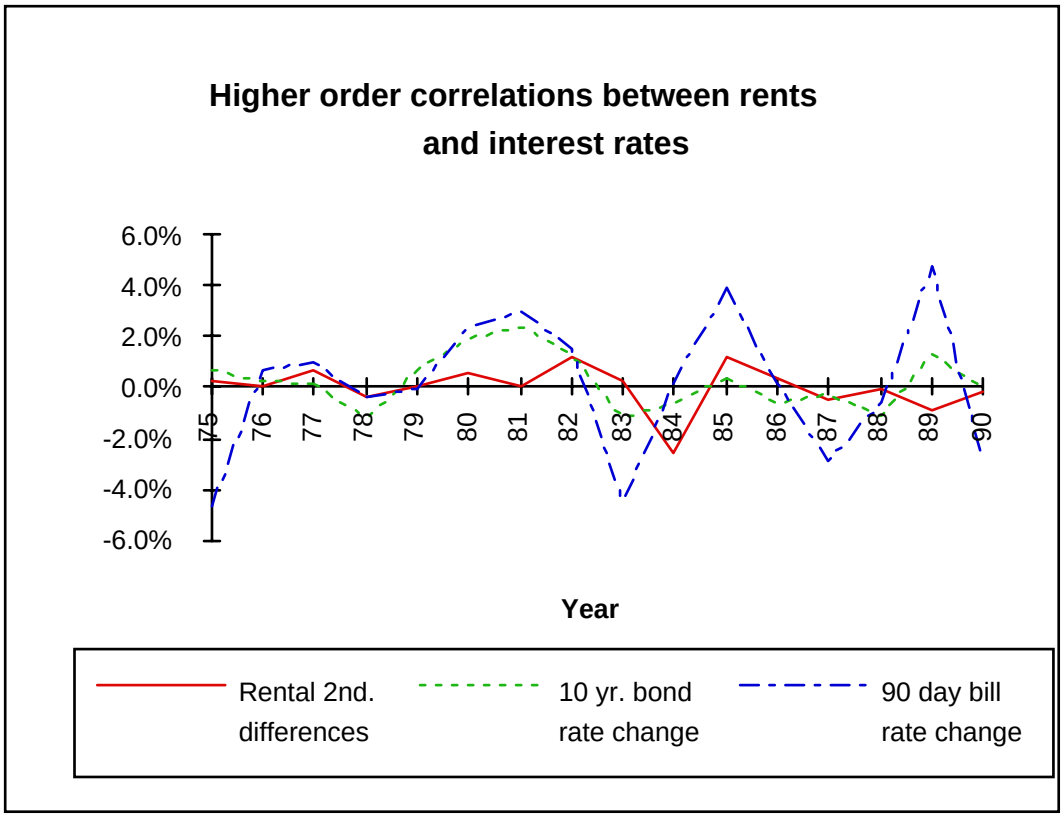
| Year | Site Value AMP Change pa | Rental Growth Pa | 10 yr. Bond rate | 90 day bill rate |
|---|---|---|---|---|
| 1973 | 102.9% | 3.0% | | |
| 74 | -39.4% | 2.2% | 9.0% | 13.2% |
| 75 | -20.0% | 5.0% | 9.7% | 8.5% |
| 76 | -14.3% | 5.2% | **10.1%** | 9.3% |
| 77 | -32.9% | **12.0%** | **10.2%** | **10.3%** |
| 78 | -46.6% | 8.3% | 9.1% | 9.9% |
| 79 | -40.0% | 9.3% | 9.8% | 9.9% |
| 80 | -37.8% | 14.9% | 11.7% | 12.2% |
| 81 | -0.8% | 15.6% | 14.0% | 15.1% |
| 82 | 58.2% | **27.9%** | **15.3%** | **16.6%** |
| 83 | 23.8% | **30.9%** | 14.1% | 12.2% |
| 84 | 15.0% | 5.5% | 13.6% | 12.3% |
| 85 | 21.2% | 17.0% | **14.0%** | 16.2% |
| 86 | 67.2% | **20.4%** | 13.4% | **16.4%** |
| 87 | 72.0% | 15.8% | 13.2% | 13.5% |
| 88 | 61.3% | 15.1% | 12.1% | 12.9% |
| 89 | 12.0% | 5.8% | 13.4% | 17.7% |
| 90 | -15.0% | 4.0% | 13.4% | 14.8% |

**Data presented by Watson (1995)**

Without an understanding of the politics of tenancy markets, such a correlation is very difficult to explain. For example, high interest rates could be expected to erode tenant profitability, hence capacity to pay increases. Likewise, high interest rates are conventionally associated with restrained capital value growth, making rental increases insupportable on the basis of rising property prices. Hence from both the landlord and tenant perspective, rising interest rates should not cause the effect observed in Watson's data, using conventional theory.

Exhibit 6 graphs the rate of change of rental growth (rental second differences) against interest rate changes (interest rate first differences). These show a clear phase correlation between maxima of rental growths and interest rates, despite returning poor regression results ($r^2$ of well below 0.5). Exploration of higher order differences exhibit the same anomaly. The conclusion must be that regression does not suit the behaviours revealed in the data. This is consistent with the proposition that cycles are not the result of linear functions as linearity is a pre-requisite for regression. Recognition that there is a fact evident in the data, and consistent with a reasonable behavioural causal theory of market action, which is invisible to regression analysis is an important methodological observation. The currently popular quantitative methodology based on regression may actually be impeding the gathering of knowledge regarding cycles.

**Exhibit 6**




Through the correction period and following, the likely market sentiment will be one of pessimism. This will be psychologically a hangover from the sobering memories of the failure of the previous boom, fertilised by hyper-sensitivity to high interest rates and the fear of future risks. Despite the negative market sentiment, the ability of rents to grow through periods of real estate price stagnation and high interest rates, has the effect of *re-setting the spring* in preparation for the next boom. Once yields have been re-built, the stage is set for a return of confidence and credit to set the next boom in motion.

While falls in interest rates provide one of the key the objective requirements for a new boom this will not be acted on until market sentiment switches from pessimistic to optimistic. The key to this switch is psychological. It includes many inputs, subjectively evaluated, taken from both the present economic climate and history. Support for this proposition is anecdotal, though it deserves specific study. However, even if positive quantitative support were available, such as the result of a social survey of the factors that real estate investors admit to influencing their confidence, this would not necessarily lead to a deterministic model for market confidence formation. This is because of the subjective, non-linear social interpretation of the data. Even the algorithm that an individual may use in concluding a position regarding market confidence may be a dynamic function influenced by the data itself and history. This is not to avoid the issue, but only to point out the difficulty in objectively modelling human behaviour. It may be necessary to leave this area uncharted, beyond recognising that individuals do respond to their environment by adopting confidence positions of either optimism or pessimism and that market confidence appear to fluctuate in a highly non-linear way. Positive attempts at observing market confidence, such as sentiment surveys, appear to have demonstrated moderate success, but still may be too remote from the real quantity which motivates market behaviour, making market behaviour

itself the best indicator of confidence. Unfortunately, this does not aid prediction of the market.

Despite the current difficulty in quantifying confidence, the assumption that market sentiment acts as a switch which must turn positive to begin a cycle upswing produces a simple but powerful theoretical model. Overall, the outcomes of this model are very consistent with the now classic property clock which has been popularly accepted since at least 1937, however, it effectively adds an explanatory foundation to it.

The importance of a behavioural foundation behind market variables has been shown to aid in several ways. Most significantly, it provides a mechanism whereby financial variables can be included in economic analysis where previously market facts of supply and demand were considered the foundational variables. In addition, it points to other variables that should be considered when attempting to explain economic fluctuations. The significance of overtly psychological variables, such as market confidence, find a place in such a model. This is a satisfying result considering the emphasis that is placed on factors such as market confidence, bullish/bearish tendencies, and other such notions in economic commentaries. While an appropriate methodology is not explored here, it should be evident that the methodology of social psychology presents itself as a most appropriate tool for further exploring the area.

Already, the success of attitude surveys, especially regarding market outlook and forecasts of key cyclic variables supports this view. Both academic and industry researchers are finding that opinion surveys of representatives from within industry provide forecasts superior to those derived either from economic theory or quantitative methods. The subjects of these surveys cannot have access to superior theoretical or quantitative forecasting tools, but are giving subjective assessments of the general expectations. Obviously, they are relying on their skill in interpreting the prevailing market attitude, an attitude composed partly of public economic information and partly of social, psychological and conventional variables. The understanding of market fluctuations appears to point the importance of the latter.

The summary below illustrates the suggested significance of market sentiments at various parts of the cycle.

## A SUMMARY OF CHARACTERISTICS OF VARIOUS KEY PARTS OF THE PROPERTY PRICE CYCLE:

**A price boom occurs when:**

1) yields are sound
2) credit is freely available
3) bidders are confident
4) bid decisions governed by funding availability rather than capitalisation.

**The peak occurs when**

1) yields have fallen due to rapid price rise
2) credit becomes expensive
3) bidders lose confidence

**The correction occurs when:**

1) landowners cannot service their commitments
2) high interest rates prompt foreclosures
3) yields become dominant in considering price

**The correction terminates when:**

1) forced sales have been cleared
2) remaining landowners are capable of holding their properties

**The recovery phase is characterised by:**

1) rental increases exceeding price increases
2) strengthening yields
3) low market confidence
4) dominance of attitude of risk aversion
5) preoccupation with concerns over vacancies and debt servicing costs

## LAND AND DEBT IN ECONOMIC DISTRIBUTION AND CYCLES

In general, the quality of manufactured products has been improving over time, while relative costs have been falling. This is partly due to technology and partly the result of the free market. Objectively, the quality of buildings has also been rising. As products, their production is subject to competition, which keeps their price close to long term normal levels. If they were becoming relatively more expensive, then building companies could be expected to be rising in value with respect to other companies. Hence, share prices in building companies should be an indicator of the relationship between building values versus other products. There seems to be little evidence of such a long term trend.

What is evident is that building companies have strongly cyclic financial performance. This should not be surprising because of their linkage to land. In the period of a land price boom, strong demand for developed space and the short term limits on builders' productive capacities mean that building prices may move ahead strongly, realising good profits. However, during periods of adjustment and recovery, especially when exacerbated by high interest rates, over-capacity in the construction industry quickly reins in prices to the extent that often building company failures abound. Overall, the risk/return profile of building companies appears to be in line with other companies and investments on the CAPM line.

By contrast, land investment in one sense is a purely financial asset that derives its value entirely from its productive utility. Urban land is not consumed in use, but is critical to industry and commerce. Ground rent respects the necessary contribution of land in the productive process, but it is highly correlated to location with respect to society. While a factory could function equally well on the edge of a city or a clearing in a remote forest, one site will be profitable while the other is not. Land takes its value from the productivity of enterprises located on it, and this is related in no small measure to social factors. As a community grows in population and productivity its land values grow, suggesting that values are ultimately related to these causes. Land in Manhattan is valuable and appreciating, while in declining rural towns it is low and diminishing.

The difficulty with land has always been its pricing with respect to labour, from the early formulation of Perry's problem of the *par*, to the current investigation its value with respect to buildings and other products. Overall, as productivity increases, land appreciates, this is common knowledge and history. But, also as productivity increases, the price of products decrease in real terms. Hence the trend for long term real appreciation of land with respect to other assets. Even buildings decay, become obsolete and lose value, attracting higher capitalisation rates as they age, despite lower

rents. Notable is the fact that capitalisation rates on physically near-obsolete buildings are still fair, despite the condition of the built component of the property asset, reflecting the return due to the underlying land which has usually appreciated over the life of the building.

Land price cycles could therefore ultimately be the result of short-term failures to correctly judge the financial value of land. These failures are compounded by chaotic relationships that originate in human nature as it attempts to correct and counter-correct for excesses and deficiencies in the valuation at any given time.

The availability of debt finance, primarily to land purchasers, but also to the productive sectors of the economy, serves to intensify the extent of the departures from notional equilibrium values. Like land, money participates in production, but the price of its use is drawn solely from its utility, having no cost of production. Panico investigated the relationship between interest rates and the rate of profit. He concluded that interest rates are the primary rate, from which profit rates are derived, counter to common belief. In coming to this conclusion he recognised that interest rates are the product of a type of social process of consensus and rallied quotes from a varied range of significant economic thinkers who thought likewise. In particular, he cited Keynes, quoting him as observing: *"It is evident ... that the rate of interest is a highly psychological phenomenon ... It may be more accurate, perhaps to say that the rate of interest is highly conventional, rather than a highly psychological phenomenon. For its actual value is largely governed by the prevailing view as to what its value is expected to be"* (Panico, 1988, p.130).

This conclusion has curious implications, but it should not come as a surprise to those working in finance. There is a strong acceptance of the technique of estimating discount rates using the risk free government bond rate, plus risk margins particular to the investment. Discount rates for DCF valuation are expected rates of profit and the practice of setting them from the risk free rate is exactly in line with Panico's assertion. This is no more than an application of one aspect of the CAPM, which also links profit rates to the rate of interest on risk free debt

Like land, the estimation of the appropriate return to money, despite being priced in the market, cannot be solved by existing marginalist theory. As Keynes observed, interest rates are a conventional outcome, closely aligned to psychological processes, and the community is continually correcting and counter-correcting their setting.

It should not be a surprise therefore, that as the various players assess the present financial environment and make decisions that will set their position for some time into the future, that the result is a constant pattern of fluctuation.

## IMPLICATIONS FOR OTHER CYCLES

The real estate cycle does not operate in a vacuum. Changes in rent affect the fixed costs of the users of land and funds applied to land are not available for other sectors. Real estate development is also affected by real estate demand, interest rates and turnover. Several distinct cycles have been identified (Phyrr, 1989), such as:

Real estate:

- The real estate price cycle
- Real estate rental cycle
- Capitalisation rate (yield) cycle

The construction (real estate development) cycle
Vacancy rate cycle

Money:

Interest rate cycle
Yield spread cycle

Trade:

Trade cycle
Production cycle
Employment cycle
Consumer demand cycle

Economic cycle literature appears to focus on production and prices as the core of the cyclical process with some inclusion of interest rates. The Hick's cycle focuses on trade cycles and largely ignores real estate as being no more than an indistinguishable item for trade. There is evidence that the various cycles are interrelated to some degree, with identifiable phasing differences. The current interest in the concept of external shocks as the seed cause of cycles suggests that trade cycle theory needs an external nudge unlike the conclusions from this analysis regarding the real estate cycle. Indeed, if the real estate cycle can operate independently of the trade cycle and its effect can double the value of a national asset, initially worth several times the national product, then this would have to serve as a potent and regular external shock for the rest of the economy. This view is also supported by the fact that real estate leads the economic direction of most of the rest of the economy.

By connecting other sectors of the economy to the real estate cycle, as shown in Exhibit 7, the linkages to the production and construction sectors become apparent. Within this more complete model, several cycles can be seen as well as the phase relations between them. The model reduces the economy to four sectors which does introduce a degree of approximation.

Further detail could be added to the model by the inclusion of the stock market into the model. This has not been done in this study for simplicity.

It is suggested that stock market booms are essentially similar to land booms, in that they are both based on speculative rent-taking and lagged yield recovery. Equities can operate in this way, despite being grounded in shares of physical productive assets, because they are necessary for production and because their financial value is purely in terms of their utility. For these reasons, despite having a fundamental value related to productive capacity (their net tangible assets backing), booms in their pricing are characterised by demand behaviour that is governed by speculative sentiments and abundant funding.

However, there are significant differences that make too strong an association problematic. These include the origin of rents and dividends, and the necessity of their contribution to production. These distinctions and their effects deserve considerably more attention before a final conclusion is drawn

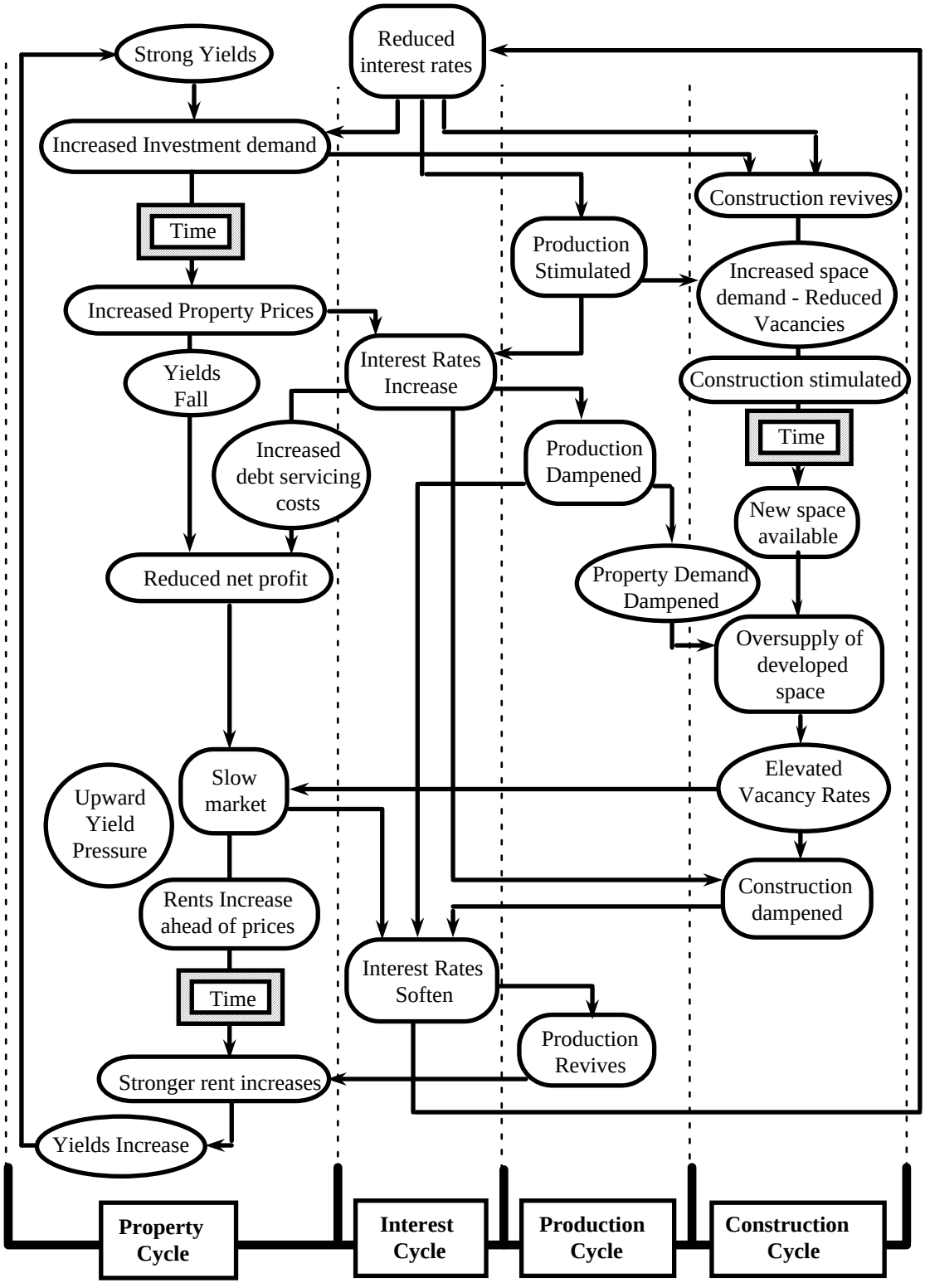
The real estate and construction sectors are both combinations of several markets and cycles, such as residential commercial, industrial and rural and each of these responds to slightly different stimuli. While considerable interest has been shown in the cyclic behaviour of developed space, it must be under-pinned by a robust theory of land. The

point here follows from Hendershott's observation regarding fact that property booms are in reality land booms hidden in the prices and rentals of developed property.

Close inspection of the complete real estate model will reveal that it contains the critical elements of the monetary cycle. This is not surprising. What is novel is the suggestion that it is the speculative rent-taking implicit in property price booms, and not the productive (manufacturing/trading) sector, that is the economic factor that stimulates upward movements in financial markets. The implication is that interest rates rise to contain speculative price booms (which may include equity trading, though it is not explored here), rather than excesses in production or trading. This assertion does not imply that the latter are not significant, only that they are not the dominant factors. This may not be true in all cycles or markets, but it does fit with recent cycles, especially in Australia.

**Exhibit 7**

**An Integrated Model of Economic Fluctuations**




## SUMMARY AND CONCLUSION

The model has exposed a set of relationships applicable to the land component within real estate assets that has the capacity to generate regular fluctuations. The process

described is intensified by the use of debt. While sound economic reasons underpin much of the cycle, its critical elements of steep speculative price rises and slow recovery are best explained psychologically. Further study of these parts of the cycle may be best pursued using a social psychology methodology.

Several generally accepted cyclical concepts, such as the popular "property cycle clock," construction and vacancy cycles and the monetary cycle have been found to be consistent with the model. Despite this, there is still good reason to be cautious before asserting the existence of true cycles in the economy as the relationships may produce chaotic fluctuations of a pseudo-cyclic nature. Evidence supporting the model has been taken from published studies of specific property markets, which have been shown to empirically support the critical hypotheses. On balance, it may be said that regular systematic patterns of fluctuations are evident and fit the causal model.

What has been outlined is a conceptual model with a small number of specific hypotheses that results in a land/debt cycle that, given human behaviour, can produce loosely regular fluctuations. Further testing should be considered through the reduction of the total cycle model (Exhibit 7) to testable hypotheses.

It would appear that the central relationships that need to be explored concern phase relations. There seems good reason to consider additional variables, such as market confidence, and to develop tools for collecting data on them. To date, the majority of study has assumed linear relationships between variables and deterministic systems. Exploration of non-linear explanations of economic fluctuations would appear worthwhile, using methodologies drawn from other social sciences or the mathematics of chaos.

The evidence is that humans do not always respond at the same rate or degree to repeated stimuli. This has been evident in investment response to interest rate changes over the last three decades - economies have boomed under interest rates that would have once been considered crippling, yet on other occasions ignored apparently attractive rates. Other parts of the economy appear to be little different. These issues all seem to suggest that while certain things can be learned from quantitative tools such as regression analysis, effective explanations will come from other methodologies.

The relationships outlined in the model concern temporal relationships between the major components of the economy. As such, they are not directed primarily towards prediction of the severity or timing of future fluctuations. Other factors, such as government policy, social changes and technology may affect the actual outcome globally or in specific sectors. The usefulness of the model is rather in providing a template to explain the major connections that exist in the economy and their degree of influence. It also provides an opportunity to explore our understanding of the nature of the components that compose the economy. This is especially important with respect to refining our understanding of the various items that make up what is collectively known as capital. In particular, land and money emerge from this study as respectively distinct species of capital assets.

The implications for policy development revolve around the significance of rent taking, both its function in real estate and as economic rent supporting the value of stocks. A preliminary conclusion could be that the behaviour of rent, especially when pre-emptively taken through speculative acquisitions lubricated by debt, may be a core issue in the operation of economic fluctuations. Historically this can be seen in many instances, such as the South Sea bubble and the Dutch tulip speculation of earlier centuries. It also accounts for the appearance of economic fluctuations concurrent with

the emergence of modern free market economies. In Europe, the key change in the Renaissance transition into modern commerce was the freedom to take rent, either in land due to the enclosures, in trade as a result of the collapse of the just price principle, or as pure financial returns as a result of the collapse of the moral and legal prohibitions on usury. Given that in liberal economies, economic rent taking is currently considered to be a core component of property rights, it could be that economic fluctuations will continue to be inescapable.

Two future directions would appear possible. If economic fluctuations are considered tolerable, then the opportunities for their exploitation may continue to provide an avenue for research. This line of research must take account of the likely *experimenter effect*, that in this case will mean that understanding fluctuations will necessarily change them, and also the like presence of chaotic behaviour. On the other hand, if economic fluctuations are recognised as socially dysfunctional, policy for their control should focus on their cause, that has been shown to originate in economic rent-taking. The discouragement of private economic rent-taking therefore emerges as the best way to prevent the various social costs that follow from economic fluctuations.

## REFERENCES:


Altman, Morris. 1999. The Methodology of Economics and the Survivial Principle Revisisted: Some Welfare and Public Policy Implications of Modeling the Economic Agent. *Review of Social Economics* 57 (4):427-449.

Ball, Michael, Andrew Wood, and Tanya Morrison. "Structures Investment and Economic Growth: A Long Run International Comparison." In International Congress on Real Estate in Singapore, National University of Singapore 1995.

Bange, Mary M. and Werner F. M. DeBondt. "Residential Construction and Interest Rates: Evidence from Eight OECD Countries, 1964-88." In AREUEA International Conference in Orlando, Florida, University of Connecticut 1996.

Barlow, Raliegh. Land Resource Economics. Englewood Cliffs: Prentice Hall, 1958.

Boland, Lawrence A. The Principles of Economics. London: Routledge, 1992.

Bourassa, Steven C. "The Impacts of Borrowing Constraints on Home Ownership in Australia." In International Congress on Real Estate in Singapore, National University of Singapore 1995.

Clayton, Jim. "Market Fundamentals, Risk and the Canadian Property Cycle: Implications for Property Valuation and Investment Decisions." Journal of Real Estate Research 12 (3 1996): 347-368.

Das, Satya P. New Perspectives on Business Cycles. Aldershot, UK: Elgar, 1993.

Davis, Kevin. The Breaking Wave. Alberton: Davis, 1990.

EIS. The Cycle Turns. Economic Indicator Service, 1998.

Elonso, W. Location and Land Use. Cambridge, Mass: Harvard University Press, 1964.

Friedman, Milton. 1953. The Methodology of Positive Economics. In *Essays in Positive Economics*. Chicago: The University of Chicago Press.

Galletly, Guy. The Crash and The coming Crisis. Plymouth: Northcote, 1988.

George, Henry. Progress and Poverty. Schalkenbach, 1992, 1879.

Goodman, John L. "Interest Rates and Housing Demand, 1993-95." In Mid Year AREUEA meeting in Washington, DC, 1995.

Gordon, Jaques, Paige Mosbaugh, and Todd Cantor. "Integrating Regional Economic Indicators with the Real Estate Cycle." The Journal of Real Estate Reseaarch 12 (3 1996): 469-501.

Grenadier, S. Persistence of Real Estate Cycles. Journal of Real Estate Finance and Economics (8 1995): 95-115.

Grenadier, S. The Strategic Exercise of Options: Development Cascades and Overbuilding in Real Estate Markets. Journal of Finance (51 1996):

Hall, Thomas E. Business Cycles: The Nature and Causes of the Economic Fluctuations. New York: Praeger, 1990.

Hargeaves, R. V. Forecasting Real Estate Behaviour. In Pacific Rim Real Estate Society conference in Sanctuary Cove, Queensland, Queensland University 1996.

Harrison, F. The Power in the Land. New York: Universe, 1983.

Harvey, Jack. Urban Land Economics. London: Macmillan, 1987.

Hendershott, Patric H. Systematic Valuation Errors and Property Cycles: A Clinical Study of the Sydney Office Market. Aukland: Real Estate Research Unit, University of Aukland, 1996.

Hendershott, Patric- H. and Edward- J. Kane. Office Market Values During the Past Decade: How Distorted Have Appraisals Been? not available. OH State U and NBER; Boston College and NBER, 1992.

Hiang, Liow Kim. "Corporate Real Estate Value and Share Price - Some Evidence and Unresolved Issues." In International Congress on Real Estate in Singapore, National University of Singapore 1995.

Jones, Richard. Supply in a Market Economy. London: Allen and Unwin, 1976.

Kavanagh, Bryan. The Recovery Myth. Melbourne: Land Values Research Group, 1994.

Lo, Kak-keung. "The Study of a Quantitative Model for Determination of Site Value." In International Congress on Real Estate in Singapore, National University of Singapore 1995.

Lusht, Kenneth M. "Forecasting and Investment Selection in Property Markets." Hawksbury Management Today (1994):

Marx, Karl. The Capital. 1906.

Mill, J.S. The principles of Political Economy. ed. D. Winch. Harmondworth, Middlesex: Penguin Classics, 1970 (1848).

Mollart, Richard and Patrick Rowland. Measuring the Effects of borrowing to Buy Property. In Pacific Rim Real Estate Society conference in Sanctuary Cove, Queensland, Queensland University 1996.

Mueller, G. "Analysing Real Estate's Physical and Financial Market Cycles." Price Waterhouse, Real Estate Now (Fall 1995): 20-21.

Mueller, Glenn. "Cycle Theories." Property Australia (February 1997): 10-13.

Newell, Graeme and George Matysiak. An Empirical Investigation into the Presence of Chaotic Behaviour in UK Property Markets. RICS, 1997. Monograph

Panico, Carlo. Interest and Profit in the Theories of Values and Distribution. Houndsmills, UK: Macmillan, 1988.

Patrick Wilson, Okunev and Rask. Step Interventions and Market Integration: Tests in the US, UK and Australian Real estateMarkets. In Pacific Rim Real Estate Society conference in Sanctuary Cove, Queensland, Queensland University 1996.

Pearce, Henry George. Value Real and Morbid. Sydney:

Pyhrr, Stephen A., Jame R. Cooper, Larry E. Wofford, Steven D. Kapplin, and Paul D. Lapides. Real Estate Investment : Strategy Analysis, Decisions. 2nd ed., New York: Wiley, 1989.

QPN. Property Market Facts. Quartile Property Network, 1998.

Ricardo, David. The Principles of Political Economy and Taxation. Dutton NY: Everyman, 1973 (1817).

Small, G. R. The Use of Information Systems in the Development of Ethical and Political Land Theory. In The First Pacific Rim Rea; Estate Society Conference in Melbourne, 1995.

Small, G.R. "Understanding the costs of inflation." Land Economics Review 1 (1 1989): 14.

Smith, Adam. An Enquiry into the Wealth of Nations. Dutton N.Y.: Everyman, 1975 (1776).

Solomou, Solomos. Phases of economic growth, 1850-1973 : Kondratieff waves and Kuznets swings. Cambridge: Cambridge University Press, 1987.

Watson, Cynthia. "Property Cycles in the Commercial Property Market." In Pacific Rim Real Estate Society Annual Conference in Melbourne, Australia, RMIT, 538-550, 1995.

Waxman, Peter. "Sydney Residential Property Market 1995 to 2000." In Pacific Asia Property Conference in Singapore, National University of Singapore 1995.

Wicksteed, Philip H. "The Scope and Method of Political Economy." The Economic Journal (1914): 1-23.

Wray, L. Randall. "Kenneth Boulding's reconstruction of Macroeconomics." Review of Social Economy LV (4 1997): 445-63.

Zarnowitz, victor. Business Cycles: Theory, History, Indicators and Forecasting. Chicago: University of Chicago, 1992.

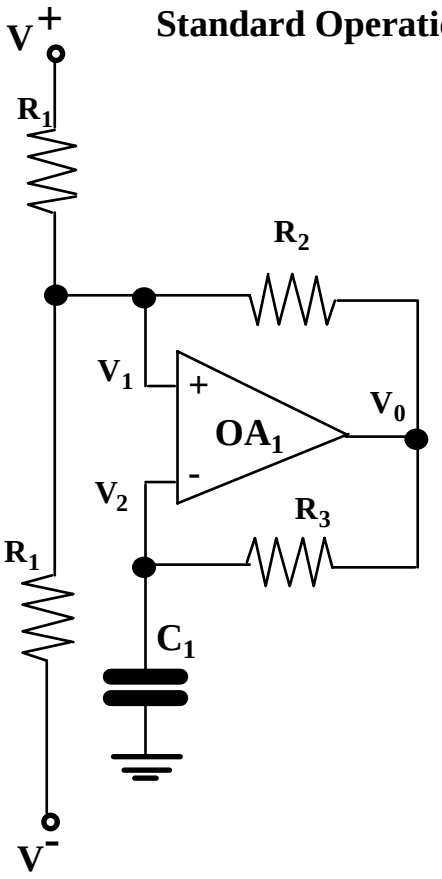
# Appendix 1

# Electronic Oscillators and Financial Cycle Analysis

Exhibit A1, shows the circuit diagram for a common oscillator currently in widespread use. As can be seen, the operation of the oscillator can be easily interpreted mathematically. A common arrangement of the passive components surrounding the operational amplifier (components chosen to make $k_1$=0.21, and $k_2$= 0.02) is graphed in Exhibit 2. $V_1$ is a square wave and $V_2$ is approximately triangular, depending on the selection of passive components.

**Exhibit A1**

## Standard Operational Amplifier Oscillator




**Operational Amplifier:**
$V_0 = (V_1 - V_2) \times 10{,}000$

**if** $(V_1 > V_2)$, **then** $V_0 = V^+$

**If** $(V_1 < V_2)$, **then** $V_0 = V^-$

***Excelspeak:***

$V_0 = \text{if}(V_1 > V_2, V^+, V^-)$

$V_1 = k_1 V_0$

For $R_1 = R_2$

$k_2 = 2/3$

$$V_{2,t} - V_{2,t-1} + k_2 . R_3 . C_1 . (V_0 - V_{2,t-1})$$

Regressing $V_2$ against $V_1$ yields a zero correlation, rising to a 0.5 correlation with a l/2 phase shift. A better result may be obtained by regressing the first derivative of $V_2$, $V'_2$, against $V_1$, as evident in Exhibit 2. Unfortunately, this only holds for particular selections of the passive components.

**Exhibit 2**

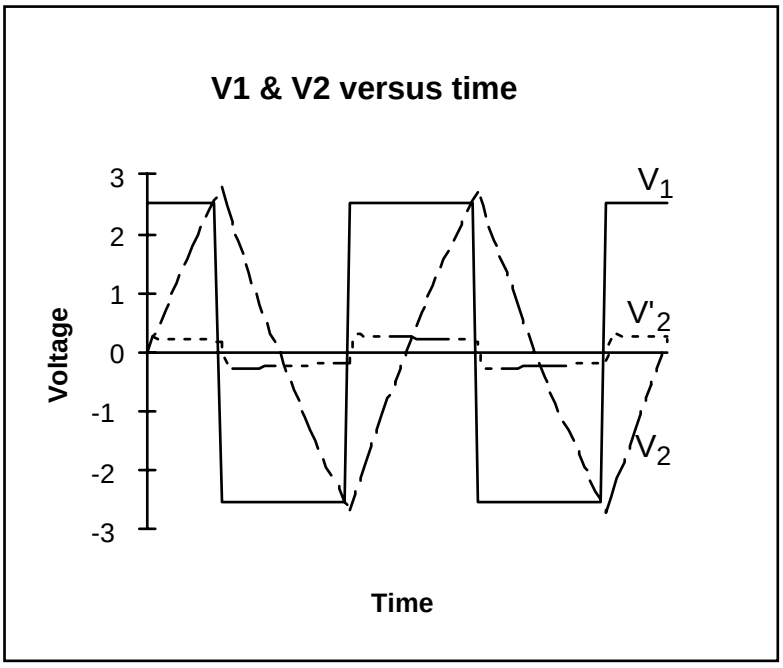
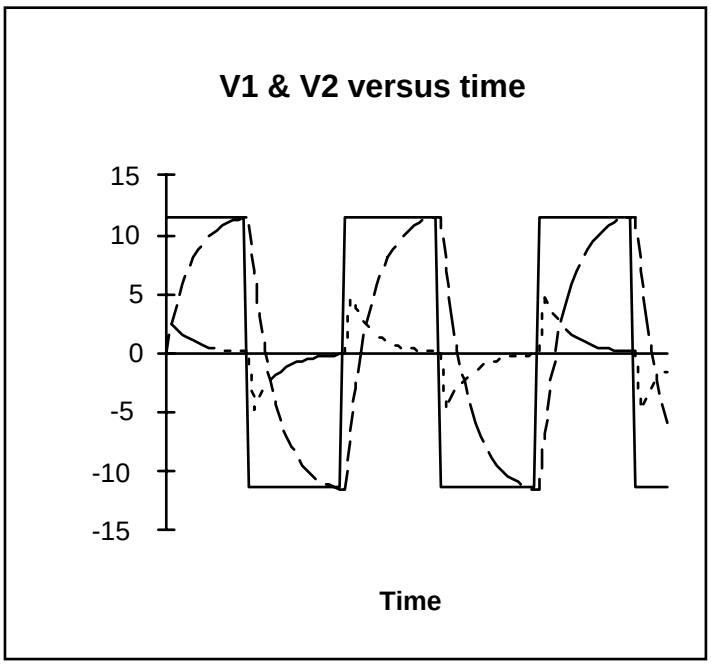



Exhibit 3 show the outputs, including $V'_2$, for $k_1$=0.95, and $k_2$= 0.2. In this case $V_1$ does not explain any aspect of $V_2$. The correlation between the wave forms, despite being causally precise, is unreliably reported by regression analysis. It can be seen that $V_2$ is actually beginning to correlate to $V_1$. While this may be encouraging, it only points up the capricious nature of regression's usefulness.

**Exhibit 3**




It may be argued that the regression technique advises inspection of scatter plots, and that this would reveal the obvious patterns in this example, but this may not be so

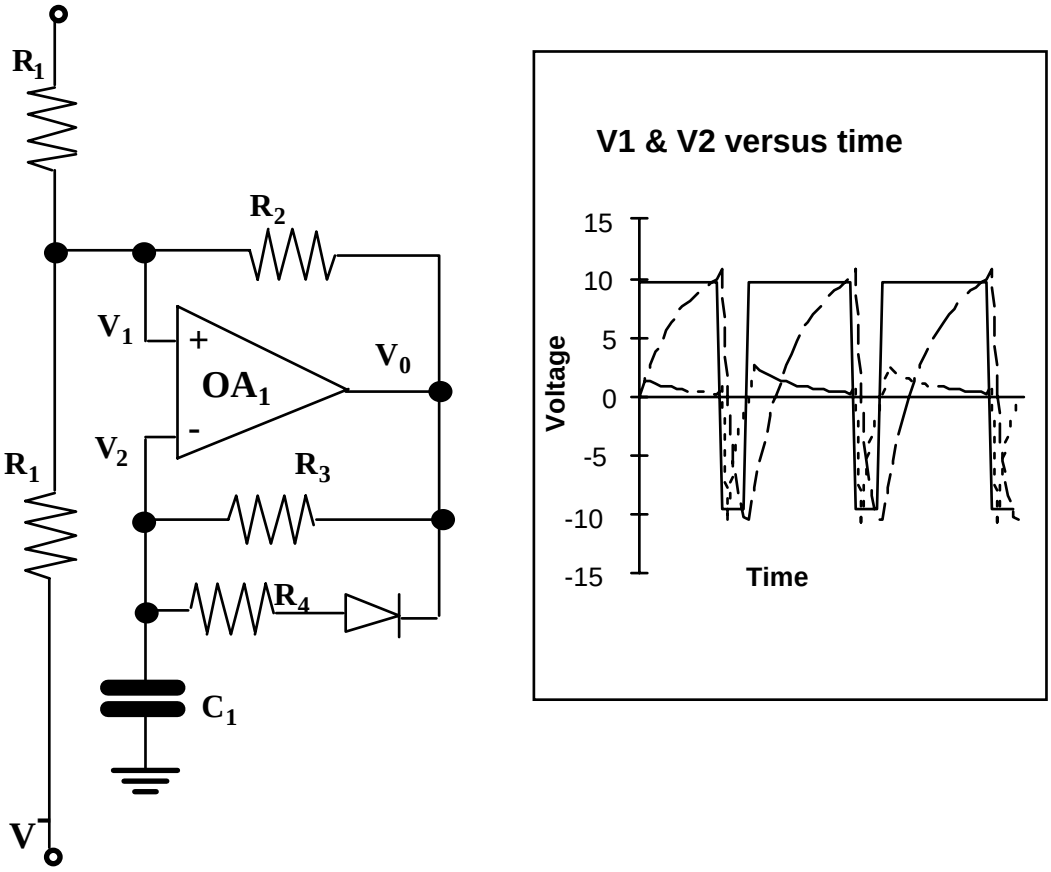
apparent when there is additional noise in the data. The example is a simple cyclic system, but real market data is not so clean. the problem is that the underlying causal relationships are masked, rather than revealed by the application of regression analysis.

This is further demonstrated in the case of a common minor variation to the oscillator shown in Exhibit 4. The addition of the diode alters the mark-space ratio of the wave-forms. The problem here is that phase shifts are not effective when regressing asymmetrical wave-forms. Financial cycles tend to display some degree of asymmetry with negative corrections occupying a relative small proportion of the entire cycle.

Ignoring the problems of regression, even developing a theoretical interpretation of the data would be difficult for an analyst ignorant of its source. $V_2$ appears to be a function of $V_1$, however, $V_1$ has only two stable values, and so it cannot be used to predict $V_2$ at all. This is no more than an implication of the fact that the functions that give to the wave-forms are not linear. Regression analysis attempts to incorporate non-linear variables, using such techniques as logit transformation. Logit transformation may by useful in taming $V_1$, but the remainder of the effect in $V_2$ is the result of autocorrelation. This may be accommodated by regressing $V_{2,t}$ against $V_{2,t-1}$. The problem with this approach is that while it may eventually produce some degree of predictive success, the actual causal parameters will be so different to those of the eventual model, that a slight change in the former will render the model useless.

The problem is very similar to the problem experienced in astronomy while it adopted the Ptolemaic system. Ptolemy posited invisible celestial spheres that were attached to each other using invisible axes to explain astronomical behaviour. The movement of the celestial bodies can be reasonably explained by the construction of a very large number of these spheres-within-spheres. Each new aberration in the observed data requires a resetting of much of the whole system and it never quite works as precisely as astronomy based on Newton's laws of physics. Even the slight errors due to movements better explained using Einstein's relatively do not upset the basic precision of the Newtonian system. This should not be surprising, because Newton's system is causally accurate. Ptolemy's is not.

## Exhibit A4




Similarly, a relatively compact and precise explanation of the oscillator can be constructed based on the causality understandable by the mere nature and behaviour of the components in the circuit. Likewise, recurrent fluctuations in human economic behaviour will only be reliably understood when the mathematical interpretation follows from the behavioural causality.

Regressing real estate price against interest rates is therefore pointless unless there is some causal relationship between the two. It is also dangerous to assume that the causal functions will be linear. In the example above, $V_1$ was a square wave that switched between two fixed values. Some human behaviour appears to exhibit non-linear switching. Feelings of optimism and pessimism tend to operate in this way. Likewise, human behaviour, especially in financial decisions, appears to be heavily dependent on history. It is autocorrelated.

## A SIMULATED SIMPLE BEHAVIOURAL MODEL OF CYCLICAL PRICING

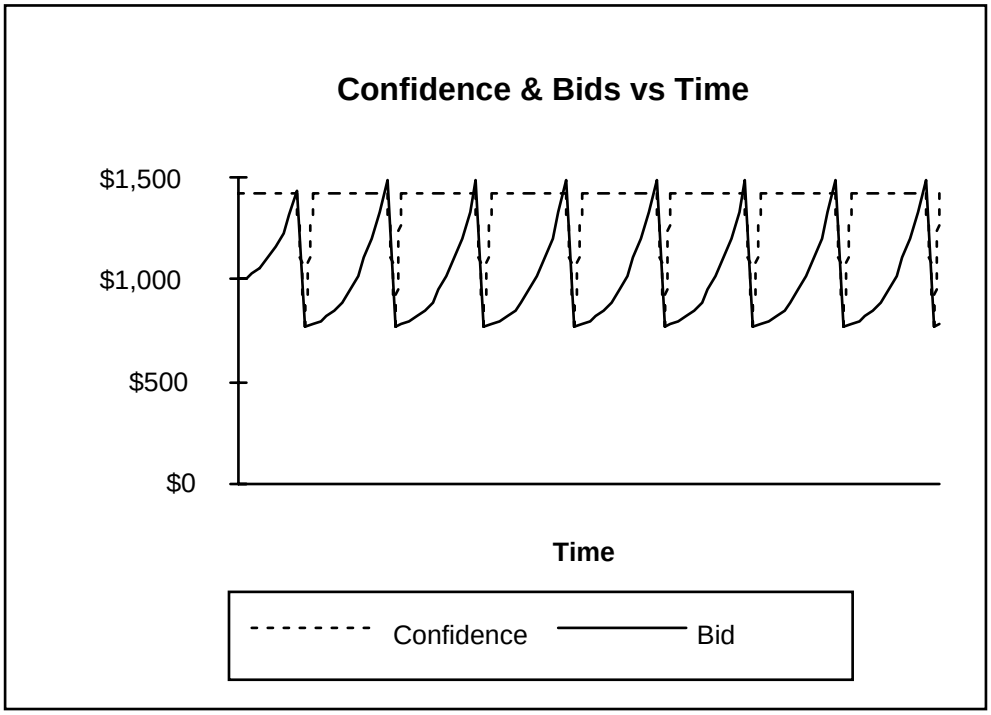
Adopting these two premises, switching between optimism and pessimism and autocorrelated bidding, a simple behavioural model of bidder behaviour can be generated that produces a cyclical pricing output. The purpose of this model is purely to demonstrate the methodology, it is not to suggest that the mathematical model proposed is definitive. Two parameters drive the model, bidder confidence and bid price.

The equations that drive the model are simple. Confidence is positive if the prevailing market yield is greater or equal to the bidder's notional minimum acceptable yield. The confident bidder will set a yield threshold lower than the long term average, expecting capital growth to make up for rental shortfall. If confidence is positive, the bidder will bid following the recent market trends. In this simulation, this means that the bidder will expect the previous rate of market growth plus a growth premium proportional to the length of time that the market has been rising.

The bid prices in a rising market will experience accelerated growth towards the end of the rising phase that will terminate when yields are pushed below the threshold minimum. When this happens, confidence switches to pessimistic. Pessimistic bidders are highly risk adverse and will only be tempted into the market by yields that are a sound margin above the long term average. They are looking for bargains that will withstand perceived risks, including elevated interest rates and vacancies. Bids will therefore be based on pessimistic yield expectations. This is manifest as a sharp negative price correction.

Once prices have corrected to pessimistic yields, the existence of bargains will stimulate a return of a basically confident attitude, but this will not be immediately evident in prices. Confidence merely allows bidders to countenance growth, but this will be very sluggish at first. The cycle produced by confidence and bid prices is shown in Exhibit A5. Note that it is very similar to the graph in Exhibit A4. Both are cycles that are generated by an autocorrelated growth/decay function switched by a bi-stable threshold criterion. It is not necessary for the switched threshold function to be exactly bi-stable, although this is the simplest conceptual starting point. It can be shown that other wave-forms can be used as thresholds, but this is beyond the scope of this study. It can also be shown this type of oscillation can be configured to yield chaotic output, but again exploration of that possibility is beyond the present study.

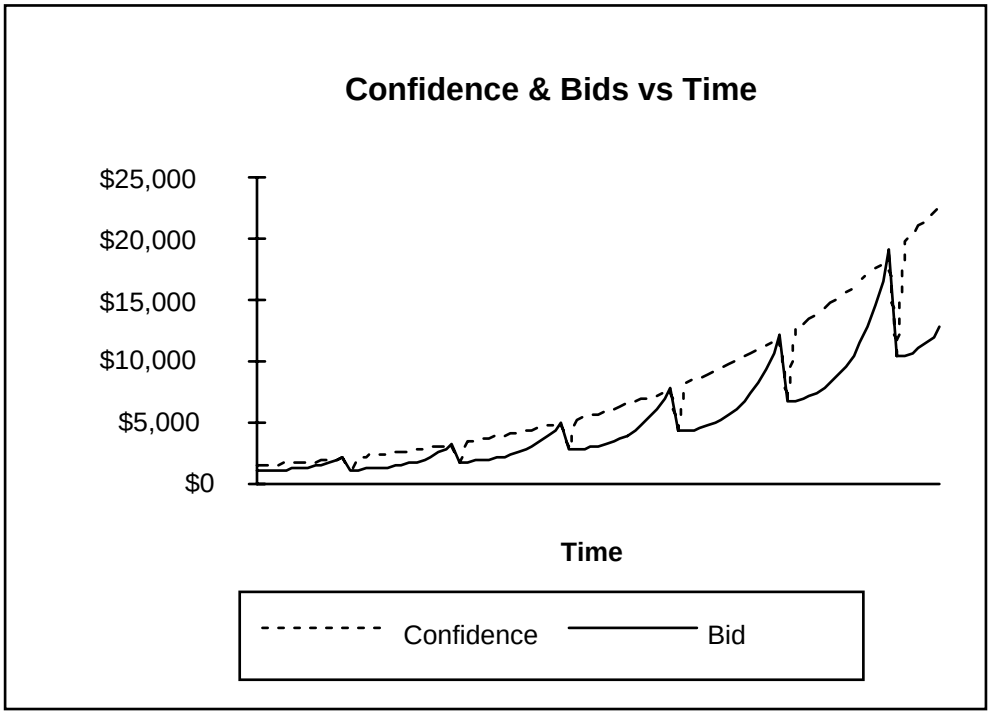
**Exhibit A5**




In the graph in Exhibit A5, confidence may be charted by either the bidder's threshold yield, or the maximum price the bidder would notionally consider. The bidder's notional maximum bid price is graphed here because it moves in the same direction as confidence and can be argued to act as a reasonable proxy. The notional maximum bid of the confident bidder could be made more realistic with the addition of debt leverage to the model.

The yields in Exhibit A5 were applied to constant rents to produce a stationary wave-form. In practice rents grow over time. The model can be easily adapted to rising rentals as shown in Exhibit A6. The solid line in this graph describes a series of rising cusps which is visually similar to market patterns. The fact that actual markets exhibit variations and period and amplitude may be suggestive of actual growth and threshold function whose parameters cause them to operate chaotically. It is also likely that the threshold function is influenced subjectively by many capricious exogenous variables. It is not proposed to attempt to fit this model definitely at this point, but merely to demonstrate that a simple set of behaviourally reasonable equations are capable of modelling market patterns considerably easier than is practical using regression techniques.

## Exhibit A6


Confidence & Bids vs Time
$25,000
$20,000
$15,000
$10,000
$5,000
$0
Time
Confidence
Bid