Buletin Geoinformasi, Jld. 2, No. 1, ms. 214 - 223, Mei, 1998

The Impact of Location on the Jakarta Condominium Prices

Azhari Husin, PhD
Panel Penilaian & Pelaburan Harta Tanah
Faculty of Geoinformation & Engineering Science
University of Technology Malaysia
Locked Bag 791, 80990 Johor Bahru

Abstract

It is well-documented and common knowledge that location is one of the most important factors influencing property prices. This article examines the relationship between condominium prices and distances from the Jakarta CBD. Although prices decline with increasing distance, the pattern is not uniform. For some distances, prices decrease sharply while for other distances the price drop is more gradual. Although the pricing pattern generally conforms to theoretical expectations, in some instances the initial price decline is followed by a price increase. This pricing pattern illustrates the inadequacy of the linear pricing model in representing the Jakarta condominium market. A non-linear model is more appropriate. The pricing pattern is very useful to developers as well as marketing agents in determining the relevant pricing levels for their condominium developments.

1.0 INTRODUCTION

The subsequent analysis is based on a real case study for a developer[1] who wishes to know the pattern of condominium prices with respect to location. Knowing the relationship between location and condominium prices is important for it will provide information as to what *extent* pricing is affected by location. It will also assist the developer in deciding whether their condominium pricing level is *appropriate* for the given location.

2.0 THEORETICAL BACKGROUND

The trade-off theory of residential[2] location stipulates that the nearer the property is to the Central Business District (CBD)[3], the higher is the price of the property (Evans, 1980 & 1983, Burns &

---

1 In an effort to maintain confidentiality, the name of the development company is not revealed. It is sufficient to indicate that the company is a prominent Singaporean developer with substantial domestic as well as foreign investments in the condominium and hotel sector.

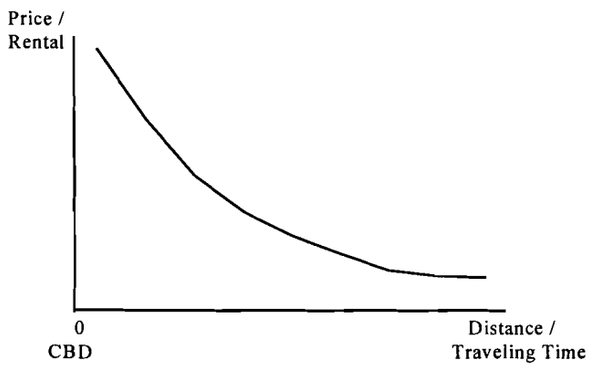
2 The term residential is often associated with landed properties such as terrace, semi-detached and detached houses. However, condominium is also considered a residential property simply because it is being used as a place of resident. The differences between condominium and the traditional landed houses are due to the facilities and the highrise structure of condominiums. Relative to landed properties, condominium living enjoys shared facilities such as swimming pool, tennis courts, sauna and etc. Furthermore, it fully managed and has 24 hours security services (Property Outlook, 1983; Hakimi, 1980/81 and Gurjit, 84/85).

Mittleback, 1964; Kain, 1983). The theory assumes that residential consumers, such as purchasers of condominiums, townhouses and other landed properties, choose a location that provide a balance or trade-off between residential costs and transportation costs. Residential costs are represented by prices or rentals of residential units while transportation costs include travelling costs.

The theory rationalises that residential consumers living near the CBD incur lower travelling costs. As such, they have more spendable income and, consequently, can afford more expensive accommodation. On the other hand, those living further away from the CBD, spend a higher proportion of their income on transportation costs and, therefore, can only buy or rent cheaper residential units.

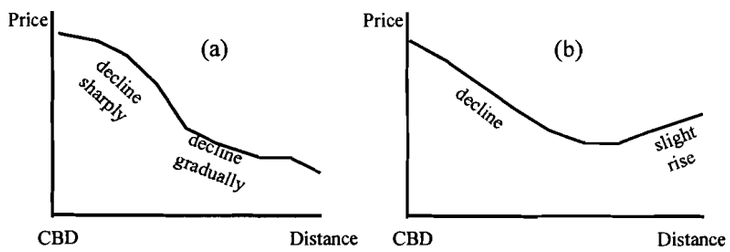
The theory implies that prices of condominium and other residential units will have their peaks in the CBD and prices will subsequently decline with increasing distance from the CDB. The general relationship between pricing and location is illustrated in fig. 1.

Fig 1: General Relationship
Between Price and Location



Whether the above general theoretical price pattern, as stipulated by the trade-off theory, is true in Jakarta, remains to be seen. It is possible that the general pricing trend may vary as depicted by Fig 2(a) - 2(b).

Fig 2: Possible Pricing Pattern



[3] The prime reason for measuring distances from the CBD is because the CBD is often used as a proxy for the centre of employment. In other words, the theory assumes that nearness to the place of employment is a major consideration in deciding where to stay or purchase a house.

Fig 2(a) illustrates that condominium prices may initially decline sharply but as distances increases the price decline is more gradual. The other possibility as shown in Fig 2(b) is that, prices may drop but increase slightly at a later stage. Which pricing trend is relevant to Jakarta will be subsequently be revealed.

3.0 THE DATA

Altogether 35 condominium developments throughout Jakarata were examined. The data collected includes their locations, pricing levels and their grades (see Table 1).

The locations of the condominiums from the CBD are indicated by their grid coordinates (X,Y) where the Semanggi Flyover is denoted as the origin (0,0)[4]. Note that it is not necessary to utilise the Semanggi Flyover as the origin of the grid. Any arbitrary point will do. In fact, the grid coordinates of the respective condominiums may be read off from the map of Jakarta.

However, it is much easier to interpret the results of the analysis (more of this later) using Semanggi Flyover as the grid origin. In this way, the price movements from the CBD may be seen much more clearly.

Table 1: Condominium Locations, Pricing Levels and Grades

No.	Condominium Development	Y Coordinate	X Coordinate	Ave. Price (US$ psm)	Grade
1	Apart Atap Merah	4.53	1.44	1 700	3
2	Taman Rasuna	-0.04	1.70	1 490	4
3	Rajawali Condo	6.02	2.33	1 400	4
4	Casagrande Condo	-0.40	2.23	1 238	4
5	Apartemen Citraland	-0.38	0.78	2 848	1
6	Mitra Bahari Apart	7.87	-0.49	1 141	4
7	Puri Kemayoran	5.34	3.39	1 584	4
8	Dukuh Golf Jkt	5.91	3.29	1 600	4
9	Simpruk Terrace	-0.85	-1.79	2 450	2
10	Marina Towers	9.17	-2.15	1 485	4
11	Mitra Sunter	5.63	6.18	1 321	4
12	Menara Kelapa Gading	4.36	8.83	1 244	4
13	Grand Cempaka	4.57	5.55	1 000	4
14	Robinson	7.11	-1.78	1 443	4
15	Kelapa Gading Apart	5.60	7.38	1 231	4
16	Muara Indah Pluit	9.00	-2.42	1 300	4
17	Taman Kemayoran	4.96	3.34	1 100	4
18	Mangga Dua Ct	6.72	1.51	1 300	4

4 MONAS (National Monument) has also been considered but the Semanggi Flyover is more appropriate since it represents the intersection between Jl. Sudirman and Jl. Gatot Subroto which together with Jl. Rasuna Said demarcates the prime commercial area of Jakarta.

19	ITC Roxy Mas	4.45	-0.80	1 855	3
20	Mitra Oasis	3.83	2.33	1 489	4
21	Juanda Regency	4.55	1.74	1 538	4
22	Pangeran Jayakarta	6.84	0.74	1 246	4
23	Taman Anggrek	3.35	-1.76	1 259	4
24	Weslink Garden	5.29	-4.06	1 119	4
25	Kintamani Condo	-3.24	-0.79	1 174	4
26	Hayam Wuruk	5.17	0.57	1 682	3
27	Tropic Apart	3.76	-1.96	1 675	3
28	Diamond Park	7.17	-1.34	1 556	4
29	Fountain Park	-2.30	2.68	1 498	4
30	Gandaria Residence	-1.96	-2.24	2 050	3
31	Park View	1.59	-1.24	1 700	3
32	Hilltop Residence	-5.34	-1.45	1 196	4
33	Apartemen Batavia	0.76	0.34	1 757	3
34	Ambassador Apart	-0.29	1.10	1 575	4
35	Pavillion Park	0.79	0.57	2 550	2

Source: Satyatama Graha Tara -
Brooke Hillier Parker

The pricing levels of the condominiums are stated in US$ per m^2. Note that the pricing level of a condominium in a particular location may vary depending on the floor level, view, building area and the provided facilities. The pricing level employed in this analysis is the average pricing level of condominium units in each location.

The grades of the condominium represents the quality of finishes and the facilities provided. Four (4) grades have been identified based on their pricing levels. These are as follows:-

Pricing Level (US$ /m^2)	**Grades**
1000 - 1600	4
>1600 - 2300	3
>2300 - 2800	2
> 2800	1

4.0 THE METHODOLOGY

The relationship between condominium prices, locations and grades may be established using multiple regression analysis (MRA). MRA is probably the most powerful tool in establishing relationship between variables (refer to Miller, 1979 for a review of MRA and pricing models). It is assumed that price is dependent on location and grades. This is expressed as follows:-

$$\text{Price} = f(\text{Location, Grade})$$
$$= f(X, Y, \text{Grade})$$
$$= \beta_o + \beta_1 X + \beta_2 Y + \beta_3(\text{Grade}) \quad \text{.....(1)}$$

where,

β_o is the constant
β_1, β_2 and β_3. are the regression coefficients
X and Y represents location where X is the grid coordinates showing the east-west direction while Y is the grid coordinate indicating the north-south direction

The above relatipnship (eq.1) denotes a *linear* relationship between condominium price and location (X, Y) as well as grade. The relationship, however, need not be linear. In fact, from a theoretical (see Fig 1) and practical[5] perspective, the pricing relationship is most probably *non-linear.*

As such, apart from a linear model, a non-linear model will also be derived. The non-linearity may be accommodated by various polynomial combinations of X's and Y's. This is shown below:-

Fig 3: Polynomial Combinations of X's and Y's

—	***X***	***Y***	***X²***	***Y²***	***XY***	***X³***	***Y³***	***X²Y***	***XY²***
X	X^2	XY	X^3	XY^2	X^2Y	X^4	XY^3	X^3Y	X^2Y^2
Y	XY	Y^2	X^2Y	Y^3	XY^2	X^3Y	Y^4	X^2Y^2	XY^3
X²	X^3	X^2Y	X^4	X^2Y^2	X^3Y	X^5	X^2Y^3	X^4Y	X^3Y^2
Y²	XY^2	Y^3	X^2Y^2	Y^4	XY^3	X^3Y^2	Y^5	X^2Y^3	XY^4
XY	X^2Y	XY^2	X^3Y	XY^3	X^2Y^2	X^4Y	XY^4	X^3Y^2	X^2Y^3
X³	X^4	X^3Y	X^5	***X^3Y^2***	X^4Y	X^6	X^3Y^3	X^5Y	X^4Y^2
Y³	***XY^3***	Y^4	***X^2Y^3***	Y^5	XY^4	***X^3Y^3***	Y^6	X^2Y^4	XY^5
X²Y	***X^3Y***	X^2Y^2	X^4Y	X^2Y^3	X^3Y^2	X^5Y	X^2Y^4	X^4Y^2	X^3Y^3
XY²	***X^2Y^2***	XY^3	X^3Y^2	XY^4	XY^3	X^4Y^2	XY^5	X^3Y^3	X^2Y^4

Note that the ***bold and italic*** combinations are the combinations which will be utilised in the pricing model. The other combinations have either been represented or are combinations which exceed the *cubic* polynomial. Normally, a non-linear relationship may be adequately represented using combinations not exceeding the cubic polynomial

5 Market observations reveal that condominium prices decline with increasing distance from the CBD. However, the decline in prices is not uniform. For some distances it decreases sharply while for other distances the price drop is gradual. This suggests that the relationship between price, location and grade is likely to be non-linear.

The non-linear pricing model is expressed as follows:-

$$\begin{aligned}\text{Price} &= f(\text{Location, Grade})\\ &= f(X, Y, \text{Grade})\\ &= f(X, Y, X^2, Y^2, XY, X^3, Y^3, X^2Y, XY^2, XY^3,\\ &\quad X^3Y, X^2Y^2, X^2Y^3, X^3Y^2, X^3Y^3, \text{Grade})\\ &= \beta_o + \beta_1 X + \beta_2 Y + \beta_3 X^2 + \beta_4 Y^2 + \beta_5 XY + \beta_6 X^3\\ &\quad + \beta_7 Y^3 + \beta_8 X^2Y + \beta_9 XY^2 + \beta_{10} XY^3 + \beta_{11} X^3Y\\ &\quad + \beta_{12} X^2Y^2 + \beta_{13} X^2Y^3 + \beta_{14} X^3Y^2 + \beta_{15} X^3Y^3 + \beta_{16}(\text{Grade}) \qquad \text{..... (2)}\end{aligned}$$

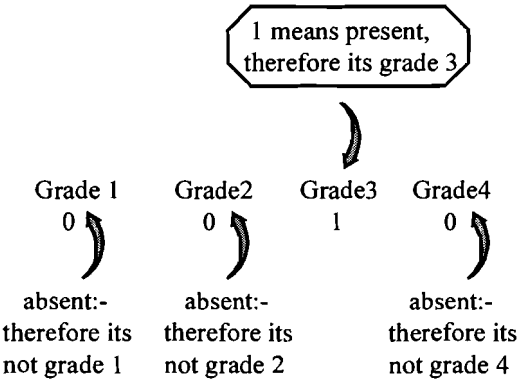
where,

β_o is the constant
β_1, β_2 ....., β_{16} are the regression coefficients
X, Y and various combinations of X's and Y's represent location

Although eq.2 contains 16 variables, not all will be incorporated into the pricing model. Sixteen variables will be *analysed* but only the *significant* variables will be *selected* into the pricing model.

5.0 ANALYSIS & FINDINGS

The data are shown in Table 2. Note that the variable Grade is represented by 4 dummy variables (Grade1 - Grade4). A dummy variable has a value of either 0 or 1. A value of 0 means absent while a value of 1 indicates present. Take for instance Apart Atap Merah which has a building grade of 3. It is represented as follows:



Firstly, a linear pricing model is established between price, location and building grade. The results of the multiple regression analysis is shown below.

R^2 = 0.85
Adjusted R^2 = 0.83
Standard Error of Estimate= 171

Table 2: The Data

Variable	β	SE β	T-value
Grade1	1499	178	8.40
Grade2	1146	132	8.67
Grade3	423	77	5.48
X	-4.01	10.55	-0.38
Y	-1.17	8.59	-0.14
Constant	1352	51	26.40

Therefore, the relationship between price, location and grade is:-

$$\text{Price} = 1352 + 1499(\text{Grade1}) + 1146(\text{Grade2}) + 423(\text{Grade3}) - 4.01X - 1.17Y \quad \text{.....3}$$

Subsequently, a non-linear relationship using various polynomial combinations of X and Y is derived. The results are as follows:-

R^2 = 0.93
Adjusted R^2 = 0.86
Standard Error of Estimate= 153

Variable	β	SE β	T-value
Grade1	1323	186	7.11
Grade2	872	156	5.59
Grade3	189	110	1.73
X	- 65	45	-1.44
X^2	- 57	38	-1.49
X^3	6.40	2.45	2.61
X^3Y^3	- 0.03	0.02	- 1.93
X^2Y^2	11.53	4.80	2.40
X^2Y^3	- 0.83	0.48	- 1.73
XY	27	13	2.08
XY^2	- 3.54	5.34	- 0.66
XY^3	0.14	0.65	0.22
Y	108	40	2.70
YX^2	- 30	9	- 3.34
Y^2	- 38	14	- 2.74
Y^3	2.30	1.44	1.59
Constant	1654	139	11.89

Therefore, the relationship between price, location and grade is:-

$$\text{Price} = 1654 + 1323(\text{Grade1}) + 872(\text{Grade2}) + 189(\text{Grade3}) - 65X - 57X^2 + 6.40X^3 - 0.03X^3Y^3 + 11.53\,X^2Y^2 - 0.83X^2Y^3 + 27XY - 3.54XY^2 + 0.14XY^3 + 108Y - 30YX^2 - 38Y^2 + 2.30Y^3 \quad \text{..... 4}$$

A comparison between eq.4 and eq.3 indicates that the non-linear model (eq.4) has a higher adjusted R^2 and a smaller SEE (Standard Eror of Estimate). This means that the non-linear pricing model has better predictive ability than the linear model (eq.3). However, the predictive performance of the non-linear model is only marginally better than the linear model. This is illustrated by their respective adjusted R^2 and SEE's. The adjusted R^2 of the non-linear model is only slightly higher at 0.86 compared to 0.83 for the linear model. Similarly, there is not much difference in their respective SEE's. Note that the SEE for the non-linear model is US$153 per m^2 while the SEE for the linear model is US$171 per m^2.

Therefore, there is no enough justification to select the non-linear model based on adjusted R^2 and SEE alone. Despite the slightly lower predictive performance, the linear model is the more appealing model because it is simple and much easier to interpret.

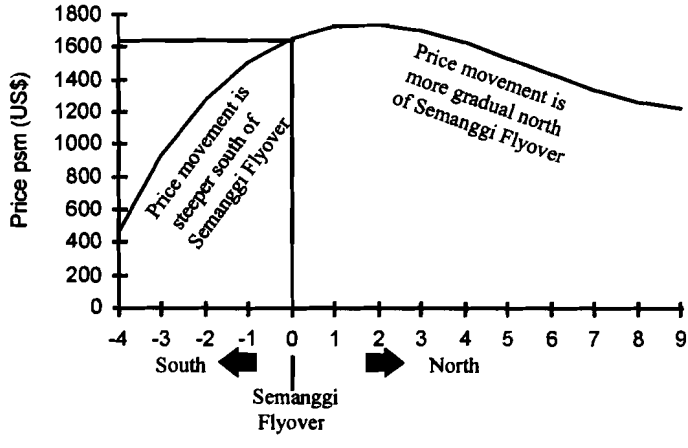
Nevertheless, the non-linear model is prefered. The main reason is that a pricing model is only good if it can simulate market conditions. Observations of the Jakarta condominium market reveals that condominium prices decrease with increasing distance from the CBD. More importantly, the price decrease is *not constant*. For some distances it decreases gradually but for other distances it declines abruptly.

Since the price decrease is constant in a linear model, it is therefore not the appropriate model to represent the relationship between pricing and location. A non constant price decrease may only be accommodated by a non-linear model. It is for this reason that eq.4 is chosen.

The price movement in the north-south direction may be simulated by varying the value of the Y coordinates while maintaining the value of the X coordinate at 0. In addition, the building grade has to be specified whether its grade 1,2,3 or 4.

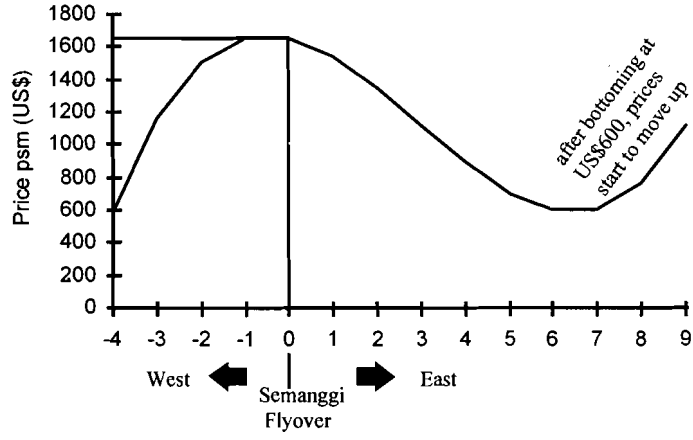
Fig 4 shows the price movement for grade 4 condominium in a north-south direction. Note that the decrease in condominium prices is more rapid to the south of Semanggi Flyover relative to the north where the decrease is more gradual.

Fig 4: Price Movement North - South of Semanggi Flyover



Meanwhile, the east-west pricing pattern may be established by subjecting the Y coordinates to 0 while the the values of the X coordinates are varied. Fig 5 shows the price movement for grade 4 condominium in a north-south direction.

Fig 5:Price Movement East-West of Semanggi Flyover



The price pattern in the east-west direction is rather interesting. Prices fall sharply in the easterly as well as westerly direction but not only that, after coordinate 7 prices increase again. One possibility is that after coordinate 7, the location has more conducive factors for condominium development. The view may be better and consumers do not mind paying a higher price although the distance is further from the CBD. Furthermore, the condominium development is closer to the Jakarta Outer Ring Road. Even though the distance is longer, the time needed to reach the CBD is shorter.

6.0 CONCLUSION

The analysis has shown that the relationship between condominium prices and location may be represented by a linear as well as a non-linear model. Although the non-linear model has a slightly superior predictive ability, the main reason it was prefered is because it yields pricing patterns which conforms to theoretical expectations and market conditions. The pricing model also enables simulations of condominium pricing levels for all locations in Jakarta. All the developer needs to do is to specify the building grade and substitute the grid coordinates of the proposed condominium development into the pricing model.

7.0 REFERENCES

Burns, L S and Mittlebach, F G (1964), "Location - Fourth Determinant of Residential Value", *The Appraisal Journal*, pp.237 - 246.

Evans, A W (1980), "A Methodological Note on the Use of Regression Equations for the Purpose of Simulating Change in Urban Location Patterns", *Environment and Planning A*, Vol.12, pp.921-926.

Evans, A W (1983), "The Determination of the Price of Land", *Urban Studies*, Vol.20, pp.119 - 129.

Gurjit, Singh (1984/85). The Development, Management and Appraisal of Condominium in Kuala Lumpur and its Suburbs. *Unpublished thesis*, 1984/85. Jabatan Penilaian & Harta Tanah, Fakulti Ukur, Universiti Teknologi Malaysia.

Hakimi, Yaacob (1980/81). The Development, Management and Appraisal of Condominium in Kuala Lumpur and its Suburbs. *Unpublished thesis*, 1980/81. Jabatan Penilaian & Harta Tanah, Fakulti Ukur, Universiti Teknologi Malaysia.

Kain, J F (1983), "The Journey-to-Work as a Determinant of Residential Location", *In Readings in Urban Analysis: Perspective of Urban Form and Structure*, ed. Lake, R W, pp.27 - 52.

Miller, N G (1979), "Residential Property Hedonic Pricing Models: A Review", *In Research in Real Estate*, ed. Sirmans, C F, Greenwich, Connecticut, JAI Press, pp.31-56.

Property Outlook (Oct/Nov 1983), "Condominiums - A New Style of Living .... or Just a Gimmick?", *Property Outlook*, Vol.1, No.2, pp.11-17.