Pacific Rim Real Estate Society (PRRES)
Conference 2001

Adelaide, 21 – 24 January 2001

MODELLING OFFICE MARKET IN MALAYSIA

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Abstract:

Previous studies undertaken in the United Kingdom and the United States of America suggest that the market of office spaces is explained by various economic indicators factors. The mix findings, therefore suggest that different locality is subject to different factors. The City of Kuala Lumpur offices shown that it is significantly associated with the level of unemployment compared to other variables such as GDP hence suggest how the unemployment level significantly affects demand and supply, consequently rent in the market.

Keywords: office market, modelling, macro level, economic indicators and employment forces.

1.0 INTRODUCTION

The growing interest in modelling commercial property increased steadily with more and more research on the issue undertaken by various parties in the United States of America and the United Kingdom as well as Europe. Research on property investment performance utilising finance and economics theories in forecasting commercial rental, have been widely undertaken in these countries. Most of the studies assumed that rental is a reduced-form equation of demand and supply. Thus rental can be forecasted by available information on factors related to demand and supply of that particular property. The relationship between office sector, economic growth and other economic indicators has been explored despite the common problem of lacking rigorous and standardised information.

In Malaysia, tendency to utilise the economic and finance theories is very minimal. Despite increasing involvement of major investors with considerable sum have been invested in property development and growing interest in property investment, research on it in Malaysia received less attention either from practitioners or academicians especially on the aspect of their pricing. Currently, prices and rents are assumed to adjust to market clearing. There is no attempt to model office rental as well as an exploration to its relationship with other economic variables or indicators. The reluctance of practitioners to adopt systematic approach to rental determination has been an evidence for the absence of neither model nor work in the related issue in the Malaysian market.

This paper attempts to model office market in Malaysia at national level. This research hence seeks to analyse the demand and supply forces for offices in the city of Kuala Lumpur for forecasting and explaining rental pattern in the market. Most works on office market in Malaysia concentrate on Kuala Lumpur's market to portray the national market. Moreover, the Kuala Lumpur's market, as an indicator of Malaysian market, has been adopted without further attempt to analyse the pattern or behaviour of regional sub-market. The regional town is a capital of every state, known as city or town, in Malaysia. Some cities are developed faster than another due to various internal and external factors. An uneven distribution of business activities between the capital city and regional town, thus contributed to the possibility of each sub-market will behave in its own way. This may led to the issue of whether the model of regional office market resembles the national's model hence will Kuala Lumpur provide reliable model for Malaysian office market. Nonetheless, an effort to critically analyse the regional office market is normally constrained by the availability of sufficient data on that fairly confined market. As a result, the pricing process for the city's office market is pursued in this study.

The paper is structured into five different parts. The first part reviews previous works on modelling office market. Malaysia office market is introduced in part two of the project. The methodology is outlined in detail in part three. The remainder of the paper is devoted to reporting the result of the research.

2.0 LITERATURE REVIEW

The literature review in this paper is divided into two main parts. First part deals with a review of previous works on modelling office performance with a particular reference on explaining rental as a performance measure. Part two discusses Malaysia office market.

Previous works on modelling office market.

Modelling office market normally involves an analysis of rental as a measure of office performance. Fraser (1986) and Rosen (1974) suggest that office rents should be influenced by demand and supply factors. As result, subsequent works on modelling office performance profound that the behaviour of office rental is normally explained by the variation in demand and supply variables. This has initiated the development of demand and supply reduced-form model, which separate demand and supply factors are used to explain rental. The model is popular in the United Kingdom (MacGregor, 1999) and has been tested at different level of geographical sub-market.

Gardiner and Hennebery (1985) highlight the need to spatially disaggregated rent prediction models, rather than a single national model, to allow for geographical variations in the behaviour of the economy and of the property. Attempts to model office rental at regional level, though may not as reliable as national level, signalled the possibility of explaining the behaviour of regional market provided necessary information is available (Gardiner and Hennebery, 1985). Nonetheless, regardless the geographical areas, the main issues in modelling office rental are selecting the right proxies for demand and supply factors and what approach to be used to explain such variation.

Previous studies have examined a wide selection of variables, which represent demand and supply forces, in attempts to predict office market performance. In case of demand, both the United Kingdom and the United States of America have selected a similar range of variables to capture

demand for office space. These factors are Gross Domestic Product, interest rates, employment, unemployment, average income and service sector employment.

Gross Domestic Product (GDP), as a significant demand proxy has been demonstrated in Hekman (1985), Gardiner and Hennebery (1988, 1991) and Guissani and Tsolacos (1991). Hekman (1985) shows that national economic condition has significant influence demand for office-based activity across the sample of 14 US cities over the period of 1979-1983. Gardiner and Hennebery (1988, 1991) examined office rent determination within standard geographical regions in the United Kingdom for the period of 1977 to 1984. Regional GDP, found to be the most significant of all variable included in the demand side measures. Similar finding exhibited in Guissani and Tsolacos (1991) as GDP was seen to be important than service sector employment in explaining quarterly real rents in the UK for the period of 1977- 1991. Service sector employment, nonetheless, is significant in Kelly (1983) and Wheaton and Torto (1988) which suggests that measures of economic activity are not all equally effective in explaining office rental values. In both mentioned works, demand for office space is strongly influenced by the cyclical growth or fluctuation in office employment. The strong level of association between service sector employment and the level of office based activity is due to the fact that service sector activity is taken place in an office space, hence changes in service employment sector is likely to be linked to changes in demand for office space (Bruno, et.al. 1993).

Dobson and Goddard (1992) identified other variables affecting demand for office spaces. Positive association between real estate interest rates and rental values for all types of commercial property including offices, between 1972 and 1987. Though the study indicates that changes in the cost of and return on capital affect the aggregate buy or rent decision in line with interest rates in four regions in the United Kingdom, therefore, the possibility of including interest rates as another demand variables in modelling office rental.

A reduction in consumer spending leads to a decline in the demand for goods and services, which in turn results in a reduction in output in these sector. Surplus capacity then has to be corrected

through industrial rationalisation in the form of corporate restructuring and a deferment of capital investment. In so far as business occupiers are under pressure to reduce their operating costs, so investment in additional will decline while rationalisation and bankruptcies will tend to increase the supply of commercial space.

In addition to demand side variables, the influence of a number of supply variables on office rental has been identified in notable empirical studies. Rosen (1984), for example, includes actual vacancy rates and real vacancy rates to illustrate that the former is lower than the later; therefore demand for office space is high consequently high rent. This implies the significant influence of vacancy rate in explaining rental behaviour. This rental adjustment model, (MacGregor, 1999) which relates changes in rent to different between natural and actual vacancy rates, is further tested in Hekman (1985). Hekman founds that office vacancy rates is a significant office rental determinant. The vacancy rate is used as a proxy of office supplied at any time for existing stock and in the form of newly built space. Guissani and Tsolacos (1991) also show that in the analysis of industrial rental, changes in vacancy rates is significant as an indicator of the mismatch between property supplied and occupier requirements.

While all of the above studies were undertaken in the United Kingdom and United States of America, an effort to apply the same framework should be undertaken in Malaysia. For this reason, a review of related study in Malaysia is undertaken in the following section.

Research on Malaysia Office Market

The aim of relating the rental movement in the city of Kuala Lumpur office market to the several macro-economic indicators is began with the review of relevant indicators. This section reviews the economic scenario in Malaysia. This will be an introduction for further analysis as highlighted in the earlier section.

The discussion of Malaysian office market is normally refers to the City of Kuala Lumpur offices. This does not indicate the non-existence of other sub-market, but the small size as well as immature of regional market, has resulted in less researchable market. Moreover, the city of Kuala Lumpur office market has been long established, therefore the information regarded the market is more organised compared to the regional market.

Offices in the City of Kuala Lumpur are commonly classified into three significant geographical areas or/ and three types of construction (modern, transitional and traditional offices (Please refer Md Yusof, 1999a). The areas are Golden Triangle Area (GTA), Central Business District (CBD) and Decentralised Area (DCA). The GTA represents the most prestigious location of office development in the City of Kuala Lumpur. This is followed by CBD, which is known as a banking region in the city. The DCA, although previously known as city fringe; where the land price is less cheap than CBD and GTA, is most sought after in the 1990s. The factors of escalating land price and overcrowded in the city centre have pushed new development to the city fringe. This will raise whether the city fringe office development will be able to capture reasonable market share hence influence the investor to risk their capital in such development? Md Yusof (1999a) shows that a pattern to occupy intelligent office space for better facilities and utilities was significant in 1997 despite good or prestigious location. Obviously good location will contribute further merit to the potential tenant. Nonetheless Md Yusof indicates that the level of rental depreciation is largely attributed to property characteristics. This nonetheless valid at micro, what factors will explain rental at macro level?

The Malaysian office market had experienced up and down turn since 1980s. Early 1980s watched the increase of demand for offices as a result of economic boom in late 1970s. Low percentages of vacancy rate were recorded in the early 1980s. Nonetheless, as the nation suffers recession in late 1984, the vacancy rate started to increase. The rate was as high as 25% when the nation was in deep recession in 1987. During this time, overbuilding occurred as the market experiencing low construction activity and possibly low vacancy rate, when then experience an increase in construction. The take-up rate, however improved steadily upon the recovery of

national economic. Due to high demand, the shortages of quality spaces occurred in the early 1990s. The government intervention through the approval of only intelligent office building has resulted in flow of such space in 1993 and on wards.

The development of properties in the city of Kuala Lumpur has been rapidly undertaken. The strong demand created by local and international in the early 1980s and 1990s has resulted in the development offices. Nonetheless, the national's economic recession in mid 1980's till late 1980s has change the structure of the office market. To meaningfully understand the dynamic of office in the City of Kuala Lumpur, the discussion is structured into four cycles; 1980-1985, 1986-1989, 1990-1997 and 1997-now.

1980-1985 - the period witnesses the rapid development of offices in the City of Kuala Lumpur. The demand was created by healthy economic in late 1970s. Demand for quality office accommodation signalled changes in priority for occupation, especially for multi-national and international companies. During this period, the stock of offices increased as a result of demand created during high time in the late 1970s. The average occupancy rate was below 80%. Rental for prime offices was around RM3-4 per square feet, which mean that the growth was less than 6% annually. In the deep of recession, the national economy shrunk to –1.1% (1985), while the level of employment dropped.

1986-1989 – The national recession in mid 1985 affected the occupation rate of offices in the City of Kuala Lumpur. The completed office spaces led to 'glut' where the owner of the building were desperate to let space available. The period has seen the arising of 'rent-free period' as well as other offer such as furnished and fully carpeted spaces. The occupancy rate plunged as low as 60 – 70%. Accordingly rent fell to the lowest level ever recorded. However, the national economy gained momentum toward the end of 1980s, therefore create another booming era to the office market in Malaysia.

1990-1997- the period recorded the highest demand and completed space compared to the earlier period. Demand created in the early 1990s as the nation wake up from its long recession. The government incentive and requirement to create modern office skyscrapers had resulted in the approval was only granted to high-rise modern offices. Following a period of slow construction in the late 1980s and early 1990s, office construction fell to a record low two to three years later. Meanwhile office vacancies plummeted from double digit levels, rent have rapidly increasing and returns to private investors over the period have been strong. This initiated further application for the office development in the City of Kuala Lumpur.

1997- now: During this period, the nation faced another recession. The recession caused significant impact on construction activity as some project has to be stopped or shelved as a result of unavailable fund. Rental is less stable as a result of high vacancy rate. When the national economy grow at less than 5% annually, the construction industry shrunk at –23% in 1998. The construction activities in all sectors, except civil engineering public works have been affected. The newly completed intelligent offices are left vacant. The flow of space created by demand during the high time has been seen as an excessive. The occupancy rate was as high as 20% has been recorded. Although some offices maintained their rental level, the overall feature of the market is depressed.

3.0 METHODOLOGY

The modelling process in this study involves evaluation of relationship between the dependent variable, Average Rent, and appropriate independent variables from historical data. Several stages involved in this study are conceptualisation of the model, model development and model specification.

3.1 Conceptualisation of the model

The relevant theories have been reviewed in the earlier section. The review helps to identify appropriate explanatory variables. The variables, which are relevant to modelling office rental, are demand and supply-side indicators.

Data: The study seeks to explain the relationship between office rental and demand and supply-related variables. The variables have been identified in the review undertaken in the first section of this study. The variables identified are variables related to demand of the office space. This included Gross Domestic Product (GDP) to measure the level of economic activity. The variable is denoted as GDP. In order to analyse the impact of employment on demand for offices as in previous reviewed works, changes in the level of unemployment, changes in service sector employment, the rate of unemployment and employment in the service sector, changes in interest rates and changes in loan granted to the construction are selected. The data for the demand-side variables were obtained from the Malaysia Annual Economic Report.

The source for data on supply-side was from the Malaysian Annual Property Market Report. Variables related to the supply of offices such as stock of offices space, the occupancy rate, take-up rate, etc. The average rental was based on 1000 square feet of prime space. There are also secondary spaces available nonetheless; the modelling exercise will concentrate only on prime space only. Although, it is important to examine both, primary and secondary space, only prime is considered due to time constraint.

To meaningfully investigate the impact of the factors over time, a series of information on the above variables is collected for a period from 1980 to 1999.

3.2 Model development

The study attempts to incorporate the causal factors as identified in the previous works. For this reason, a multiple regression is performed on time-series information gathered. Rent is the

dependent variable whose value is determined by variations in supply and demand. The model should therefore incorporate demand and supply factors hence shown as;

Rental = f (Demand and Supply) + e

The relationship between changes in demand, supply and changes in rent is examined.

4.0 EMPIRICAL FINDINGS

The finding of the study is divided into two sections;

4.1 Preliminary Analysis

Correlation analysis: The analysis involves an examination of correlation or relationship between average rental and selected variables. Eleven independent/explanatory variables have been selected. A bivariate association between rental, demand and supply related is shown in Table 1.0. The level of association between variables is classified under three level; strong, moderate and low. Strong level of association is signified by correlation of 0.6 and above. This indicates that when 60% or more variation in one variable is explained by another variable, the level of association is said to be strong. Accordingly, moderate level of association proxies by correlation of 0.4 to 0.59 as 40 to 59% of variation in one variable is explained by another variable. Finally, low level of association is shown by the value of correlation of less than 0.4 in absolute value.

An examination of correlation analysis, as in Table 1.0, indicates that the average rent of offices in the City of Kuala Lumpur is strongly linked to changes in demand, level of unemployment. Each with correlation of 0.693 and –0.885 signifies that the influence of both variables is significant on

the level of rent in the City of Kuala Lumpur offices. Changes in supply of existing office stock and stock taken up are found to be significantly related to the average rent.

Strong associations are recorded between demand related variables (with an exception of take-up, employment level and changes in BLR). All other variables exhibit significant co-movement and vice-versa. Rental, for example, is strongly explained by changes in supply and employment level as mentioned earlier. As supply increased, rental decreased. Similarly as the unemployment level increase, rental decreases and vice versa. This shows how rental market in the City of Kuala Lumpur is sensitive to the unemployment level, instead of total employment, which is expected to show similar pattern.

TABLE 1.0 A SUMMARY OF CORRELATION ANALYSIS

Factors	Correlations
1. Changes in Demand- CHINDD	0.693
2. Changes in Supply - SS_CUM	-0.969
3. Occupancy Rates – OCC_RATE	0.534
4. Take –up rate – TAK_UP	-0.009
5. Vacancy Rate – VAC_RATE	-0.537
6. Changes in Employment level- EMP_CHG	0.061
7. Unemployment level – UNEMP	-0.885
8. Changes in service sector – SERS_CHG	-0.387
9. Economic Growth – GDP	0.414
10. Changes in loan awarded – LN_CHG	0.347
11. Changes in Base Lending Rate – BLR_CHG	0.083

Nonetheless, the correlation provides early indications of link between selected demand and supply variables and rent. Figure 1 summarises the relationship between the variables graphically.

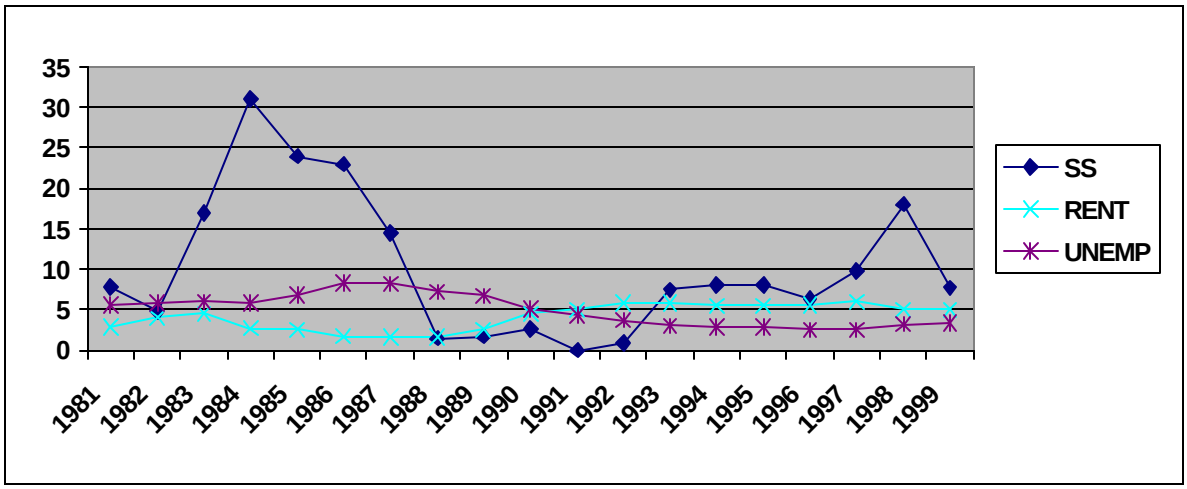

FIGURE 1.0 Change in Rent, Office Supply and Unemployment.

The correlation analysis, however, is unable to reveal the relationship between multiple variables. As a result, multiple regression analysis is performed.

4.2 Further Analysis

Several models have been developed. However, the decent model is consisting of unemployment and occupancy rates. The model can be depicted as;

ORNT = 4.416 -0.688 (Unemployment) + 0.003463 (Occupancy rate).

The model explains 90.4% of variation in the Kuala Lumpur office rental based on information gathered in this study. Interestingly, with only one variable, that is unemployment, the model is able to explain 88.4% of variation in the office rental in the City of Kuala Lumpur. This has statistically proven that the impact of unemployment level on office market is very significant. About 3% further in rental is influenced by occupancy rate.

The variable, hence indicate how rental responded to unemployment through lower demand especially in the situation of increasing supply. This is also explained the second or probably the

third stage effect of GDP on rental. The GDP affects unemployment, consequently unemployment affect demand hence rent. Therefore, in the City of Kuala Lumpur is statistically shown that rental of offices is greatly influenced by unemployment.

5.0 CONCLUSIONS AND LIMITATION

The analysis has indicate that office rental in the City of Kuala Lumpur is strongly influenced by changes in unemployment level and average occupancy rate recorded for the market. Although, findings in other studies indicate the significant of other variables such as GDP, total employment as well as growth in service sector, the study however is unable to prove such significance in the Kuala Lumpur market. Based on the information collected, unemployment level affects demand for spaces hence high unemployment will dampen the demand consequently lowered rental level. Although, occupancy rate appears in the model, low to weak influence suggests that the factor is not as significant as unemployment.

The findings however, may subject to some limitations. The model, however, has not been robustly tested which meant that some error might occur. The may led to some findings may not appear as expected. For example, although it is expected other variables will be included in the model, this is not actually happen. The model for Kuala Lumpur offices may not be able to use to the regional level due to differences in fundamental characteristics of the market.

Nonetheless, the work offers considerable encouragement that an office rent prediction model can be developed in this country. The study should serve as a first step to statistical analysis in the property investment and initiate further analysis related to modelling property performance.

FURTHER READING

Antwi, A. and Henneberry, J. (1995) Developers, non-linearity and asymmetry in the development cycle, Journal of Property Research, 12(3), 217-39.

Ball, M., Lizieri, C. and MacGregor, B. D. (1998) The economics of commercial property markets, Routledge, London.

Barras, R. (1983) A simple theoretical model of the office development cycle, Environment and Planning A, 15, 1361-94.

Barras, R and Ferguson, D (1987), Dynamic Modelling of the Building Cycle: Empirical Results, Environment and Planning, 19: 493 - 520.

Barras, R and Ferguson, D (1987), Dynamic Modelling of the Building Cycle: 1 Theoretical Framework, Environment and Planning, 19: 353-367.

Benjamin, J. D., Judd, D. and Winkler, D. T. (1995) An analysis of shopping center investment, The Journal of Real Estate Finance and Economics, 10(2), 161-8.

Benjamin, J. D., Judd, D. and Winkler, D. T. (1998) A simultaneous model and empirical test of the demand and supply of retail space, The Journal of Real Estate Research, 16(1), 1-14.

D'Arcy, E, McGough and Tsolacos S. (1997), National Economic Trends, Market Size and city growth effects on European office rents, Journal of Property Research 14(4): 297-308.
DiPasquale, D. and Wheaton, W. C. (1996) Urban economics and real estate markets, Prentice-Hall, Englewood Cliffs (NJ).

Dobson, S.M and Goddard, J.A (1992), The determinant of Commercial Property prices and Rents, Bulletin of Economic Research 44(4): 301-315.
Gardiner, C. and Henneberry, J. (1988) The development of a simple regional office rent prediction model, Journal of Valuation, 7, 36-52.

Gardiner, C. and Henneberry, J. (1991) Predicting regional office rents using habit-persistence theories, Journal of Property Valuation and Investment, 9, 215-26.

Giussani, B., Hsia, M. and Tsolacos, S. (1993) A comparative analysis of the major determinants of office rental values in Europe, Journal of Property Valuation and Investment, 11, 157-72.

Harris, R. (1995) Using co-integration analysis in econometric modelling, Prentice Hall/Harvester Wheatsheaf, Hemel Hempstead.

Hendershott, P. (1995) Real effective rent determination: evidence from the Sydney office market. Journal of Property Research, 12(2), 127-35.

Hendershott, P., Lizieri, C. and Matysiak, G. A. (1999) The workings of the London office market, Real Estate Economics, 27(2), forthcoming.

Key, T., MacGregor, B. D., Nanthakumaran, N. and Zarkesh, F. (1994) Economic cycles and property cycles, Main report for Understanding the property cycle, Royal Institution of Chartered Surveyors, London.
Maddala, G. (1994) Econometrics, McGraw-Hill, Maidenhead.

McGough T. and Tsolacos, S. (1995) Forecasting commercial rental values using ARIMA models, Journal of Property Valuation and Investment, 13(5), 6-22.

McNamara, P. F. (1991) The problems of forecasting rental growth at the local level, in Investment, procurement and performance in construction, Venmore-Rowland, P., Mole, T. and Brandon, P. (Eds), E & F N Spon, London, 64-76.

Mills, T. C. (1991) Time series techniques for economists, Cambridge University Press, Cambridge.

Morrison, N. (1997) A critique of a local property forecasting model, Journal of Property Research, 14(3), 237-55.

Orr, A. M. (1996) Modelling regional industrial property markets: equilibrium or disequilibrium?, Aberdeen Papers in Land Economy, 96-10, University of Aberdeen.

Shilling, J. D., Sirmans, C. F. and Corgel, J. B. (1987) Price adjustment process for rental office space, Journal of Urban Economics, 22, 90-100.

Shilling, J. D., Sirmans, C. F. and Corgel, J. B. (1992) Natural office vacancy rates: some additional estimates, Journal of Urban Economics, 31, 140-3.

Silver.M and Goode.M (1990), economic Forecasting Model for Rents in the British Retail Property market, Omega International Journal of Management Science, 18(5): 529-539.

Tsolacos, S. (1998) Econometric modelling and forecasting of new retail development, Journal of Property Research, 15(4), 265-84.

Tsolacos, S., Keogh, G. and McGough, T. (1997) Modelling use, investment and development in the British office market, Aberdeen Papers in Land Economy, 97-01, University of Aberdeen.

Valuation and Property Service Department, Ministry of Finance, Malaysia (1999) *Property Market Report 1998*, National Printing Department, Malaysia.

Valuation and Property Service Department, Ministry of Finance, Malaysia (1998) *Property Market Report 1997*, National Printing Department, Malaysia.

Valuation and Property Service Department, Ministry of Finance, Malaysia (1997) *Property Market Report 1996*, National Printing Department, Malaysia.

Valuation and Property Service Department, Ministry of Finance, Malaysia (1996) *Property Market Report 1995*, National Printing Department, Malaysia.

Valuation and Property Service Department, Ministry of Finance, Malaysia (1995) *Property Market Report 1994*, National Printing Department, Malaysia.

Valuation and Property Service Department, Ministry of Finance, Malaysia (1994) *Property Market Report 1993*, National Printing Department, Malaysia.

Valuation and Property Service Department, Ministry of Finance, Malaysia (1993) *Property Market Report 1992*, National Printing Department, Malaysia.

Valuation and Property Service Department, Ministry of Finance, Malaysia (1992) *Property Market Report 1991*, National Printing Department, Malaysia.

Valuation and Property Service Department, Ministry of Finance, Malaysia (1991) *Property Market Report 1990*, National Printing Department, Malaysia.

Valuation and Property Service Department, Ministry of Finance, Malaysia (1990) *Property Market Report 1989*, National Printing Department, Malaysia.

Valuation and Property Service Department, Ministry of Finance, Malaysia (1989) *Property Market Report 1988*, National Printing Department, Malaysia.

Valuation and Property Service Department, Ministry of Finance, Malaysia (1988) *Property Market Report 1987*, National Printing Department, Malaysia.

Valuation and Property Service Department, Ministry of Finance, Malaysia (1987) *Property Market Report 1986*, National Printing Department, Malaysia.

Valuation and Property Service Department, Ministry of Finance, Malaysia (1986) *Property Market Report 1985*, National Printing Department, Malaysia.

Valuation and Property Service Department, Ministry of Finance, Malaysia (1985) *Property Market Report 1984*, National Printing Department, Malaysia.

Valuation and Property Service Department, Ministry of Finance, Malaysia (1984) *Property Market Report 1983*, National Printing Department, Malaysia.

Valuation and Property Service Department, Ministry of Finance, Malaysia (1983) *Property Market Report 1982*, National Printing Department, Malaysia.

Valuation and Property Service Department, Ministry of Finance, Malaysia (1982) *Property Market Report 1981*, National Printing Department, Malaysia.

Valuation and Property Service Department, Ministry of Finance, Malaysia (1981) *Property Market Report 1980*, National Printing Department, Malaysia.

Wheaton, W. C. (1987) The cyclic behavior of the national office market, Journal of the American Real Estate and Urban Economics Association, 15(4), 281-99.

Wheaton, W. C. and Torto, R. G. (1990) An investment model of the demand and supply for industrial real estate, Journal of the American Real Estate and Urban Economics Association, 18(4), 530-47.

Wheaton, W. C., Torto, R. G. and Evans, P. (1997) The cyclic behaviour of the Greater London office market, The Journal of Real Estate Economics and Finance, 15(1), 77-92.

EXHIBIT A - List of variables in the analysis

SS – Annual Supply of commercial construction output

GDP – Gross Domestic Product at 1978 prices.

SERVOPT – Service sector output

CONGDP- Construction output.

BIOPT – Banking, insurance output

EMP – total employment

UNEMP – unemployment level

SERVEMP – service sector employment

BIEMP – banking and insurance sector employment

REN – rent (office, retail, hotel)

OCRAT – Average Occupancy rate (office, retail, hotel)

VRAT- average vacancy rate

CPI – Consumer Price Index