

**THE SIGNIFICANCE OF SPATIAL FACTORS IN INFLUENCING THE PRICE OF  
HERITAGE PROPERTIES IN GEORGE TOWN, PENANG.**

**by**

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**KEPENTINGAN FAKTOR-FAKTOR RERUANG DALAM MEMPENGARUHI  
HARGA HARTANAH WARISAN DI GEORGE TOWN, PULAU PINANG.**

**oleh**

**SOON LAM TATT**

**Tesis yang diserahkan untuk  
memenuhi keperluan bagi  
Ijazah Sarjana Sains**

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## **LIST OF ABBREVIATION**

<b>CBD</b>	<b>Central Business District</b>
<b>ESRI</b>	<b>Environmental Systems Research Institute</b>
<b>GT1</b>	<b>George Town 1</b>
<b>GIS</b>	<b>Geographic Information System</b>
<b>HPI</b>	<b>House Price Index</b>
<b>JPPH</b>	<b>Jabatan Penilaian dan Perkhidmatan Harta (Valuation and Property Services Department)</b>
<b>MPPP</b>	<b>Majlis Perbandaran Pulau Pinang (Municipal Council of Penang Island)</b>
<b>MRT</b>	<b>Mass Rapid Transit</b>
<b>SERI</b>	<b>Socio-Economic &amp; Environmental Research Institute</b>
<b>UNESCO</b>	<b>United Nations Educational, Scientific and Cultural Organization</b>

# **KEPENTINGAN FAKTOR-FAKTOR RERUANG DALAM MEMPENGARUHI HARGA HARTANAH WARISAN DI GEORGE TOWN, PULAU PINANG.**

## **ABSTRAK**

Tujuan penyelidikan ini adalah untuk menentukan kepentingan faktor-faktor ruang yang dipilih sekali gus menentukan faktor-faktor ruang yang mempengaruhi harga hartanah warisan di George Town 1, Pulau Pinang. Faktor-faktor ruang yang berkaitan dengan lokasi, kejiranan and kemudahan awam seperti stesen pengangkutan awam, lebuhraya, pasaraya dan sekolah telah dianalisis dalam penyelidikan ini. Analisis Hedonic Regression telah dijalankan dalam penyelidikan ini untuk mengkaji hubungan antara faktor-faktor ruang dengan harga hartanah warisan di George Town 1. 231 nombor transaksi hartanah warisan pada tahun 1998 hingga tahun 2004 telah diaplikasikan dalam analisis ini. Kepentingan faktor-faktor ruang dalam mempengaruhi harga hartanah warisan telah dibuktikan dalam keputusan penyelidikan ini. Melalui kajian ini, stesen feri, pasaraya dan sekolah memainkan peranan yang penting dalam mempengaruhi harga hartanah warisan di George Town 1, Pulau Pinang. Untuk menentukan kepentingan faktor-faktor ruang, analisis 'spatial autocorrelation' telah dijalankan. Keputusan analisis ini telah menunjukkan bahawa harga-harga hartanah warisan di George Town 1 mempunyai hubungan ruang yang positif. Hubungan ruang yang positif telah menunjukkan bahawa harga hartanah warisan di George Town 1 sering bergantung pada jiran-jirannya. Geo-statistical - Kriging telah diproseskan untuk mengkaji hubungan antara harga hartanah warisan dengan jiran-jirannya. Perbandingan antara harga anggaran Kriging dengan harga transaksi sebenar pada tahun 2005 telah menunjukkan bahawa harga anggaran Kriging adalah dekat dengan harga transaksi sebenar. Oleh sebab anggaran Kriging menggunakan harga jiran-jiran untuk menganggar harga,

keputusan ini menunjukkan bahawa faktor-faktor reruang mempunyai pengaruh atas harga hartanah warisan di George Town 1.

# **THE SIGNIFICANCE OF SPATIAL FACTORS IN INFLUENCING THE PRICE OF HERITAGE PROPERTIES IN GEORGE TOWN, PENANG.**

## **ABSTRACT**

The aim of this research is to determine the significance of selected spatial factors and the influence of these spatial factors on heritage property prices in George Town 1. Spatial factors related to location, neighbourhood and local amenities such as transportation points, highway, shopping centre and school are tested in this research. Hedonic regression analysis is used to study the relationship between spatial factors and heritage property price in George Town 1. A total of 231 heritage property transaction records from year 1998 to 2004 are used in this analysis. The empirical result shows that spatial factor has significant influence on heritage property prices. 'Ferry route', 'shopping centre' and 'primary and secondary school' are three significant factors influencing heritage property prices in George Town 1. To further verify the significance of the above spatial factors, a spatial autocorrelation analysis is used for the second test. The analysis result indicates that property prices in George Town 1 are positive spatial autocorrelated. The positive spatial autocorrelated transaction prices in George Town reflect that property prices in George Town tend to depend on its neighbour. A geo-statistical method called Kriging is then used to verify the dependency of heritage property prices on its neighbours. A comparison between the predicted prices obtained from the Kriging map with actual transaction prices found that the predicted prices are reasonably close to the actual prices. As the Kriging method uses neighbouring properties prices to predict prices, the findings indicate that spatial factors especially neighbourhood has an influence on heritage property prices in George Town.

# **1.0 INTRODUCTION**

## **1.1 Background of Research**

George Town retains many historical shop houses which are often considered as architectural gem. As with any other type of gem, the value of heritage property is now of great interest to investors especially after the joint inscription of Melaka and George Town as World Heritage City. Heritage property prices may be different as compared with non-heritage property prices in George Town due to the differing structural and architecture factors. Factors such as architecture design of heritage property do have a positive impact to property prices. This is shown in George Town, where Art Deco architecture design is found to be a positive influence on the heritage property prices (Lee et al, 2009). Consequently, there are many stakeholders in George Town willing to pay more for a heritage property (Lee et al, 2009) which may pushes the price of heritage properties upwards.

Other than structural and architectural factors, numerous empirical studies found that many spatial factors or local amenities namely waterfront, shopping mall, traffic noise and sea view also significantly affect properties prices (Correll et al, 1978) (Palmquist, 1992) (Chin, 2003). Spatial factors influencing property prices are commonly related to location or natural factors which can make a positive impact on a property.

In order to study the factors influencing property prices, several analysis methods such as cost-benefit analysis, contingent valuation method, travel cost models, and

hedonic regression method have been widely used in property market research. However, Hedonic Regression Analysis is one of the statistical methods which is popular in housing market studies (Suriatini, 2006). Many researchers frequently use it to analyse or determine the significant factors influencing property prices.

An empirical study on heritage property price in George Town using hedonic regression method found that the structural and conservation attribute significantly influences housing price in George Town (Lee et al, 2009). However, the research did not study the influence of spatial factors on the price of heritage properties. Currently, studies have only explains the structural and architectural influences on prices of heritage properties in George Town while neglecting the spatial factor which should be as important as properties are spatially located. As such, there is a gap in understanding how prices of heritage properties behave. Therefore, there is a need to study the behaviour of heritage property price from the spatial angle and this research aim to meet this need.

Due to the relative suitability of Hedonic Regression analysis method for such studies, it will be used in this research. However, various variables or factors included in regression analysis may cause some common problems like multicollinearity, spatial autocorrelation and heteroscedasticity. Multicollinearity is commonly tested in Hedonic Regression Model but spatial autocorrelation is paid the least attention in real estate literature (Suriatini, 2006). As such, to fill in the gap on the effect of spatial factors on property price, spatial autocorrelation between heritage property prices in George Town 1 will be analysed.



If there is positive spatial autocorrelation for property prices in George Town 1, it reflects that property prices in George Town 1 tend to depend on its neighbour. In short, an increase of property price because of a particular reason in George Town 1 may positively have an impact on the property prices of its neighbour properties. To further analyse the results of spatial autocorrelation, Kriging is one of the most common further describes the spatial pattern of the heritage property prices in George Town 1 as Kriging predicts house prices based on nearby properties and the residuals are weighted by distance and the weights are derived from the estimated spatial autocorrelation function (Basu & Thibodeau, 1998).

## **1.2 Problem Statement**

An investor or buyer normally purchases or invests a property based on his own demand or requirement such as property size, building type, distance from working area, nearby facilities or amenities. As such, it can be said that factors influencing property price are classified in three main categories: - structural factors, locational factors and neighbourhood factors (Chin et al, 2004). Structural factors normally mean those physical factors from building itself which can positively or negatively influence the property price like gross floor area, building structural condition, building design and others. For this research, locational factors and neighbourhood factors such as public amenities and distance from public transportation and local facilities are defined as spatial factors. Spatial factors remain a significant factor influencing property price and some researchers even believe location is the major factor to determine the property price (Kiel & Zabel, 2008).

Thus far, researches from other parts of the world have shown that spatial factors such as urban green area, airport noise and pollution level have significantly affected property prices (Morancho, 2003) (Pope, 2008) (Dubin & Sung, 1993). Apart from the above, Chin (2004) studies the impact of the Asian financial crisis on the prices of condominiums in Penang by using hedonic regression analysis while Hamid (2006) predicts the residential property price for single storey houses in Johor Bahru. Chin (2003) has studied some spatial factors such as distance from school and tenure of land whereas Hamid studied the distance from nearest town. These local and international research shows that spatial factors should be a concern for any study on property prices.

As a World Heritage City, the conservation development for heritage building in George Town is still in its infancy and many properties in George Town have been dilapidated (Goh, 2008). In order to revitalise the heritage properties in George Town, factors influencing heritage property prices should be studied especially in development planning. Lee et al (2009) studied the structural and conservation attribute on heritage property prices in George Town whereas spatial factors are not been analysed in detail. Is the heritage property prices are solely influenced by structural factors because of its architectural design and history? Thus a research question arises.

1) Are spatial factors such as local facilities or local amenities significantly influencing the heritage property prices in George Town?

## **1.3 Research Aim and Objective**

### **1.3.1 Aim:**

The aim of this research is:-

- 1) To determine significance of selected spatial factors and the influence of these spatial factors on heritage property prices in George Town 1.

### **1.3.2 Objective**

The objectives of this research are:-

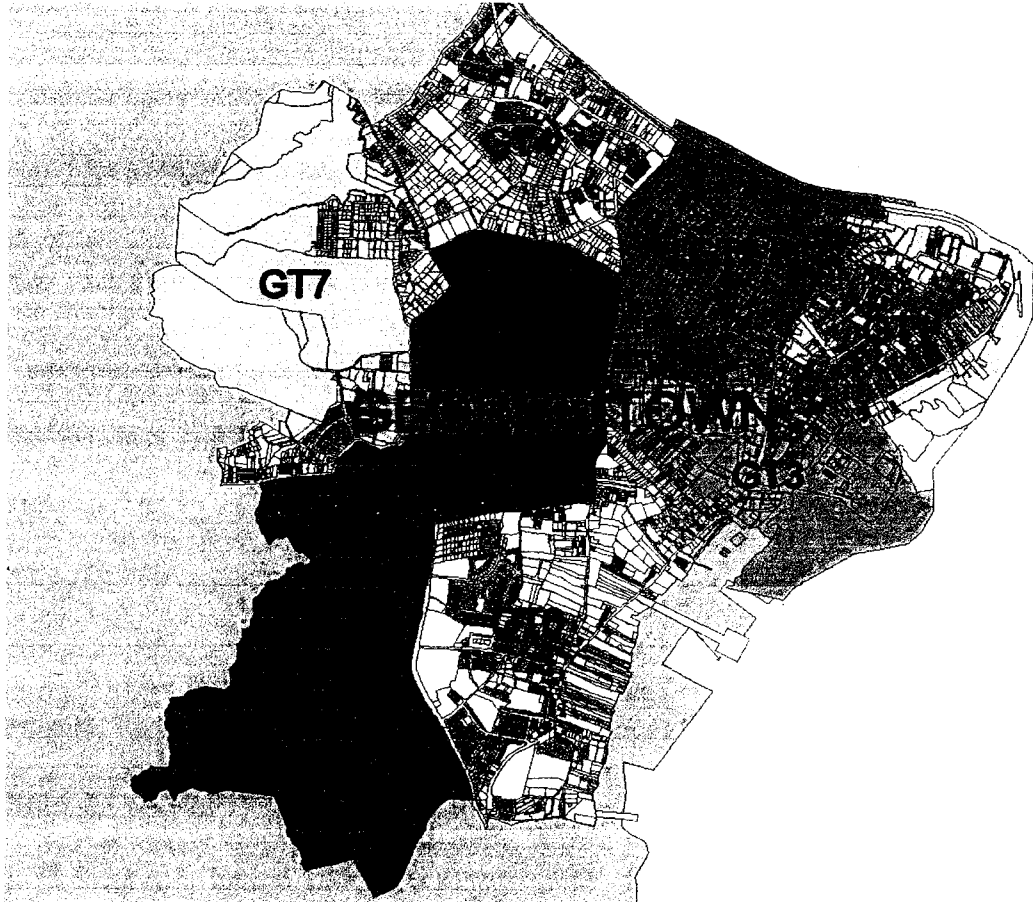
- 1) To identify the significance and influence of spatial factors on the heritage property prices in the study area by using hedonic regression analysis.
- 2) To further verify the significance of spatial factors by using spatial autocorrelation method.

## **1.4 Scope of Research**

The research mainly focuses on heritage properties and there are only two heritage cities in Malaysia listed by UNESCO recently which are George Town and Melaka. The size of conservation zone and the number of conservation properties in George Town is larger than in Melaka. With a larger size of conservation zone and number of heritage properties, the study would be able to obtain a better pool of data and also study a wider impact of the spatial factors on heritage properties. Therefore, George Town instead of Melaka is selected as the study area of this research.

Located at the inner city of George Town, George Town 1 is designated as the core and buffer conservation zone to protect the heritage properties in George Town. George Town 1 is the most suitable study area for this research since most of the

properties in George Town 1 are heritage properties. In order to study heritage property prices, transaction data is needed and due to the limitation in obtaining such data, the research is constraint to only. Residential property prices and commercial property prices in George Town 1 and Penang from year 1998 to year 2004.



**Figure 1.1 Location of George Town 1 in George Town, Penang**

**Source: Majlis Perbandaran Pulau Pinang (MPPP) (Municipal Council of Penang Island, 2007)**

## **1.5 Significance of Research**

This research studies the factors influencing heritage property prices in George Town 1 using hedonic regression analysis and spatial autocorrelation method. The hedonic regression analysis is a useful indicator to explain the significance of spatial factors in influencing heritage property prices in George Town 1. Other than increasing the knowledge on property behaviour in the academic arena, these results may also

enable property agents to better understand the influence of spatial factors on the price of heritage properties in George Town 1, thus improving accuracy in their business advice. Additionally, the Kriging prediction map which is derived from the spatial autocorrelation concept can be promoted as a computer aided tool to predict the heritage property prices and as a point of reference by property agents and even interested investors. For heritage property owners, the Kriging prediction map provides a suggested selling price for their properties.

## **1.6 Organisation of Research**

There are six chapters in this research. Chapter one introduces the overall process of the research and discusses the research milestones. This chapter also discusses the research background, research aim, research objective, the significance and limitation of research and the brief introduction of each chapter.

Chapter two is the review property transacted market in Penang and George Town 1 from the year of 1998 to 2004. In this chapter, a comparison between property prices in Penang and George Town 1 is discussed by using the descriptive method.

Chapter three reviews the influence of spatial factors on property prices and postulates the spatial factors which can influence the heritage property prices in George Town 1 to decide a suitable method to analysis the heritage property prices in George Town 1. This chapter also study the spatial autocorrelation in assessing the price of heritage properties by using the transaction records in George Town 1 from the angle of spatial consideration. Spatial Autocorrelation is adopted as the tool to investigate the spatial relationship within each property prices in George Town 1 and it also can examine the importance of spatial factors on heritage property prices. In

addition, Kriging is discussed in this chapter predicting the heritage property prices in George Town 1 spatially adopting the spatial autocorrelation concept.

Chapter four discusses the research methodology. In this chapter, the entire research methods that are used in this research are discussed and the research methods are proposed to achieve the objectives of this research. The methods used in this research can be divided as methods which are used to collect the research data and the methods for analysing the data we collected. Instead of descriptive analysis, some empirical analysis methods like Hedonic Regression Analysis, Spatial Autocorrelation Analysis and Kriging which lead to studying the property price of heritage properties are also discussed in this chapter. Furthermore, this chapter also reviews the source and limitation of data collection.

In Chapter Five, this chapter analyses secondary data like transaction record and assessment record by using Hedonic Regression Analysis, Spatial autocorrelation and Kriging. This analysis mainly studies the factors influencing the prices of heritage properties in George Town 1. This method also leads one to find out the major spatial factors that can significantly make an impact the on heritage property prices in George Town 1. In addition, the Kriging method predicts the heritage property prices in George Town 1 by using the transacted property records from the year of 1998 to 2004. A comparison between the prediction price of Kriging and actual transaction price in the year of 2005 is discussed.

Finally, Chapter Six is the conclusion for all the results based on the analysis. This chapter also discusses the achieving of research scope and objectives in this research and defining the factors which can significantly influence the heritage property prices in George Town 1.

## **2.0 PROPERTY BEHAVIOUR IN PENANG AND GEORGE TOWN 1**

### **2.1 Introduction**

Heritage property market may be different as compared with non-heritage property market, therefore it is important to comprehend and distinguish between these two types of property before further studying on factors influencing heritage property market.

In order to fathom the property trend in George Town 1 and Penang, the number of property transactions in George Town 1 and Penang and their market trend will be analysed. At first, this chapter focuses on the property transaction market in Penang to study the behaviour of overall property market. Next, heritage property transactions in George Town 1 are analysed using descriptive statistics method. Finally, a comparison between the overall transacted properties in Penang and transacted heritage properties in George Town 1 is conducted to indentify the similarity or difference between both market trends.

Due to the limited availability of data, this research only focuses on the residential property prices and commercial property prices in George Town 1 and Penang from year 1998 to year 2004.

### **2.2 Property transactions in Penang from year 1998 to year 2004**

Table 2.1 shows the number of property transactions for residential and commercial in Penang from year 1998 to year 2004 which is adopted from quarterly Penang Statistics year 1999 to year 2005 (SERI, 1999-2005)



Prior to the Asian financial crisis in 1997, the property market was badly affected by the significant devaluation of Malaysia Ringgit, the flight of foreign capital, financial distress of financial institutions, deterioration in employment and economic conditions (Kien, 2006). Therefore, the property market had experienced recession in the year 1998 arising from the Asian Financial Crisis. The impact of the recession reduced the Penang property transactions in 1998 to the lowest as compared to 1999 to 2004 which only registered 7,355 in number of transactions. (Please refer to Table 2.1 for details)

The Malaysian economy slowly recovered in year 1999 and the Penang property market rebounded from bottom performance in year 1998 (Property Transacted in Malaysia, 1999). The property transactions in year 1999 recorded 8,216 in number of transactions accounting for 11.7% increase compared to year 1998. Efforts from the government to resuscitate the economy continued and it succeeded in generating a growth of 68% and 12.8% in number of transactions in year 2000 and year 2001 respectively.

In the year 2002, as a result of uncertainties arising from international terrorism and volatility in the global economy, the property market activities in Penang registered a decrease in number of transactions after enjoying positive growth since year 1999. (Property Market Report, 2002). The number of transactions decreases significantly at 13% from 15,569 transactions in year 2001 to 13,544 transactions in year 2002.

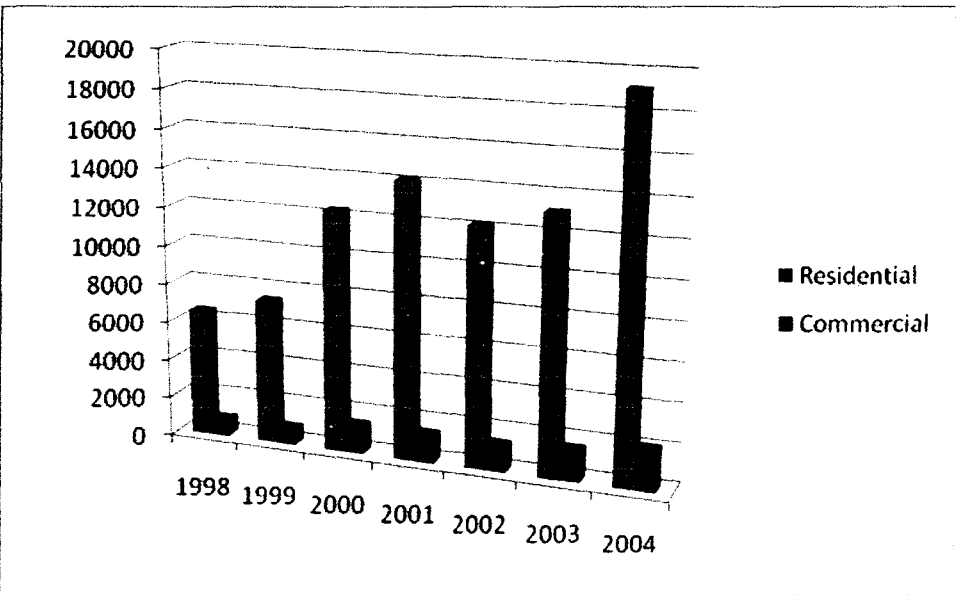
Despite uncertainties in the global environment, the property transactions for year 2003 recovered moderately at 9% which recorded 14,767 in number of transactions

compared to year 2002. Under supportive macroeconomic policies and favourable financial conditions, year 2004 was a particularly good year for the Penang property market (Heem, 2005) (Property Market Report, 2005). This particular year enjoyed an improvement of 44.3% increase which recorded 21,306 in number of transactions as compared to year 2003.

**Table 2.1 Number of property transactions in Penang from year 1998 to year 2004**

Year	Residential	Commercial	Total
1998	6506	849	7355
1999	7393	823	8216
2000	12380	1424	13804
2001	14133	1436	15569
2002	12194	1350	13544
2003	13177	1590	14767
2004	19205	2101	21306

**Source: Quarterly Penang Statistics 1999 to 2005 - SERI**



**Figure 2.1 Transacted residential and commercial properties in Penang from year 1998 to year 2004.**

### **2.3 Property transactions in GT1 from year 1998 to year 2004**

Table 2.2 shows the number of heritage property transactions for residential and commercial in George Town 1 from year 1998 to year 2004. Similar to non-heritage property market in Penang, the heritage property market had experienced the dump market in year 1998 arising from the Asian Financial Crisis, which only registered 7 transactions.

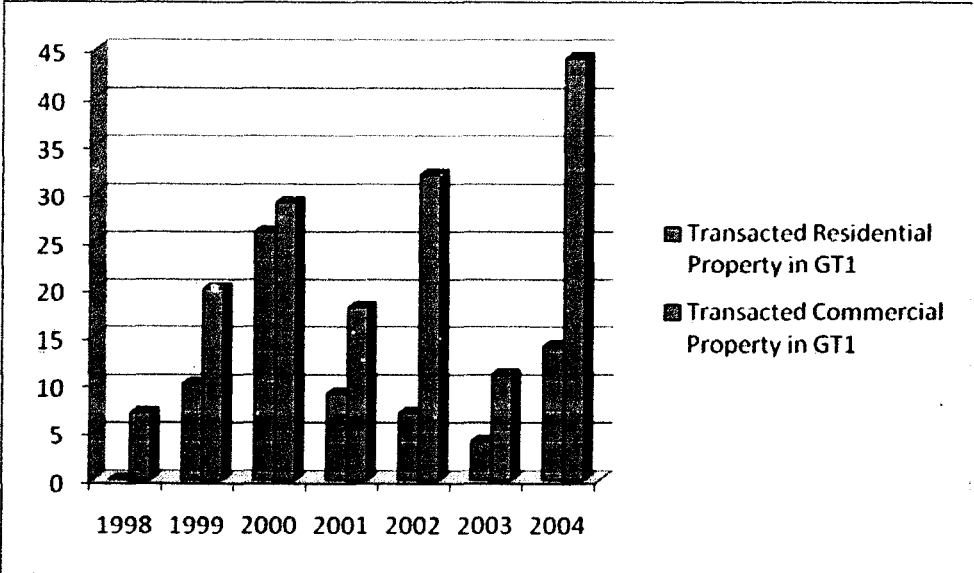
During the economy recovery process and the repealing of Rent Control Act, the heritage property market enjoyed an upward trend in year 1999 and year 2000, which recorded 30 and 55 in number of transactions respectively. However, the heritage property market had experienced a recession in year 2001 which accounted for 51% decrease in number of transactions.

The heritage property market is observed to have an unstable trend in year 2002 to year 2004. Against the performance in year 2001, the number of transactions increased by 44.4% to 39 units in year 2002. However, the number of transactions declined by 61.5% to register 15 transactions in year 2003. Similarly to the non-heritage property market in Penang, year 2004 was a particular good year for property market. The heritage property also enjoyed an upsurge in number of transactions which recorded 58 units, increased by fourfold compared to year 2003.

**Table 2.2 Number of property transactions in GT1 from May 1998 to year 2004**

Year	Residential	Commercial	Total
Since May 1998	0	7	7
1999	10	20	30
2000	26	29	55
2001	9	18	27
2002	7	32	39
2003	4	11	15
2004	14	44	58

**Source: Quarterly Penang Statistics 1999 to 2005 - SERI**



**Figure 2.2 Transacted residential and commercial properties in GT1 from year 1998 to year 2004.**

## 2.4 Comparison of Property Market Trends in Penang and GT1

Comparisons on the overall transactions, residential and commercial transactions will be studied to distinguish the property behaviour between Penang and George Town 1 in this section.

### i) Penang

Year	1998	1999	2000	2001	2002	2003	2004
Residential	-	↑	↑	↑	↓	↑	↑
Commercial	-	↓	↑	↑	↓	↑	↑
Overall	-	↑	↑	↑	↓	↑	↑

### ii) George Town 1

Year	1998	1999	2000	2001	2002	2003	2004
Residential	-	↑	↑	↓	↓	↓	↑
Commercial	-	↑	↑	↓	↑	↓	↑
Overall	-	↑	↑	↓	↑	↓	↑

### iii) Overall

Year	1998	1999	2000	2001	2002	2003	2004
Penang	-	↑	↑	↑	↓	↑	↑
George Town 1	-	↑	↑	↓	↑	↓	↑

### iv) Residential

Year	1998	1999	2000	2001	2002	2003	2004
Penang	-	↑	↑	↑	↓	↑	↑
George Town 1	-	↑	↑	↓	↓	↓	↑

### v) Commercial

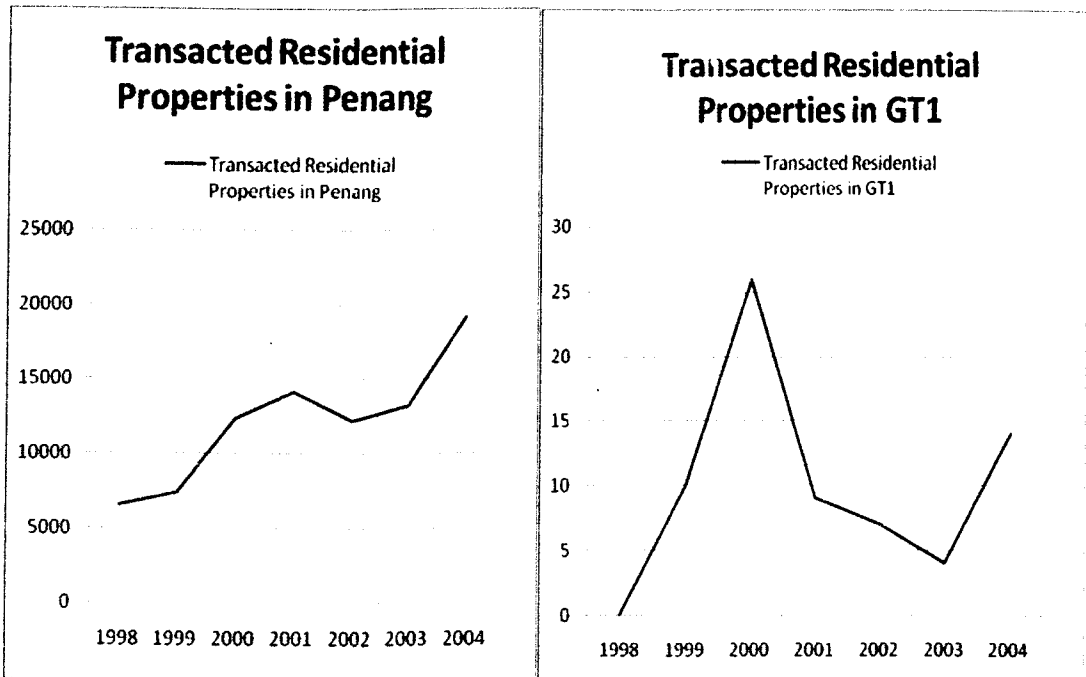
Year	1998	1999	2000	2001	2002	2003	2004
Penang	-	↓	↑	↑	↓	↑	↑
George Town 1	-	↑	↑	↓	↑	↓	↑

↑ denote increase in number of transactions  
↓ denote decrease in number of transactions

**Figure 2.3 Comparison of Property Market Trends in Penang and George Town 1 from year 1988-2004.**

Note: ↑ shows an increase and ↓ shows a decrease compared to previous year.

Figure 2.3 shows the comparison of property market trends between Penang and George Town 1 from year 1998 to year 2004. From the table, the circled areas indicate the different trends between Penang and George Town 1. Referring to Table 2.3 (iii), although the number of transactions in Penang and George Town 1 increased in year 1999, it is noted that the increase of number of transactions in Penang was contributed by residential properties. Conversely, there was a decrease in the number of transactions for commercial properties (Table 2.3(i)). Interestingly, the number of transactions for commercial properties in George Town 1 increased in year 1999 (Table 2.3(v)). It is postulated that the increase demand for commercial properties in George Town 1 was due to the repeal of the Rent Control Act.(Soon, 2007) The investors were more interested in heritage properties rather than modern properties, and thus the demand for properties especially commercial properties in George Town 1 increased.

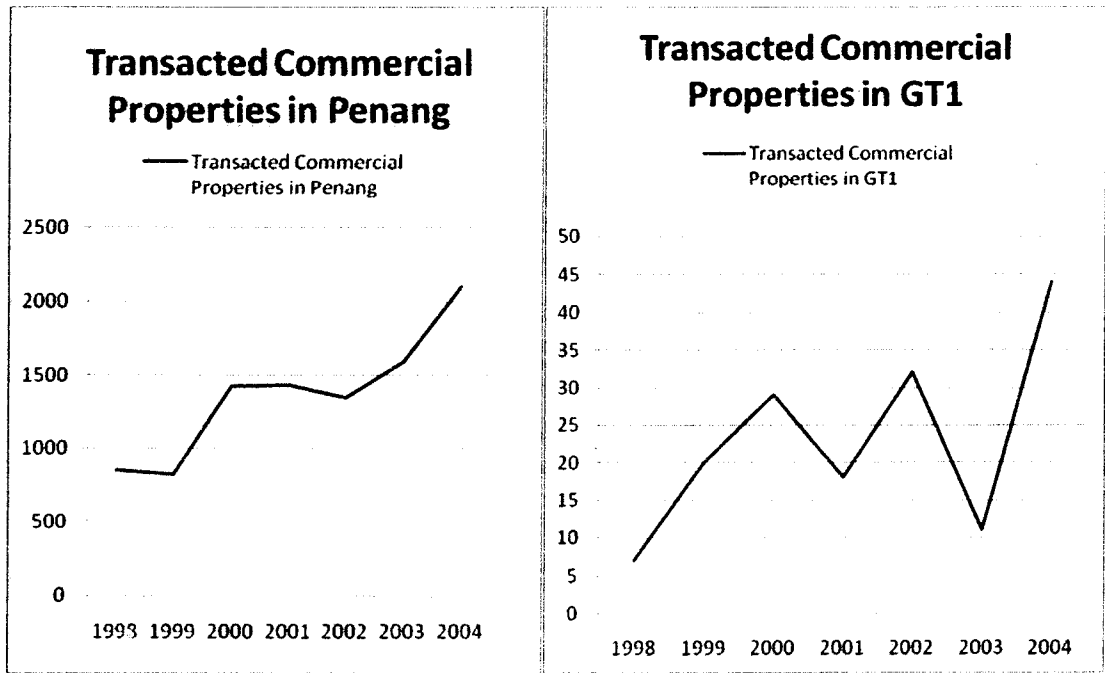


**Figure 2.4 Transacted residential properties in Penang and George Town (GT1) from 1998 to 2004**

**Table 2.3 Comparison of transacted residential properties in Penang and George Town (GT1) from 1998 to 2004**

Year	Penang		George Town (GT1)	
	Residential	% change	Residential	% change
1998	6506	-	0	-
1999	7393	13.6	10	-
2000	12380	67.5	26	160.0
2001	14133	14.2	9	-65.4
2002	12194	-13.7	7	-22.2
2003	13177	8.1	4	-42.9
2004	19205	45.7	14	250.0

Source: Quarterly Penang Statistics 1999 to 2005 - SERI



**Figure 2.5 Transacted commercial properties in Penang and George Town (GT1) from 1998 to 2004**

**Table 2.4 Comparison of transacted commercial properties in Penang and George Town (GT1) from 1998 to 2004**

Year	Penang		George Town (GT1)	
	Commercial	% change	Commercial	% change
1998	849	-	7	-
1999	823	-3.1	20	85.7
2000	1424	73.0	29	45.0
2001	1436	0.8	18	-37.9
2002	1350	-6.0	32	77.8
2003	1590	17.8	11	-65.6
2004	2101	32.1	44	300.0

**Source: Quarterly Penang Statistics 1999 to 2005 - SERI**

The different property market trends between Penang and George Town 1 are also noted in year 2001. The number of transactions in Penang increased for both residential properties and commercial properties whereas the number of transactions in George Town 1 decreased for both residential properties and commercial properties. According to the Nor'Aini et al (2007), Property Market Report 2001 stated that some decontrolled heritage properties were in an oversupply situation following the repeal of the Rent Control Act. Some were left vacant and in very dilapidated conditions after their tenants had left those buildings when rentals soared after the repeal of the Rent Control Act in 2000. Thus, due to the oversupply situation, buyers' interest started to shift back on modern properties.



In the year 2002, due to the uncertainties arising from the US-Iraq war and volatility in the global economy, the number of transactions in Penang decreased for both residential properties and commercial properties (Property Market Report, 2002). Interestingly, the overall number of transactions in George Town 1 showed an increase despite uncertainties in the global environment. Referring to Table 2.3 (ii), the increase in overall number of transactions in George Town 1 was contributed by commercial properties. In fact, there was a drop in residential properties. In 2002, there was an implementation of the development project in George Town 1 at Little India. This trend may indicate that the development of Little India Street did attract investment in the properties there (Soon, 2007).

Besides that, the year 2003 also recorded a different property market trend between Penang and George Town 1. The number of transactions in Penang increased in both residential properties and commercial properties whereas the number of transactions in George Town 1 decreased in both residential properties and commercial properties. It is suggested that the condition was similar to year 2001 when buyers' interest was more focused on modern properties which may be due to more attractive packages that were offered on modern properties.

## **2.5 Summary**

There may be other reasons that affect the property market trends in Penang and George Town 1. However the above analysis shows that the property behaviour in Penang and George Town 1 is slightly different. Government policies, structural factors, spatial factors are conceivable factors that influence the transaction market for commercial and residential properties in George Town 1. For example, after the repeal of the Rent Control Act, some decontrolled heritage properties in GT1 were oversupply. Previous empirical analysis has studied the impact of structural factors and government policies in George Town and it statistically proved that lot size, art deco architectural design and conservation policies significantly influence the property prices in George Town (Fang, 2007). However, the impact of spatial factors on property prices is unknown in George Town 1 thus far but it may be one of the factors which significantly make an impact on the property prices in George Town 1.

## **3.0 SPATIAL FACTORS INFLUENCING PROPERTY PRICES**

### **3.1 Introduction**

This chapter discusses the various factors that are found to influence property prices based on previous literature. It then introduces the concept of spatial factors and its influence on property prices and discusses findings of similar researches. The measurement method for spatial factors in previous researches such as walking time, distance and dummy value are discussed in this chapter too. The discussion then proceeds to elaborate on the use of spatial autocorrelation in investigating the significance of spatial factors on property prices. Lastly, Kriging is introduced in this chapter as an extended effort to spatially describe and predict the property market.

### **3.2 Factors influencing property prices**

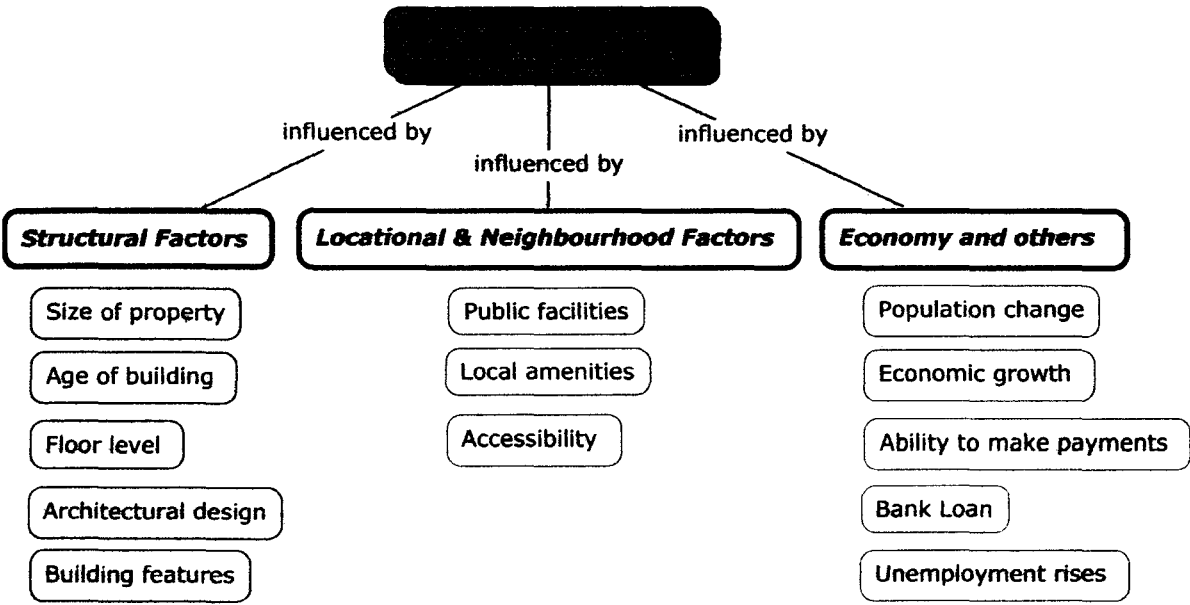
There are numerous factors that will affect the price of a property and all these factors are based on the concept of 'supply and demand'. Supply and demand is one of the most basic concepts of economics, which determine the property market prices. For instance, if the demand for a property at a certain area is high while the supply or land is limited, the property prices there will go up (Estates, 2008). This indicates that the demand of the buyer is the main reason that dictates or brings up the factor influencing the property prices. Other than buyer's own demand, other indirect factors such as economy growth, population change, ability to make payment, level of employment and availability of bank loan may also indirectly influence the property market.

An investor or buyer commonly purchases or invests a property based on his own demands or requirements and these requirements are the factors influencing property prices. These factors mainly can be classified in two main categories: - structural factors, 'locational and neighbourhood' factors. Structural factors include size of property, age of building and floor level are found to be significant in influencing property prices in Penang (Chin, 2004). In addition, Rahim (2006) also found that a trendy architectural design, extra features and improvements of building designs can also increase the value of a property.

From the above researches conducted, other than structural factors, spatial factors are also significant in influencing property prices. Generally, completed houses in established well-populated areas normally fetch a higher price than their equivalent types in new areas. These completed houses are situated in a prime locality whereby public facilities, local amenities, transport points and all essential services are easily available and close to the employment centres or town area. It could be said that location and neighbourhood factors which is defined spatial factors in this study may have an impact on property prices.

In addition, new houses in new growth areas are usually located further away from the town area which usually lacks public facilities and transportation services. When the supply of houses in an area is limited, prices of residential properties in prime localities will usually rise up (Tan, 2009). Location and neighbourhood factors include local amenities or facilities and accessibility such as transportation, shopping malls, schools and highway.

Besides economic growth, population change, the ability to make payments and bank loan, the economy goes into a recession and unemployment rises, property prices are likely to fall as the demand would fall significantly (Pettinger, 2008).



**Figure 3.1 Factors influencing property prices**

### 3.3 Spatial factors influencing property prices

Numerous empirical studies have been conducted to study factors influencing property prices in Malaysia but most of them focus on modern property market. (Chin 2004, Rahim, 2006) Although previous researches only involve on modern properties, they found that spatial factors are significant in influencing property prices. Furthermore, some researchers even believe location is the main factor to determine the price of properties price (Kiel & Zabel, 2008).

Spatial factors influencing property prices may include several locational and neighbourhood factors in the study area. To present these spatial factors more systematically in this research, measurement method for spatial factors are used as a

guideline to categories these spatial factors. These measurement methods for spatial factors are walking time, distance and dummy value.

Spatial factors which are measured by distance are the most common found in previous researches. For instance, Hamid & Hashim (1991) studies the influence from nearest town (CBD) by using distance measurement units. There could also have been a reduction of approximately RM 26 of per sq. ft. price of a residential unit located each km away from the CBD, based on the linear regression model.

In addition, Tyrvaainen & Miettinen (2000) measured the distance from each terraced house to the edge of the forested area to study impact of the direct distance to the nearest forested area on property prices. This forested area is important for screening and pollution control, and has psychological effects with regard to noise abatement and improvement of the urban landscape. The estimation results show that an increase of one kilometer in the distance to the nearest forested area leads to an average decrease of 5.9 percent in the market price.

Spatial factors do not only consider the local amenities or facilities but green area is also one of the significant factors. In the city of Castellón, Spain, an empirical research shows that every 100 meter far away from green area may cause a drop of property prices (approximately 1800 pound) (Morancho, 2003). This result is common as people now are looking for healthy life as green area can bring cleaner and fresher air.