DETERMINANTS OF HOUSING PRICE INDEX IN MALAYSIA

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DECLARATION

We hereby declare that:

(1) This undergraduate research project is the end result of our own work and that due acknowledgement has been given in the references to ALL sources of information be they printed, electronic, or personal.

(2) No portion of this research project has been submitted in support of any application for any other degree or qualification of this or any other university, or other institutes of learning.

(3) Equal contribution has been made by each group member in completing the research project.

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LIST OF ABBREVIATIONS

CC	Construction Cost
UR	Unemployment Rate
LR	Lending Rate
RPGT	Real Property Gain Tax
OP	Oil Price
WEF	World Economic Forum
NAPIC	National Property Information Centre
GST	Goods and Services Tax
MHPI	Malaysia House Price Index
KLCON	Kuala Lumpur Construction
OPR	Overnight Policy Rate
MHLG	Ministry of Housing and Local Government
VPSD	Valuation and Property Services Department
CIDB	Construction Industry Development Board of Malaysia
EViews	Econometrics View
OLS	Ordinary Least Square
ARCH	Autoregressive Conditional Heteroscedasticity
CNLRM	Classical Normal Linear Regression Model
VIF	Variance Inflation Factor
TOL	Tolerance
RESET	Ramsey Regression Equation Specification Error Test
ROI	Return on Investment
GDP	Gross Domestic Products

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PREFACE

Housing plays a very important role in our life. Housing is an important fix asset for the people as well as a basic need for the citizen. Nowadays the housing price in Malaysia is much higher compare to last time. In the past few years, market of residential house in Malaysia has experienced a significant price expansion throughout the whole Malaysia. Therefore, the factors that contribute to the increasing trend in the Malaysian housing price is crucial to be assessed so that the government and policy controllers are able to control the hike in housing price in order to maintain the affordability of owning a house in Malaysia. Besides, the fluctuation of housing price creates risk of unsustainability for lenders and buyers and that will lead residential market becomes more unstable.

ABSTRACT

This paper examines the determinants of housing price in Malaysia based on quarterly data from 2010 to 2017. The sustained high and uncertain housing price in Malaysia is one of the hot topics in the recent years. This paper aims to examine empirically whether the increasing trend in the Malaysian housing price is associated to the lending rate, unemployment rate, oil price, construction cost and real property gain tax in Malaysia. Ordinary Least Squares method is adopted in this study. The tests concluded that all lending rate, unemployment rate, construction cost and real property gain tax are positively correlated with housing prices while oil price are negatively correlated. In addition, the results indicated that among all the variables, oil price is the only variable which is not a significant determinant of housing price in Malaysia. In short, this research suggests the policy maker to be mindful in implementing policy which will directly affect the housing price and change the whole economy. Investors are advised paying attention to the changes in housing price in order to make adjustment on their investments.

CHAPTER 1: RESEARCH OVERVIEW

1.0 Introduction of Study

The aim of this study is to determine the influence of changes in construction cost and other economic factors on housing price index in Malaysia from 2010 Q1 to 2017 Q4. There are five economic variables that will be used in this study to determine its effect on Malaysia house price index, which are construction cost (CT), unemployment rate (UR), Lending Rate (LR), Real property gain tax (RPGT) and oil price (OP). This chapter will include following section: background of this research, problem statement, objectives of this research, research questions, hypothesis of the study, significance of the study, chapter layout of the study, and lastly, the conclusion of this chapter.

1.1 Research Background

1.1.1 Malaysia

World Bank's country-classification system has been instilled just a few years after independence of Malaysia from United Kingdom back in 1957. Malaysia would qualify as a middle-income country. The country generates prosperity from economy influenced by production of exporting commodity such as rubber, tin, palm oil, petroleum and raw natural resources. Malaysia nowadays owns a diversified economy as well as leading the exporting of electrical appliances, electronic parts and components even natural gas. Over 30 years ago, Malaysia has lower down the high poverty rates and also the income inequalities. One of the objectives of Malaysia is to achieve high income status by 2020 in the same time ensuring the growth is sustainable (Yusof & Bhattasali, n.d). There are less than 1 percent of Malaysian households who live in extreme poverty; the government shifted their focus toward addressing the well-being of the poorest 40 percent of the population. These low-income household would still be vulnerable to fluctuation or economic shocks as well as increasing of cost of living and growing financial obligations. Although income inequality in Malaysia is high compared to other East Asian countries, however it declines gradually from year to year (World Bank, 2017).

According to Malaysian Investment Development Authority (2017), Malaysia was in 18th place in 2015, after suffering a steep fall of seven spots to 25th in 2016, Malaysia moved up 2 spots to the 23rd ranking out of 137 countries in the World Economic Forum’s (WEF) 2017-2018 Global Competitiveness Report (GCR). Malaysia has overtaken Ireland and Qatar and remained ahead of economies such as China, South Korea, and Estonia and the latest ranking explained by the strength of Malaysia’s macroeconomics fundamentals and the economic policies are moving on the right track. The exporting activity is doing well and they also will continue to receive healthy flows of foreign direct investments. This shows that Malaysia has higher degree of improvement on openness to foreign markets.

1.1.2 Housing Market in Malaysia

The early 1990’s was known as Malaysia’s peak or golden year. The economy back then was expanded in rapid pace which driven by manufacturing sector as pillar growth. There are various rural-urban migrations that need for housing in the cities.

The housing industry has played a vital role in the economy. It has various roles. Housing can be a shelter as well as investment. It is the largest component of household wealth in many countries. Approximately 60 percent of household wealth is tied to the property. Therefore, the changes in housing price would affect the household wealth effects significantly as the portion of wealth spent by most of households' is the largest for housing (Le, 2015).

In year 2016, Knight Frank, who known as a global real estate consultancy has rated Malaysia for being world's best choice and welcomed for real estate investors. In this case, real estate in Malaysia has offered the best value with highest yield comes with little volatility in the market throughout Asia-Pacific region (Adilla, 2016). This achievement also comes with the enhancement on road and rail network development which increases the residents on their daily mobility and connectivity needs.

According to the statistic by National Property Information Centre, NAPIC (2017), percentage of transactions on principal property sub-sectors in 3rd quarter of 2017 consisted of 77.8% of residential, 9% of commercial, 3% of industrial, 6.9% of agricultural, 3.3% of development. As for the housing type, Malaysian housing market in year 2017 consisted of 58% of terraced house, 10% of semi-detached house, 7.7% of detached house, and 24.2% of high-rise residential property. Terraced house is a house built linked with each other in continuous row in uniform style which up to three floors. Detached house is quite common in Malaysia as in bungalow with its own land. Semi-detached house is the kind of design that combined one and another house just like a mirror on one side only by a common wall. High-rise residential properties such as condominium and apartments and usually found in limited land area.

However, this study will be based on Malaysian housing market data tool. The research background of Malaysian housing price would be in section 1.1.4.1 below.

1.1.2.1 The impact of housing bubble on Malaysia

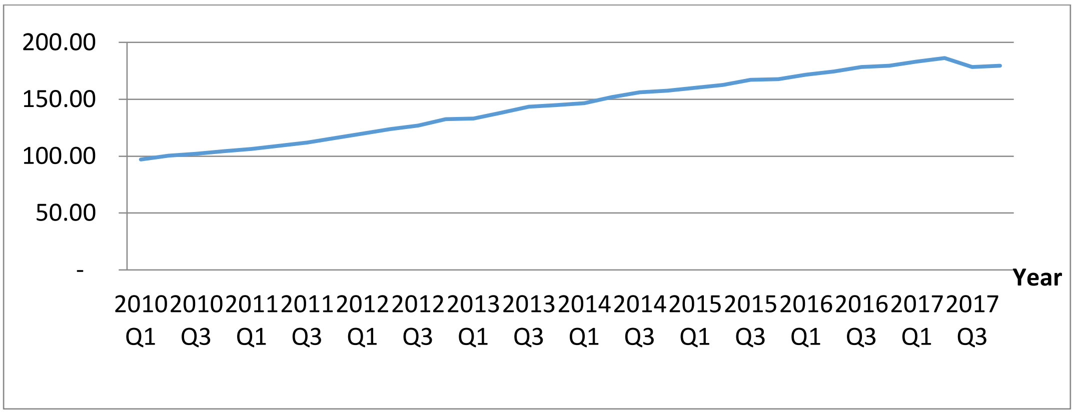
The dominant cause of financial crisis back in year 2008 is the excessive use of credit in United States especially in the housing market. Thereafter, the real estate bubble has eventually burst which led into a recession. However, the case doesn't affect much on the local financial institution. The local Malaysian still have to make a down-payment of 10% for the deposit, and borrowers have to gain good credit history before approved by the bankers for mortgage loans (Lau, 2008).

Therefore, housing prices should be monitored from time to time by investors and policymakers to determine structural changes and economic changes. This study could facilitate to detect if there is any formation of similarity of property bubble. Thus, financial crisis could somehow be prevented in time. For instance, government could restrict bank borrowings as in lending rate, raising property gain tax and et cetera to cool the property market as well as lengthen the collapsing periods (Yip, Wong & Lim, 2017).

1.1.3 Determinants of Housing Prices Changes in Malaysia

1.1.3.1 Trend of Housing Price Index in Malaysia

Figure 1.1: Malaysia Housing Price Index From year 2010-2017 quarterly



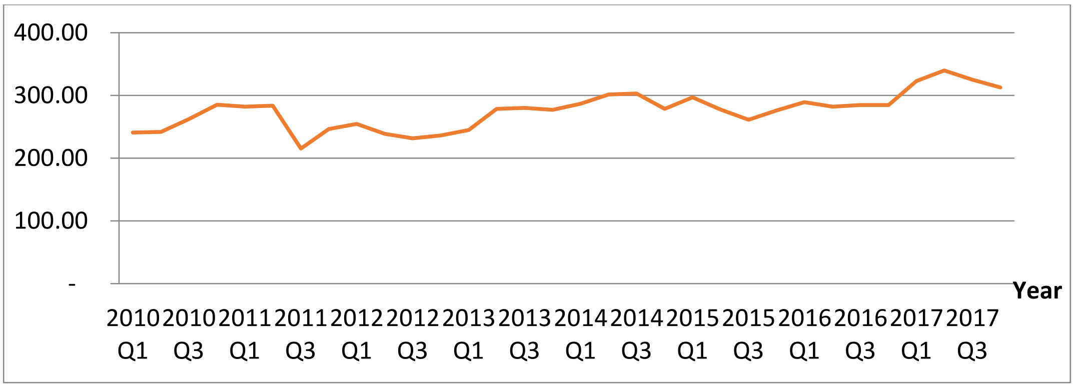
(2000=100), Source from DataStream – National Property Information Centre (NAPIC)

Rapid economic development which happened in Malaysia nowadays has boosts up the demand of residential housing especially among the urban area. The price of a house in Malaysia has a steady growth of price appreciation from index 91.60 in year 2008 Q3 to 186.3 in year 2017 Q2 show in Figure 1.1. According the statistic done by NAPIC, the price of a house in Malaysia as publicized by the Malaysian housing price index which it had a stable increasing since year 2008 whilst the housing price index is twice as much when reached year 2017. The moment when housing prices were keep moving up from year 2008 to 2017 means that there is a positive housing price index changes.

Continuously increase of housing price has led the investors' to be worried and uncertain on Malaysia's future. They are predicting whether the non-stop increasing of house price will lead to another house bubble to be happened in Malaysia once again. A research done by Matt (2015) also indicates many housing or property markets in Asia inclusive of Malaysia tend to follow the same path of US housing bubble. With the changes in Real Property Gains Tax (RPGT) and implementation of Goods and Services Tax (GST) recently, it would be some cool down on housing market activities (Nadaraj, 2015).

1.1.3.2 Trend of Construction Cost

Figure 1.2: Average KLCON Index from year 2010-2017 quarterly (in index)

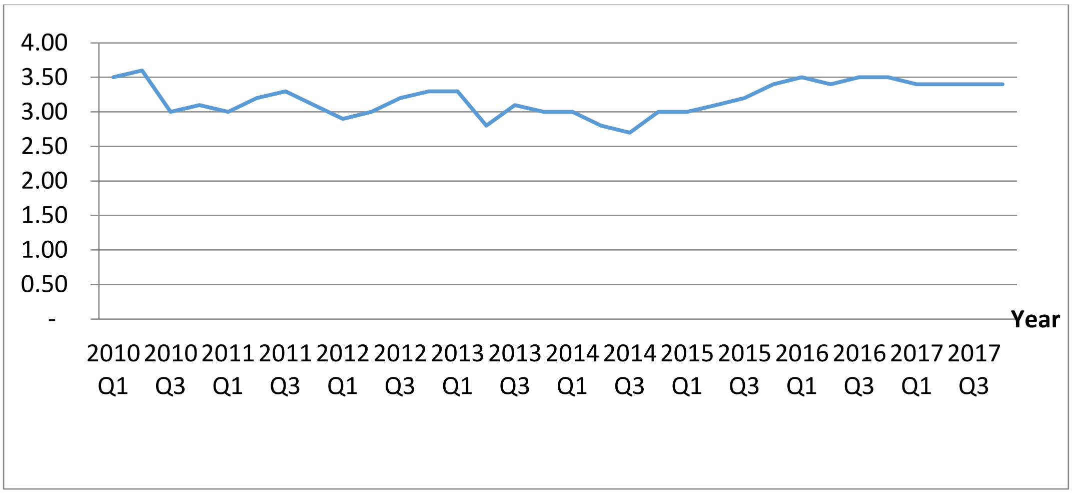


Source from DataStream – Bloomberg

Construction cost has a major impact on the housing price since the construction cost is unavoidable in building houses and it had directly influence on MHPI. As shown in the table above, it is basically uptrend in construction cost after year 2010. Although there are some slight drops in the construction cost, it did not affect much in the KLCON performance. The reason behind the drastically drop in construction cost especially in year 2008 Q3 is due to the global finance crisis 2008. None of the sectors had been exempt from the financial crisis. The construction sector is considered as one of the most vulnerable sectors towards financial crisis. During global financial crisis, the demand for housing decreased and caused the drop in the demand for the construction material and eventually drastically drops in the construction cost in Malaysia (Meyn & Kennan, 2009).

1.1.3.3 Trend of Unemployment Rate

Figure 1.3: Average Total Unemployment Rate from 2010-2017 quarterly (in %)



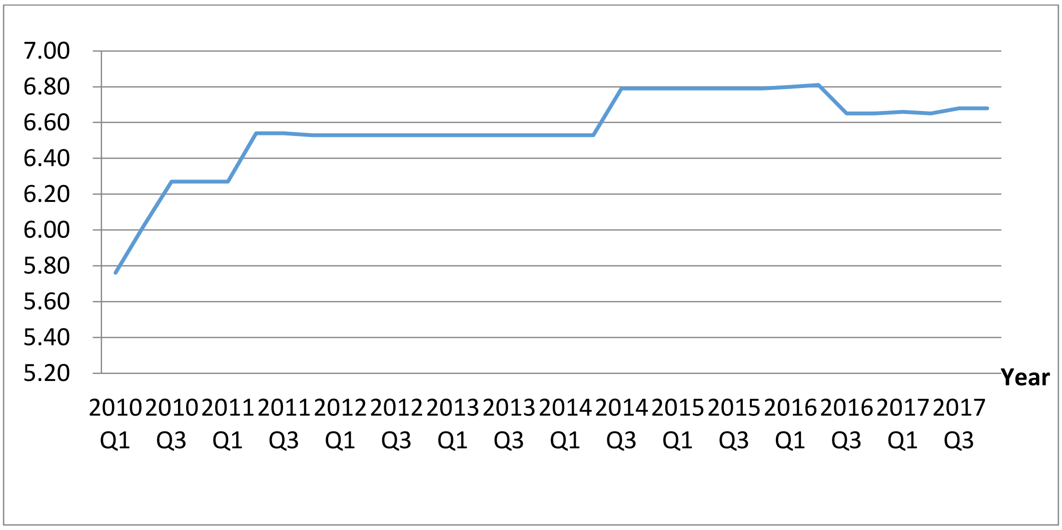
Source from DataStream – Bloomberg

The labour market has a great impact on the housing price as higher in unemployment in the labour market will reduce the demand of renting and investing in the housing market. (Bouchouicha and Ftiti, 2012)

Based on the graph, the unemployment rate fluctuated substantially from year 2010 to 2017. However, there is a dramatic high level of unemployment rate which reached 4.0% in 2009 Q1. This is probably due to the economic crisis in the first quarter of 2009 and many of the workers were permanently terminated by the factories. The jobless rate remained high and dropped to 3.0% in 2010 Q3. Thus, the rate had been fluctuated and met 2.7% in 2014 Q3. The increase in number of labour entering to the market contributed low rate of unemployment for the year 2013 and 2014. After that, the unemployment rate increased firmly and stabilized at 3.40% in the year 2017.

1.1.3.4 Trend of Lending Rate

Figure 1.4: Average annual Base Lending Rate from year 2010-2017 quarterly (in %)



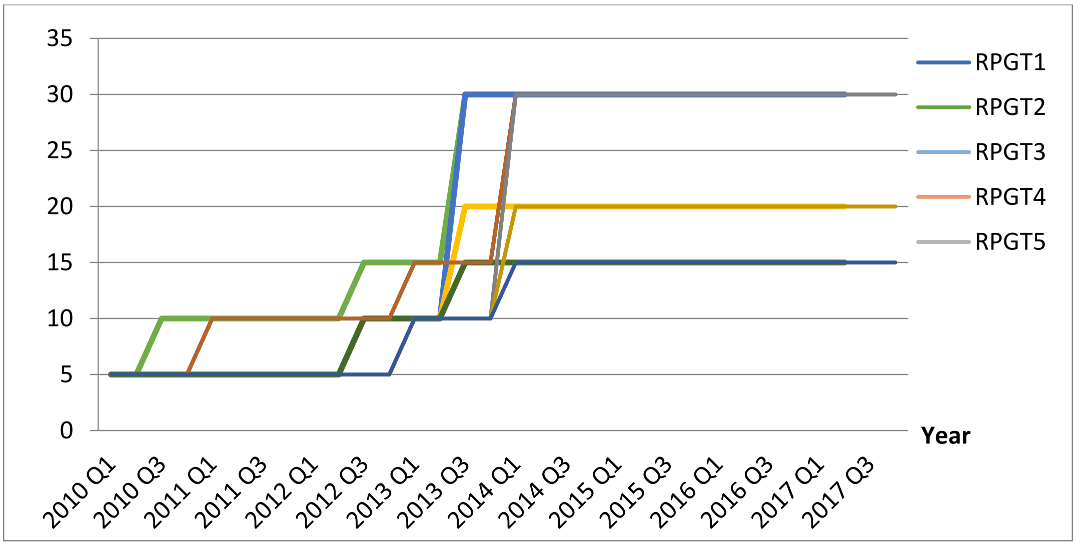
Source from DataStream – Bloomberg

Housing market is highly affected by the credit markets as most of the people normally do not have enough money to buy a property or house. Hence, credit purchase is chosen frequently (Wachter, 2016).

As shown in the table above, the lending rate in early 2010 is quite low. According to the Bank Negara Malaysia, economy of Malaysia had encountered a serious problem of fundamental slowdown in the early 2009 that arising from critical deterioration in the global conditions. Therefore, the Bank decreased the Overnight Policy Rate by a total of 150 basis points from November of 2008 to February of 2009. With the decrease of OPR to historically low in February of 2009, the bank had remained the OPR constant for the rest of the year and within two weeks of the last Overnight Policy Rate adjustment, lending rate adjusted lower by a total of 121 basis points to 5.5%. Starting from 2010, the lending rate has increased steadily with an average of 6.5%.

1.1.3.5 Trend of Real Property Gain Tax

Figure 1.5: Real property gain Tax from year 2010 to Year 2017



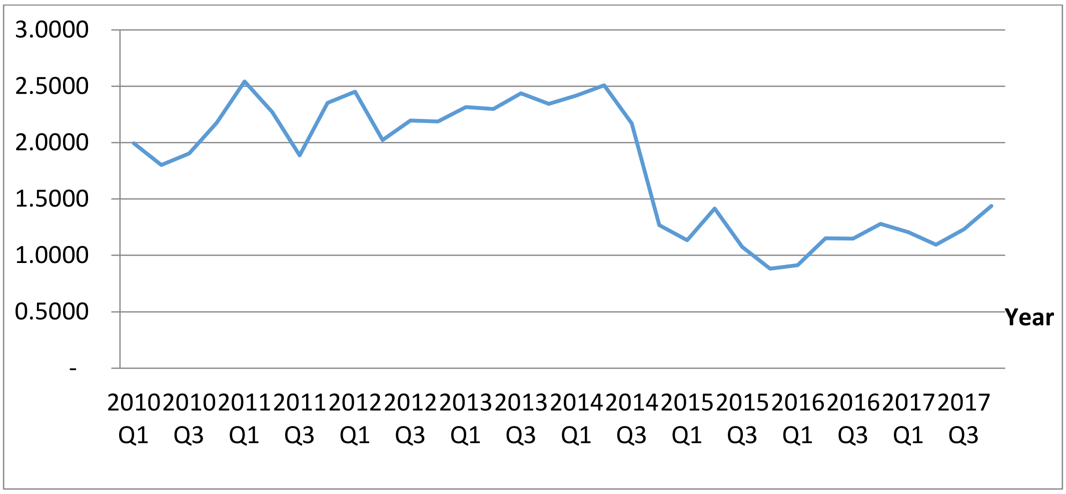
Source from Real Property Gain Tax rate - Loanstreet

The graph above is shoving that the real Malaysia property gain tax changing from year 2010 to year 2017. Real property gain tax is a kind of chargeable tax applied on the profit by the speculative activities of house of real estate. It will be different between 1 year to 5 year lifetime of house or real estate disposal.

There are a constant RPGT rate in year 2010 regardless the house or real estate is holding by how many years. By the graph showing above, it told that there is a significant rise in RPGT rate of disposal more than 5 year in the end of year 2014. Furthermore, there is a trend about increasing 1 year holding period RPGT rate from year 2010 till 2017. In the beginning of year 2014, the entire RPGT rate had become constant in 1 year to 5 years' time of disposal which the first 3 year holding period will be 30%, 20 % RPGT rate of 4 year holding period and 15 % of 5 year or onward holding period.

1.1.3.6 Trend of Oil Price

Figure 1.6: Average annual Crude Oil Price Changes from year 2010-2017 quarterly (in U.S dollar)



Source from DataStream – Bloomberg

A big swing in oil prices is a key factor that causing housing market booms. Oil price shocks would be a substantial part of making the housing market to be fluctuates as it is a crucial role in determining behavior of house prices and the volume of housing stock over time (Khiabani, n.d).

The average annual crude oil price has changes dramatically over year 2008 to 2017 quarterly show in Figure 1.4 above. According to the statistic by Bloomberg, the crude oil price has fallen from 3.33 to 1.18 USD in year 2009 Q1 yet it bounced back and rocketed to 2.54 USD in the year 2011 Q1. After that, the crude oil price has steepened to 1.88 to the year 2011 Q3 and started to recovery, after that it maintain steadily increase until 2.51 in the year 2014 Q2. After that it started fell to 1.09 USD in year 2017 Q2 and rose again to 1.44 USD in Q4.

1.2 Problem Statement

Based on the *Figure 1.1* above, housing price in Malaysia keeps on going up throughout the years. According to Reen and Razali (2016), volatility of house price creates risk of unsustainability for lenders and they added, an increase in volatility of house price increases the negative home equity probability. Hence, the losses of mortgage foreclosure become worse. The volatility in house price is crucial to assess, because it will lead residential property market become more unstable and the fact that currently, residential has become a hot and sensitive issue in Malaysia.

According to Zainal et. al. (2016), the government policies on tax has caused a tough blow in the housing market. Land acquisition costs and building materials are the major components of construction cost that are most affected due to the policies on tax. On the other hand, the increase in cost due to the policies has caused many issues in the business capital flow of developers. Therefore, developers have made decision to increasing the housing prices in order to cover the risk of losses and retain profit. As a result, the end buyers will ultimately face the increase in price. It is crucial to study the relationship of the affected construction cost and the house price in Malaysia because there are limited literatures and analyses done on the subject matter.

Next, because of the insufficient legal regulations or provisions to protect the purchasers, the housing projects abandonment in Malaysia has been affecting the housing industry (Razak et al, 2015). According to Ministry of Housing and Local

Government (MHLG), the project that is uncompleted or under halt is said to be abandoned. When more and more housing projects are being abandoned, it increases the unemployment rate because the labour employed for the housing projects loses their job. A sudden of upward movement in unemployment rate will lead to a drip in income and thus reduce the capability of purchasing homes which in return causes the housing prices to fall (Doraisamy et al, 2014). While almost all the studies proved that unemployment rate and house price have a negative relationship, Xu and Tang (2014) argued that unemployment rate and housing price can be positively related. This study will further determine the relationship between unemployment rate and housing price in Malaysia.

According to Tang & Tan (2015), the risk of a property bubble is the current concern in Malaysia. Therefore, with increasing the bank lending rate and imposing of RGPT, the government of Malaysia wants to control soaring housing price of the country. Nevertheless, those can only be considered as effective tools when there is a relationship between lending rate, RPGT and housing prices. Besides, according to Ong (2013), RPGT plays an important role in housing price but limited research has been done on the subject matter. Thus, this study aims for a systematic examination of the lending rate and RPGT which may influence the housing price in Malaysia.

Lastly, according to Le (2015), the rise in world oil price has led to a significant growth in housing price in Malaysia in the past decade. However, a limited number of researches have taken into account this variable in studying the house price index in Malaysia. Thus, this research attempts to study the relationship between oil price and house price in Malaysia.

1.3 Research Objectives

The objectives of this research are to examine the relationship of construction costs and other economic factors with Malaysia's housing price index.

1.3.1 General Objective

The main objective for this study is to determine the relationship between construction costs and other economic factors such as oil price, Base Lending Rate (BLR), Real Property Gain Tax (RPGT) and unemployment rate with housing price index in Malaysia.

1.3.2 Specific Objectives

i. To examine whether there is significant relationship between the changes in oil price and the housing price index in Malaysia.

ii. To examine whether there is significant relationship between the changes in construction costs and the housing price index in Malaysia.

iii. To examine whether there is significant relationship between the changes in Base Lending Rate (BLR) and the housing price index in Malaysia.

iv. To examine whether there is significant relationship between the changes in Real Property Gain Tax (RPGT) and the housing price index in Malaysia.

v. To examine whether there is significant relationship between the changes in unemployment rate and the housing price index in Malaysia.

1.4 Research questions

i. Is there any significant relationship between the changes in oil price on housing price index in Malaysia.

ii. Is there any significant relationship between the changes in construction costs on housing price index in Malaysia.

iii. Is there any significant relationship between the changes in Base Lending Rate (LR) on housing price index in Malaysia.

iv. Is there any significant relationship between the changes in Real Property Gain Tax (RPGT) on housing price index in Malaysia.

v. Is there any significant relationship between the changes in unemployment rate on housing price index in Malaysia.

1.5 Hypothesis of Study

In this study, the dependent variable is the house price index in Malaysia and the independent variables are construction costs, oil price, Base Lending Rate (BLR), Real Property Gain Tax (RPGT) and unemployment rate. The following is the five hypotheses in the study.

1.5.1 Construction Costs

H_0: There is no significant relationship between construction costs with house price index in Malaysia.

H_1: There is a significant relationship between construction costs with house price index in Malaysia.

1.5.2 Unemployment Rate

H_0: There is no significant relationship between unemployment rate with house price index in Malaysia.

H_1: There is a significant relationship between unemployment rate with house price index in Malaysia.

1.5.3 Base Lending Rate (BLR)

H_0: There is no significant relationship between Base Lending Rate (BLR) with house price index in Malaysia.

H_1: There is a significant relationship between Base Lending Rate (BLR) with house price index in Malaysia.

1.5.4 Real Property Gain Tax (RPGT)

H_0: There is no significant relationship between Real Property Gain Tax (RPGT) with house price index in Malaysia.

H_1: There is a significant relationship between Real Property Gain Tax (RPGT) with house price index in Malaysia.

1.5.5 Oil Price

H_0: There is no significant relationship between oil price with house price index in Malaysia.

H_1: There is a significant relationship between oil price with house price index in Malaysia.

1.6 Significance of the study

The significance of this study is to capture a clearer picture on how the chosen independent variables such as lending rate, unemployment rate, construction cost, oil price and real property gain tax would impact on the dependent variable, housing price. Thus, this research has collected the fact and evidence from previous study and research on our own study. The contribution of the results is for the future researchers to assist them in future study in related field, investors in housing investment, policy makers and also employees.

1.6.1 Future researcher

According to Tupenaite, Kanapeckiene and Naimaviciene (2017), the housing price movements in the market in Lithuania are mostly explained by economic indicator. In their results, interest rate and inflation are the most significant. They suggest that other variables should be also assessed like the construction cost index, housing supply, and real estate transactions. The results are to be used in future research for a more accurate research and their research is on line with other relevant studies. In contrast, Cohen and Karpaviciute (2017) assessed the determinants of housing price in Lithuania and the Granger causality test showed that inflation and interest rate are not causal determinants of the housing price. They argued that research that it could be showed a wrong result with only assessing the correlation and regression analysis in the model. Causal relations should be examined before including the variable in the model.

1.6.2 Policy Maker

According to the discussion of Gustafsson, Stockhammar and Osterholm (2016), they deliberate about the importance of policy which will directly affect to the housing price. Policy makers have a role in the economy that they are responsible for the changing in housing price and demand in the market to stabilizing the economy. This study recommends to policy makers on changing different policy will results in changing housing price. Besides, the study by Liu, Miao and Zha (2016) discuss the relationship between labor market and housing market and they expect policy makers to use their research as reference in improving the future policy design as the changing policy will directly impact on labor market as well as housing market. In addition, Bouchouicha and Ftiti (2012) investigate the real estate market in the US and UK and they found discrepancy in the real estate market and monetary policy between them. Reed and Ume (2016) suggested policy makers to be mindful in analyzing and implementing policy in the housing market as the policy will directly impact on housing price, labor force, supply and demand in the market and economic growth.

1.6.3 Investor

This study provides recommendation for investors in housing investments as the housing price can be affected by many factors. Ni, Wen and Huang (2011) conducted a research of housing market in US market, data collected from 1994 to 2010. In the year 1997, the interest rate was declined rapidly as affected by US bubble and subprime mortgage market was expanded since the interest rate was low. The investors short sale their property due to the late repayment and involve in the US subprime crisis in 2007. Besides, Xu and Tang (2014) proved that there is a significant relationship between lending rate and housing price. The changing in lending rate will directly impact on their investment on housing market. Grum and Govekar (2016) discussed on the influence of macroeconomic factors on the price of real estate and they believe that the result is important for the investors to predict and forecast the behavior in the real estate market. Thus, Bouchouicha and Ftiti (2012) indicated that low interest rate in the market increase the housing price. Investors in housing market can track on the changing in interest rate to make a good investment since the cost of financing is lower with lower interest rate.

1.6.4 Employee and Household

Besides, this study provides a precious insight for household to rent or buy a house. Reed and Ume (2016) discussed labor market frictions in housing market and the results show that low friction will increase the housing price. Workers need higher wages to pay for expensive rental or buy a house and higher wages could lead to longer unemployment. Branch, Petrosky-Nadeau and Rocheteau (2016) study the household finance on housing market and their results suggest to household on financing will loans in a frictional good market or rent, buy and sell home in the housing market. Furthermore, Sterk (2015) studies the linkages of the equity level of homeowners, geographical mobility and labor market. The researcher found that when the house price decline, unemployment rises as the credit-constrained homeowner found it difficult to move for a new job offer. Thus, the study shows the relationship between patient and impatient household which the patient households lend to the impatient household to make profit.

1.7 Chapter Layout of the Study

1.7.1 Chapter 1: Research Overview

Discussion of introduction of the study, research background, problem statement, objectives of the research, research questions, hypothesis of study, significance of the study, layout of the chapter, and conclusion.

1.7.2 Chapter 2: Literature Review

Reviewing of the literature which includes how past researchers carried out their researches, relevant theories, findings and results of their researches.

1.7.3 Chapter 3: Methodology

Discuss the method of data collection, data sources, sample size, followed by the model that will be used in this study.

1.7.4 Chapter 4: Data Analysis

This chapter will focus on the use of methodology stated in Chapter 3 to carry out all the tests. The outcomes generated will be analyzed and discussed.

1.7.5 Chapter 5: Discussion, Implication, and Conclusion.

This chapter will conclude this research by summarizing the statistical analysis, major findings, implications of study, limitation of study and some of the recommendations for future research.

1.8 Conclusion

From the research, it is showing a significant increment trend of Malaysia house price. This study has determined the five variables: construction cost (CT), unemployment rate (UR), lending rate (LR), Real property gain tax (RPGT) and oil price (OP) that can help us to better understand about the impact and relationship between the variables and Malaysia price house index. This chapter had discussed about the introduction, background, problem statement, objectives, questions, hypothesis as well as significance of study and lastly, the chapter layout. For next chapter, there will be further discussion about the literature review of relevant variables in the research.

CHAPTER 2: LITERATURE REVIEW

2.0 Introduction

Firstly, this chapter will summarize the literature review of foreign and local studies in order to have a deep understanding on how past or other researchers towards determinants of housing prices. In addition, the layout of this chapter will be as following: review of the literature, which will review the past studies done by past researchers. Review of relevant theoretical models will be the next, which is to study the theories and concepts applied on determinants of housing price by referring to the past studies. This followed by proposed theoretical or conceptual framework, which will discuss the relationships between housing price index and real property gain tax rate, unemployment rate, lending rate, oil price, and construction cost, whether they are positively or negatively correlated with the dependent variable (housing price index). Lastly, there will be a brief conclusion about this chapter.

2.1 Review of the Literature: Dependent Variable

2.1.1 Malaysia house price index (MHPI)

Housing price is affected by the economic essential components like the supply and demand of the house market. Housing price index (HPI) with the function as analyse the residential house price trend approximately. In other word, house price index can use to measure the overall price variation and movement of the local residential house over the time. Malaysia house price index was create Valuation and Property Services Department (VPSD) under hedonic basic. Malaysia house price index had covered the house market in Malaysia which includes all the states and federal territories. Based on Afiqah, Lizam, & Jalil (2012), Malaysia house price index the most suitable to be used to proxy the Malaysia house price.

After go through a great number of research, there are some determinants can significant influence the Malaysia house price index. These researches actually have experienced some test to analyse whether the determinants is positive or negative relationship with Malaysia house price index. According to Mariadas, Selvanathan, & Hong (2012), it supported constuction cost have positive relationship to housing price index because of the price of raw materials. Moreover, house price index can be influence by lending rate which proxy as the interest rate of loan approved. It shown the lending rate is either positive or inverse relationship with the house price index which suport by the research done by Pillaiyan (2015).

Unemployment rate with determined as significant and inverse relationship with Malaysia house price index. This statement is agreed in the research conduct by the research doned by Karamelikli (2016). Futhermore, Ong (2013) is conclude that real property gain tax is one of the macroeconomic variable which is positive relationship with Malaysia house price index. Accorrding to Vita (2015), oil price is significantly positive relationship with Malaysia house price index. Due with the transportation cost and raw material cost increase, it leading a rise in the house price.

2.2 Independent Variable

2.2.1 Construction Costs

According to Construction Industry Development Board of Malaysia (CIDB), building materials are referred to the substances and equipment that involving in the work underground until finishing works. In their report, CIDB classified the main building materials into seven categories, by which are steel reinforcement, sand, round iron, cement, aggregates, and readily mixed concrete and bricks ("Construction Materials by CIDB Malaysia," 2017).

According to Mariadas, Selvanathan and Tan (2016), the construction cost is one of the main elements in the housing development projects and it can directly determine the succeed and failure of the projects. The cost of construction defined as the expenses that involved in the housing development such as the budgeting cost, cost estimating, technology, material costs, labour costs, transportation costs and so on. The increasing in the development cost will not solely borne by the developer itself, instead the rigid expenditure in development cost will be transfer to the end buyers by increasing the housing price. The main factor that led to the increasing of the construction cost in Malaysia is the shortage of the skilled labour force in construction sector. Construction involves many expertise with high level of education, such as engineers, and construction site workers. Working in the construction side required more physical energy compared to other sectors and less Malaysians are willing to be involved in this sector. Therefore, developers need to depend on the cheaper foreign labour force.

The commodity price is considered as one of the construction costs in housing development. The commodity price is severely influenced by the market demands, production costs and the developers' expected profit in the project. The expected profit of the developers directly determined the unit housing price (Wang & Jiang, 2016). According to both of them, the housing price is calculated by the formula, construction cost x (1 + expected profit rate), therefore we can clearly see that the construction cost directly affected the housing price.

In addition, building materials contribute vastly to the quality and housing price, therefore building materials play a significant role in the housing development.

According to Akanni, Oke and Omotilewa (2014), one of the main factors that driving to the increasing in housing price is the rapid inflation in costs of building materials. The government's policy in protecting the local manufacturers had indirectly led to the increase in building materials cost. The local manufacturers are unable to produce enough amount of raw building materials based on the local demand, and eventually the action promoted to the rising of production cost of housing. Besides that, the building materials have often constituted to the largest input of the housing construction costs in most of the developing countries. The cost of building materials had contributed to more than half of the developing cost of a house (Ugochukwu & Chioma M, 2015). Therefore, we can conclude that the elements of construction cost are one of the main determinants of house price in Malaysia.

In a nutshell, construction cost is one of the main elements in the development of housing and it had been included in the studies by previous authors. Therefore, we had taken into account the significant relationship between construction cost and housing price in Malaysia and adapted it into our study.

2.2.2 Unemployment Rate

Unemployment rate is a percentage that indicated a share in a labor force for those who are willing and available to work but unemployed.

According to Gustafsson, Stockhammer and Osterholm (2016), they indicated that unemployment rate and housing price have a negative relationship as the housing price falls to a level due to the unemployment rate is at the peaks at point higher than the basic scenario. Besides, Tupenaite, Kanapeckiene and Naimaviciene (2017) distinguish the determinants that affect housing price. They found that as unemployment rate increased, the house price index was reduced.

Xu and Tang (2014) proved that unemployment rate and housing price can be positively related. A rising in unemployment rate can be followed by increasing in housing price. Besides, Sterk (2015) shows that unemployment rate and housing price are negatively related as the unemployment makes the investor to invest less due to the borrowing constraint, thus results in declining of housing price.

According to Jansson (2017), the results show that as the unemployment risk increased, the local housing price decreased at the same time. Bouchouicha and Ftiti (2012) proved that low employment will result to a decrease in housing price. As the higher unemployment rate will reduce the demand of the renting and investing, thus contributes to a decrease in housing price. Another result from Cohen and Karpaviciute (2017) proved that when the unemployment rate rises, housing price will fall by a percentage, holding other variables unchanged and this shows a negative relationship between them.

Grum and Govekar (2016) show that there is a negative relationship between unemployment rate and real estate price in Slovenia, Greece, France, Poland and Norway as the unemployment rate increase, the price of property will decline. Based on the results from Liu, Miao and Zha (2016), they proved that when there was an increase in unemployment rate as the job finding rate falls, land price falls. The results from the time-series paths show that an increase in land price is associated with a decrease in unemployment rate.

According to Branch, Petrosky-Nadeau and Rocheteau (2015), during a market tightness, unemployment increases and housing price decreases. Housing price has a positive relationship with market tightness and a negative relationship with unemployment rate. Teulings (2014) indicates that reallocation of labour leads to a loss in industry specific human capital which results in unemployment. Thus, high unemployment will result in low house prices.

In short, conflict of the relationship between housing price and unemployment rate is found from the previous studies. Unemployment rate is good to be used as an independent variable in this research since it will affect the labour force and housing price in the market.

2.2.3 Lending Rate

Lending rate is a charge on loan. Previous studies have different results on the connection between lending rate and housing price. Zhang et al. (2012) found that the lending rate is one of the most influential exogenous variables for housing price. Carbó-Valverde & Rodriguez-Fernandez (2010) found bank lending affected housing price all the time.

Shi et al. (2014) stated that lending rates are significantly and positively related to housing prices. Xu and Tang (2014) agreed with this result and concluded the existence of positive relationship between lending rate and house price. They also confirmed that lending rate has significant impact on the housing prices. According to Shi et al. (2013), the real interest rate, either fixed or floating, is positively related to the real house price, after taking the effect of real rental rates into account. This is also supported by Olowofeso and Oyetunji (2013) which found that when there is a high rate of interest in the lending policy of an economy, there is always a corresponding upward movement in the property's prices and vice-versa. Tse et al. (2014) concluded that correlation between housing prices and mortgage interest rates is largely positive. Mandell et al. (2011) stated that an exogenous shock that rises bank lending will lead to an increase in housing price. This impact will remain positive and significantly different from zero over five periods, i.e., more than a year. This suggested that bank lending will impact the housing market and the impact will remain for some time.

Ibrahim and Law (2014) argued that lending rate is negatively related with house price which was supported by Holstein et al. (2013) and Choudhury (2014).

Olanipekun (2015) followed this argument. They found a significant relationship between house price of all types and the base lending rate. However, this relationship is negative but fairly strong. It implied that the greater the house price, the lower the lending rate. This relationship has been established empirically also by Ni et al. (2011).

Ong (2013) found that lending rate and the housing price has no significant relationship. If everyone is looking for the same stuff, the speculators or buyers will not concern about the lending rate being charged by the financial banks, because the supply and demand are unbalanced, specifically when the economy is in good condition. The fact that investors are optimistic and confident about the housing market is also one of the reasons. Viewing from perspective of speculators', they might not be holding the houses or properties for long term but selling them in short term. Therefore, they could obtain more gain than the cost. On the perspective of buyers', they might be willing to pay more to get their desired type of house. Le (2015) concluded that lending rate does not Granger-cause the house price of Malaysia.

Almutairi (2016) concluded that there is insignificant relationship between lending rate and housing price because only 2.3% of the forecast error variance in house price is explained by lending rate. This is supported by Rebi (2014) which stated that the lending rate, even though part of the modeling, came out to be statically insignificant although it has the expected sign. In other hand, the high demand for houses during the transition period might be due to the other factors of social demographic, that lending interest levels were not as much important as for households. According to Huang et al. (2015), the standardized coefficient is the smallest for long-term lending rate as one standard deviation increase in lending rate almost does not change the housing price. All the other components of amenity have higher standardized coefficients than the lending rate proxy do.

As a conclusion, there are many results for the connection between lending rate and housing price. So, this study attempts to find out the relationship between lending rate and housing price in Malaysia belongs to which category.

2.2.4 Real Property Gain Tax (RPGT)

Real property gain tax is known as a kind of capital gain tax in Malaysia and active on year 2013. It is the tax applied on the profit which people gain from the disposal of property. The rates are depended on the duration that the seller owned the property or known as the property holding period. The tax is only charge when profit and only to the person who sell the property.

According to Sean & Hong (2014), RPGT is significant affect the house price in the short run by change investor decision to invest the property. This result showed that there is negative relationship between the real property gain tax and house price. Research done by Ong (2013) reveals that the RPGT is negatively and significantly associated with the housing price.

Mitchell, D. J. (2014) state that capital gain will cause insufficient change behaviour of company and household who want to avoid the tax. And this is supported by National Tax Research Center which noted capital gain tax will cause a slowdown of property market.

In short, there are many arguments and statements which confused the relationship between the house price index and RPGT. So, this study can use RPGT as a variable to determine the actual relationship with the Malaysia House Price Index.

2.2.5 Oil Price

Crude oil is dark oil that consists mainly of hydrocarbons. It is pumped out from the beneath of ground and refine into finished petroleum products and there are myriad of uses that affect our lives such as gasoline, diesel fuel, home heating oil, jet-fuel, and et cetera. In United States, one barrel of oil is about 42 US gallons and it is around 159 liters or 35 imperial gallons. Crude oil has been a key commodity of success to global economy. In this case, it stands a very important part for the economic development as well as the growth for industrialized and developing countries.

Vasel (2016) indicates that a falling price for the oil will not only influence residents' gas tank on transportation yet it would also affect house's value or price. According to Larson & Zhao (2016) found strong evidence saying there is a positive reaction on house to oil price changes in oil exporting area, and it turns out to be negative when a house is further from the center of city. There is a positive export price effect of increasing oil prices on salary; it leads to a house price appreciation in the city relative to other cities. The commuters would also consume oil indirectly in the form of. In this case, an increase in the price of oil would have difference commuting costs between the center-city and suburban locations. Transportation cost is one of the reasons that steepen the house price gradient. Therefore, there is a close relationship between oil prices and house prices in many places over a long-time horizon that consists of periods of which are stable, rising, and falling oil prices. Le (2015) indicates that housing market fluctuations is because oil price being substantial portion of in Malaysia. The increase of world oil price has led to a significant growth of housing price index in Malaysia in the past decade.

However, Agnello, Castro, Hammoudeh & Sousa (2017) indicate that there is a negative association with length of the housing boom and oil price. The researcher found that price of the oil has an insignificant effect on the housing price. Besides, Blake (2016) also indicates the result show high real estate cost has consistently negative relationship with high gasoline prices. Thus, there is a negative coefficient on the interaction term implies that an increase in oil price will influence a larger drop on home values.

There are different results from different research on relationship between housing price index and oil price. Therefore, oil price has taken into consideration of being one of the exogenous in the model.

2.3 Review of Relevant Theoretical Models

2.3.1 Model

2.3.1.1 Hedonic Pricing Model

Hedonic pricing model is used to analyse the price factor, and this is common applied to house price evaluation. It is coming with the purpose to come out with an accurate prediction about the price by given the determinant.

Hedonic pricing model initially is founded by Lancaster 1966) which regarding the theory of consumer behaviour but Lancaster (1966) do not had discussed detailed in this study. Thus, it had extended by (Rosen, 1974) which state that the price value can be determined by its both internal characteristic and external factor that influencing it. Rosen had stood a point that the total price value was attributing by each characteristics or factors related with it. And every combination of different determinants will create a special price range in the equilibrium market. This model is flexible enough to make suit the relationship among the market good with its internal characteristic and external factor.

Based on Monson (2009), this hedonic pricing model had been used to calculate the transaction value of the building. In the same time, a regression analysis is created to determine the relationship between the independent variables and the dependent variables and the finding can be used in future prediction. The coefficient is generated and can be used to form a hedonic pricing model. Under this study an equation had been illustrate as below:

Market Price = f (tangible & building characteristics, other influencing factors)

Hedonic pricing method is known as one of the alternative to determines housing or real estate valuation. From the research done by Xiao (2017), it had determined the house property whether will affected by which kind of characteristic. Those characteristics were covered structural characteristic, locational characteristic, neighbourhood characteristic, environmental characteristic and others. The hedonic pricing model was to be created to determine those correlations between the characteristic and the house property valuation.

As an alternate real estate valuation method, hedonic modelling can be used by developers, corporate real estate groups, owners, and operators to determine which building characteristics add significant value to the potential transaction price. The results produced can provide important information for future decisions and help each party better understand the economics surrounding each asset, thus improving asset underwriting.

2.3.2 Theory

2.3.2.1 Economic Theory – Law of Demand and Supply Theory

According to Gale (1955), the relationship or interaction between the supply and demand of resources can be best explained of law of supply and demand theory. This theory indicates that the desire for a product and whether there is availability for the particular product. In general, the price would be increased whenever the supply is lower than the demand. Therefore, if the demand of a good is greater than the supply (Figure 2.1), the price of the good will increase. Besides, if the supply of a good is greater than the demand (Figure 2.2), the price of the good will decrease. Next, the price of the good will adjust by itself to the point that the supply and demand are equilibrium, which is known as equilibrium of economic (Figure 2.3).

Figure 2.1 Supply and demand curve

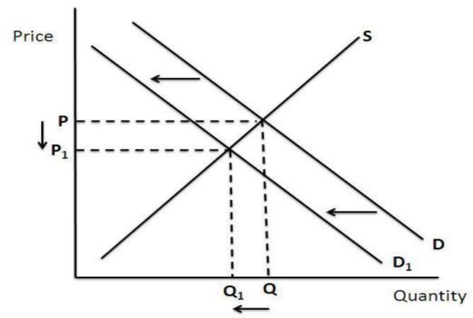
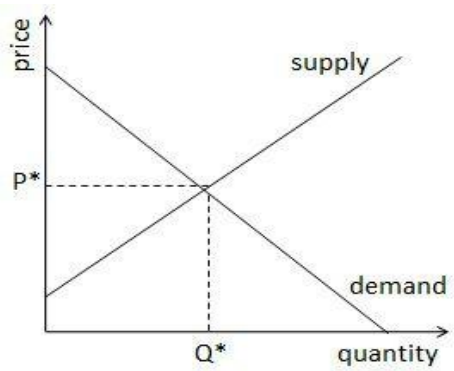


Figure 2.2 Supply and demand curve

Figure 2.3 Equilibrium of Supply and demand curve



The linkage of the law of demand and supply to the lending rate, oil price, unemployment rate, construction cost which affect the housing market in Malaysia will be discussed below.

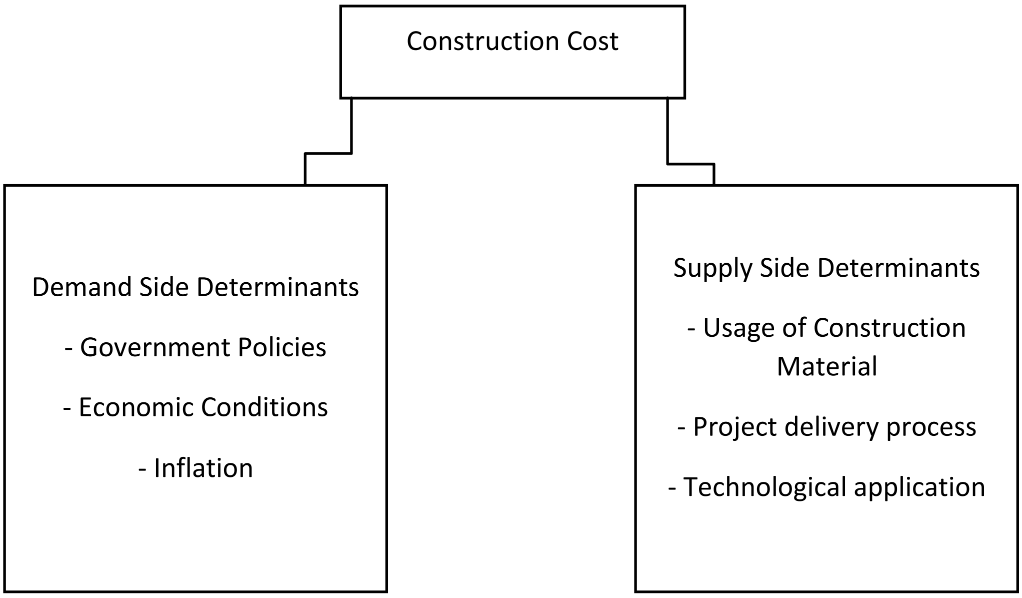
Lending Rate

According to Hardwick & Langmead (1994), the lending rate fluctuation is influenced by the demand and supply of credit or loanable funds. Lending rate is calculated by the intersection of savings' supply schedule with money's demand schedule, with the appropriate supply schedule which formed in terms of savings. According to neo-classical, lending is the credit price which is found by the supply and demand of the loanable funds. There are three sources for the demand of loanable funds, which are consumers, government, and businesses. They need them for the aims of immediate consumption, investment, and hoarding. When the lending rate is low, more funds are needed and borrowed than when the rate is high. Besides, the sources of supply of loanable funds are savings, bank credits, and dishoarding. According to them, saving is seen as the allocation of the supply of loanable funds and release of resources into the production of capital goods from production of recent consumer goods. Investment also is viewed as a provision of demand for loanable funds. As the lending rate is higher, the individuals and households are more willing to save rather than invest and sacrifice the current consumption for future consumption. A conclusion that can be derived is that the fall of lending rate will lead to greater investment to take place.

Construction Cost

The long-term variation of housing price is contributed by the supply and demand of construction cost because the construction cost directly affected the housing price. This is due to the reason that the expected profit rate of total housing price is calculated through "construction costs x (1 + expected profit rate) (Wang & Jiang, 2016).

Figure 2.4: Determinants of supply and demand of construction cost



On the demand side of determinants, the government policies on taxation and duty on imports of machinery and equipment can either positively influence or negatively influence the construction cost. The economic condition such as financial crisis may have negative impact on construction cost and vice versa. Besides that, the inflation is the main reason for the increase in construction cost. The Good and Service Tax (GST) further increased the construction cost.

On the supply side determinants, the usage of construction material will have direct impact on the supply of construction cost. In the project delivery process, productive efficiency and quality are the main concerns of the supply of construction cost. Furthermore, the application of new technology will change the demand of construction cost naturally because the firms can enhance the technology capabilities based on the demand (Weddikkara & Devapriya, 2001).

Oil Price

There are researchers have studied that the changes of demand or supply could influence the oil price on the housing market. There is an immediate and bad effect of crude oil supply shock on the current crude oil price which is the consistent of laws of supply and demand. Besides that, the demand for crude oil transport services can be derived from imbalance between supply and demand for crude oil (Shi,Yang & Li, 2013). Although consumers can benefit and saved cost from lower pump prices. However, the terms of trade deterioration will then trickle through to lower incomes where the household income balance sheet will be worsening thus it may slow the housing market (Baffes, Kose, Ohnsorge & Stocker, 2015).

Unemployment Rate

According to Harris and Todaro (1970), the rural sector can be utilized all labour on one single production or supply of the labour to urban sector. The unemployment rate is driven by the supply and demand of labour. Higher expected wages will attract more labour and results in migration to the urban. Limited supply of labour will result in higher expected wages. Thus, the unemployment rate will be affected and so the housing price. Besides, Coulson and Fisher (2009) indicated that an increase in ownership of housing will shift labour supply up and this result in an increase in wages of the individual. As the wages rise, supply of worker increases and unemployment rate fall, results in higher housing price.

2.3.2.2 Optimal Tax Theory (RPGT)

Optimal tax theory also known as the theory of optimal taxation which had explained by Piketty & Saez (2012). It is regarding the research about how the tax implementation causes inefficiency and slowdown in the market under given economic constraints. Some economists are argued that the implementation of tax will toward behaviour distortion since the tax payer will choose in beneficial way by paying the lower tax between two options with same risk and same return.

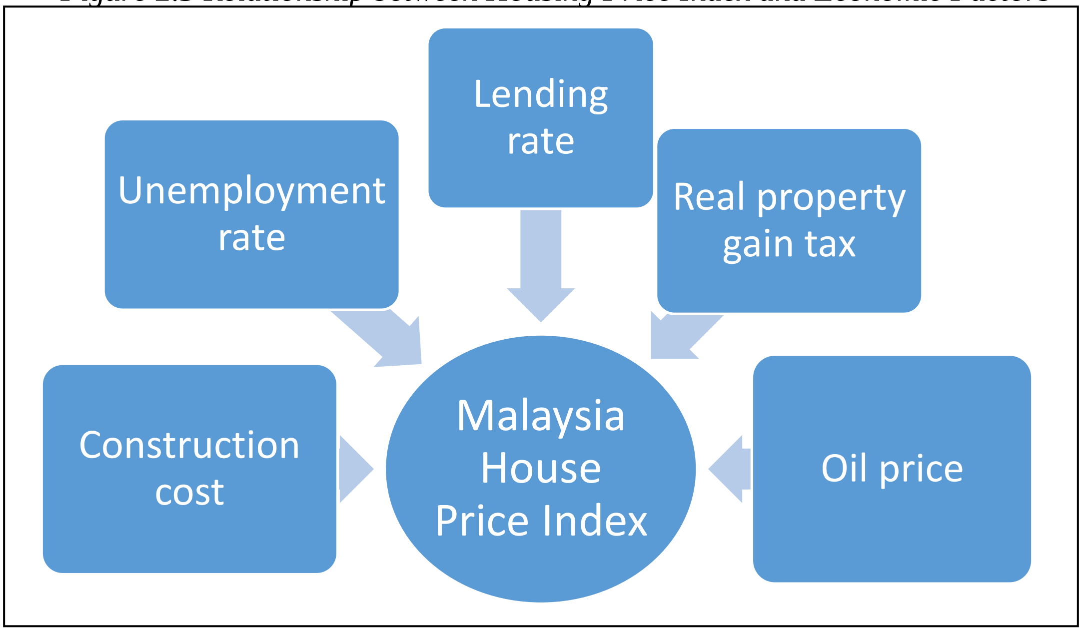
In the research conducted by Mankiw, Weinzierl, & Yagan (2009), there are result in two types of argument, some economists stand behind no taxation in capital income but some are argued in some taxation of capital income. This statement had mention again by Jacobs (2012) with either capital income should be taxed or should not be taxed. Capital gain can be taxed to minimize the arbitrage between capital and labour income. If capital income without tax policy, there are big motivation for conversation of labour earning which being taxed to capital earnings which not being taxed. So capital gain tax policy is necessary to avoid these phenomena (Jacobs, 2012).

By the way, capital gain tax had cause significant effect to the house price. Capital gain tax policy had over stimulated the house market, thus cause fluctuation in house price (Yanotti, 2011). Aregger, Brown, & Rossi (2013) had make a conclusion about high capital gain tax actually will speed up the movement of house price.

Now many government had process the capital gain tax policy like the country facility in house building which includes United State, Norway, Denmark and Belgium (Andrews, Bonta, & Wormith, 2011). Malaysia also active the real property gain tax in year 2013.

2.4 Conceptual Framework

Figure 2.5 Relationship between Housing Price Index and Economic Factors



2.5 Hypotheses Development

2.5.1 Construction Cost

H_0 : There is no significant relationship between the construction costs and the Housing Price in Malaysia.

H_1: There is a significant relationship between the construction costs and the Housing Price in Malaysia.

There is a positive relationship between the construction cost and Malaysia housing price. According to Osmadi, Kamal and Hassan (2015), there are high premiums that charged by federal government and state government to developers for each housing project. Henceforth, developers will eventually transfer the costs to house buyers and result in the surging price in housing sector in Malaysia. Moreover, based on the journal article by (Ihuah, 2015), the increasing costs of construction materials indicated the higher demand in the market and it is also led to the increase in the development costs of housing sector.

2.5.2 Unemployment Rate

H_0 : There is no significant relationship between the Unemployment rate and the Housing Price in Malaysia.

H_1: There is a significant relationship between the Unemployment rate and the Housing Price in Malaysia.

According to Sterk (2015), the study proved that unemployment rate and housing price is negatively related. The higher the unemployment rate, the lower the housing price. Investor tends to invest less in the housing market due to borrowing constraint. This reduces the demand in housing market and also the housing price. Besides, Tupenaite, Kanapeckiene and Naimaviciene (2017) indicated that as unemployment rate increased, house price index was reduced.

2.5.3 Lending Rate

H_0 : There is no significant relationship between the Lending Rate and the Housing Price in Malaysia.

H_1: There is a significant relationship between the Lending Rate and the Housing Price in Malaysia.

Xu and Tang (2014) found that the relationship exists between housing prices and lending rate is positive in long run. This study says that the lending rate is connected tightly with the mortgage rates, therefore, people can consider long term fixed loan either five-year or ten-year, as they may have lost their deals in the situation of short loans when lending rate starts to rise. Besides, the empirical results of this study conclude that lending rate has significant influence on the housing price of UK. Thus, this hypothesis is used to determine the relationship between the lending rate and house price index in Malaysia.

2.5.4 Real Property Gain Tax

H_0 : There is no significant relationship between the Real Property Gain Tax and the Housing Price in Malaysia.

H_1: There is a significant relationship between the Real Property Gain Tax and the Housing Price in Malaysia.

According to Ong (2013), the empirical results indicated that real property gain tax is positively correlated with housing price. Thus, this indicates that government have imposed 5 percent of real property gain tax when the seller the house within 5 years. This aims to discourage speculator from selling the house. Hence, this hypothesis is adopted to examine the connection between the real property gain tax and housing price in order to test whether real property gain tax has significant effect on the housing price in Malaysia.

2.5.5 Oil Price

H_0: There is no significant relationship between the Oil Price and the Housing Price in Malaysia

H_1: There is significant relationship between the Oil Price and the Housing Price in Malaysia

According to Idrisov, Kazakova & Polbin (2015), the researchers indicate that there is a short term positive effect of oil prices has combined with long run negative relationship. This study indicates that the increasing of oil price would provide an additional source of investment funding which it could positively impact on accumulated capital within the domestic economy. Consequently, it would also impact on the physical output of products and services. As such, this hypothesis testing is conducted to determine the connection between oil prices and housing price in order to test whether oil price and housing price has important effect on the house price in Malaysia.

2.6 Conclusion

In short, in this chapter, the relationship between independent variables and house price are reviewed from the previous researches and evidences are found to support it. The theoretical frameworks and models are identified to capture the relationship between housing price index with lending rate, unemployment rate, oil price, construction cost, and real property gain tax in Malaysia. Hypotheses also are made in this chapter.

CHAPTER 3: METHODOLOGY

3.0 Introduction

In chapter 3, the methodology and tests adopted to examine the relationships and associations between the chosen variables will be discussed and explained in details. Research methodology is basically a systematic planning that needs to be done when conducting a research. The procedures and steps that have designed and planned are followed by to conduct this research and meet the research objectives.

Also, this chapter will discuss details in the data collection of the chosen variables to gather all the data and transform it into more useful information. Besides, the steps in data processing will be also discussed in this chapter. In addition, the tests and models used in data analysis, correlation analysis and diagnostic checking is explained to ensure the variables used is related in this research in order to examine the relationship and association between the exogenous variables (lending rate, real property gain tax, unemployment rate, oil price and construction cost) and the endogenous variable (housing price).

3.1 Research Design

The research design is outlined for the research methodology and strategy to specifically mention and discuss on the method of data collection, types of measurement and analysis of the data to better further address the research problem in the future work. The independent variables (lending rate, real property gain tax, unemployment rate, oil price and construction cost) is found having a relationship between the dependent variable (housing price) in the previous research from other study and it still ambiguous. Thus, this design is concentrated on the secondary data which is the historical data that collected from others from previous study and the data is on quantitative-based. Besides, the design of this research is more advisable on quantitative-based and also the time series data is used.

3.2 Data Collection Methods

For determination of the relationship between the Malaysia house price index and its six related variables, all the relevant data and information collection is needed. And the data collection method is playing a crucial role in the research (Sekaran & Bougie, 2009). Malaysia price index can measure by MHPI from National Property Information Centre (NAPIC). In Table 3.1 are shown the sources of dependent variable and independent variable. Sekaran & Bougie (2009) stated that data can actually be obtained in the form of primary data or secondary data. Therefore, in this research, the data used are collected from secondary data *(refer to Appendix 3.1)*.

Table 3.1 Sources and measurement of data

Variable	Proxy	Unit measurement	Sources
Malaysia house price index	MHPI	In index	Bloomberg
Construction Cost	CC	In Index	Bloomberg
Unemployment Rate	UR	In percentage,%	Bloomberg
Lending Rate	LR	In percentage,%	Bloomberg
Real Property Gain Tax	RPGT	In percentage,%	Data Stream(JPPH-Valuation and Property Services Department)
Oil Price	OP	In US Dollar, USD	Bloomberg

3.2.1 Secondary Data

The collection method used in this study would be secondary data. In short, secondary data meaning that those data have been collected or conducted by someone before such as like journals, social book ,magazines, articles, historical data and others. Besides, secondary data consists of both quantitative and qualitative form. For quantitative data, it can get from survey and questionnaires, financial statement as well as statistic. Meanwhile, the qualitative data can retrieved from the journal, newspaper and any booklet and publications. The secondary data can be classified into two ways which are qualitative and quantitative. The qualitative data can be easily gets from newspapers, diaries, interviews, transcripts, etc., while the quantitative data can be retrieved from survey, financial statements and statistics.

According to Lowry (2015), the researcher indicates that application of primary data and secondary data. It shows that there is high reliability on secondary data compared with the primary data. In Finance perspective, the researchers are more rely on secondary data collection in their research, even in accounting, operation and information system management which mainly focus in quantitative sources (Lowry, 2015).

There are some advantages that encouraging the usage of secondary data. According to Daas and Arends-Tóth (2012), the researchers mentioned that secondary data is derived from primary data in statistic form. Moreover, secondary data collection is more cost effective compared with primary data since the required information have been provided by previous researchers. Moreover, secondary data provides a greater understanding and comparison along the dependent variable and independent variables (Daas & Arends-Tóth, 2012). The secondary data of the exogenous variables are construction cost, unemployment rate, lending rate, real property gain tax, oil price can directly obtained from the data stream at related website whilst the endogenous variables, Malaysia house price index, can be obtained from National Property Information Centre (NAPIC).

3.2.2 Analytical Tool – EViews

The full name of the software for EViews is Econometric Views. It is one of the Windows- based statistical analysis tool which frequently use by the specialist employer like economists financial analysts, policy decider, government agency and also the related researcher. It can provide a perfect package for any work functioning with time series, cross-section, or longitudinal data. There are some reasons that EViews could be a best choice and it is competitive among others analytical tools or software.

First of all, EViews is an innovative design since it can directly connected with other Microsoft software like power point and Microsoft Excel, and permit the data direct perform in EViews. It also encourage in function automatically with conversation of outside data. This is a drawback for others software since the features cannot be done by other analytical tool. Moreover, EViews is one of a strong analytical device. For instance, it supports the long run variance calculation, multiple equation linear and nonlinear least square conductors. EViews are also advance in both stationary and non-stationary panel data analysis. It is less time consuming since the function is convenience to be used and the outcome of result would be retrieved in seconds.

Furthermore, EViews provides multitasking such as forecasting, stimulating and performing multiple equations. It can update the results immediately whenever a new data or changes is added. The presentation outcome is easy to read with consisted of custom graph and tables which can link to the data input and also link to other software. Through the outcome compute in EViews, some problem may insignificant like heteroscadasticity, autocorrelation and multicollinearity problem can be detected effectively by application of EViews (Rajesh, Madhvapaty & Sahani 2017). The researchers can review and interpret the results in logical manner.

In this study, E-views 8 will be applied in aim to for the empirical result. And the results will use to analyse the findings since E-views 8 is the most suitable in time-series data evaluation. Moreover, E-view 8 will be used to run ordinary least square (OLS), multicollinearity tests (Correlation Analysis, Variance Inflating Factor, and Tolerance), Autoregressive Conditional Heteroscedasticity (ARCH) test, Breusch-Godfrey LM test, Ramsey RESET test, and Jarque-Bera test.

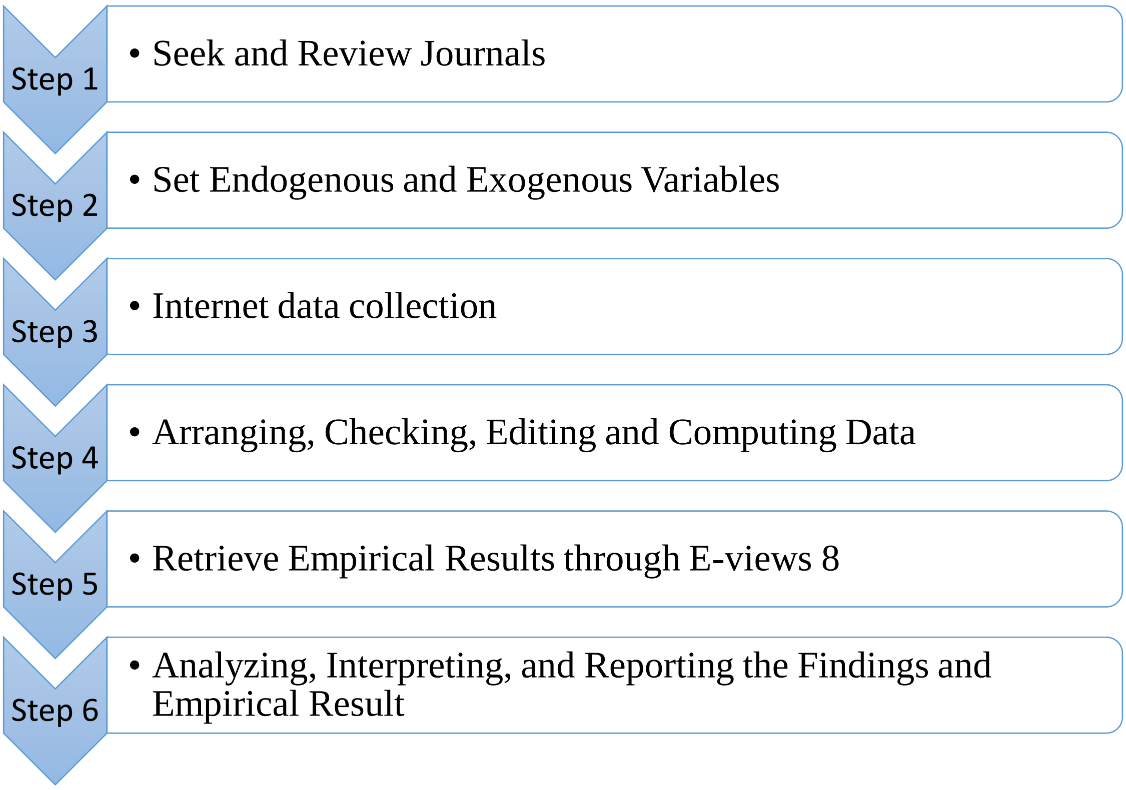
3.3 Data Processing

Data processing means the procedure of managing data preparation to data interpretation. It is transforming an idle numerical data into useful information through specified software such as E-view 8. The key steps in this procedure are data checking, editing and computing. Besides, the result could with lower chance of having any misleading result if the data are stated with special or unusual treatment before begin analyzing.

In this research, accuracy and consistency of the data would be confirmed by data checking in order to prevent any error made by human calculation. If there is any mistake emerged, the data editing would then apply to amend the error. Last but not least, the results will then be computed precisely by using E-view 8 in data computing.

In this section, data processing would indicate how this research setting the endogenous variable (Malaysian Housing Price Index) and exogenous variable (real property gain tax, unemployment rate, lending rate, oil price, and construction price) by assessing the journals done by various researchers to get better information and understanding about the determinants of housing price index. Thus, it is also describing about collecting the data of Malaysia Housing Price Index, real property gain tax, unemployment rate, lending rate, oil price and construction price until the interpretation of empirical results.

Figure 3.1: The Steps of Data Processing



Step 1: Seek and Review Journals

There are various journals related with determinants of the housing price index have been found on the online database such as ScienceDirect, Google Scholar and et cetera. These researches of the journals consist of different countries and there would be around 100 journals have been chosen and reviewed for summary purpose.

Step 2: Set Endogenous and Exogenous Variables

Endogenous and exogenous variables are set through the discussion based on the summaries of around 100 journals and data availability. In this research, it would be using quarterly data due to data availability of endogenous and sample size issue. Furthermore, the exogenous variables are chosen by going through the journals. However, real property gain tax, unemployment rate, lending rate, oil price, and construction price are chosen for this research in order to fulfill the requirements of quarterly data and data availability.

Step 3: Internet data collection

The data of exogenous variable are collected from Data Stream and the endogenous variable are collected from National Property Information Centre (NAPIC).

Step 4: Arranging, Checking, Editing and Computing Data

Collected data would be arranged in an excel file. A skim checking to make sure data are in according sequence and in column form was done. After that, data editing would also be used while there is any error occurred. Last but not least, data will be computed to detect whether there is any error in empirical model through diagnostic checking. If there are any econometric problems emerged, it would be overcome by using data editing to amend or E-view 8.

Step 5: Retrieve Empirical Results through E-view 8

If the model is ensured with no problem, E-views 8 would be used to run the OLS to retrieve the empirical result. Therefore, t-test, F-test could be run and R^2 and adjusted R^2 could be obtained.

Step 6: Analyzing, Interpreting, and Reporting the Findings and Empirical Result

Identify the significance of individual exogenous variables and the model. After that, interpret the results of significance of the exogenous and model, R^2 and adjusted R^2. Furthermore, comparison would be made on these results with previous researchers and to make sure whether the results are consistent with the hypothesis made in Chapter 1.

3.4 Data Analysis

3.4.1 Descriptive Data

3.4.1.1 Mean

In statistic, mean is an average of a group of numbers or data points. A set of numbers has been calculated as “central” of value.

3.4.1.2 Median

A median can be defined as the middle of number in a sorted list of numbers. In order to determine the median value in a sequence of numbers, it must first be arranged the value from lowest to highest.

3.4.1.3 Mode

Mode can be considered as a statistical term which has the most frequent occurred number that showed in the data. The mode can be determined by collecting and organizing the data in order to count the frequency emerged of each result. The most frequently occurrences of result would be the mode of the data set.

3.4.1.4 Standard deviation

Standard deviation is where a measure of the mean's dispersion of a set of data of each other. It can be defined by using the square root of variance. There would be higher standard deviation within a data set as well as higher fluctuation if the data between each other are further from the mean.

3.4.2 Ordinary Least Square (OLS)

Ordinary Least Square defines the association between endogenous variable and exogenous variable. Besides, the assumptions of Classical Normal Linear Regression Model (CNLRM) to be fulfilled in order to use are as below:

1. There are parameters in the regression model
2. X values are fixed in repeated sampling, or Zero covariance between μ_i and X_i
3. Zero mean value of disturbance term, μ_i
4. Homoscedasticity or equal variance of μ_i
5. No autocorrelation between the disturbances
6. The number of observation (n) n must be greater than the number of parameters to be estimated (k)
7. No multicollinearity
8. X values are variability
9. Model are correctly specified, therefore will be no specification problems

Once these requirements are fulfilled, then the OLS will be BLUE or else it could have misleading result.

BLUE concept is constructed from Best, Linear, Unbiased, and Efficient. They are defined as below:

- Best defines the estimators have minimum variance

- Linear defines the parameters are linear form
- Unbiased defines that the expected values are approximately or equal to the true values
- Efficient defines the estimators are precise and reliable.

Misleading results are normally caused by multicollinearity, heteroscedasticity, autocorrelation and normal assumption hasn't met. Thus, this research will be using E-view 8 to run diagnostic checking to prevent from these econometric problems.

This research would be forming a regression model on housing price index with real property gain tax, unemployment rate, lending rate, oil price, and construction price by using OLS in E-views 8.

3.4.2.1 T-test Statistics

H_0: $\beta_1 = 0$. $\beta_2 = 0$, $\beta_3 = 0$, $\beta_4 = 0$, $\beta_5 = 0$ (Insignificant)
H_1: $\beta_1 \neq 0$, $\beta_2 \neq 0$, $\beta_3 \neq 0$, $\beta_4 \neq 0$, $\beta_5 = 0$ (Significant)

Where, β_1 = Real property gain tax
β_2 = Unemployment tax
β_3 = Lending rate
β_4 = Oil price
β_5 = Construction price

The t-test defines the mean of the two groups are statistically difference among each other. The founder named William Sealy Gosset created and proposed t-test to overcome problem associated with small sample size (n<30). The reason is research with small sample size would tend to cause the estimated mean and standard deviation to be difference from actual mean and standard deviation. Thus, the assumption of t-test is the population standard deviation is unknown and normally disturbed.

T-test is used to determine the significance association between endogenous variable and exogenous variables have no importance association in between. Besides, the alternative hypothesis testing represents that the exogenous variables are statistically importance to endogenous variable. Thus, if the t-test statistic of the result is found more than the critical value, it indicates means are significantly different at the level of alpha. Nevertheless, if the exogenous variable's p-value is more than the alpha (0.05), then there is 95% chance of being significant different. Meanwhile, if p is less than the significance level of 5%., then the null hypothesis would be rejected, vice versa.

Therefore, this research would test real property gain tax, unemployment rate, lending rate, oil price, and construction price individually to determine their individual significances on housing price index in Malaysia by using t-test.

3.4.2.2 F-test Statistic (ANOVA)

H_0: $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$ (Insignificant)
H_1: $\beta_i \neq 0$, at least one of β_i is different from zero, where i = 1, 2, 3 & 4 (Significant to
Y)

Where, Y = Housing price index in Malaysia
β_1 = Real property gain tax
β_2 = Unemployment tax
β_3 = Lending rate
β_4 = Oil price
β_5 = Construction price

F-test statistic defines the variances of two population are equal. Analysis of variance (ANOVA) usually is used to control one or more exogenous variables and to observe the impacts on the endogenous variable to see the response of the exogenous variables. The assumption of the F-test is the populations are normally distributed and also the samples are selected randomly. Besides, it must be large sample size and population must have same variance.

Thus, the whole model can be determined whether it is a significance model by using the F-test. Null hypothesis indicates that no exogenous variable is significant to endogenous variable where alternative hypothesis is significant to endogenous variable. For instance, if the F-statistic result is higher than its critical value, then the null hypothesis will be rejected. It indicates at least one of the parameter is linearly associated to the response. On the other hand, it can also be tested with p-value. If the p-value is less than the alpha, then the null hypothesis would be rejected, vice versa.

Therefore, this research will be testing the significance of the whole model on determinants of housing price index in Malaysia by using F-test.

3.5 Diagnostic Checking

3.5.1 Multicollinearity

According to Abdi (2007), multicollinearity examines the relationship between explanatory variables. If multicollinearity exists in the model, it is difficult to tell which exogenous variables are affecting the endogenous variable. Multicollinearity will cause the estimated coefficients to have high standard errors. Thus, there are few ways to find the problem of multicollinearity in the model.

Firstly, according to Gujarati (2012), if the results of the test showed a high R-squared in the model and few significant exogenous variables, the model is said to have multicollinearity problem. Next, high pair-wise correlation between two exogenous variables is another method of detecting multicollinearity as correlation test can be conducted to calculate the degree of correlation among the two or more random variables from the range of -1 to +1. The positive correlation indicates that the correlation is between 0 and 1 (0 < r1, 2 < r1, 2 < 0). Therefore, if correlation between two exogenous variables is higher than 0.8, ignoring the signs, the model may have the potential of a severe multicollinearity. The other two ways are variance inflation factor (VIF) and tolerance (TOL), which can be used to find the seriousness of multicollinearity. By conducting the least square test using one of the independent variables as dependent variable on the model's remaining regressors in order to find the R-squared, and putting the determination coefficient into the formula, the results of variance inflation factor and tolerance can be determined. The same steps are repeated for every exogenous variable. If the VIF is higher, the multicollinearity problem in the model is more serious. A VIF of more than 10 indicates a serious multicollinearity exists in the model (Gujarati, 2012). Or else, there is no serious multicollinearity problem between independent variables. If VIF is equal to 1, it means that no multicollinearity between independent variables.

$$VIF = 1 / R2$$

$$TOL = 1 / VIF$$

TOL is inverse method of VIF. If TOL is equal to 1, it means the model is not exposing to multicollinearity problem. If TOL is equal to 0, the model is likely to experience serious multicollinearity problem.

In this study, these 4 methods would be applied to detect whether there is any linear relationship among construction cost, real property gain tax, lending rate, unemployment rate, and oil price.

3.5.2 Autocorrelation

H_0: No autocorrelation among the error terms

H_1: Autocorrelation among the error terms

Autocorrelation is defined as correlation of a time series with the past and future values. Autocorrelation can be known as “serial correlation” or “lagged correlation” that refers to disturbance term of any observations that is correlated to the other observations’ disturbance term. If it happened, it violates the CLRM assumptions. The positive autocorrelation means the tendency to have the same sign from a period to the other. For example, the probability of tomorrow being cooler is higher if the weather today is rainy. The negative autocorrelation can be said that the disturbance term has a tendency to change the sign from positive to negative and back again in consecutive observation. Next, spatial autocorrelation is calculated by degree of data value that is attributable to their relatively close locational position (Basu & Thibodeau, 1998). Housing price may experience spatial autocorrelation such as the neighbourhood tends to develop at the same time and identical design and that the neighbourhood residential properties share location amenities (Basu & Thibodeau, 1998).

Autocorrelation normally will appear in time series data where the model left out relevant independent variables, data problem or data manipulation, and applied wrong functional form. When the model left out significant independent variables and applied wrong functional form, it causes the estimated parameters to become biased, inconsistent, and inefficient. Nevertheless, when data manipulation or data problem exists, the estimated parameters will remain consistent and unbiased, but inefficient. Therefore, the problem of autocorrelation can be detected by Breusch-Godfrey LM Test, Durbin-Watson Test, and Durbin’s h Test. As Durbin-Watson Test has some limitations, such as providing inconclusive results and only applicable for first order of series correlation and Durbin’s h test has lagged dependent variable problem, this study will conduct Breusch-Godfrey LM test to examine whether autocorrelation exists among the error terms. Null hypothesis suggests that autocorrelation does not exist among the error terms, while the alternative hypothesis suggests that autocorrelation exists among the error terms. Therefore, if the test statistics is more than the critical value or the p-value is lower than 5% significance level, the null hypothesis will be rejected. Otherwise, the null hypothesis will not be rejected. When there is an autocorrelation problem, Newey-West Method will be applied to solve this problem.

3.5.3 Heteroskedasticity

H_0: Heteroskedasticity among error terms.

H_1: Homoscedasticity among error terms.

One of the main assumptions of the OLS estimators is the error terms of the independent variables should be homoscedasticity among each other. Heteroskedasticity happens when the error terms of independent variables are correlated with each other and sharing different variances. The assumptions of the OLS estimators to perform in the best condition is that the OLS estimators should be BLUE (best, linear and unbiased estimators). With the presence of heteroskedasticity problem, the assumptions of OLS estimators no longer hold. The OLS estimators are unable to perform in the best condition since the OLS estimators with the presence of heteroskedasticity problem are unable to estimate with the smallest variance and it may eventually cause to the either too high or too low significant tests due to the biased standard errors and variances. Henceforth, the model will be biased and the data analysis tends to be inaccurate and inefficient.

However, there are several ways to detect heteroskedasticity problem, for instance, Breusch-Pagan-Godfrey test, Park test, White test, Goldfeld-Quandt test and Autoregressive Conditional Heteroskedasticity (ARCH) test.

In our studies, we carried out Autoregressive Conditional Heteroskedasticity (ARCH) test to find the problem of heteroscedasticity because ARCH test is only applicable for time series data, which fulfilled the requirement of our study.

Null hypothesis indicated homoscedasticity among error terms, whereas alternative hypothesis indicated heteroscedasticity among error terms. Hence, if test statistic is more than the critical value or the p-value is lower than 5% significant level, then null hypothesis will be rejected. Otherwise, the null hypothesis will not be rejected. If the null hypothesis is being rejected, the heteroscedasticity problem presents in the model, and the White's Heteroscedasticity-Correlated Variances and Standard Error method will be used in order to solve the heteroscedasticity problem to prevent the inaccurate of OLS estimators.

3.5.3.1 Autoregressive Conditional Heteroscedasticity (ARCH) test

The ARCH test was introduced by Engle in year 1982. After the introduction, the ARCH model had been widely used by the researchers in modelling the time series data analysis (Eagle, 1982).

ARCH test explained how the variance of the recent period's error terms is related to the size of the error terms of the previous periods. Therefore, ARCH test is the most suitable test to examine heteroscedasticity problem in this study.

3.5.4 Normality Test

H_0: Normally distribution of error terms

H_1: Not normally distribution of error terms

The normality of the residuals is less significant as long as this study meets the assumptions to the mean and variance covariance structure of the residuals as this study is dealing with large samples. However, Jarque–Bera test will still be carried out to ensure to meet the normality assumption.

Jarque-Bera test can be carried out simply using the E-views software. Jarque-Bera test can examine whether the skewness and kurtosis of the sample match the skewness and kurtosis of normal distribution. Jarque-Bera test statistic is defined as: JB = $N/6$ (S 2 + [(K – 3)^2]/24), where N denotes the sample size, S denotes the sample skewness, and K denotes the sample kurtosis. P-value is determined using a distribution quantiles table. In this study, normality test will be carried out by using E-views 8. Null hypothesis suggests that error term has a normal distribution, while alternative hypothesis indicates that error term does not have a normal distribution. Hence, if the test statistics is more than the critical value or p-value is lower than 5% significance level, then the null hypothesis will be rejected. Otherwise, the null hypothesis will not be rejected.

3.5.5 Model Specification

H_0: Model is precisely specified

H_1: Model is not precisely specified

Model specification is considered one of the most significant diagnostic checking of analysis of data. Omission of relevant variables, adoption of the wrong functional form, inclusion of unnecessary variables, and measurement errors can cause the problem of model specification (Gujarati, 2012). Severe model specification might cause biased estimators and other problems such as autocorrelation, multicollinearity, or heteroscedasticity. Model specification can be determined by Ramsey Regression Equation Specification Error Test (RESET).

Ramsey (1969) proposed a general functional form misspecification test, Regression Specification Error Test (RESET), which has been proven to be useful. The test can be carried out using the E-views software.

In this study, Ramsey RESET test will be carried out by E-views 8. Null hypothesis suggests the model is precisely specified, while the alternative hypothesis indicates that the model is not precisely specified. Hence, if F-test statistics is more than the critical value or p-value is lower than 5% significance level, then the null hypothesis will be rejected. Otherwise, the null hypothesis will not be rejected.

3.6 Conclusion

In a nutshell, there will be some tests are using in order to examine the relationships between the construction costs, lending rate, oil price, real property gain tax (RPGT), oil price, and unemployment rate with the Malaysia Housing Price Index (MHPI). The data type of our study is secondary data, which applied time series data, investigation period is from 2010Q1 to 2017Q4 and the frequency is on quarterly basis. There are total 32 observations have been taken from each independent variable as well as the dependent variable. The data of independent variables are obtained from DataStream and Bloomberg, whereas the data of dependent variable are collected from National Property Information Centre (NAPIC). Other than that, this study also provided the flow of data process to give the readers have a better understanding on processing the meaningless raw data into useful information by using E-view 8. Besides that, T-test and F-test are employed to examine the relationship between regressors and regressand and knowing the significance of the predictor variables on the predicted variable as well as the reliability of the model. Moreover, there will be a series of diagnostic checking tests carried out to prevent economic problems in the model. The diagnostic checking tests will be employed are multicollinearity test, Breusch-Godfrey test, Autoregressive Conditional Heteroskedasticity (ARCH) test, Jarque-

Bera test, and lastly, Ramsey RESET test. Last but not least, all the tests will be carried out and the result will be shown in Chapter 4.

CHAPTER 4: DATA ANALYSIS

4.0 Introduction

As mentioned in chapter three, Ordinary Least Square (OLS) Regression has been used as the main model in this research to study the housing price market from first quarter of 2010 to the last quarter of 2017 in Malaysia. This study comprises of 32 observations and focuses on quarterly performance.

Research methodologies of the study will be discussed thoroughly. Multiple tests, hypothesis testing (T-test and F-test) and diagnostic checking (Multicollinearity, Heteroscedasticity, Autocorrelation, Normality of the error term and Model Specification), will be carried out to ensure that the hypothesis as well as the data is validated and reliable. Therefore, in this chapter, the analysis and interpretations of the results will be presented in a well-organised manner.

4.1 Description of the Empirical Models

Several economic models will be used to illustrate and examine the relationship between housing price index with oil price, lending rate, unemployment rate, construction cost, and real property gain tax in Malaysia from 2010 Q1 to 2017 Q4.

Economic Model:

$\mathrm{MHPI}_t = \beta_0 + \beta_1\mathrm{OIL}_t + \beta_2\mathrm{LR}_t + \beta_3\mathrm{UR}_t + \beta_4\mathrm{CC}_t + \beta_5\mathrm{RPGT}_{ti} + \mu_t$ (**Model 4.1**)

$\mathrm{MHPI}_t = \beta_0 + \log\beta_1\mathrm{OIL}_t + \log\beta_2\mathrm{LR}_t + \log\beta_3\mathrm{UR}_t + \log\beta_4\mathrm{CC}_t + \log\beta_5\mathrm{RPGT}_{ti} + \varepsilon_t$ (**Model 4.2**)

Estimated Economic Model:

$\widehat{MHPI}_t = \widehat{\beta}_0 + \log \widehat{\beta_1} OIL_t + \log \widehat{\beta}_2 LR_t + \log \widehat{\beta}_3 UR_t + \log \widehat{\beta}_4 CC_t + \log \widehat{\beta}_5 RPGT_{ti} + \widehat{\varepsilon}_t$ (**Model 4.3**)

N = 32 observations t = 2010 Q1 – 2017 Q4 i = 1, 2, 3, 4, 5

Where,

$MHPI_t$ = Housing Price Index in Malaysia from 2010 Q1 to 2017 Q4 (Index)

OIL_t = Oil Price of Malaysia from 2010 Q1 to 2017 Q4 (USD)

LR_t = Lending Rate in Malaysia from 2010 Q1 to 2017 Q4 (%)

UR_t = Unemployment Rate in Malaysia from 2010 Q1 to 2017 Q4 (%)

CC_t = Population Growth in Malaysia from 2010 Q1 to 2017 Q4 (Index)

$RPGT_{ti}$ = Real Property Gain Tax in first to fifth year in Malaysia from 2010 Q1 to 2017 Q4 (%)

Model 4.2 is the fundamental model of the study. Housing price is examined by using the 4 exogenous variables, which are OIL, LR, UR, CC, and RPGT. Oil price is measured by US Dollar, construction cost is measured in Index, whereas the remaining independent variables (LR, UR and RPGT) are measured in percentage form. Based on the Real Property Gains Tax Act 1976, RPGT is a tax which charge on the gains of disposal of property and the percentage charged on first year to fifth year is different. Therefore, all the tests will be carried out five times to test with these RPGT while other variables remain constant. An error term denoted by *εt* is inserted into the equation to take into account of the random errors that would stem out upon testing.

4.2 Data and Descriptive Statistic

Table 4.1 (By referring to Appendix 4.1)

	MHPI	OIL	LR	UR	CONC

Mean	144.1500	0.532622	1.879873	1.157467	5.613923
Median	145.8500	0.667125	1.877172	1.163151	5.631764
Maximum	186.3000	0.932558	1.918392	1.280934	5.828681
Minimum	97.20000	-0.125677	1.750937	0.993252	5.372543
Std. Dev	28.67168	0.343368	0.036762	0.075618	0.106656
Skewness	-0.159268	-0.453219	-1.718040	-0.277788	-0.211058
Kurtosis	1.661976	1.673696	6.446497	2.143740	2.617266
Observations	32	32	32	32	32

Table 4.2 (By referring to Appendix 4.1)

	RPGT1	**RPGT2**	**RPGT3**	**RPGT4**	**RPGT5**
Mean	2.815931	2.815391	2.591961	2.389228	2.245387
Median	3.054624	3.054624	2.851891	2.649159	2.505318
Maximum	3.401197	3.401197	3.401197	2.995132	2.708050
Minimum	1.609438	1.609438	1.609438	1.609438	1.609438
Std. Dev	0.658881	0.658881	0.849990	0.652846	0.517163
Skewness	-0.561957	-0.561957	0.160090	-0.250067	-0.355669
Kurtosis	1.927418	1.927418	1.152889	1.210248	1.254958
Observations	32	32	32	32	32

In this study, there will be 32 observations comprised of time-series quarterly data. They are taken from the housing price index including all types of houses in Malaysia from 2008 to 2017.

Based on the table 4.2.1, the results indicate that average Malaysia housing price index is 144.15. The highest reading of housing price is 186.3 meanwhile the lowest reading is 97.2. Therefore, this has led to a big standard deviation of 28.67 as the housing price approximately to 10 years. The main reason that causing huge standard deviation is because of wide range of sampled data has been used. However, it doesn’t affect much or create an issue. The medium of the Malaysia housing price is 145.85. Moreover, the housing price index in this study is skewed to right because the skewness is less than zero which is -0.159268. The data of Malaysia housing price index is considered having less volatility since the Kurtosis is less than 3 which is 1.661976.

Besides that, the average oil price is $ 0.53 and the price peak to $ 0.93 meanwhile the lowest reading is $-0.13 from 2008 Q1 to 2017 Q4. Moreover, the standard deviation of result was 28.67. The median of the oil price is $ 0.67 and the skewness of oil price is skewed to the right side since the skewness is less than zero which is -0.453219. The data of oil price is considered less volatile since the Kurtosis is less than 3 which is 1.673696.

Furthermore, the average lending rate from the result was 1.88%. The highest lending rate was 1.92% meanwhile the lowest was 1.75% from 2008 Q1 to 2017 Q4. Besides, the standard deviation was 0.036762. The median of the lending rate was 1.87% and the skewness of lending is right-skewed because the skewness is less than zero which is -1.718040. The data of lending rate would more likely to be volatile since the Kurtosis is more than 3 which is 6.446477.

In addition, the average for unemployment rate from the result was 1.16%. The highest unemployment rate shot up to 1.28% meanwhile the lowest was 0.99%. The standard deviation was 0.075618 and it is right-skewed since the skewness is less than zero which is -0.277788. The data of unemployment rate would less likely to be volatile since the Kurtosis is less than 3 which is 2.14374.

The average for construction cost is 5.613 and the highest reading from the result was 5.8287 meanwhile the lowest reading was 5.3725 from 2008 Q1 to 2017 Q4. The standard deviation in this case is 0.106656 and it was right-skewed since the skewness is less than zero which is -0.211058. The data of construction cost has less volatility since the Kurtosis is less than 3 which is 2.617266.

Based on the table 4.1.2, it shows that RPGT 1 have the highest reading of 3.41197% and the lowest reading of 1.609438%. It comes out an average value for RPGT 1 is 2.815931% and the median for RPGT1 is 3.054624%. The standard deviation is 0.658881 and it show that the RPGT 1 is right- skewed because the skewness for RPGT 1 is in negative value which is -0.561957. About the kurtosis of 1.927418, it showed that RPGT 1 is less volatile in this case since the kurtosis is less than 3.

For RPGT 2, the table show that it had a totally same data reading with RPGT 1 which is means equal to 2.815391%, maximum reading of 3.41197% minimum reading of 1.609438% and the median for RPGT1 is 3.054624%. Since the standard deviation of 0.658881 is same with RPGT 1 so the skewness for RPGT 2 also will skewed to right side. This case showed that RPGT 2 is less volatile since the kurtosis is less than 3 which is 1.927418.

Moreover, the average of RPGT 3 is show as 2.591961%. The highest reading of RPGT 3 is up to 3.401197% and the lowest reading is 1.609438%. The standard deviation is show as 0.849990 and the median is 2.51891%. The skewness of RPGT 3 will skewed to left side because it is positive value which is 0.160090. About the kurtosis of 1.152889, it showed that RPGT 3 is less volatile in this case since the kurtosis is less than 3.

In addition, the average for RPGT 4 from the result was 2.389228%. The highest RPGT is shot up to 2.995132% meanwhile the lowest was 1.60948%. The standard deviation was 0.652846, median reading was 2.649159% and it is right-skewed since the skewness is less than zero which is -0.250067. The data of unemployment rate would less likely to be volatile since the Kurtosis is less than 3 which is 2.14374.

Besides that, the results indicate the average reading for RPGT 5 is 2.245387 %. The lowest rate for RPGT 5 is 1.609438 which is same with RPGT 1 to RPGT 4. The highest rate is show as 2.708050% and the median of 2.24587%. Standard deviation of RPGT 5 is 0.517163 and it is skewed to right because the skewness is less than zero which is -0.355669. The data of RPGT 5 is considered having less volatility since the Kurtosis is less than 3 which is 1.254958.

4.3 Hypothesis Testing

Hypothesis testing would be carried out in this study to make sure that no econometric problems exist in the estimated regression model. Moreover, the results are interpreted accordingly.

4.3.1 T-test

These particular tests are likely to identify the significant of each exogenous variable with the housing price index by using the p-value at the significance level of 5%. ($\alpha = 0.05$)

1. RPGT 1

Hypothesis:

H_0: $\beta_i = 0$

H_1: $\beta_i \neq 0$ i= oil price, lending rate, unemployment rate, construction cost & RPGT1

Decision Rule:

Reject H_0 if the p-value of the test statistic is less than the significance level of 5%. Otherwise, do not reject H_0.

Table 4.3: Test-statistic (By referring to Apendix 4.2)

Oil price	0.4298

Lending rate	0.1658
Unemployment rate	0.0097
Construction cost	0.0126
Real property gain tax 1	0.0000

Decision Making:

Do not reject H_0 since the p-value for oil price is greater than the 5% significance level

Do not reject H_0 since the p-value for lending rate is greater than the 5% significance level

Reject H_0 since the p-value for unemployment rate is lower than 5% significance level

Reject H_0 since the p-value for construction cost is lower than 5% significance level

Reject H_0 since the p-value for RPGT 1 is lower than 5% significance level

Conclusion:

There is insufficient evidence to conclude that oil price and lending rate individually and significantly influencing on the housing price index at 5% significance level.

There is enough evidence to conclude that unemployment rate, construction cost and RPGT1 individually and significantly influencing on the housing price index at 5% significance level.

2. RPGT 2

Hypothesis:

H_0: $\beta_i = 0$

H_1: $\beta_i \neq 0$ i= oil price, lending rate, unemployment rate, construction cost & RPGT2

Decision Rule:

Reject H_0 if the p-value of the test statistic is less than the significance level of 5%. Otherwise, do not reject H_0.

Table 4.4: Test-statistic (By referring to Apendix 4.2)

Oil price	0.4298
Lending rate	0.1658
Unemployment rate	0.0097
Construction cost	0.0126
Real property gain tax 2	0.0000

Decision Making:

Do not reject H_0 since the p-value for oil price is more than the significance level of 5%

Do not reject H_0 since the p-value for lending rate is more than significance level of 5%

Reject H_0 since the p-value for unemployment rate is less than significance level of 5%

Reject H_0 since the p-value for construction cost is less than significance level of 5%

Reject H_0 since the p-value for RPGT 2 is less than significance level of 5%

Conclusion:

There is insufficient evidence to conclude that oil price and lending rate individually and significantly influencing on the housing price index at 5% significance level.

There is enough evidence to conclude that unemployment rate, construction cost and RPGT2 individually and significantly influencing on the housing price index at 5% significance level.

3. RPGT 3

Hypothesis:

H_0: $\beta_i = 0$

H_1: $\beta_i \neq 0$ i= oil price, lending rate, unemployment rate, construction cost & RPGT3

Decision Rule:

Reject H_0 if the p-value of the test statistic is less than the significance level of 5%. Otherwise, do not reject H_0.

Table 4.5: Test-statistic (By referring to Apendix 4.2)

Oil price	0.3964
Lending rate	0.0001
Unemployment rate	0.0015
Construction cost	0.0418
Real property gain tax 3	0.0000

Decision Making:

Do not reject H_0 since the p-value for oil price is more than the significance level of 5%

Reject H_0 since the p-value for lending rate is more than significance level of 5%

Reject H_0 since the p-value for unemployment rate is less than significance level of 5%

Reject H_0 since the p-value for construction cost is less than significance level of 5%

Reject H_0 since the p-value for RPGT 3 is less than significance level of 5%

Conclusion:

There is insufficient evidence to conclude that oil price individually and significantly influencing on the housing price index at 5% significance level.

There is enough evidence to conclude that lending rate, unemployment rate, construction cost and RPGT3 individually and significantly influencing on the housing price index at 5% significance level.

4. RPGT 4

Hypothesis:

H_0: $\beta_i = 0$

H_1: $\beta_i \neq 0$ i= oil price, lending rate, unemployment rate, construction cost & RPGT4

Decision Rule:

Reject H_0 if the p-value of the test statistic is less than the significance level of 5%. Otherwise, do not reject H_0.

Table 4.6: Test-statistic *(By referring to Apendix 4.2)*

Oil price	0.5317
Lending rate	0.0001
Unemployment rate	0.0013
Construction cost	0.0408
Real property gain tax 4	0.0000

Decision Making:

Do not reject H_0 since the p-value for oil price is more than the significance level of 5%

Reject H_0 since the p-value for lending rate is more than significance level of 5%

Reject H_0 since the p-value for unemployment rate is less than significance level of 5%

Reject H_0 since the p-value for construction cost is less than significance level of 5%

Reject H_0 since the p-value for RPGT 4 is less than significance level of 5%

Conclusion:

There is insufficient evidence to conclude that oil price individually and significantly influencing on the housing price index at 5% significance level.

There is enough evidence to conclude that lending rate, unemployment rate, construction cost and RPGT4 individually and significantly influencing on the housing price index at 5% significance level.

5. RPGT 5

Hypothesis:

H_0: $\beta_i = 0$

H_1: $\beta_i \neq 0$ i= oil price, lending rate, unemployment rate, construction cost & RPGT5

Decision Rule:

Reject H_0 if the p-value of the test statistic is less than the significance level of 5%. Otherwise, do not reject H_0.

Table 4.7: Test-statistic (By referring to Apendix 4.2)

Oil price	0.8364
Lending rate	0.0001
Unemployment rate	0.0016
Construction cost	0.0293
Real property gain tax 5	0.0000

Decision Making

Do not reject H_0 since the p-value for oil price is more than the significance level of 5%

Reject H_0 since the p-value for lending rate is more than significance level of 5%

Reject H_0 since the p-value for unemployment rate is less than significance level of 5%

Reject H_0 since the p-value for construction cost is less than significance level of 5%

Reject H_0 since the p-value for RPGT 5 is less than significance level of 5%

Conclusion

There is insufficient evidence to conclude that oil price individually and significantly influencing on the housing price index at 5% significance level.

There is enough evidence to conclude that lending rate, unemployment rate, construction cost and RPGT5 individually and significantly influencing on the housing price index at 5% significance level.

4.3.2 F – Test

F test is not similar to T test. F-test determines the overall significance of the model as a whole by including all exogenous variables which are lending rate (LR), oil price (OP), unemployment rate (UR), real property gain tax (RPGT), and construction cost (CC). The result for the test is as the following:

Hypothesis:

H0: $\beta1 = \beta2 = \beta3 = \beta4 = \beta5 = 0$ (The model is insignificant)

H1: At least one of the βi is different from zero, where i = 1, 2, 3, 4, 5 (At least one exogenous variable is important to the model)

Decision Rule:

Reject H0, if the p-value of F-test statistics is less than the 5 % significance level. Otherwise, do not reject H0.

Decision-Making:

Reject H0, because the p-value of F- test statistics is 0.000000, which is less than the 5% significance level.

Conclusion:

Based on the above result, at least one of the βi is different from zero at the significance level of 5% with adequate evidence. It means that at least one exogenous variable (OP, LR, UR, RPGT1-5, and CC) that is significantly explaining housing price index in Malaysia.

4.4 Diagnostic Checking

Several diagnostic checking would be approached such as multicollinearity, autocorrelation, heteroscedasticity, model specification and normality of error term to make sure that model is significant in the study. There will be solution(s) to solve for every econometric problem that exists; it would be either solves them or reducing even removing the problem(s) entirely.

4.4.1 Multicollinearity Test

Multicollinearity test is used to test the model on the independent variables to see whether the variables are correlated. If the multicollinearity problem exists in the model, the precision of the estimated results will decrease as the effect of the variable depends on the others. There are ways to detect the multicollinearity problem in a model (Jim Frost, 2017).

Hypothesis:

H_0: There is no multicollinearity problem existed among the independent variables.
H_1: There is multicollinearity problem existed among the independent variables.

i. High R^2 but few significant independent variables

Table 4.8: Results of Initial regression output with different RPGT (By referring to Apendix 4.2)

Initial regression output	R-squared	Independent variables
With RPGT1	0.941398	3 significant
With RPGT2	0.941398	3 significant
With RPGT3	0.934575	4 significant
With RPGT4	0.939463	4 significant
With RPGT5	0.940829	4 significant

Based on the results, the model has high R-squared but not few significant independent variables. There is no multicollinearity problem existed in the model.

ii. High pair-wise correlation coefficients

Table 4.9: Correlation matrix analysis (By referring to Apendix 4.3)

	LOGOIL	**LOGLR**	**LOGUR**	**LOGCONC**	**LOGRPGT1**
LOGOIL	1.000000	0.520157	0.561116	0.400796	0.609447
LOGLR	0.520157	1.000000	0.112134	0.416127	0.828777
LOGUR	0.561116	0.112134	1.000000	0.040773	0.032157
LOGCONC	0.400796	0.416127	0.040773	1.000000	0.647757
LOGRPGT1	0.609447	0.828777	0.032157	0.647757	1.000000

	LOGOIL	**LOGLR**	**LOGUR**	**LOGCONC**	**LOGRPGT2**
LOGOIL	1.000000	0.520157	0.561116	0.400796	0.609447
LOGLR	0.520157	1.000000	0.112134	0.416127	0.828777
LOGUR	0.561116	0.112134	1.000000	0.040773	0.032157
LOGCONC	0.400796	0.416127	0.040773	1.000000	0.647757
LOGRPGT2	0.609447	0.828777	0.032157	0.647757	1.000000

	LOGOIL	**LOGLR**	**LOGUR**	**LOGCONC**	**LOGRPGT3**
LOGOIL	1.000000	0.520157	0.561116	0.400796	0.694835
LOGLR	0.520157	1.000000	0.112134	0.416127	0.694965
LOGUR	0.561116	0.112134	1.000000	0.040773	0.113772
LOGCONC	0.400796	0.416127	0.040773	1.000000	0.712736
LOGRPGT3	0.694835	0.694965	0.113772	0.712736	1.000000

	LOGOIL	LOGLR	LOGUR	LOGCONC	LOGRPGT4
LOGOIL	1.000000	0.520157	0.561116	0.400796	0.670969
LOGLR	0.520157	1.000000	0.112134	0.416127	0.697147
LOGUR	0.561116	0.112134	1.000000	0.040773	0.096536
LOGCONC	0.400796	0.416127	0.040773	1.000000	0.713103
LOGRPGT4	0.670969	0.697147	0.096536	0.713103	1.000000

	LOGOIL	LOGLR	LOGUR	LOGCONC	LOGRPGT5
LOGOIL	1.000000	0.520157	0.561116	0.400796	0.637699
LOGLR	0.520157	1.000000	0.112134	0.416127	0.694041
LOGUR	0.561116	0.112134	1.000000	0.040773	0.075655
LOGCONC	0.400796	0.416127	0.040773	1.000000	0.707750
LOGRPGT5	0.637699	0.694041	0.075655	0.707750	1.000000

Correlation is a measurement of the relationships between or among the independent variables to see how things are related. A correlation coefficient shows the ranges between -1 and 1 which indicates that there is a perfect negative or positive correlation while 0 means there is no correlation between the variables. A positive correlation indicates that those variables will increase or decrease in parallel, while a negative correlation indicates that one of the variables increase and the other decrease. Basically, there are strong correlations between the variables as it moves closer to value of 1, either negative or positive direction. (Ashley Crossman, 2017) There is a high possibility of having serious multicollinearity problem in the regression if the value exceeds 0.8.

Based on the results, the highest pair-wise correlation is between lending rate and RPGT which shows a value of 0.828777. After that, the study will carry out VIF and TOL to test on the multicollinearity problem.

iii. Variance Inflation Factor (VIF) and Tolerance (TOL)

VIF and TOL are used to detect multicollinearity problem in a model. If the VIF value fall between 1 and 10 and TOL value more than zero, the model has no serious multicollinearity and the variance of the regression coefficient is not inflated.

LOGOIL and LOGLR, ***(refer to Appendix 4.4)***

$VIF = 1 / (1 - R^2) = 1 / (1 - 0.270564) = 1.3709$
$TOL = 1 / VIF = 0.7294$

LOGOIL and LOGUR, ***(refer to appendix 4.5)***

$VIF = 1 / (1 - R^2) = 1 / (1 - 0.314851) = 1.4595$
$TOL = 1 / VIF = 0.6851$

LOGOIL and LOGCONC, ***(refer to Appendix 4.6)***

$VIF = 1 / (1 - R^2) = 1 / (1 - 0.160637) = 1.1914$
$TOL = 1 / VIF = 0.8394$

LOGOIL and LOGRPGT1, ***(refer to Appendix 4.7)***

$VIF = 1 / (1 - R^2) = 1 / (1 - 0.371426) = 1.5909$
$TOL = 1 / VIF = 0.6286$

LOGLR and LOGUR, ***(refer to Appendix 4.8)***

$VIF = 1 / (1 - R^2) = 1 / (1 - 0.012574) = 1.0127$
$TOL = 1 / VIF = 0.9874$

<u>LOGLR and LOGCONC, ***(refer to Appendix 4.9)***</u>

$VIF = 1 / (1 - R^2)$ = 1 / $(1 - 0.173161)$ = 1.2074

$TOL = 1 / VIF$ = 0.8268

<u>LOGLR and LOGRPGT1, ***(refer to Appendix 4.10)***</u>

$VIF = 1 / (1 - R^2)$ = 1 / $(1 - 0.686871)$ = 3.1936

$TOL = 1 / VIF$ = 0.3131

<u>LOGUR and LOGCONC, ***(refer to Appendix 4.11)***</u>

$VIF = 1 / (1 - R^2)$ = 1 / $(1 - 0.001662)$ = 1.0017

$TOL = 1 / VIF$ = 0.9983

<u>LOGUR and LOGRPGT1, ***(refer to Appendix 4.12)***</u>

$VIF = 1 / (1 - R^2)$ = 1 / $(1 - 0.001034)$ = 1.0010

$TOL = 1 / VIF$ = 0.9990

<u>LOGCONC and LOGRPGT1, ***(refer to Appendix 4.13)***</u>

$VIF = 1 / (1 - R^2)$ = 1 / $(1 - 0.419589)$ = 1.7229

$TOL = 1 / VIF$ = 0.5804

<u>LOGOIL and LOGRPGT2, ***(refer to Appendix 4.14)***</u>

$VIF = 1 / (1 - R^2)$ = 1 / $(1 - 0.371426)$ = 1.5909

$TOL = 1 / VIF$ = 0.6286

<u>LOGLR and LOGRPGT2, ***(refer to Appendix 4.15)***</u>

$VIF = 1 / (1 - R^2)$ = 1 / $(1 - 0.686871)$ = 3.1936

$TOL = 1 / VIF$ = 0.3131

LOGUR and LOGRPGT2, ***(refer to Appendix 4.16)***

$VIF = 1 / (1 - R^2)$ = 1 / $(1 - 0.001034)$ = 1.0010
$TOL = 1 / VIF$ = 0.9990

LOGCONC and LOGRPGT2, ***(refer to Appendix 4.17)***

$VIF = 1/(1 - R^2)$ = 1 / $(1 - 0.419589)$ = 1.7229
$TOL = 1 / VIF$ = 0.5804

LOGOIL and LOGRPGT3, ***(refer to Appendix 4.18)***

$VIF = 1 / (1 - R^2)$ = 1 / $(1 - 0.482795)$ = 1.9335
$TOL = 1 / VIF$ = 0.5172

LOGLR and LOGRPGT3, ***(refer to Appendix 4.19)***

$VIF = 1 / (1 - R^2)$ = 1 / $(1 - 0.482976)$ = 1.9341
$TOL = 1 / VIF$ = 0.5170

LOGUR and LOGRPGT3, ***(refer to Appendix 4.20)***

$VIF = 1 / (1 - R^2)$ = 1 / $(1 - 0.012944)$ = 1.0131
$TOL = 1 / VIF$ = 0.9871

LOGCONC and LOGRPGT3, ***(refer to Appendix 4.21)***

$VIF = 1 / (1 - R^2)$ = 1 / $(1 - 0.507993)$ = 2.0325
$TOL = 1 / VIF$ = 0.4920

LOGOIL and LOGRPGT4, ***(refer to Appendix 4.22)***

$VIF = 1 / (1 - R^2)$ = 1 / (1 − 0.450199) = 1.8188

$TOL = 1 / VIF$ = 0.5498

<u>LOGLR and LOGRPGT4, ***(refer to Appendix 4.23)***</u>

$VIF = 1 / (1 - R^2)$ = 1 / (1 − 0.486015) = 1.9456

$TOL = 1 / VIF$ = 0.5140

<u>LOGUR and LOGRPGT4, ***(refer to Appendix 4.24)***</u>

$VIF = 1 / (1 - R^2)$ = 1 / (1 − 0.009319) = 1.0094

$TOL = 1 / VIF$ = 0.9907

<u>LOGCONC and LOGRPGT4, ***(refer to Appendix 4.25)***</u>

$VIF = 1 / (1 - R^2)$ = 1 / (1 − 0.508516) = 2.0347

$TOL = 1 / VIF$ = 0.4915

<u>LOGOIL and LOGRPGT5, ***(refer to Appendix 4.26)***</u>

$VIF = 1 / (1 - R^2)$ = 1 / (1 − 0.406659) = 1.6854

$TOL = 1 / VIF$ = 0.5933

<u>LOGLR and LOGRPGT5, ***(refer to Appendix 4.27)***</u>

$VIF = 1 / (1 - R^2)$ = 1 / (1 − 0.481693) = 1.9294

$TOL = 1 / VIF$ = 0.5183

<u>LOGUR and LOGRPGT5, ***(refer to Appendix 4.28)***</u>

$VIF = 1 / (1 - R^2)$ = 1 / (1 − 0.005724) = 1.0058

$TOL = 1 / VIF$ = 0.9943

LOGCONC and LOGRPGT5, ***(refer to Appendix 4.29)***

$VIF = 1 / (1 - R^2) = 1 / (1 - 0.500911) = 2.0037$

$TOL = 1 / VIF = 0.4991$

Table 4.10: Results of VIF

	LOGOIL	**LOGLR**	**LOGUR**	**LOGCONC**	**LOGRPGT1**
LOGOIL	1.0000	1.3709	1.4595	1.1914	1.5909
LOGLR	1.3709	1.0000	1.0127	1.2074	3.1936
LOGUR	1.4595	1.0127	1.0000	1.0017	1.0010
LOGCONC	1.1914	1.2074	1.0017	1.0000	1.7229
LOGRPGT1	1.5909	3.1936	1.0010	1.7229	1.0000

	LOGOIL	**LOGLR**	**LOGUR**	**LOGCONC**	**LOGRPGT2**
LOGOIL	1.0000	1.3709	1.4595	1.1914	1.5909
LOGLR	1.3709	1.0000	1.0127	1.2074	3.1936
LOGUR	1.4595	1.0127	1.0000	1.0017	1.0010
LOGCONC	1.1914	1.2074	1.0017	1.0000	1.7229
LOGRPGT2	1.5909	3.1936	1.0010	1.7229	1.0000

	LOGOIL	**LOGLR**	**LOGUR**	**LOGCONC**	**LOGRPGT3**
LOGOIL	1.0000	1.3709	1.4595	1.1914	1.9335
LOGLR	1.3709	1.0000	1.0127	1.2074	1.9341
LOGUR	1.4595	1.0127	1.0000	1.0017	1.0131
LOGCONC	1.1914	1.2074	1.0017	1.0000	2.0325
LOGRPGT3	1.9335	1.9341	1.0131	2.0325	1.0000

	LOGOIL	LOGLR	LOGUR	LOGCONC	LOGRPGT4
LOGOIL	1.0000	1.3709	1.4595	1.1914	1.8188
LOGLR	1.3709	1.0000	1.0127	1.2074	1.9456
LOGUR	1.4595	1.0127	1.0000	1.0017	1.0094
LOGCONC	1.1914	1.2074	1.0017	1.0000	2.0347
LOGRPGT4	1.8188	1.9456	1.0094	2.0347	1.0000

	LOGOIL	LOGLR	LOGUR	LOGCONC	LOGRPGT5
LOGOIL	1.0000	1.3709	1.4595	1.1914	1.6854
LOGLR	1.3709	1.0000	1.0127	1.2074	1.9294
LOGUR	1.4595	1.0127	1.0000	1.0017	1.0058
LOGCONC	1.1914	1.2074	1.0017	1.0000	2.0037
LOGRPGT5	1.6854	1.9294	1.0058	2.0037	1.0000

Table 4.11: Results of TOL

	LOGOIL	LOGLR	LOGUR	LOGCONC	LOGRPGT5
LOGOIL	1.0000	0.7294	0.6851	0.8394	0.6286
LOGLR	0.7294	1.0000	0.9874	0.8268	0.3131
LOGUR	0.6851	0.9874	1.0000	0.9983	0.9990
LOGCONC	0.8394	0.8268	0.9983	1.0000	0.5804
LOGRPGT5	0.6286	0.3131	0.9990	0.5804	1.0000

	LOGOIL	LOGLR	LOGUR	LOGCONC	LOGRPGT5
LOGOIL	1.0000	0.7294	0.6851	0.8394	0.6286
LOGLR	0.7294	1.0000	0.9874	0.8268	0.3131
LOGUR	0.6851	0.9874	1.0000	0.9983	0.9990

LOGCONC	0.8394	0.8268	0.9983	1.0000	0.5804
LOGRPGT5	0.6286	0.3131	0.9990	0.5804	1.0000

	LOGOIL	**LOGLR**	**LOGUR**	**LOGCONC**	**LOGRPGT5**
LOGOIL	1.0000	0.7294	0.6851	0.8394	0.5172
LOGLR	0.7294	1.0000	0.9874	0.8268	0.5170
LOGUR	0.6851	0.9874	1.0000	0.9983	0.9871
LOGCONC	0.8394	0.8268	0.9983	1.0000	0.4920
LOGRPGT5	0.5172	0.5170	0.9871	0.4920	1.0000

	LOGOIL	**LOGLR**	**LOGUR**	**LOGCONC**	**LOGRPGT5**
LOGOIL	1.0000	0.7294	0.6851	0.8394	0.5498
LOGLR	0.7294	1.0000	0.9874	0.8268	0.5140
LOGUR	0.6851	0.9874	1.0000	0.9983	0.9907
LOGCONC	0.8394	0.8268	0.9983	1.0000	0.4915
LOGRPGT5	0.5498	0.5140	0.9907	0.4915	1.0000

	LOGOIL	**LOGLR**	**LOGUR**	**LOGCONC**	**LOGRPGT5**
LOGOIL	1.0000	0.7294	0.6851	0.8394	0.5993
LOGLR	0.7294	1.0000	0.9874	0.8268	0.5183
LOGUR	0.6851	0.9874	1.0000	0.9983	0.9943
LOGCONC	0.8394	0.8268	0.9983	1.0000	0.4991
LOGRPGT5	0.5933	0.5183	0.9943	0.4991	1.0000

Based on the results calculated, there is no serious multicollinearity problem existed in the model. The results show that the values of VIF are close to 1, fall between 1 and 10. Besides, the TOL values are more than zero. This indicates that the estimated parameters are unbiased and efficient.

4.4.2 Autocorrelation

The autocorrelation problem occurs when the classical assumption, which assumes no autocorrelation between disturbances, is violated in a correctly specified equation. Breusch-Godfrey LM test will be used in this study to determine whether there is autocorrelation among the error terms.

4.4.2.1 Breusch-Godfrey LM Test:

Hypothesis:

H0: There is no autocorrelation exists among the error terms

H1: There is autocorrelation exists among the error terms

Decision rule:

Reject H0, if the p-value of Chi-square is less than the 5% significance level. Otherwise, do not reject H0.

Table 4.12: Breusch Godfrey Serial Correlation LM Test with RPGT1, (refer to Appendix 4.30)

F-statistic	2.250371	**Prob. F(5,21)**	0.0869
Obs*R-squared	11.16399	**Prob. Chi-Square (5)**	0.0482

Table 4.13: Breusch Godfrey Serial Correlation LM Test with RPGT2, (refer to Appendix 4.31)

F-statistic	2.250371	**Prob. F (5,21)**	0.0869
Obs*R-squared	11.16399	**Prob. Chi-Square (5)**	0.0482

Table 4.14: Breusch Godfrey Serial Correlation LM Test with RPGT3, (refer to Appendix 4.32)

F-statistic	2.188120	**Prob. F (5,21)**	0.0942
Obs*R-squared	10.96095	**Prob. Chi-Square (5)**	0.0522

Table 4.15: Breusch Godfrey Serial Correlation LM Test with RPGT4, (refer to Appendix 4.33)

F-statistic	1.935386	**Prob. F (5,21)**	0.1310
Obs*R-squared	10.09429	**Prob. Chi-Square (5)**	0.0726

Table 4.16: Breusch Godfrey Serial Correlation LM Test with RPGT5, (refer to Appendix 4.34)

F-statistic	1.798853	**Prob. F (5,21)**	0.1567
Obs*R-squared	9.595716	**Prob. Chi-Square (5)**	0.0875

Decision-Making:

For test with *RPGT 1* and *RPGT 2*, reject H0, because the p-value of Chi-Squared is 0.0482, which is less than the 5 % significance level.

For test with *RPGT 3, RPGT 4, and RPGT 5,* do not reject H0, because the p-value of Chi-Squared is 0.0522, 0.0726, and 0.0875 respectively, which is more than the 5 % significance level.

Conclusion:

Autocorrelation does exist in the model with RPGT 1 and 2, at the 5% significance level. Autocorrelation does not exist in the model with RPGT 3, 4 and 5, at the 5% significance level.

Since there is an autocorrelation problem in the model with RPGT 1 and 2, Newey-West HAC Standard Errors and Covariance Test will be used to overcome the problem.

4.4.2.2 Remedy for Autocorrelation

Newey-West HAC Standard Errors and Covariance Test:

Table 4.17: Results of Newey-West HAC Standard Errors & Covariance Test
(refer to Appendix 4.35)

	Standard Error	
	OLS Regression	Newey-West Test
Log OIL	7.375103	8.679442
Log LR	74.24660	89.48381
Log UR	27.09715	30.71016
Log CC	18.64302	19.53547
Log RPGT 1 and 2	4.644747	5.422960

** The standard errors are taken from Breusch-Godfrey LM Test and NEWEY-WEST test.

From the table above, the standard error of OIL, LR, UR, CC, and RPGT 1 and 2 have increased after carrying out the Newey-West test. Hence, it shows that the researchers can use Newey-West test to get the standard errors of OLS estimators that are corrected from autocorrelation problem.

4.4.3 Heteroscedasticity Test

Heteroscedasticity test indicates whether the variance of the error terms is not constant between each other observation in the regression model. Whenever there is unequal variance of disturbance term exists, the heteroscedasticity would happen. Basically, it can be found in cross-sectional data or in a time series data. The ordinary least square will not be best, linear, unbiased and efficient thus ARCH test would be carried out to test whether the model fulfilled this assumption of Homoscedasticity. White's Heteroscedasticity-Corrected Variance and Standard Error will then be conducted if heteroscedasticity is detected.

1. RPGT 1

Hypothesis:

H_0: Homoscedasticity among the error terms

$H_{1:}$ Heteroscedasticity among the error terms

Decision Rule:

Reject H_0 if the p-value of Chi-square is less than significance level of 5%. Otherwise, do not reject H_0.

Table 4.18: ARCH Test (refer to Appendix 4.36)

F-statistic	0.879949	**Prob.F**	0.5115
Obs*R-squared	4.676942	**Prob. Chi-Square (5)**	0.4566

Decision Making:

Do not reject H_0 since the p-value of Chi-square is 0.4566 which is larger than 0.05.

Conclusion:

Hence, there is insufficient evidence to conclude that there is a heteroscedasticity problem in this model at 5% significance level.

2. RPGT 2

Hypothesis:

H_0: Homoscedasticity among the error terms

$H_{1:}$ Heteroscedasticity among the error terms

Decision Rule:

Reject H_0 if the p-value of Chi-square is less than significance level of 5%. Otherwise, do not reject H_0.

Table 4.19 ARCH Test (refer to Appendix 4.37)

F-statistic	0.879949	**Prob.F**	0.5115
Obs*R-squared	4.676942	**Prob. Chi-Square (5)**	0.4566

Decision Making:

Do not reject H_0 since the p-value of Chi-square is 0.4566 which is larger than 0.05.

Conclusion:

Hence, there is insufficient evidence to conclude that there is a heteroscedasticity problem in this model at 5% significance level.

3. RPGT 3

Hypothesis:

H_0: Homoscedasticity among the error terms

H_1: Heteroscedasticity among the error terms

Decision Rule:

Reject H_0 if the p-value of Chi-square is less than significance level of 5%. Otherwise, do not reject H_0.

Table 4.20: ARCH Test (refer to Appendix 4.38)

F-statistic	0.177010	**Prob.F**	0.9682
Obs*R-squared	1.091905	**Prob. Chi-Square (5)**	0.9548

Decision Making:

Do not reject H_0 since the p-value of Chi-square is 0.9548 which is larger than 0.05.

Conclusion

Hence, there is insufficient evidence to conclude that there is a heteroscedasticity problem in this model at 5% significance level.

4. RPGT 4

Hypothesis:

H_0: Homoscedasticity among the error terms

H_1: Heteroscedasticity among the error terms

Decision Rule:

Reject H_0 if the p-value of Chi-square is less than significance level of 5%. Otherwise, do not reject H_0.

Table 4.21: ARCH Test (refer to Appendix 4.39)

F-statistic	0.311479	**Prob.F**	0.9005
Obs*R-squared	1.864121	**Prob. Chi-Square (5)**	0.8676

Decision Making:

Do not reject H_0 since the p-value of Chi-square is 0.8676 which is larger than 0.05.

Conclusion:

Hence, there is insufficient evidence to conclude that there is a heteroscedasticity problem in this model at 5% significance level.

5. RPGT 5

Hypothesis:

H_0: Homoscedasticity among the error terms

$H_{1:}$ Heteroscedasticity among the error terms

Decision Rule:

Reject H_0 if the p-value of Chi-square is less than significance level of 5%. Otherwise, do not reject H_0.

Table 4.22: ARCH Test (refer to Appendix 4.40)

F-statistic	0.209940	**Prob.F**	0.9545
Obs*R-squared	1.285363	**Prob. Chi-Square (5)**	0.9364

Decision Making:

Do not reject H_0 since the p-value of Chi-square is 0.9364 which is larger than 0.05.

Conclusion:

Hence, there is insufficient evidence to conclude that there is a heteroscedasticity problem in this model at 5% significance level.

4.4.4 Model Specification

Model specification is used to determine which independent variables should be included in or excluded out from the regression equation It is one of the most important diagnose checking tools of the independent variables. Serious model specification problem can lead to biased estimators and other problems such as heteroscedasticity, multicollinearity and autocorrelation problem. Model specification problem can be checked using Ramsey RESET test.

1. Specification: MHPI C LOGOIL LOGLR LOGUR LOGCONC LOG**RPGT1**

Hypothesis:

H_0: Model is precisely specified.

H_1: Model is not precisely specified.

Decision Rule:

Reject H_0, if p-value of F-test statistic is less than the significant level of 5%.

Or else, do not reject H_0.

Table 4.23: Ramsey RESET test, (refer to Appendix 41)

	Value	df	Probability
F-statistic	1.768637	(5, 21)	0.1631

Likelihood Ratio	11.24589	5	0.0467

Decision Making:

Do not reject H_0, because p-value of F-statistics is 0.1631, which is larger than the significant level of 5%.

Conclusion:

Hence, the model has met the model specification assumption at the 5% level of significance.

2 Specification: MHPI C LOGOIL LOGLR LOGUR LOGCONC LOG**RPGT2**

Hypothesis:

H_0: Model is precisely specified.

H_1: Model is not precisely specified.

Decision Rule:

Reject H_0, if p-value of F-test statistic is less than the significant level of 5%.

Or else, do not reject H_0.

Table 4.24: Ramsey RESET test, (refer to Appendix 4.42)

	Value	df	Probability
F-statistic	1.768637	(5, 21)	0.1631
Likelihood Ratio	11.24589	5	0.0467

Decision Making:

Do not reject H_0, because p-value of F-statistics is 0.1631, which is larger than the significant level of 5%.

Conclusion:

Hence, the model has met the model specification assumption at the 5% level of significance.

3. Specification: MHPI C LOGOIL LOGLR LOGUR LOGCONC LOG**RPGT3**

Hypothesis:

H_0: Model is precisely specified.

H_1: Model is not precisely specified.

Decision Rule:

Reject H_0, if p-value of F-test statistic is less than the significant level of 5%.

Or else, do not reject H_0.

Table 4.25: Ramsey RESET test, (refer to Appendix 4.43)

	Value	df	Probability
F-statistic	3.011527	(5, 21)	0.0334
Likelihood Ratio	17.29908	5	0.0040

Decision Making:

Reject H_0, because p-value of F-statistics is 0.0334, which is smaller than the significant level of 5%.

Conclusion:

Hence, the model has not met the model specification assumption at the 5% level of significance.

4. Specification: MHPI C LOGOIL LOGLR LOGUR LOGCONC LOG**RPGT4**

Hypothesis:

H_0: Model is precisely specified.

H_1: Model is not precisely specified.

Decision Rule:

Reject H_0, if p-value of F-test statistic is less than the significant level of 5%.

Or else, do not reject H_0.

Table 4.26: Ramsey RESET test, (refer to Appendix 4.44)

	Value	df	Probability
F-statistic	2.468501	(5, 21)	0.0657
Likelihood Ratio	14.79394	5	0.0113

Decision Making:

Do not reject H_0, because p-value of F-statistics is 0.0657, which is larger than the significant level of 5%.

Conclusion:

Hence, the model has met the model specification assumption at the 5% level of significance.

5. Specification: MHPI C LOGOIL LOGLR LOGUR LOGCONC LOG**RPGT5**

Hypothesis:

H_0: Model is precisely specified.

H_1: Model is not precisely specified.

Decision Rule:

Reject H_0, if p-value of F-test statistic is less than the significant level of 5%.

Or else, do not reject H_0.

Table 4.27: Ramsey RESET test, (refer to Appendix 4.45)

	Value	df	Probability
F-statistic	2.561211	(5, 21)	0.0584
Likelihood Ratio	15.23576	5	0.0094

Decision Making:

Do not reject H_0, because p-value of F-statistics is 0.0584, which is larger than the significant level of 5%.

Conclusion:

Hence, the model has met the model specification assumption at the 5% level of significance.

4.4.5 Normality Test

Normality is one of the essential opponent for statistical tests which included t test or F test. Normality test is a statistical process to determine the normal distribution of error term. In the purpose to make sure the data used are follow the normal distribution standard, the hypothesis testing of Jarque-Bera normality test has been conducted for this research. The level of significance used is 5%, which α=0.05 in this Jarque-Bera normality test.

Hypothesis:

Ho: The error term is normally distributed.

H1: The error term is not normally distributed.

Decision Rules:

Reject Ho if P-value of normality test is less than the significant level of 5%. Otherwise, do not reject Ho.

Figure 4.1 Normality testing with RPGT1

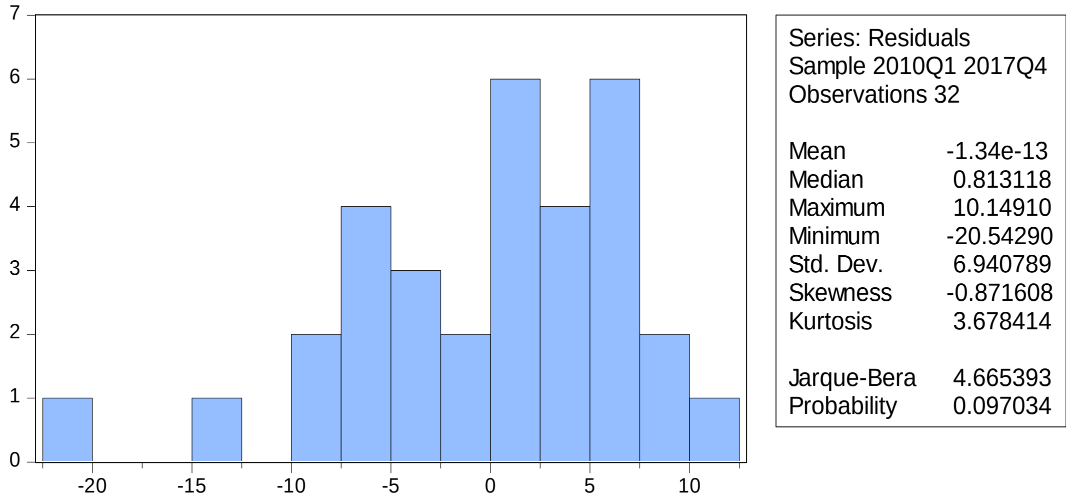


Figure 4.2 Normality testing with RPGT2

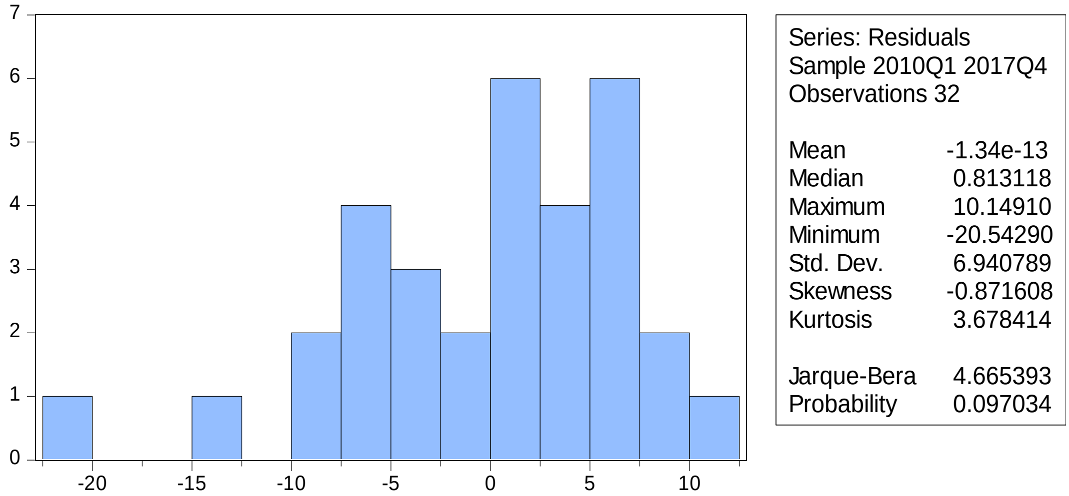


Figure 4.3 Normality testing with RPGT3

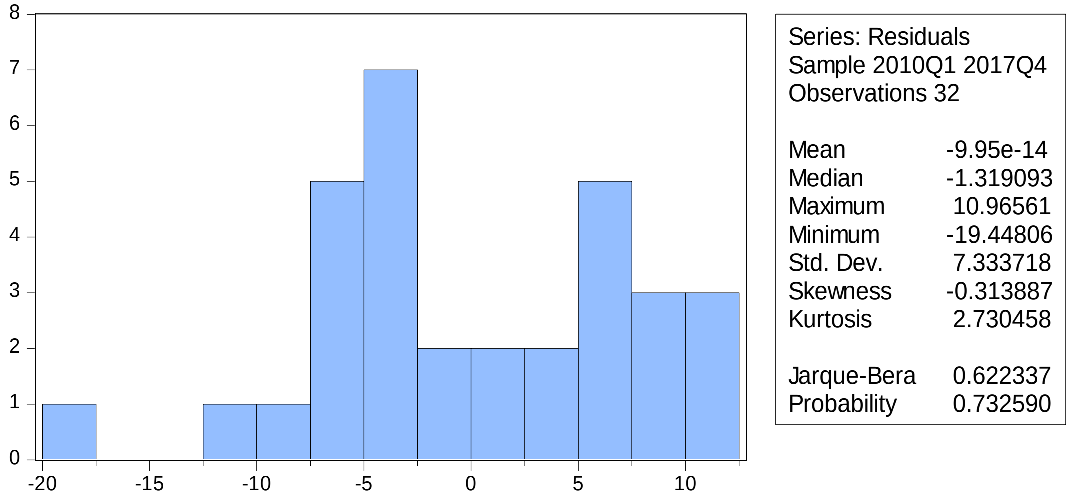


Figure 4.4 Normality testing with RPGT4

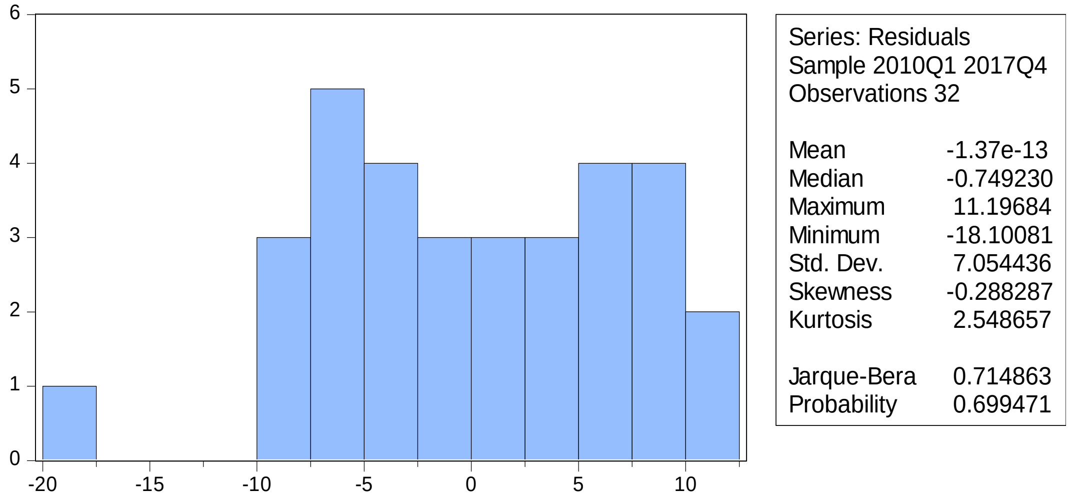
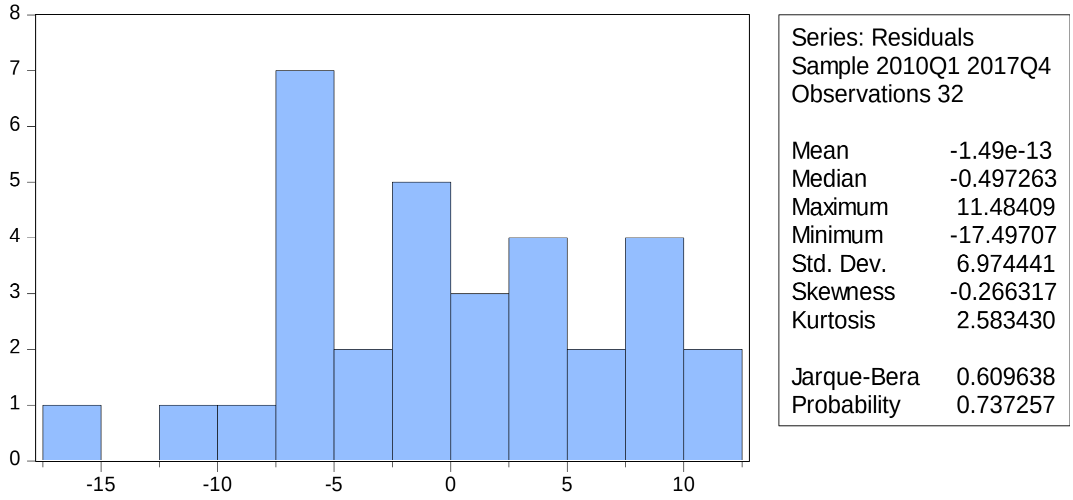


Figure 4.5 Normality testing with RPGT5



<u>Decision Making:</u>

Based on the result of Figure 4.1 the normality test with RPGT 1, it showed that do not reject H_0 since P-value (0.097034) is greater than the significant level of 5%.

Based on the result of Figure 4.2 the normality test with RPGT 2, it showed that do not reject H_0 since P-value (0.097034) is greater than the significant level of 5%.

Based on the result of Figure 4.3 the normality test with RPGT 3, it showed that do not reject H_0 since P-value (0.732590) is greater than the significant level of 5%.

Based on the result of Figure 4.4 the normality test with RPGT 4, it showed that do not reject H_0 since P-value (0.699471) is greater than the significant level of 5%.

Based on the result of Figure 4.5 the normality test with RPGT 5, it showed that do not reject H_0 since P-value (0.737257) is greater than the significant level of 5%.

<u>Conclusion:</u>

There is sufficient evidence to conclude that the error term is normally distributed in the model with RPGT1, RPGT2, RPGT3, RPGT4, and RPGT5 at the level of significant 5%.

4.5 Conclusion

This chapter aims to determine whether the economic model is BLUE. This study found that four exogenous variables (UR, LR, RPGT, and CC) have significant association with the endogenous variable (HPI). Besides that, diagnostic checking also has been conducted to detect whether the econometric problems such as multicollinearity, heteroscdasticity, autocorrelation, model specification, and normality of error term exist in the economic model through E-view 8. The findings of these tests proved that there is no multicollinearity problem, homoscedasticity, and error terms are all normally distributed. Model specification is correct except for RPGT3 as the gap of percentage between year to year is big. Nevertheless, there is autocorrelation problem existed in the model and the problem is solved by the Newey-West test.

CHAPTER 5: DISCUSSION, IMPLICATION, CONCLUSION

5.0 Introduction

Overall outline of chapter 1 to chapter 4 will be provided in this chapter. Besides that, this chapter will also give a concise summary of statistical analysis as well as major findings in chapter 4. The findings found in chapter 4 will be used and compared with the objectives mentioned in chapter 1 to examine whether there is a relationship between housing price index in Malaysia with the exogenous variables which are construction cost, lending rate, unemployment rate, RPGT, and oil price in Malaysia. Moreover, the implications and policies will be suggested in this study followed by limitations of this study. Last but not least, there will be some recommendations for the future researchers.

5.1 Summary of statistical Analyses

This study discussed about whether there are a significant relationship between the Malaysia house price index and its independent variables which included construction cost, oil price, Base Lending Rate (BLR), Real Property Gain Tax(RPGT) and unemployment rate. After go thought few hypothesis testing and diagnostic checking in last chapter, the results from the testing was answer the research problem of this study.

Reviewing the results of the F-test and T-test from previous chapter, it showed that the oil price individually has no any significant relationship with housing price index. The lending rate sometimes have not influencing the housing price index but sometimes it significantly and individually affected the housing price index. Only the unemployment rate, construction cost and RPGT are significantly and individually relating to the change of housing index insignificant level of 5%. And F-test is showing that there are at least one of the independent variable which are construction cost, oil price, Base Lending Rate (BLR), Real Property Gain Tax (RPGT) is significantly related to the change of housing price index.

Besides that, there are summarization of the result of different diagnostic checking which covered multicollinearity test, autocorrelation test, heteroscedasticity test, model specification test and normality test.

Table 5.1 Summary of Diagnostic Checking

Type of Diagnostic Checking	**Summary of Results Obtain**
Multicollinearity Test	Absent. Means that the variables are unbiased and efficient.
Autocorrelation Test	Present in RPGT1 and RPGT2. Absent in RPGT3, RPGT4 and RPGT5. Solve it by using Newey-West HAC Standard Error & Covariance.
Heteroscedasticity Test	Absent. The regression model does not contain any heteroscedasticity problem.
Model Specification Test	Present in RPGT3. Absent in RPGT1, RPGT2, RPGT4 and RPGT5.
Normality Test	Absent. All error terms are normally distributed.

5.2 Discussion of Major Findings

Table 5.2: Summary of the Results and Theories

Dependent Variable	Independent Variables	Significant Level	Expected Sign (Theoretical)	Result
Malaysia	Lending	5%	Positive,	Positive,

Housing Price Index (MHPI)	Rate		*Supported by Shi et al. (2014); Xu and Tang (2014)*	yet significant
Malaysia Housing Price Index (MHPI)	Construction Costs	5%	Positive, *Supported by Akanni, P. O., Oke, A. E., & Omotilewa, O. J. (2014); Ugochukwu, I. B., & Chioma, M. I. B. (2015)*	Positive, yet significant
Malaysia Housing Price Index (MHPI)	Real Property Gain Tax (RPGT)	5%	Negative, *Supported by Ong (2013); Mitchell, D. J. (2014)*	Positive, yet significant
Malaysia Housing Price Index (MHPI)	Unemployment Rate	5%	Negative, *Supported by Gustafsson, Stockhammer & Osterholm (2016); Tupenaite, Kanapeckiene and Naimaviciene (2017)*	Positive, yet significant
Malaysia Housing Price Index (MHPI)	Oil Price	5%	Positive, *Supported by Larson & Zhao (2016); Vasel (2016)*	Negative, but not significant

According to *Table 5.2*, it showed that the outcomes obtained in chapter 4 are inconsistent with the theoretical expectation obtained from journals in chapter 1. From the table, the result showed that lending rate, construction costs, Real Property Gain Tax (RPGT) and unemployment rate are significant to Malaysia Housing Price Index (MHPI), whereas oil price has no significant effect in driving Malaysia Housing Price Index (MHPI). Moreover, the expected signs of some independent variables are various from the results obtained. Those independent variables are Real Property Gain Tax (RPGT), unemployment rate and oil price.

According to the previous studies, the Real Property Gain Tax (RPGT) and unemployment rate are negatively related with Malaysia Housing Price Index (MHPI), whereas oil price is positively related with MHPI. The RPGT is tax imposed to the disposal of the property on the profit gained. According to Mitchell, D.J. (2014), people tend to avoid the tax charged on them so people will tend to demand less for the housing, especially for those speculators. For the case of unemployment rate, the higher the unemployment rate, the lower the MPHI. This is because high unemployment rate will reduce the demand of the renting and investing in housing and thus leads to decrease in housing price due to the lower purchasing power of the buyers (Bouchouicha & Ftiti, 2012). On the other hand, there is a positive relationship between oil price and MHPI.According to Zhao (2016), he stated that the positive export price will contribute to the increased in wages, eventually lead to the housing price appreciation in the city. There is higher job opportunity in the city, and people will demand for the housing. Besides that, the transportation cost of the construction materials will also influence the housing price. Henceforth, the oil price is positively related with the MHPI.

However, the results that obtained from chapter 4 are differing with the expected results in chapter 1. Lending rate, construction costs, RPGT, and unemployment rate are positively related with MHPI, whereas the oil price is negatively related with MHPI.

Based on the research done by Ong (2013), it mentioned the first implementation of Real Property Gain Tax (RPGT) is make a boost in housing sector and had catch the attraction from foreign investor. And this is a strategy for government to avoid the speculation between the buy and sell activities of houses or other real estate. When year 2010, government had re-imposed the RPGT to discourage the speculators to buy and sell the houses and real estate within five years. So, the investor and speculators may not consider selling the house or any real estate in short period and the new house will become more demand so it indirectly affected the house price. Ching (2013) have stated that the property seller might increase the selling price to cover the RPGT that might imply in buying and selling transaction.

The reason for the unemployment rate to be positively related with MHPI is the unemployment rate in the nation is high and causing the economic downturn.

Moreover, the high unemployment also indicates that the less local workers turnover in domestic market, the developer needs to outsource their workers from other nations and caused the high production costs, contributing to increase in housing price (Xu & Tang, 2014).

There is no evidence to show how the oil price positively influenced the housing price in the long run. There is a stable uptrend in the MHPI throughout the years. The oil price is quite fluctuated. We can observe that in most of the time when the overall picture of the oil price increase had led to the increase in MHPI. However, the changes are not so obvious and it does not contribute much to the housing price in Malaysia. Hence, there is an insignificant positive relationship between the oil price and MHPI.

5.3 Implications of study

5.3.1 Policy Maker and Government

According to Rahman (2008), the housing market stands a very important role in economic growth and welfare of a country. Besides, the different conditions of the housing market will lead to changes on economy in Malaysia.

In this case, the Malaysian government indeed carries a vital role in influencing the factors that would affect the country. Therefore, it is important that government to be aware of concept on the relationship between the factors and housing market. Government could refer to the result of this study, they could analyze further on the RPGT, lending rate, unemployment rate which could be under their control since they are significant to the housing market which also would eventually affect on economy.

Besides, insignificant variable doesn't impact much on the housing market. In another word, it might contribute or represent a very limited effect to the housing market in Malaysia. For example, this study has indicated the crude oil price to be insignificant. However, government has already removed the subsidization in recent year and the oil price would adjust according to global oil price. This implied oil price will sooner or later affect the housing market. Thus, government should consider the adverse effect after removing the subsidization.

For policy makers, they could use this study to identify the shortcomings in policy implementation such as policy makers to make improvements. After understanding this study, the policy makers can create policy with taking several aspects into account instead just focusing only on inflation problem. Therefore, a stability of the housing market could be achieved with the cooperation between policy makers and government.

5.3.2 Potential Investors

Macroeconomics factors are important to take into consideration for investors before making a decision entering a housing market. Thus, excess education and knowledge of macroeconomics performance are the key success for the investors. The investors will more likely to enter the market while considering factors such as real property gain tax, lending rate and demand or supply of the housing at the same time. On the other hand, the major finding of this study indicates the relationship between economic variable (construction cost, unemployment rate, lending rate, real property gain tax, and oil price) and the Malaysia housing price index. Therefore, the potential investors might able to analyze and choose the most efficient decision by focusing the significant variables.

Besides that, the potential investors might need to be aware on the monetary policy implements by the government. The monetary policies would affect the functions such as lending rate and real property gain tax. This action might also affect the housing price performance directly. The monetary contractions would lead to an increase in the rate or taxes (Hammoudeh, Nguyen & Sousa, 2015). Therefore, the potential investors should be alert of changes in monetary policies as well as analyze the impact of changes.

5.3.3 Future Researchers

Refer back to the literature review; there are few arguments on the topic of determinants of housing market performance which leads to different results. For instance, Le (2015) said that oil price has become a most substantial portion on housing market fluctuation yet the result was in an opposite way. Nevertheless, this study could provide future researchers a new perspective result by taking the common macroeconomics variables with the Malaysia housing price index. On the other hand, future researchers could use this study as guidance in studying the determinants of housing price index.

5.3.4 Household and Employees

This study is also could be important to households and employees in before making any decision of purchasing a property either for themselves or investments. It provides a great opportunity to the household to access and understand that an affordable housing accompanied with advantages position provided by the major economic factors. Floating interest rate would affect the overnight policy rate as well as lending rate which influence the purchasing decision made by them. It would reduce the demand of housing and hurting their return on investment (ROI) if the borrowing cost increased. Therefore, this study could be their new investment indicator also named ROI which is return of information.

5.4 Limitations of the study

Throughout the research, there are several limitations encountered in and the ideal result in expectations was hindered in the study. However, there is no perfect research without any limitation.

Firstly, the dependent variable, housing price index is not only affected by the chosen macroeconomic variables. There are more variables having an impact on the housing price index but not included in this study. For example, inflation rate is not included in this research. This is because the inflation rate is correlated with the independent variables. Housing price index is not only affected by macroeconomic factor but also microeconomic factors. Many of the variables are excluded in order to get a perfect result but they have their inherent relationships.

Besides, RPGT is one of the independent variables explaining the housing price index and it is very significant. The study obtained results for five different rates for RPGT since RPGT has five different rates from the year one to year five. The research found that the results obtained are not consistent which consist of different rates of RPGT while holding other variables unchanged. For example, result from RPGT year three shows that the model has specification problem while other years not.

In addition, the study faced problem in collecting data and only limited data can be obtained. The study conducted time series data in sampling method from year 2010 to 2017 in quarterly basis. The data provides 32 observations for each variable and the sample size is considered small. The results obtained from the statistical tests reduced its credibility as the test usually required a large sample size which creates meaningful results.

Last but not least, the study covered the housing market of a whole Malaysia as it used the data of Malaysia as a whole. However, the result is not accurate for the household or investor to determine the housing price movement in a particular geographical area. Different geographical area might have different housing price movement as their living standard and wealth are not the same. For example, the overall housing price in Malaysia could be increasing while the housing price of a particular geographical area experiencing a decline in price. This result is sufficient enough to explain the housing price in a whole Malaysia but not applicable to use for a particular geographical area in Malaysia.

5.5 Recommendation for Future Research

For future studies, there are some macroeconomic variables that can be taken into account such as gross domestic products (GDP), and money supply. Gross domestic products may reflect the country’s economy’s performance. Therefore, it might be affecting the buyers and sellers to decide whether to purchase or sell their property. Next, money supply might also have important effect on the changes house prices. For example, when government applies easy monetary policy, money supply goes up. This leads to an increase in purchasing power of people as well as the government investment, which may directly raise the demand and price of houses.

For the sake of future studies, researchers are recommended to attempt to employ a large number of sample sizes to increase the precision of the results. They could try to collect data from more sources such as World Bank database and other reliable resources.

Future researchers also can carry out a study about the housing prices based on the specific geographical areas only as the housing market changes geographically. For example, the scope of the study can be narrowed down to specific rural or urban areas to determine the difference in the trend or performance of housing prices in those areas compared to the changes of housing price in Malaysia as a whole. The finding of their study may be more precise to make particular estimation or implications of the performance of housing market in those particular geographical areas.

5.6 Conclusion

There will be overall conclusion in this chapter. Besides, the discussion on major findings about the outcomes are carried out in chapter 4 are completed. This study indicates that construction cost, lending rate, unemployment rate, and real property gain tax are significant related to the housing price index. However, the oil price is found to be insignificant to the housing price index. Nevertheless, there is free of econometric problems in this model by using diagnostic checking. Therefore, the results of this study could be trusted and it is reliable.

Last but not least, there are few implications and policies provided in this research. Besides that, the limitations and recommendations of this research are discussed for the person who will be conducting the relevant topic in the near future.

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Appendices

Chapter 3: Methodology

Appendix 3.1: Malaysian Housing Price Index, Construction Cost, Lending Rate, Unemployment Rate, Oil Price, and Real Property Gain Tax, Quarterly, from 2010 to 2017

						RPGT				
Year	MHPI	CONC	LR	UR	OIL	RPGT1	RPGT2	RPGT3	RPGT4	RPGT5
2010 Q1	97.20	240.69	5.76	3.50	1.9943	5	5	5	5	5
2010 Q2	100.40	241.86	6.02	3.60	1.8007	5	5	5	5	5
2010 Q3	102.00	262.23	6.27	3.00	1.9040	5	5	5	5	5
2010 Q4	104.30	285.01	6.27	3.10	2.1757	5	5	5	5	5
2011 Q1	106.40	282.11	6.27	3.00	2.5410	10	10	5	5	5
2011 Q2	109.20	283.79	6.54	3.20	2.2719	10	10	5	5	5
2011 Q3	112.00	215.41	6.54	3.30	1.8857	10	10	5	5	5
2011 Q4	116.00	246.58	6.53	3.10	2.3531	10	10	5	5	5
2012 Q1	119.90	254.57	6.53	2.90	2.4529	10	10	5	5	5
2012 Q2	123.90	238.97	6.53	3.00	2.0229	10	10	5	5	5
2012 Q3	126.80	231.66	6.53	3.20	2.1950	10	10	5	5	5
2012 Q4	132.60	236.20	6.53	3.30	2.1862	10	10	5	5	5
2013 Q1	133.10	244.83	6.53	3.30	2.3150	15	15	10	10	10
2013 Q2	138.10	278.35	6.53	2.80	2.2990	15	15	10	10	10
2013 Q3	143.60	279.89	6.53	3.10	2.4364	15	15	10	10	10
2013 Q4	145.00	277.23	6.53	3.00	2.3433	15	15	10	10	10
2014 Q1	146.70	286.68	6.53	3.00	2.4186	30	30	30	20	15
2014 Q2	152.00	301.80	6.53	2.80	2.5088	30	30	30	20	15
2014 Q3	156.30	303.15	6.79	2.70	2.1705	30	30	30	20	15

2014 Q4	157.60	278.42	6.79	3.00	1.2683	30	30	30	20	15
2015 Q1	160.20	296.75	6.79	3.00	1.1333	30	30	30	20	15
2015 Q2	162.80	277.69	6.79	3.10	1.4160	30	30	30	20	15
2015 Q3	167.10	261.34	6.79	3.20	1.0736	30	30	30	20	15
2015 Q4	167.80	276.24	6.79	3.40	0.8819	30	30	30	20	15
2016 Q1	171.80	289.54	6.80	3.50	0.9129	30	30	30	20	15
2016 Q2	174.40	282.07	6.81	3.40	1.1507	30	30	30	20	15
2016 Q3	178.50	284.63	6.65	3.50	1.1486	30	30	30	20	15
2016 Q4	179.50	284.52	6.65	3.50	1.2790	30	30	30	20	15
2017 Q1	183.30	323.21	6.66	3.40	1.2048	30	30	30	20	15
2017 Q2	186.30	339.91	6.65	3.40	1.0962	30	30	30	20	15
2017 Q3	178.50	325.22	6.68	3.40	1.2302	30	30	30	20	15
2017 Q4	179.50	312.53	6.68	3.40	1.4386	30	30	30	20	15

Chapter 4: Data Analysis

Appendix 4.1: Descriptive Statistics

	MHPI	**OIL**	**LR**	**UR**	**CONC**
Mean	144.1500	0.532622	1.879873	1.157467	5.613923
Median	145.8500	0.667125	1.877172	1.163151	5.631764
Maximum	186.3000	0.932558	1.918392	1.280934	5.828681
Minimum	97.20000	-0.125677	1.750937	0.993252	5.372543
Std. Dev	28.67168	0.343368	0.036762	0.075618	0.106656
Skewness	-0.159268	-0.453219	-1.718040	-0.277788	-0.211058
Kurtosis	1.661976	1.673696	6.446497	2.143740	2.617266
Observations	32	32	32	32	32

	RPGT1	**RPGT2**	**RPGT3**	**RPGT4**	**RPGT5**

Mean	2.815931	2.815391	2.591961	2.389228	2.245387
Median	3.054624	3.054624	2.851891	2.649159	2.505318
Maximum	3.401197	3.401197	3.401197	2.995132	2.708050
Minimum	1.609438	1.609438	1.609438	1.609438	1.609438
Std. Dev	0.658881	0.658881	0.849990	0.652846	0.517163
Skewness	-0.561957	-0.561957	0.160090	-0.250067	-0.355669
Kurtosis	1.927418	1.927418	1.152889	1.210248	1.254958
Observations	32	32	32	32	32

Appendix 4.2 Initial Regression Output (Source: Developed for research via EViews 8.0)

Dependent Variable: MHPI
Method: Least Squares
Date: 02/22/18 Time: 00:27
Sample: 2010Q1 2017Q4
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-498.0329	210.4110	-2.366953	0.0257
LOGOIL	-5.851690	7.295930	-0.802049	0.4298
LOGLR	108.8387	76.33458	1.425811	0.1658
LOGUR	76.70511	27.47296	2.792022	0.0097
LOGCONC	48.41188	18.06062	2.680522	0.0126
LOGRPGT1	28.45687	4.828456	5.893575	0.0000

R-squared	0.941398	Mean dependent var	144.1500
Adjusted R-squared	0.930129	S.D. dependent var	28.67168
S.E. of regression	7.578844	Akaike info criterion	7.055959
Sum squared resid	1493.411	Schwarz criterion	7.330785
Log likelihood	-106.8953	Hannan-Quinn criter.	7.147056
F-statistic	83.53439	Durbin-Watson stat	1.064871
Prob(F-statistic)	0.000000		

Dependent Variable: MHPI
Method: Least Squares
Date: 02/22/18 Time: 00:28
Sample: 2010Q1 2017Q4
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-498.0329	210.4110	-2.366953	0.0257
LOGOIL	-5.851690	7.295930	-0.802049	0.4298
LOGLR	108.8387	76.33458	1.425811	0.1658
LOGUR	76.70511	27.47296	2.792022	0.0097
LOGCONC	48.41188	18.06062	2.680522	0.0126
LOGRPGT2	28.45687	4.828456	5.893575	0.0000

R-squared	0.941398	Mean dependent var	144.1500
Adjusted R-squared	0.930129	S.D. dependent var	28.67168
S.E. of regression	7.578844	Akaike info criterion	7.055959
Sum squared resid	1493.411	Schwarz criterion	7.330785
Log likelihood	-106.8953	Hannan-Quinn criter.	7.147056
F-statistic	83.53439	Durbin-Watson stat	1.064871
Prob(F-statistic)	0.000000		

Dependent Variable: MHPI
Method: Least Squares
Date: 02/22/18 Time: 00:29
Sample: 2010Q1 2017Q4
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-826.6038	187.8756	-4.399739	0.0002
LOGOIL	7.281389	8.443438	0.862373	0.3964
LOGLR	296.1433	61.58883	4.808392	0.0001
LOGUR	103.1934	29.03186	3.554488	0.0015
LOGCONC	42.81907	19.99712	2.141261	0.0418
LOGRPGT3	19.42080	3.644218	5.329210	0.0000

R-squared	0.934575	Mean dependent var	144.1500
Adjusted R-squared	0.921994	S.D. dependent var	28.67168
S.E. of regression	8.007895	Akaike info criterion	7.166094
Sum squared resid	1667.286	Schwarz criterion	7.440919
Log likelihood	-108.6575	Hannan-Quinn criter.	7.257191
F-statistic	74.28060	Durbin-Watson stat	1.271528
Prob(F-statistic)	0.000000		

Dependent Variable: MHPI
Method: Least Squares
Date: 02/22/18 Time: 00:30
Sample: 2010Q1 2017Q4
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-803.1427	181.2023	-4.432298	0.0002
LOGOIL	5.019253	7.917597	0.633936	0.5317
LOGLR	285.2378	59.71029	4.777029	0.0001
LOGUR	100.4951	27.88537	3.603864	0.0013
LOGCONC	41.26151	19.16645	2.152799	0.0408
LOGRPGT4	25.30101	4.418211	5.726528	0.0000

R-squared	0.939463	Mean dependent var	144.1500
Adjusted R-squared	0.927822	S.D. dependent var	28.67168
S.E. of regression	7.702939	Akaike info criterion	7.088442
Sum squared resid	1542.717	Schwarz criterion	7.363267
Log likelihood	-107.4151	Hannan-Quinn criter.	7.179539
F-statistic	80.69838	Durbin-Watson stat	1.322651
Prob(F-statistic)	0.000000		

Dependent Variable: MHPI
Method: Least Squares
Date: 02/22/18 Time: 00:30
Sample: 2010Q1 2017Q4

Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-807.5697	178.2552	-4.530413	0.0001
LOGOIL	1.589388	7.619152	0.208604	0.8364
LOGLR	280.9571	59.25383	4.741585	0.0001
LOGUR	96.93440	27.53566	3.520322	0.0016
LOGCONC	43.11158	18.69614	2.305908	0.0293
LOGRPGT5	30.50081	5.219379	5.843762	0.0000

R-squared	0.940829	Mean dependent var	144.1500
Adjusted R-squared	0.929449	S.D. dependent var	28.67168
S.E. of regression	7.615590	Akaike info criterion	7.065633
Sum squared resid	1507.927	Schwarz criterion	7.340458
Log likelihood	-107.0501	Hannan-Quinn criter.	7.156729
F-statistic	82.68016	Durbin-Watson stat	1.324838
Prob(F-statistic)	0.000000		

Appendix 4.3: Correlation Analysis (Source: Developed for research via EViews 8.0)

	LOGOIL	LOGLR	LOGUR	LOGCONC	LOGRPGT1
LOGOIL	1.000000	-0.520157	-0.561116	-0.400796	-0.609447
LOGLR	-0.520157	1.000000	-0.112134	0.416127	0.828777
LOGUR	-0.561116	-0.112134	1.000000	-0.040773	0.032157
LOGCONC	-0.400796	0.416127	-0.040773	1.000000	0.647757
LOGRPGT1	-0.609447	0.828777	0.032157	0.647757	1.000000

	LOGOIL	LOGLR	LOGUR	LOGCONC	LOGRPGT2
LOGOIL	1.000000	-0.520157	-0.561116	-0.400796	-0.609447
LOGLR	-0.520157	1.000000	-0.112134	0.416127	0.828777
LOGUR	-0.561116	-0.112134	1.000000	-0.040773	0.032157
LOGCONC	-0.400796	0.416127	-0.040773	1.000000	0.647757
LOGRPGT2	-0.609447	0.828777	0.032157	0.647757	1.000000

	LOGOIL	LOGLR	LOGUR	LOGCONC	LOGRPGT3
LOGOIL	1.000000	-0.520157	-0.561116	-0.400796	-0.694835
LOGLR	-0.520157	1.000000	-0.112134	0.416127	0.694965
LOGUR	-0.561116	-0.112134	1.000000	-0.040773	0.113772
LOGCONC	-0.400796	0.416127	-0.040773	1.000000	0.712736
LOGRPGT3	-0.694835	0.694965	0.113772	0.712736	1.000000

	LOGOIL	LOGLR	LOGUR	LOGCONC	LOGRPGT4
LOGOIL	1.000000	-0.520157	-0.561116	-0.400796	-0.670969
LOGLR	-0.520157	1.000000	-0.112134	0.416127	0.697147
LOGUR	-0.561116	-0.112134	1.000000	-0.040773	0.096536
LOGCONC	-0.400796	0.416127	-0.040773	1.000000	0.713103
LOGRPGT4	-0.670969	0.697147	0.096536	0.713103	1.000000

	LOGOIL	LOGLR	LOGUR	LOGCONC	LOGRPGT5
LOGOIL	1.000000	-0.520157	-0.561116	-0.400796	-0.637699
LOGLR	-0.520157	1.000000	-0.112134	0.416127	0.694041
LOGUR	-0.561116	-0.112134	1.000000	-0.040773	0.075655
LOGCONC	-0.400796	0.416127	-0.040773	1.000000	0.707750
LOGRPGT5	-0.637699	0.694041	0.075655	0.707750	1.000000

Appendix 4.4

Dependent Variable: LOGOIL
Method: Least Squares
Date: 02/24/18 Time: 10:30
Sample: 2010Q1 2017Q4
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	9.665911	2.738457	3.529693	0.0014
LOGLR	-4.858461	1.456455	-3.335813	0.0023

R-squared	0.270564	Mean dependent var	0.532622
Adjusted R-squared	0.246249	S.D. dependent var	0.343368
S.E. of regression	0.298108	Akaike info criterion	0.477740
Sum squared resid	2.666051	Schwarz criterion	0.569348
Log likelihood	-5.643834	Hannan-Quinn criter.	0.508105
F-statistic	11.12765	Durbin-Watson stat	0.327342
Prob(F-statistic)	0.002276		

Appendix 4.5

Dependent Variable: LOGOIL
Method: Least Squares
Date: 02/24/18 Time: 10:31
Sample: 2010Q1 2017Q4
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.481778	0.795926	4.374499	0.0001
LOGUR	-2.547939	0.686227	-3.712966	0.0008

R-squared	0.314851	Mean dependent var	0.532622
Adjusted R-squared	0.292013	S.D. dependent var	0.343368
S.E. of regression	0.288917	Akaike info criterion	0.415104
Sum squared resid	2.504183	Schwarz criterion	0.506712
Log likelihood	-4.641657	Hannan-Quinn criter.	0.445469
F-statistic	13.78611	Durbin-Watson stat	0.417734
Prob(F-statistic)	0.000835		

Appendix 4.6

Dependent Variable: LOGOIL
Method: Least Squares
Date: 02/24/18 Time: 10:31
Sample: 2010Q1 2017Q4
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7.776383	3.023647	2.571855	0.0153
LOGCONC	-1.290321	0.538504	-2.396122	0.0230

R-squared	0.160637	Mean dependent var	0.532622
Adjusted R-squared	0.132658	S.D. dependent var	0.343368

S.E. of regression	0.319783	Akaike info criterion	0.618111
Sum squared resid	3.067827	Schwarz criterion	0.709719
Log likelihood	-7.889769	Hannan-Quinn criter.	0.648476
F-statistic	5.741401	Durbin-Watson stat	0.457382
Prob(F-statistic)	0.023009		

Appendix 4.7

Dependent Variable: LOGOIL
Method: Least Squares
Date: 02/24/18 Time: 10:32
Sample: 2010Q1 2017Q4
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.426980	0.217979	6.546413	0.0000
LOGRPGT1	-0.317606	0.075435	-4.210354	0.0002

R-squared	0.371426	Mean dependent var	0.532622
Adjusted R-squared	0.350474	S.D. dependent var	0.343368
S.E. of regression	0.276731	Akaike info criterion	0.328921
Sum squared resid	2.297405	Schwarz criterion	0.420530
Log likelihood	-3.262741	Hannan-Quinn criter.	0.359287
F-statistic	17.72708	Durbin-Watson stat	0.444937
Prob(F-statistic)	0.000214		

Appendix 4.8

Dependent Variable: LOGLR
Method: Least Squares
Date: 02/24/18 Time: 10:32
Sample: 2010Q1 2017Q4
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.942971	0.102298	18.99318	0.0000
LOGUR	-0.054514	0.088199	-0.618082	0.5412

R-squared	0.012574	Mean dependent var	1.879873
Adjusted R-squared	-0.020340	S.D. dependent var	0.036762
S.E. of regression	0.037134	Akaike info criterion	-3.688122
Sum squared resid	0.041367	Schwarz criterion	-3.596513
Log likelihood	61.00995	Hannan-Quinn criter.	-3.657756
F-statistic	0.382026	Durbin-Watson stat	0.175530
Prob(F-statistic)	0.541185		

Appendix 4.9

Dependent Variable: LOGLR
Method: Least Squares
Date: 02/24/18 Time: 10:33
Sample: 2010Q1 2017Q4
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.

C	1.074675	0.321294	3.344833	0.0022
LOGCONC	0.143429	0.057222	2.506546	0.0178

R-squared	0.173161	Mean dependent var	1.879873
Adjusted R-squared	0.145600	S.D. dependent var	0.036762
S.E. of regression	0.033980	Akaike info criterion	-3.865614
Sum squared resid	0.034640	Schwarz criterion	-3.774005
Log likelihood	63.84982	Hannan-Quinn criter.	-3.835248
F-statistic	6.282772	Durbin-Watson stat	0.297101
Prob(F-statistic)	0.017842		

Appendix 4.10

Dependent Variable: LOGLR
Method: Least Squares
Date: 02/24/18 Time: 10:33
Sample: 2010Q1 2017Q4
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.749662	0.016472	106.2234	0.0000
LOGRPGT1	0.046241	0.005700	8.112167	0.0000

R-squared	0.686871	Mean dependent var	1.879873
Adjusted R-squared	0.676434	S.D. dependent var	0.036762
S.E. of regression	0.020911	Akaike info criterion	-4.836609
Sum squared resid	0.013118	Schwarz criterion	-4.745000
Log likelihood	79.38574	Hannan-Quinn criter.	-4.806243
F-statistic	65.80725	Durbin-Watson stat	0.755408
Prob(F-statistic)	0.000000		

Appendix 4.11

Dependent Variable: LOGUR
Method: Least Squares
Date: 02/24/18 Time: 10:34
Sample: 2010Q1 2017Q4
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.319753	0.726204	1.817330	0.0792
LOGCONC	-0.028908	0.129335	-0.223510	0.8247

R-squared	0.001662	Mean dependent var	1.157467
Adjusted R-squared	-0.031615	S.D. dependent var	0.075618
S.E. of regression	0.076804	Akaike info criterion	-2.234665
Sum squared resid	0.176964	Schwarz criterion	-2.143057
Log likelihood	37.75464	Hannan-Quinn criter.	-2.204300
F-statistic	0.049957	Durbin-Watson stat	0.660189
Prob(F-statistic)	0.824654		

Appendix 4.12

Dependent Variable: LOGUR
Method: Least Squares

Date: 02/24/18 Time: 10:36
Sample: 2010Q1 2017Q4
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.147075	0.060517	18.95468	0.0000
LOGRPGT1	0.003691	0.020943	0.176222	0.8613

R-squared	0.001034	Mean dependent var	1.157467
Adjusted R-squared	-0.032265	S.D. dependent var	0.075618
S.E. of regression	0.076828	Akaike info criterion	-2.234036
Sum squared resid	0.177076	Schwarz criterion	-2.142427
Log likelihood	37.74458	Hannan-Quinn criter.	-2.203670
F-statistic	0.031054	Durbin-Watson stat	0.682373
Prob(F-statistic)	0.861304		

Appendix 4.13

Dependent Variable: LOGCONC
Method: Least Squares
Date: 02/24/18 Time: 10:37
Sample: 2010Q1 2017Q4
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.318658	0.065062	81.74712	0.0000
LOGRPGT1	0.104855	0.022516	4.656983	0.0001

R-squared	0.419589	Mean dependent var	5.613923
Adjusted R-squared	0.400242	S.D. dependent var	0.106656
S.E. of regression	0.082599	Akaike info criterion	-2.089184
Sum squared resid	0.204676	Schwarz criterion	-1.997575
Log likelihood	35.42694	Hannan-Quinn criter.	-2.058818
F-statistic	21.68749	Durbin-Watson stat	0.926535
Prob(F-statistic)	0.000061		

Appendix 4.14

Dependent Variable: LOGOIL
Method: Least Squares
Date: 02/24/18 Time: 10:39
Sample: 2010Q1 2017Q4
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.426980	0.217979	6.546413	0.0000
LOGRPGT2	-0.317606	0.075435	-4.210354	0.0002

R-squared	0.371426	Mean dependent var	0.532622
Adjusted R-squared	0.350474	S.D. dependent var	0.343368
S.E. of regression	0.276731	Akaike info criterion	0.328921
Sum squared resid	2.297405	Schwarz criterion	0.420530
Log likelihood	-3.262741	Hannan-Quinn criter.	0.359287
F-statistic	17.72708	Durbin-Watson stat	0.444937
Prob(F-statistic)	0.000214		

Appendix 4.15

Dependent Variable: LOGLR
Method: Least Squares
Date: 02/24/18 Time: 10:39
Sample: 2010Q1 2017Q4
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.749662	0.016472	106.2234	0.0000
LOGRPGT2	0.046241	0.005700	8.112167	0.0000

R-squared	0.686871	Mean dependent var	1.879873
Adjusted R-squared	0.676434	S.D. dependent var	0.036762
S.E. of regression	0.020911	Akaike info criterion	-4.836609
Sum squared resid	0.013118	Schwarz criterion	-4.745000
Log likelihood	79.38574	Hannan-Quinn criter.	-4.806243
F-statistic	65.80725	Durbin-Watson stat	0.755408
Prob(F-statistic)	0.000000		

Appendix 4.16

Dependent Variable: LOGUR
Method: Least Squares
Date: 02/24/18 Time: 10:39
Sample: 2010Q1 2017Q4
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.147075	0.060517	18.95468	0.0000
LOGRPGT2	0.003691	0.020943	0.176222	0.8613

R-squared	0.001034	Mean dependent var	1.157467
Adjusted R-squared	-0.032265	S.D. dependent var	0.075618
S.E. of regression	0.076828	Akaike info criterion	-2.234036
Sum squared resid	0.177076	Schwarz criterion	-2.142427
Log likelihood	37.74458	Hannan-Quinn criter.	-2.203670
F-statistic	0.031054	Durbin-Watson stat	0.682373
Prob(F-statistic)	0.861304		

Appendix 4.17

Dependent Variable: LOGCONC
Method: Least Squares
Date: 02/24/18 Time: 10:40
Sample: 2010Q1 2017Q4
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.318658	0.065062	81.74712	0.0000
LOGRPGT2	0.104855	0.022516	4.656983	0.0001

R-squared	0.419589	Mean dependent var	5.613923
Adjusted R-squared	0.400242	S.D. dependent var	0.106656

S.E. of regression	0.082599	Akaike info criterion	-2.089184
Sum squared resid	0.204676	Schwarz criterion	-1.997575
Log likelihood	35.42694	Hannan-Quinn criter.	-2.058818
F-statistic	21.68749	Durbin-Watson stat	0.926535
Prob(F-statistic)	0.000061		

Appendix 4.18

Dependent Variable: LOGOIL
Method: Least Squares
Date: 02/24/18 Time: 10:42
Sample: 2010Q1 2017Q4
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.260160	0.144466	8.722901	0.0000
LOGRPGT3	-0.280690	0.053042	-5.291889	0.0000

R-squared	0.482795	Mean dependent var	0.532622
Adjusted R-squared	0.465555	S.D. dependent var	0.343368
S.E. of regression	0.251022	Akaike info criterion	0.133907
Sum squared resid	1.890357	Schwarz criterion	0.225515
Log likelihood	-0.142510	Hannan-Quinn criter.	0.164272
F-statistic	28.00408	Durbin-Watson stat	0.521810
Prob(F-statistic)	0.000010		

Appendix 4.19

Dependent Variable: LOGLR
Method: Least Squares
Date: 02/24/18 Time: 10:42
Sample: 2010Q1 2017Q4
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.801966	0.015464	116.5258	0.0000
LOGRPGT3	0.030057	0.005678	5.293809	0.0000

R-squared	0.482976	Mean dependent var	1.879873
Adjusted R-squared	0.465742	S.D. dependent var	0.036762
S.E. of regression	0.026870	Akaike info criterion	-4.335135
Sum squared resid	0.021660	Schwarz criterion	-4.243526
Log likelihood	71.36215	Hannan-Quinn criter.	-4.304769
F-statistic	28.02442	Durbin-Watson stat	0.416796
Prob(F-statistic)	0.000010		

Appendix 4.20

Dependent Variable: LOGUR
Method: Least Squares
Date: 02/24/18 Time: 10:43
Sample: 2010Q1 2017Q4
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.

C	1.131233	0.043951	25.73854	0.0000
LOGRPGT3	0.010121	0.016137	0.627226	0.5353

R-squared	0.012944	Mean dependent var	1.157467
Adjusted R-squared	-0.019958	S.D. dependent var	0.075618
S.E. of regression	0.076369	Akaike info criterion	-2.246030
Sum squared resid	0.174965	Schwarz criterion	-2.154421
Log likelihood	37.93648	Hannan-Quinn criter.	-2.215664
F-statistic	0.393412	Durbin-Watson stat	0.690548
Prob(F-statistic)	0.535256		

Appendix 4.21

Dependent Variable: LOGCONC
Method: Least Squares
Date: 02/24/18 Time: 10:43
Sample: 2010Q1 2017Q4
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.382115	0.043767	122.9726	0.0000
LOGRPGT3	0.089433	0.016069	5.565496	0.0000

R-squared	0.507993	Mean dependent var	5.613923
Adjusted R-squared	0.491593	S.D. dependent var	0.106656
S.E. of regression	0.076049	Akaike info criterion	-2.254428
Sum squared resid	0.173502	Schwarz criterion	-2.162819
Log likelihood	38.07084	Hannan-Quinn criter.	-2.224062
F-statistic	30.97474	Durbin-Watson stat	1.072989
Prob(F-statistic)	0.000005		

Appendix 4.22

Dependent Variable: LOGOIL
Method: Least Squares
Date: 02/24/18 Time: 10:43
Sample: 2010Q1 2017Q4
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.375780	0.176162	7.809729	0.0000
LOGRPGT4	-0.352899	0.071202	-4.956327	0.0000

R-squared	0.450199	Mean dependent var	0.532622
Adjusted R-squared	0.431872	S.D. dependent var	0.343368
S.E. of regression	0.258811	Akaike info criterion	0.195024
Sum squared resid	2.009495	Schwarz criterion	0.286633
Log likelihood	-1.120391	Hannan-Quinn criter.	0.225390
F-statistic	24.56517	Durbin-Watson stat	0.485111
Prob(F-statistic)	0.000026		

Appendix 4.23

Dependent Variable: LOGLR
Method: Least Squares

Date: 02/24/18 Time: 10:44
Sample: 2010Q1 2017Q4
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.786081	0.018236	97.94438	0.0000
LOGRPGT4	0.039256	0.007371	5.326107	0.0000

R-squared	0.486015	Mean dependent var	1.879873
Adjusted R-squared	0.468882	S.D. dependent var	0.036762
S.E. of regression	0.026791	Akaike info criterion	-4.341028
Sum squared resid	0.021533	Schwarz criterion	-4.249420
Log likelihood	71.45646	Hannan-Quinn criter.	-4.310663
F-statistic	28.36742	Durbin-Watson stat	0.417234
Prob(F-statistic)	0.000009		

Appendix 4.24

Dependent Variable: LOGUR
Method: Least Squares
Date: 02/24/18 Time: 10:44
Sample: 2010Q1 2017Q4
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.130752	0.052076	21.71334	0.0000
LOGRPGT4	0.011182	0.021048	0.531232	0.5992

R-squared	0.009319	Mean dependent var	1.157467
Adjusted R-squared	-0.023703	S.D. dependent var	0.075618
S.E. of regression	0.076509	Akaike info criterion	-2.242364
Sum squared resid	0.175607	Schwarz criterion	-2.150756
Log likelihood	37.87783	Hannan-Quinn criter.	-2.211999
F-statistic	0.282207	Durbin-Watson stat	0.687721
Prob(F-statistic)	0.599170		

Appendix 4.25

Dependent Variable: LOGCONC
Method: Least Squares
Date: 02/24/18 Time: 10:44
Sample: 2010Q1 2017Q4
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.335577	0.051736	103.1315	0.0000
LOGRPGT4	0.116500	0.020911	5.571323	0.0000

R-squared	0.508516	Mean dependent var	5.613923
Adjusted R-squared	0.492133	S.D. dependent var	0.106656
S.E. of regression	0.076008	Akaike info criterion	-2.255491
Sum squared resid	0.173317	Schwarz criterion	-2.163883
Log likelihood	38.08786	Hannan-Quinn criter.	-2.225126
F-statistic	31.03964	Durbin-Watson stat	1.070508
Prob(F-statistic)	0.000005		

Appendix 4.26

Dependent Variable: LOGOIL
Method: Least Squares
Date: 02/24/18 Time: 10:45
Sample: 2010Q1 2017Q4
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.483313	0.214980	6.899785	0.0000
LOGRPGT5	-0.423397	0.093374	-4.534444	0.0001

R-squared	0.406659	Mean dependent var	0.532622
Adjusted R-squared	0.386881	S.D. dependent var	0.343368
S.E. of regression	0.268864	Akaike info criterion	0.271236
Sum squared resid	2.168629	Schwarz criterion	0.362845
Log likelihood	-2.339778	Hannan-Quinn criter.	0.301602
F-statistic	20.56118	Durbin-Watson stat	0.448089
Prob(F-statistic)	0.000086		

Appendix 4.27

Dependent Variable: LOGLR
Method: Least Squares
Date: 02/24/18 Time: 10:45
Sample: 2010Q1 2017Q4
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.769097	0.021512	82.23883	0.0000
LOGRPGT5	0.049335	0.009343	5.280225	0.0000

R-squared	0.481693	Mean dependent var	1.879873
Adjusted R-squared	0.464416	S.D. dependent var	0.036762
S.E. of regression	0.026904	Akaike info criterion	-4.332656
Sum squared resid	0.021714	Schwarz criterion	-4.241047
Log likelihood	71.32250	Hannan-Quinn criter.	-4.302290
F-statistic	27.88078	Durbin-Watson stat	0.417841
Prob(F-statistic)	0.000011		

Appendix 4.28

Dependent Variable: LOGUR
Method: Least Squares
Date: 02/24/18 Time: 10:45
Sample: 2010Q1 2017Q4
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.132629	0.061286	18.48099	0.0000
LOGRPGT5	0.011062	0.026619	0.415570	0.6807

R-squared	0.005724	Mean dependent var	1.157467
Adjusted R-squared	-0.027419	S.D. dependent var	0.075618

S.E. of regression	0.076647	Akaike info criterion	-2.238741
Sum squared resid	0.176245	Schwarz criterion	-2.147133
Log likelihood	37.81986	Hannan-Quinn criter.	-2.208376
F-statistic	0.172699	Durbin-Watson stat	0.685000
Prob(F-statistic)	0.680682		

Appendix 4.29

Dependent Variable: LOGCONC
Method: Least Squares
Date: 02/24/18 Time: 10:46
Sample: 2010Q1 2017Q4
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.286183	0.061243	86.31422	0.0000
LOGRPGT5	0.145961	0.026600	5.487209	0.0000

R-squared	0.500911	Mean dependent var	5.613923
Adjusted R-squared	0.484274	S.D. dependent var	0.106656
S.E. of regression	0.076594	Akaike info criterion	-2.240135
Sum squared resid	0.175999	Schwarz criterion	-2.148527
Log likelihood	37.84216	Hannan-Quinn criter.	-2.209769
F-statistic	30.10946	Durbin-Watson stat	1.058042
Prob(F-statistic)	0.000006		

Appendix 4.30: Breusch-Godfrey Serial Correlation LM Test (Source: Developed for research via EViews 8.0)

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	2.250371	Prob. F(5,21)	0.0869
Obs*R-squared	11.16399	Prob. Chi-Square(5)	0.0482

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 02/22/18 Time: 00:53
Sample: 2010Q1 2017Q4
Included observations: 32
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	40.75904	194.3990	0.209667	0.8359
LOGOIL	-4.990607	7.375103	-0.676683	0.5060
LOGLR	1.039671	74.24660	0.014003	0.9890
LOGUR	-26.56108	27.09715	-0.980217	0.3381
LOGCONC	-1.009422	18.64302	-0.054145	0.9573
LOGRPGT1	-1.333460	4.644747	-0.287090	0.7769
RESID(-1)	0.577986	0.211579	2.731774	0.0125
RESID(-2)	-0.064284	0.246651	-0.260628	0.7969
RESID(-3)	-0.123379	0.240872	-0.512216	0.6138
RESID(-4)	0.273189	0.232852	1.173229	0.2538
RESID(-5)	-0.391504	0.239223	-1.636561	0.1166

R-squared	0.348875	Mean dependent var	-1.34E-13
Adjusted R-squared	0.038815	S.D. dependent var	6.940789
S.E. of regression	6.804752	Akaike info criterion	6.939406
Sum squared resid	972.3976	Schwarz criterion	7.443253
Log likelihood	-100.0305	Hannan-Quinn criter.	7.106417
F-statistic	1.125186	Durbin-Watson stat	1.829425
Prob(F-statistic)	0.389851		

Appendix 4.31: Breusch-Godfrey Serial Correlation LM Test (Source: Developed for research via EViews 8.0)

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	2.250371	Prob. F(5,21)	0.0869
Obs*R-squared	11.16399	Prob. Chi-Square(5)	0.0482

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 02/22/18 Time: 00:59
Sample: 2010Q1 2017Q4
Included observations: 32
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	40.75904	194.3990	0.209667	0.8359
LOGOIL	-4.990607	7.375103	-0.676683	0.5060
LOGLR	1.039671	74.24660	0.014003	0.9890
LOGUR	-26.56108	27.09715	-0.980217	0.3381
LOGCONC	-1.009422	18.64302	-0.054145	0.9573
LOGRPGT2	-1.333460	4.644747	-0.287090	0.7769
RESID(-1)	0.577986	0.211579	2.731774	0.0125
RESID(-2)	-0.064284	0.246651	-0.260628	0.7969
RESID(-3)	-0.123379	0.240872	-0.512216	0.6138
RESID(-4)	0.273189	0.232852	1.173229	0.2538
RESID(-5)	-0.391504	0.239223	-1.636561	0.1166

R-squared	0.348875	Mean dependent var	-1.34E-13
Adjusted R-squared	0.038815	S.D. dependent var	6.940789
S.E. of regression	6.804752	Akaike info criterion	6.939406
Sum squared resid	972.3976	Schwarz criterion	7.443253
Log likelihood	-100.0305	Hannan-Quinn criter.	7.106417
F-statistic	1.125186	Durbin-Watson stat	1.829425
Prob(F-statistic)	0.389851		

Appendix 4.32: Breusch-Godfrey Serial Correlation LM Test (Source: Developed for research via EViews 8.0)

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	2.188120	Prob. F(5,21)	0.0942
Obs*R-squared	10.96095	Prob. Chi-Square(5)	0.0522

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 02/22/18 Time: 01:02
Sample: 2010Q1 2017Q4
Included observations: 32
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	89.18086	179.0885	0.497971	0.6237
LOGOIL	-7.350273	9.629377	-0.763318	0.4538
LOGLR	-16.61251	59.48296	-0.279282	0.7828
LOGUR	-36.68995	31.38105	-1.169176	0.2554
LOGCONC	-1.540373	18.99880	-0.081077	0.9361
LOGRPGT3	-1.174241	3.766704	-0.311742	0.7583
RESID(-1)	0.482423	0.229518	2.101896	0.0478
RESID(-2)	0.275964	0.226126	1.220396	0.2358
RESID(-3)	-0.231809	0.247246	-0.937566	0.3591
RESID(-4)	0.148972	0.248654	0.599114	0.5555
RESID(-5)	-0.238714	0.240686	-0.991808	0.3326

R-squared	0.342530	Mean dependent var	-9.95E-14
Adjusted R-squared	0.029448	S.D. dependent var	7.333718
S.E. of regression	7.224928	Akaike info criterion	7.059238
Sum squared resid	1096.191	Schwarz criterion	7.563085
Log likelihood	-101.9478	Hannan-Quinn criter.	7.226249
F-statistic	1.094060	Durbin-Watson stat	1.917798
Prob(F-statistic)	0.409684		

Appendix 4.33: Breusch-Godfrey Serial Correlation LM Test (Source: Developed for research via EViews 8.0)

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.935386	Prob. F(5,21)	0.1310
Obs*R-squared	10.09429	Prob. Chi-Square(5)	0.0726

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 02/22/18 Time: 01:04
Sample: 2010Q1 2017Q4
Included observations: 32
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	75.14128	176.9507	0.424645	0.6754
LOGOIL	-4.909673	9.040508	-0.543075	0.5928
LOGLR	-19.95238	58.50578	-0.341033	0.7365
LOGUR	-30.96350	30.51559	-1.014678	0.3218
LOGCONC	0.390733	18.29919	0.021352	0.9832
LOGRPGT4	-0.642709	4.582142	-0.140264	0.8898
RESID(-1)	0.445460	0.232821	1.913317	0.0694
RESID(-2)	0.249358	0.225011	1.108204	0.2803
RESID(-3)	-0.239915	0.239029	-1.003706	0.3269

RESID(-4)	0.125198	0.247721	0.505400	0.6185
RESID(-5)	-0.260276	0.238361	-1.091940	0.2872

R-squared	0.315446	Mean dependent var	-1.37E-13
Adjusted R-squared	-0.010531	S.D. dependent var	7.054436
S.E. of regression	7.091485	Akaike info criterion	7.021953
Sum squared resid	1056.072	Schwarz criterion	7.525800
Log likelihood	-101.3513	Hannan-Quinn criter.	7.188964
F-statistic	0.967693	Durbin-Watson stat	1.952523
Prob(F-statistic)	0.497774		

Appendix 4.34: Breusch-Godfrey Serial Correlation LM Test (Source: Developed for research via EViews 8.0)

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.798853	Prob. F(5,21)	0.1567
Obs*R-squared	9.595716	Prob. Chi-Square(5)	0.0875

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 02/22/18 Time: 01:06
Sample: 2010Q1 2017Q4
Included observations: 32
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	62.02228	176.0670	0.352265	0.7281
LOGOIL	-1.830804	8.500444	-0.215378	0.8316
LOGLR	-23.88101	58.46972	-0.408434	0.6871
LOGUR	-22.00600	29.71186	-0.740647	0.4671
LOGCONC	1.303274	17.85283	0.073001	0.9425
LOGRPGT5	0.783719	5.463117	0.143456	0.8873
RESID(-1)	0.390766	0.233756	1.671679	0.1094
RESID(-2)	0.212562	0.225584	0.942275	0.3568
RESID(-3)	-0.251178	0.230065	-1.091768	0.2873
RESID(-4)	0.073064	0.246081	0.296911	0.7695
RESID(-5)	-0.293828	0.234885	-1.250942	0.2247

R-squared	0.299866	Mean dependent var	-1.49E-13
Adjusted R-squared	-0.033531	S.D. dependent var	6.974441
S.E. of regression	7.090406	Akaike info criterion	7.021649
Sum squared resid	1055.751	Schwarz criterion	7.525496
Log likelihood	-101.3464	Hannan-Quinn criter.	7.188660
F-statistic	0.899426	Durbin-Watson stat	2.002379
Prob(F-statistic)	0.550003		

Appendix 4.35: Newey – West Test, RPGT1 = RPGT2 (Source: Developed for research via EViews 8.0)

Dependent Variable: MHPI
Method: Least Squares

Date: 02/22/18 Time: 01:22
Sample: 2010Q1 2017Q4
Included observations: 32
HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-498.0329	264.2260	-1.884875	0.0707
LOGOIL	-5.851690	8.679442	-0.674201	0.5061
LOGLR	108.8387	89.48381	1.216295	0.2348
LOGUR	76.70511	30.71016	2.497711	0.0192
LOGCONC	48.41188	19.53547	2.478153	0.0200
LOGRPGT1	28.45687	5.422960	5.247480	0.0000

R-squared	0.941398	Mean dependent var	144.1500
Adjusted R-squared	0.930129	S.D. dependent var	28.67168
S.E. of regression	7.578844	Akaike info criterion	7.055959
Sum squared resid	1493.411	Schwarz criterion	7.330785
Log likelihood	-106.8953	Hannan-Quinn criter.	7.147056
F-statistic	83.53439	Durbin-Watson stat	1.064871
Prob(F-statistic)	0.000000		

Appendix 4.36: Autoregressive Conditional Heteroscedasticity (ARCH) Test (Source: Developed for research via EViews 8.0)

Heteroskedasticity Test: ARCH

F-statistic	0.879949	Prob. F(5,21)	0.5115
Obs*R-squared	4.676942	Prob. Chi-Square(5)	0.4566

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 02/22/18 Time: 00:51
Sample (adjusted): 2011Q2 2017Q4
Included observations: 27 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	44.02683	26.67847	1.650275	0.1138
RESID^2(-1)	0.382922	0.207181	1.848246	0.0787
RESID^2(-2)	-0.242956	0.218241	-1.113248	0.2782
RESID^2(-3)	-0.024836	0.224233	-0.110762	0.9129
RESID^2(-4)	0.006650	0.218371	0.030454	0.9760
RESID^2(-5)	-0.049849	0.204939	-0.243238	0.8102

R-squared	0.173220	Mean dependent var	48.01058
Adjusted R-squared	-0.023632	S.D. dependent var	79.97904
S.E. of regression	80.91856	Akaike info criterion	11.81789
Sum squared resid	137504.1	Schwarz criterion	12.10586
Log likelihood	-153.5416	Hannan-Quinn criter.	11.90352
F-statistic	0.879949	Durbin-Watson stat	1.851130
Prob(F-statistic)	0.511517		

Appendix 4.37: Autoregressive Conditional Heteroscedasticity (ARCH) Test (Source: Developed for research via EViews 8.0)

Heteroskedasticity Test: ARCH

F-statistic	0.879949	Prob. F(5,21)	0.5115
Obs*R-squared	4.676942	Prob. Chi-Square(5)	0.4566

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 02/22/18 Time: 00:58
Sample (adjusted): 2011Q2 2017Q4
Included observations: 27 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	44.02683	26.67847	1.650275	0.1138
RESID^2(-1)	0.382922	0.207181	1.848246	0.0787
RESID^2(-2)	-0.242956	0.218241	-1.113248	0.2782
RESID^2(-3)	-0.024836	0.224233	-0.110762	0.9129
RESID^2(-4)	0.006650	0.218371	0.030454	0.9760
RESID^2(-5)	-0.049849	0.204939	-0.243238	0.8102

R-squared	0.173220	Mean dependent var	48.01058
Adjusted R-squared	-0.023632	S.D. dependent var	79.97904
S.E. of regression	80.91856	Akaike info criterion	11.81789
Sum squared resid	137504.1	Schwarz criterion	12.10586
Log likelihood	-153.5416	Hannan-Quinn criter.	11.90352
F-statistic	0.879949	Durbin-Watson stat	1.851130
Prob(F-statistic)	0.511517		

Appendix 4.38: Autoregressive Conditional Heteroscedasticity (ARCH) Test (Source: Developed for research via EViews 8.0)

Heteroskedasticity Test: ARCH

F-statistic	0.177010	Prob. F(5,21)	0.9682
Obs*R-squared	1.091905	Prob. Chi-Square(5)	0.9548

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 02/22/18 Time: 01:01
Sample (adjusted): 2011Q2 2017Q4
Included observations: 27 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	54.54395	32.79978	1.662936	0.1112
RESID^2(-1)	-0.046928	0.218951	-0.214331	0.8324
RESID^2(-2)	-0.022837	0.218660	-0.104440	0.9178
RESID^2(-3)	-0.080237	0.216496	-0.370619	0.7146
RESID^2(-4)	0.169051	0.217121	0.778602	0.4449
RESID^2(-5)	-0.001858	0.219660	-0.008458	0.9933

R-squared	0.040441	Mean dependent var	55.42476
Adjusted R-squared	-0.188026	S.D. dependent var	74.78940
S.E. of regression	81.51789	Akaike info criterion	11.83265
Sum squared resid	139548.5	Schwarz criterion	12.12062
Log likelihood	-153.7408	Hannan-Quinn criter.	11.91828
F-statistic	0.177010	Durbin-Watson stat	1.091757
Prob(F-statistic)	0.968235		

Appendix 4.39: Autoregressive Conditional Heteroscedasticity (ARCH) Test (Source: Developed for research via EViews 8.0)

Heteroskedasticity Test: ARCH

F-statistic	0.311479	Prob. F(5,21)	0.9005
Obs*R-squared	1.864121	Prob. Chi-Square(5)	0.8676

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 02/22/18 Time: 01:04
Sample (adjusted): 2011Q2 2017Q4
Included observations: 27 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	45.31234	28.67235	1.580350	0.1290
RESID^2(-1)	-0.038075	0.218054	-0.174614	0.8631
RESID^2(-2)	-0.065636	0.213693	-0.307150	0.7618
RESID^2(-3)	-0.036719	0.212585	-0.172725	0.8645
RESID^2(-4)	0.246454	0.212713	1.158626	0.2596
RESID^2(-5)	0.023378	0.218788	0.106851	0.9159

R-squared	0.069042	Mean dependent var	51.61674
Adjusted R-squared	-0.152615	S.D. dependent var	65.21492
S.E. of regression	70.01468	Akaike info criterion	11.52842
Sum squared resid	102943.2	Schwarz criterion	11.81638
Log likelihood	-149.6336	Hannan-Quinn criter.	11.61404
F-statistic	0.311479	Durbin-Watson stat	1.061127
Prob(F-statistic)	0.900494		

Appendix 4.40: Autoregressive Conditional Heteroscedasticity (ARCH) Test (Source: Developed for research via EViews 8.0)

Heteroskedasticity Test: ARCH

F-statistic	0.209940	Prob. F(5,21)	0.9545
Obs*R-squared	1.285363	Prob. Chi-Square(5)	0.9364

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares

Date: 02/22/18 Time: 01:05
Sample (adjusted): 2011Q2 2017Q4
Included observations: 27 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	42.01623	26.31847	1.596454	0.1253
RESID^2(-1)	0.051676	0.217237	0.237880	0.8143
RESID^2(-2)	-0.044372	0.214589	-0.206776	0.8382
RESID^2(-3)	-0.009897	0.213664	-0.046319	0.9635
RESID^2(-4)	0.207817	0.213682	0.972554	0.3418
RESID^2(-5)	-0.032349	0.217992	-0.148395	0.8834

R-squared	0.047606	Mean dependent var	50.47352
Adjusted R-squared	-0.179154	S.D. dependent var	64.50786
S.E. of regression	70.04836	Akaike info criterion	11.52938
Sum squared resid	103042.2	Schwarz criterion	11.81734
Log likelihood	-149.6466	Hannan-Quinn criter.	11.61501
F-statistic	0.209940	Durbin-Watson stat	1.128864
Prob(F-statistic)	0.954521		

Appendix 4.41: Ramsey RESET Test (Source: Developed for research via EViews 8.0)

Ramsey RESET Test
Equation: UNTITLED
Specification: MHPI C LOGOIL LOGLR LOGUR LOGCONC LOGRPGT1
Omitted Variables: Powers of fitted values from 2 to 6

	Value	df	Probability
F-statistic	1.768637	(5, 21)	0.1631
Likelihood ratio	11.24589	5	0.0467

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	442.5302	5	88.50605
Restricted SSR	1493.411	26	57.43888
Unrestricted SSR	1050.881	21	50.04194
Unrestricted SSR	1050.881	21	50.04194

LR test summary:

	Value	df
Restricted LogL	-106.8953	26
Unrestricted LogL	-101.2724	21

Unrestricted Test Equation:
Dependent Variable: MHPI
Method: Least Squares
Date: 02/22/18 Time: 00:55
Sample: 2010Q1 2017Q4
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-3360135.	1815355.	-1.850952	0.0783
LOGOIL	-37813.72	20425.42	-1.851307	0.0782

LOGLR	703531.4	379857.4	1.852093	0.0781
LOGUR	495759.7	267710.2	1.851852	0.0782
LOGCONC	312878.5	168961.5	1.851774	0.0782
LOGRPGT1	183960.4	99329.90	1.852014	0.0781
FITTED^2	-121.9033	65.13428	-1.871570	0.0753
FITTED^3	1.213118	0.642308	1.888687	0.0728
FITTED^4	-0.006719	0.003531	-1.903076	0.0708
FITTED^5	1.96E-05	1.03E-05	1.914677	0.0693
FITTED^6	-2.37E-08	1.23E-08	-1.923360	0.0681

R-squared	0.958763	Mean dependent var	144.1500
Adjusted R-squared	0.939127	S.D. dependent var	28.67168
S.E. of regression	7.074033	Akaike info criterion	7.017025
Sum squared resid	1050.881	Schwarz criterion	7.520872
Log likelihood	-101.2724	Hannan-Quinn criter.	7.184036
F-statistic	48.82533	Durbin-Watson stat	1.336064
Prob(F-statistic)	0.000000		

Appendix 4.42: Ramsey RESET Test (Source: Developed for research via EViews 8.0)

Ramsey RESET Test
Equation: UNTITLED
Specification: MHPI C LOGOIL LOGLR LOGUR LOGCONC LOGRPGT2
Omitted Variables: Powers of fitted values from 2 to 6

	Value	df	Probability
F-statistic	1.768637	(5, 21)	0.1631
Likelihood ratio	11.24589	5	0.0467

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	442.5302	5	88.50605
Restricted SSR	1493.411	26	57.43888
Unrestricted SSR	1050.881	21	50.04194
Unrestricted SSR	1050.881	21	50.04194

LR test summary:

	Value	df
Restricted LogL	-106.8953	26
Unrestricted LogL	-101.2724	21

Unrestricted Test Equation:
Dependent Variable: MHPI
Method: Least Squares
Date: 02/22/18 Time: 01:00
Sample: 2010Q1 2017Q4
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-3360135.	1815355.	-1.850952	0.0783
LOGOIL	-37813.72	20425.42	-1.851307	0.0782
LOGLR	703531.4	379857.4	1.852093	0.0781
LOGUR	495759.7	267710.2	1.851852	0.0782
LOGCONC	312878.5	168961.5	1.851774	0.0782

LOGRPGT2	183960.4	99329.90	1.852014	0.0781
FITTED^2	-121.9033	65.13428	-1.871570	0.0753
FITTED^3	1.213118	0.642308	1.888687	0.0728
FITTED^4	-0.006719	0.003531	-1.903076	0.0708
FITTED^5	1.96E-05	1.03E-05	1.914677	0.0693
FITTED^6	-2.37E-08	1.23E-08	-1.923360	0.0681

R-squared	0.958763	Mean dependent var	144.1500
Adjusted R-squared	0.939127	S.D. dependent var	28.67168
S.E. of regression	7.074033	Akaike info criterion	7.017025
Sum squared resid	1050.881	Schwarz criterion	7.520872
Log likelihood	-101.2724	Hannan-Quinn criter.	7.184036
F-statistic	48.82533	Durbin-Watson stat	1.336064
Prob(F-statistic)	0.000000		

Appendix 4.43: Ramsey RESET Test (Source: Developed for research via EViews 8.0)

Ramsey RESET Test
Equation: UNTITLED
Specification: MHPI C LOGOIL LOGLR LOGUR LOGCONC LOGRPGT3
Omitted Variables: Powers of fitted values from 2 to 6

	Value	df	Probability
F-statistic	3.011527	(5, 21)	0.0334
Likelihood ratio	17.29908	5	0.0040

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	696.2572	5	139.2514
Restricted SSR	1667.286	26	64.12639
Unrestricted SSR	971.0289	21	46.23947
Unrestricted SSR	971.0289	21	46.23947

LR test summary:

	Value	df
Restricted LogL	-108.6575	26
Unrestricted LogL	-100.0080	21

Unrestricted Test Equation:
Dependent Variable: MHPI
Method: Least Squares
Date: 02/22/18 Time: 01:02
Sample: 2010Q1 2017Q4
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-3294934.	2608125.	-1.263334	0.2203
LOGOIL	28336.19	22390.24	1.265560	0.2195
LOGLR	1152176.	910565.9	1.265340	0.2196
LOGUR	401446.7	317279.5	1.265278	0.2196
LOGCONC	166567.5	131648.8	1.265242	0.2196
LOGRPGT3	75582.94	59713.21	1.265766	0.2195
FITTED^2	-78.63297	58.51806	-1.343738	0.1934
FITTED^3	0.836177	0.588063	1.421917	0.1697

FITTED^4	-0.004932	0.003292	-1.497984	0.1490
FITTED^5	1.53E-05	9.74E-06	1.570315	0.1313
FITTED^6	-1.95E-08	1.19E-08	-1.637593	0.1164

R-squared	0.961897	Mean dependent var	144.1500
Adjusted R-squared	0.943752	S.D. dependent var	28.67168
S.E. of regression	6.799961	Akaike info criterion	6.937997
Sum squared resid	971.0289	Schwarz criterion	7.441844
Log likelihood	-100.0080	Hannan-Quinn criter.	7.105008
F-statistic	53.01313	Durbin-Watson stat	1.373059
Prob(F-statistic)	0.000000		

Appendix 4.44: Ramsey RESET Test (Source: Developed for research via EViews 8.0)

Ramsey RESET Test
Equation: UNTITLED
Specification: MHPI C LOGOIL LOGLR LOGUR LOGCONC LOGRPGT4
Omitted Variables: Powers of fitted values from 2 to 6

	Value	df	Probability
F-statistic	2.468501	(5, 21)	0.0657
Likelihood ratio	14.79394	5	0.0113

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	571.0727	5	114.2145
Restricted SSR	1542.717	26	59.33527
Unrestricted SSR	971.6444	21	46.26878
Unrestricted SSR	971.6444	21	46.26878

LR test summary:

	Value	df
Restricted LogL	-107.4151	26
Unrestricted LogL	-100.0181	21

Unrestricted Test Equation:
Dependent Variable: MHPI
Method: Least Squares
Date: 02/22/18 Time: 01:04
Sample: 2010Q1 2017Q4
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2233117.	2498029.	-0.893952	0.3815
LOGOIL	13628.77	15202.53	0.896480	0.3802
LOGLR	773828.3	863851.0	0.895789	0.3805
LOGUR	272598.2	304337.9	0.895709	0.3806
LOGCONC	111912.2	124952.5	0.895638	0.3806
LOGRPGT4	68662.97	76621.59	0.896131	0.3803
FITTED^2	-55.51602	57.48681	-0.965718	0.3452
FITTED^3	0.597295	0.576122	1.036750	0.3116
FITTED^4	-0.003562	0.003217	-1.107291	0.2807
FITTED^5	1.12E-05	9.49E-06	1.175902	0.2528
FITTED^6	-1.44E-08	1.16E-08	-1.241282	0.2282

R-squared	0.961872	Mean dependent var	144.1500
Adjusted R-squared	0.943716	S.D. dependent var	28.67168
S.E. of regression	6.802116	Akaike info criterion	6.938631
Sum squared resid	971.6444	Schwarz criterion	7.442478
Log likelihood	-100.0181	Hannan-Quinn criter.	7.105642
F-statistic	52.97822	Durbin-Watson stat	1.373640
Prob(F-statistic)	0.000000		

Appendix 4.45: Ramsey RESET Test (Source: Developed for research via EViews 8.0)

Ramsey RESET Test
Equation: UNTITLED
Specification: MHPI C LOGOIL LOGLR LOGUR LOGCONC LOGRPGT5
Omitted Variables: Powers of fitted values from 2 to 6

	Value	df	Probability
F-statistic	2.561211	(5, 21)	0.0584
Likelihood ratio	15.23576	5	0.0094

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	571.2173	5	114.2435
Restricted SSR	1507.927	26	57.99721
Unrestricted SSR	936.7102	21	44.60525
Unrestricted SSR	936.7102	21	44.60525

LR test summary:

	Value	df
Restricted LogL	-107.0501	26
Unrestricted LogL	-99.43224	21

Unrestricted Test Equation:
Dependent Variable: MHPI
Method: Least Squares
Date: 02/22/18 Time: 01:06
Sample: 2010Q1 2017Q4
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-471613.5	2497227.	-0.188855	0.8520
LOGOIL	929.7673	4786.949	0.194230	0.8479
LOGLR	161190.3	846030.6	0.190525	0.8507
LOGUR	55581.82	291877.3	0.190429	0.8508
LOGCONC	24705.75	129809.9	0.190323	0.8509
LOGRPGT5	17527.81	91837.92	0.190856	0.8505
FITTED^2	-14.55076	57.00670	-0.255246	0.8010
FITTED^3	0.184043	0.569456	0.323190	0.7497
FITTED^4	-0.001245	0.003167	-0.393075	0.6982
FITTED^5	4.31E-06	9.31E-06	0.463614	0.6477
FITTED^6	-6.02E-09	1.13E-08	-0.533464	0.5993

R-squared	0.963243	Mean dependent var	144.1500
Adjusted R-squared	0.945740	S.D. dependent var	28.67168

S.E. of regression	6.678716	Akaike info criterion	6.902015
Sum squared resid	936.7102	Schwarz criterion	7.405862
Log likelihood	-99.43224	Hannan-Quinn criter.	7.069026
F-statistic	55.03234	Durbin-Watson stat	1.409454
Prob(F-statistic)	0.000000		