NEXUS BETWEEN HOUSING GLUT, HOUSING AFFORDABILITY, HOUSING PRICE AND HOUSING TRANSACTION IN MALAYSIA

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A research project submitted in partial fulfilment of the requirement for the degree of

BACHELORS OF FINANCE (HONS)

UNIVERSITI TUNKU ABDUL RAHMAN

FACULTY OF BUSINESS AND FINANCE

DEPARTMENT OF FINANCE

AUGUST 2018

DECLARATION

We hereby declare that:

(1) This undergraduate research project is the ed 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 paper research project has been submitted in support of any application for any other degree of qualification of this or any other university, or other institutes of learning.

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

(4) The word count of this research is 24382 words.

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Date: 17th August 2018

ACKNOWLEDGEMENT

Our study has been successfully completed with the assistance of various parties. We would like to express our special thanks of gratitude to everyone who helped us a lot in completing our study.

First of all, we would like to thank Universiti Tunku Abdul Rahman (UTAR) for giving us this golden opportunity to conduct this study. This have let us to learn on the way to conduct a study and we have gain experience while conducting this study.

Secondly, we would like to thank our supervisor, Dr. Yip Chee Yin, who encourage, guide and support have made all of the difference. This study will not be successful without the proper guidance as well as her patience and encouragement to complete this study. Dr Yip was also giving valuable advice to help us in this study when we are facing some difficulties and she is giving her best effort to teach us until we understand what we supposed to do with this study.

Thirdly, we will also like to thank our coordinator, Ahmad Harith Ashrofie bin Hanafi and second examiner, Dr. Zuriawati Binti Zakaria for giving us useful suggestions and correcting the mistakes in our study. With these suggestions regarding the relevant study, we are able to amend and improve our study.

Last but not least, we would like to thank to our parents and friends who had given us support and help while we were in need for assistance. Not to forget, we would also like to thank our group members for sacrificing their valuable time and their hard work in order to complete this study. We have learnt, shared and experienced various memorable moments together throughout the voyage of completing this meaningful study.

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LIST OF ABBRAVIATIONS

ANOVA	Analysis of Variance
ARCH	Autoregressive Conditional Heteroscedasticity
ARDL	Autoregressive Distributed Lag Model
BGLM	Breusch–Godfrey Test
BLUE	Best Linear Unbiased Estimators
BNM	Bank Negara Malaysia
DV	Dependent Variable
DW	Durbin-Watson Test
GC	Granger Causality Test
GDP	Gross Domestic Product
GDPG	Gross Domestic Product Growth
GST	Goods and Services Tax
HCSE	White's Heteroscedasticity-Corrected Variance and Standard Error
IBS	Industrialized Building Systems
IMF	International Monetary Fund
IV	Independent variable
JB	Jarque-Bera test
LHDN	Lembangan Hasil Dalam Negera
LR	Lending Rate
MM2H	Malaysia My Second Home

NAPIC	National Property Information Centre
OLS	Ordinary Linear Square
PCIHTV	Percentage Changes in Housing Transaction Volume
PG	Population Growth
PMMS	Primary Mortgage Market Survey
PPR	Program Perumahan Rakyat
PR1MA	Perumahan Rakyat 1 Malaysia
Q	Quarter
RESET	Ramsey Regression Equation Specification Error Test
RPGT	Real Property Gains Tax
SE	Standard Error
SST	Sales and Services Tax
TOL	Tolerance
UR	Unemployment Rate
US	United States
UTAR	University Tunku Abdul Rahman
VIF	Variance Inflation Factor

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PREFACE

In Malaysia, housing activities are vital in macro-economic policy to adjust cyclical movements and maintain economic growth. In recent year, over developed in houses market lead to housing excess supply. Hence, housing glut has become a popular topic being discuss. The variable including gross domestic product growth, lending rate, population growth, and unemployment are the factor that cause housing glut, affordability, and housing price in Malaysia

This research is conducted based on the guidelines that consists of 3 main sections:

First Section: Preliminary pages that include copyright pages, declaration, acknowledgement, contents page, list of tables, list of figures, list of abbreviation, list of appendix, preface and abstract.

Second Section: The body (content) of the research

Chapter 1: Research Overview

Chapter 2: Literature Review

Chapter 3: Methodology

Chapter 4: Data Analysis

Chapter 5: Discussion, Conclusion, and Implication

Third Section: The end materials consist of references and appendixes

Fulfilling the above criteria completes this research study. The study provides various types of information above about housing sector in Malaysia which will be useful for future researchers.

ABSTRACT

This study aims to investigate and identify the nexus between **Housing Glut, Housing Affordability, and Housing Price** in Malaysia and how it relates to **Housing Transaction Volume** from year 1996 to 2016 by using regression and economic analysis. Housing glut is the current issue and it is due to housing price and housing affordability. Change in housing transaction volume act as an indicator to represent the nexus between **Housing Glut, Housing Affordability, and Housing Price** as they are correlated with each other. Our major finding suggest that, housing transaction volume can be divided into buying and selling perspective. From the buyer's viewpoint, the housing transaction volume (buying) increase when the housing price is low and it increases the housing affordability of a house buyer. Lower housing price increases the transaction volume (buying) and thus decreases the housing glut. Another result from seller viewpoint is housing transaction volume (selling) will increases when the housing price is high, seller will enter to the market to gain more profit. When the housing price is high, it decreases the housing affordability for home buyer and increase the housing glut in the housing market of Malaysia.

CHAPTER 1: LITERATURE REVIEW

1.0 Introduction

In this research, the main objective is to investigate about the status of the housing market in Malaysia and this will be discussed in the beginning of the chapter. This research will be focused in the relationship between change in housing transaction volume and four independent factors which are population growth, gross domestic product growth, unemployment rate and lending rate. A house is a basic and necessary need to everyone and it is not only providing a space of accommodation, it can also act as a powerful investment tool (Rameli, Johar, & Ho, 2006). Researchers found that there are some issues in the property market and yet to be solved, including housing glut, houses pricing and affordability which may affected the housing transaction volume and even affected the overall performance of Malaysia. In simple words, housing glut means that a property market is oversupplying, while the respond from demand remain low (Kerk, 2017). Housing affordability shows whether the house buyer has ability to afford a property. Consequently, this research are studying the nexus of housing glut, housing affordability and housing price (macroeconomic variables). Housing transaction volume act as an intermediary to identify how independent variables will affect the macroeconomic variables.

This research is to examine how the housing transaction volume influenced by the four factors during the 21 years from 1996 until 2016. The research background will be discussed after the introduction part. The part of research background is important, because it will enhance the understanding for those factors that affecting the housing transaction volume of Malaysia. The objective of this research is to investigate how these four independent variables affect to the volume of housing transaction and how volume of housing transaction explains in housing price, affordability and housing glut. After the part of research background, the following of this chapter will continue with the trends of all determinants and dependent variable, problem statement, research objectives and questions, hypothesis, significance of study, and chapter layout.

1.1 Research Background

Property market of Malaysia can be divided into three main sectors which are residential, industrial and commercial (Razif, Samsulkamal, & Halim, n.d.). Among these sectors, the residential properties have the highest demand in Malaysia market. This is due to the importance of residential which stated on the introduction part before. Property market is also important to Malaysian government's income due to the taxes that charge from purchasing or disposing a property. For example, when an individual is willing to own a property, individual needs to pay stamp duty to government (LHDN, 2013) ; while disposal a property and realize profit from that property, the seller needs to pay real property gain tax to government (LHDN, 2016).

Malaysian property market ranked in 'The World's Hottest Real Estate Markets' by the 9th in 2012 (Ghelani, 2012) and the housing price of Malaysia was ranked in the 5th place which is evolution rapidly among Asia Pacific during the year 2012 to 2017 (Chew, 2017) . This is because Malaysian government had strongly encourage and attract foreign investment in Malaysia. In the property market, foreigners have some rules and regulations to follow, in order to own a house in Malaysia.

First, foreigners cannot own and purchase properties which market value below RM1 million. To prevent loss of foreign investment, Malaysia's government had launched a project called 'Malaysia My Second Home' (MMSH). Under this project, foreigners can purchase and own properties at RM500,000 or above (Malaysia My Second Home, 2017). This action is to reduce the pressure on the Malaysians whose were in a low or middle income families when they purchasing houses without drive away the foreigners. However, when this foreign investment increases, the developers are more willing to construct the residential with high quality and design which can sell at higher price and mostly between RM250, 000 to RM500, 000 or even above RM500,000. Therefore, this may cause the issue of housing glut and make Malaysian unaffordable (Cheah, Almeida, Shukri, & Lim, 2017).

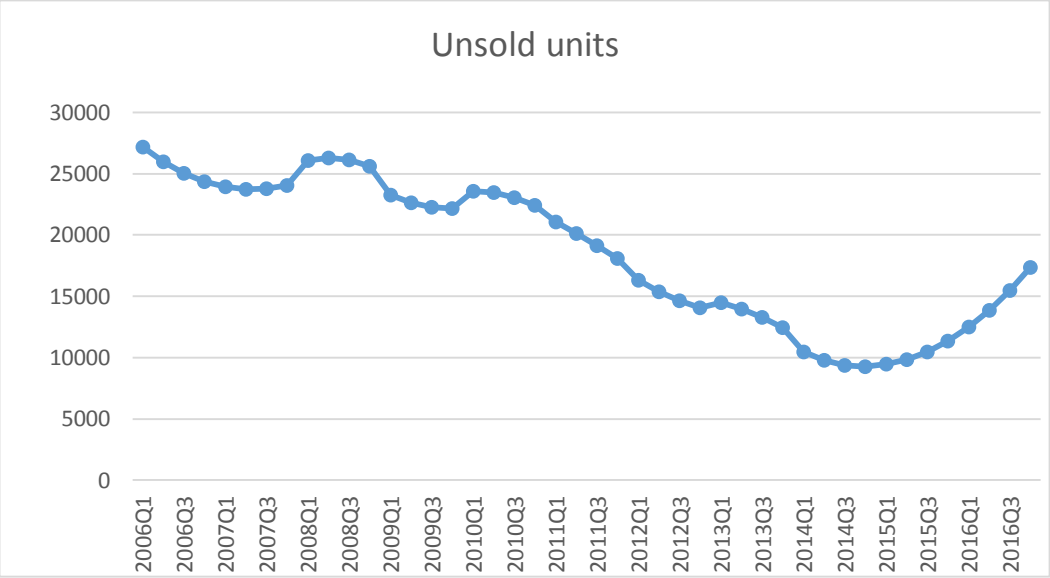
Based on the data that collected from National Property Information Centre (NAPIC) shown, the unsold residential properties in the year 2016 had 14792 units

and those units are worth RM 8.56 billion. The change in housing transaction volume in Malaysia had been collected among the year 1996 until 2016 for the following analysis and comparison.

1.1.2 Research background of Macroeconomic variables in Malaysia

1.1.2.1 Trend of Housing Glut in Malaysia

Figure 1.1: Unsold units from 2006-2016, Source from Annual Property Market Report (NAPIC)



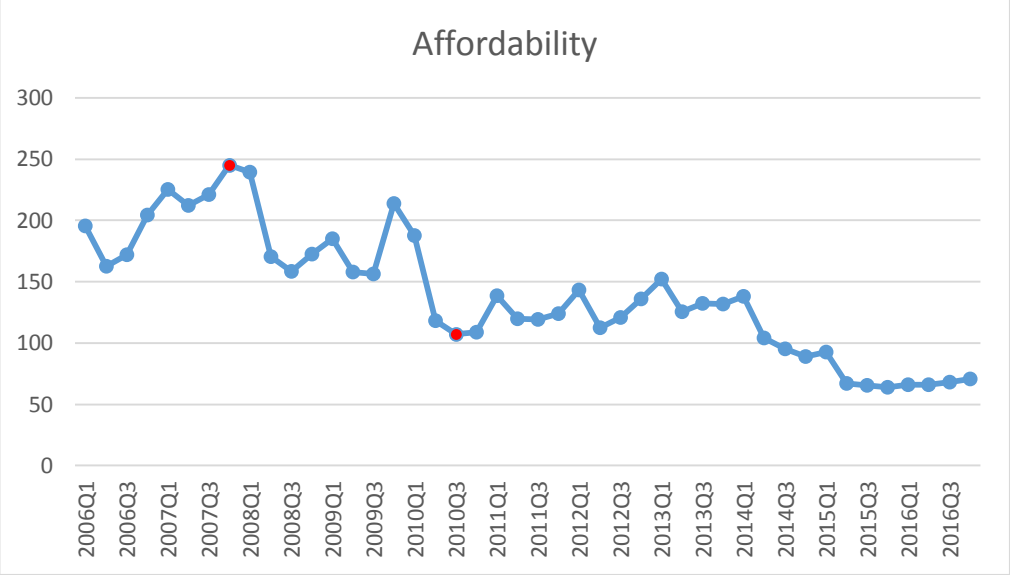
Glut defines as excess produced of a commodity, Malaysia residential property is facing glut situation. Several factors could lead to inelastic demand by consumer toward long term assets, including market condition, price factor, country economy performance and financial institution. The sign of market need on houses in urban area has increased during economic recovery. Opportunity in property investment has noticed by developer, developer fulfil the need without proper analysis has leaded to overbuilding or glut in the market (Yusof & Ismail, 2012). If the price of a houses is too expensive or when second hand property are facing excessive supply compared to demand, it will also can turn market into glut states (Shimizu, Nishimura, & Karato, 2007). In economy perspective, the unfavourable economic factors brought about by the glut put more pressure on the provision of affordable housing in Kenya (Siryah, 2010).If bank adopt “Lending frenzy” could produce a

glut of commercial real estate in most regions of the county (Follain, Hendershott, & Ling, 1992)

The diagram above showed that the unsold houses units in Malaysia from year 2006 to year 2016. The units were decreased steadily from quarter one of year 2006 to quarter two of year 2007. However, started from third quarter of year 2008, the total amount of unit's unsold increase until second quarter of year 2008. Moreover, started from quarter three of year 2008, the amount of units unsold in Malaysia decrease slowly by each quarter and this condition continue until the quarter four of year 2014. Therefore, to the units of houses unsold in Malaysia has decrease for approximately six years. Yet, the market started to grow up again since first quarter of year 2015 until fourth quarter of year 2016. In conclusion, the diagram above showed that the houses of units sold in Malaysia was unstable as well. When the number of houses unsold increases, the number of houses sold decrease, and vice versa.

1.1.2.2 Trend of Housing Affordability in Malaysia

Figure 1.2: Affordability index from 2006 – 2016, Source construct by Dr Yip Chee Yin

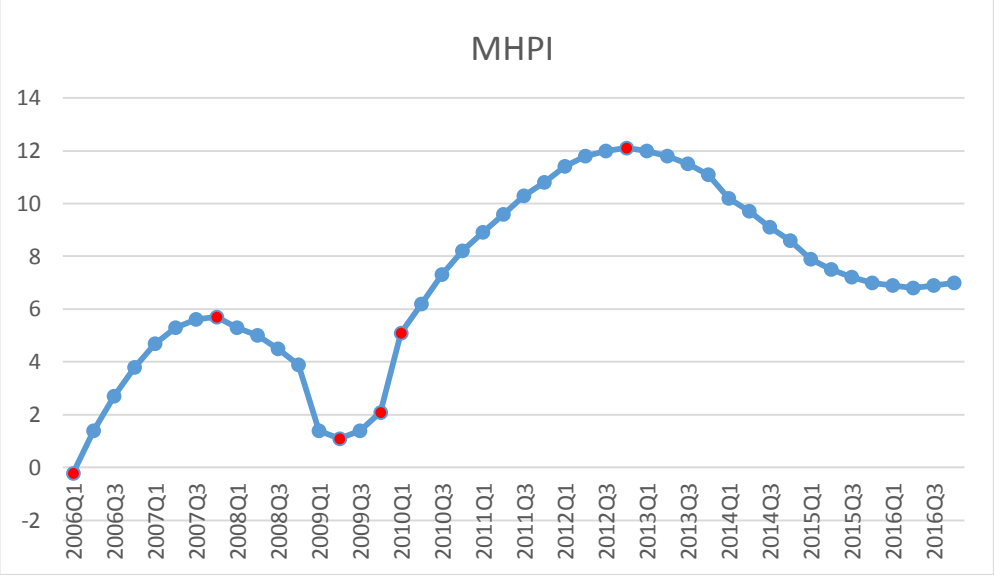


"Affordability" word is highly independent and lead by the element of locality. The function of affordability is act as a benchmark for individual to refer whether his or her income is sufficient to pay for a house and others family expenditure. Housing income, household expenditure, and housing prices is one of the way to measure affordability on particular section of society (Sani, Rahim, & C Munaaim, 2008). Rule of thumb stated, house repayment should not occupied more than 30 percent of the individual income consist of an individual coverable range. There is no optimal housing affordability index, but indexes should be evaluated based on their effectiveness (Haurin, 2016). Theoretically, a higher affordability index should have higher ownership rate. This is because houses turn more affordable, so people more likely to own a houses compare to rent (Goodman, Li, & Zhu, 2018). In addition, housing affordability indexes not only significant used by policy makers or real estate practitioners, but also others group including housing interest groups, existing home owners than plan to change property or people plan to buy a houses also useful to these group in decision making and better clarify the impact of proposed policies on housing affordability (Bourassa & Haurin, 2016).

Follow by information on above table has showed that the Malaysia affordability index from year 2006 to year 2016. From 2006Q1 to 2015Q1, eight years, the index performance can be descripted as fluctuate. In this significant climb and fall period, peak points has achieved in 2007Q4. While for the bottom line was happened in 2014Q4. The downward slopping trend did not station, it has continuously decrease to another bottom amount after a minor increased. In conclusion, when affordability index decrease, people ability to purchase a houses will decrease.

1.1.2.3 Trend of Housing Price Index in Malaysia

Figure 1.3: Malaysia Housing Price Index from 2006-2016, Source from Malaysia Housing Price Index Report (NAPIC)



Price of residential properties is playing a significant role in developed countries economic. Factor of value can influence individual or household decision making, this including buying nor selling the properties or direct invest in property market (Afiqah, Lizam, & Jalil, 2012). The objective of House Price Index (HPI) is to represent the house prices general movement and also serve as an indicator to measure housing market performance (Kassim, Redzuan, & Harun, 2017). According to Li and Tu (2011) define housing price index offers a gauge of measuring standard of living and wealth of households and homelands. The MHPI coverage take into account of 13 states and two federal territories. (Kassim, Redzuan, & Harun, 2017). Malaysian House Price Index (MHPI) was introduced by Valuation and Property Services Department (VPSD). The function of MHPI can provide deeper understand regard on the real estate market by producing accurate measure the price of real estate. Moreover, housing price index not just aim to deliver historical information on the price changes over time (Afiqah, Lizam, & Jalil, 2012). Residential market has its own cycle where it is prone to boom and bust, so this explain the presence index is also very important (Wallace, 1996). The

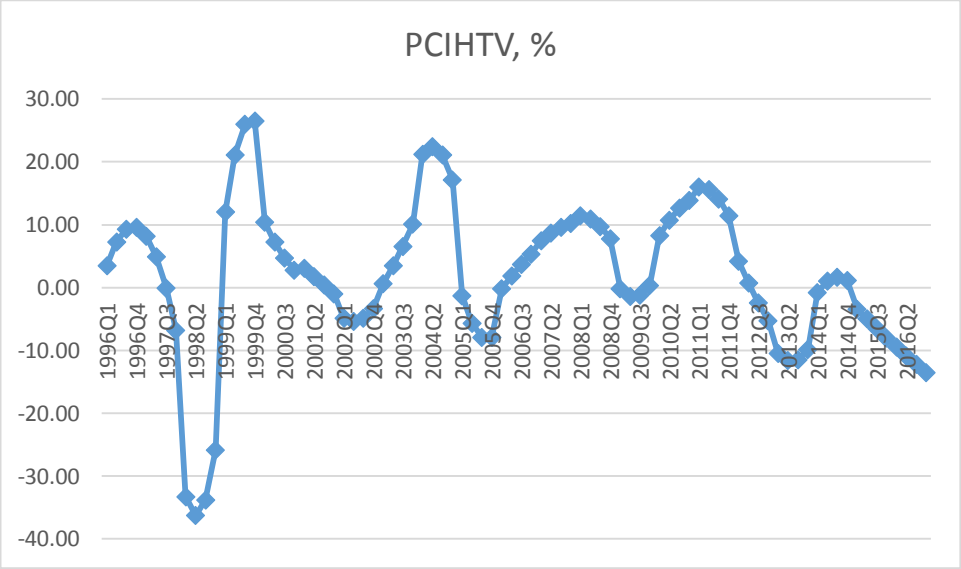
demand increase feature regard to houses on urban area residential aspect in recent year is because of the rapid economic development states in Malaysia (Ong, 2013).

Housing price index (HPI) has undergo a significant upward slope from -0.2 in period 2006Q1 to the peak points 5.7 during the period of 2007 quarter 4. In a short period, HPI has started to drop slowly. Between 2008Q4 to 2009Q2 this period, HPI has decreased 2.5 points. It was considered a dramatically drop and also hit the lowest point among year 2006 to 2016. Afterward, HPI started to recover. It has illustrated a stable grow trend and achieved another highest points during 2012Q4. Within this stable growth period, 2009Q4 to 2010Q1 this duration need to be highlighted. This is because HPI jumped three points in that moment. Then, HPI movement of flow has reverted to previous downward way.

1.1.3 Research Background of Factors of Percentage Changes in Housing Transaction Volume in Malaysia

1.1.3.1 Trend of Percentage Changes in Housing Transaction Volume (PCIHTV, %) in Malaysia

Figure 1.4: Percentage Changes in Housing Transaction from 1996Q1-2016Q4, source from data stream – National Property Information Centre (NAPIC).



According to the Mahalingam (2018), property development of Malaysia was getting better especially in this near decade. However, from the statistic that collected from NAPIC showed that the housing transaction volume is not getting better as the property development growth. The diagram above is the percentage changes in housing transaction volume from quarter 1 year 1996 to quarter 4 year 2016 and the data is collected from NAPIC to construct the graph. Based the graph above, among this ten years the percentage changes in housing transaction volume is highly fluctuated and the greatest difference is from the quarter 2 of year 1998 to quarter 4 in year 1999. In quarter 2 of 1998 there have a decreasing in percentage changes in housing transaction volume about 36.25% and recovery about 26.47%

in quarter 4 of 1999, among this two years there have a big changes in almost 62.72%. This two points had hit the lowest and the highest point among this 80 observations.

In the quarter 4 in year 1999, when the recovery reached the peak point, the percentage changes in housing transaction volume started to decline until the quarter 2 of year 2002. The percentage change in housing transaction volume is continuously fluctuated and finally from the quarter 3 of year 2014 there have an increasing in 1.66% compared to the previous quarter. Started from the quarter 3 of year 2014 the percentage changes in housing transaction volume is continuously declined until the quarter 4 of 2016.

1.1.3.2 Trend of Gross Domestic Product Growth, GDPG in Malaysia.

Figure 1.5: Malaysia Gross Domestic Product Growth, GDPG from year 1996Q1-2016Q4, Source from Datastream-The World Bank

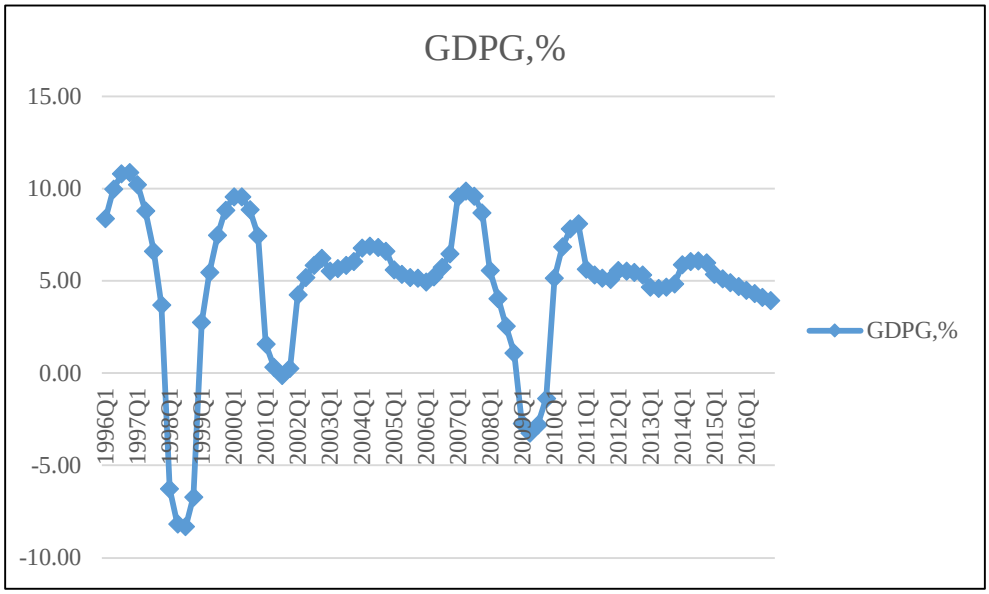
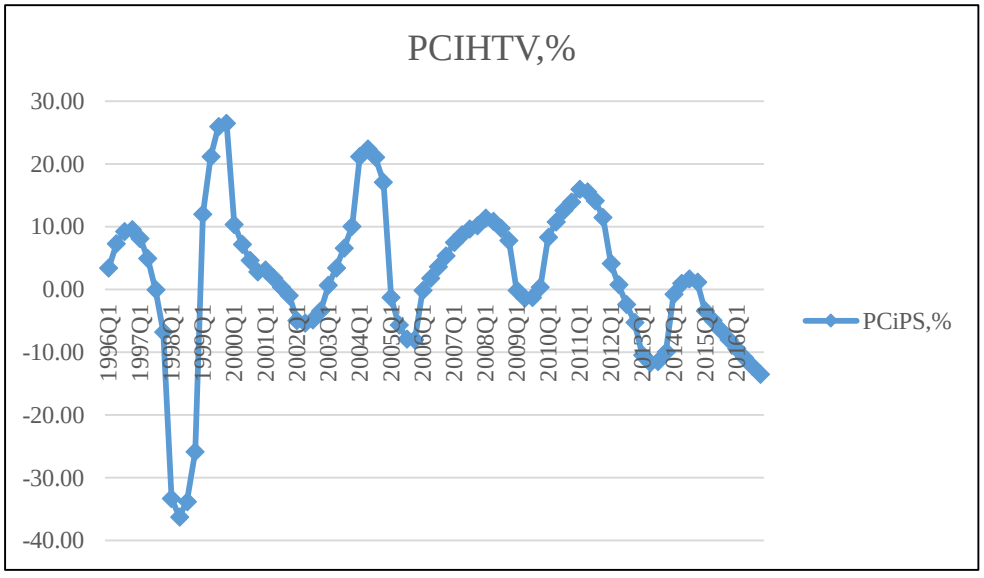


Figure 1.4: Percentage Changes in Housing Transaction Volume, PCIHTV from year 1996Q1-2016Q4, Source from Datastream-National property information Centre (NAPIC)



The Gross Domestic Product (GDP) is a measurement of the total market value of final goods and services made and provided in a particular country; it is derived from all the household consumptions, investments by businesses, government spending and the difference between export and import (Kurtzleben, 2014). According to Landefeld, Seskin and Fraumeni, (2008) GDP estimates the overall economy productivities, consumer spending that used to buy final goods and services and military spending by government. In short, GDP of a country stands as an indicator to show the economy performance of the specific country.

There are two graphs shown in the above which are the Gross Domestic Product Growth (GDPG, %) and the percentage change in housing transaction volume (PCIHTV, %). As both of the variables are in percentage (%) form, the data will be easier and more accurate to compare their relationship among the variables.

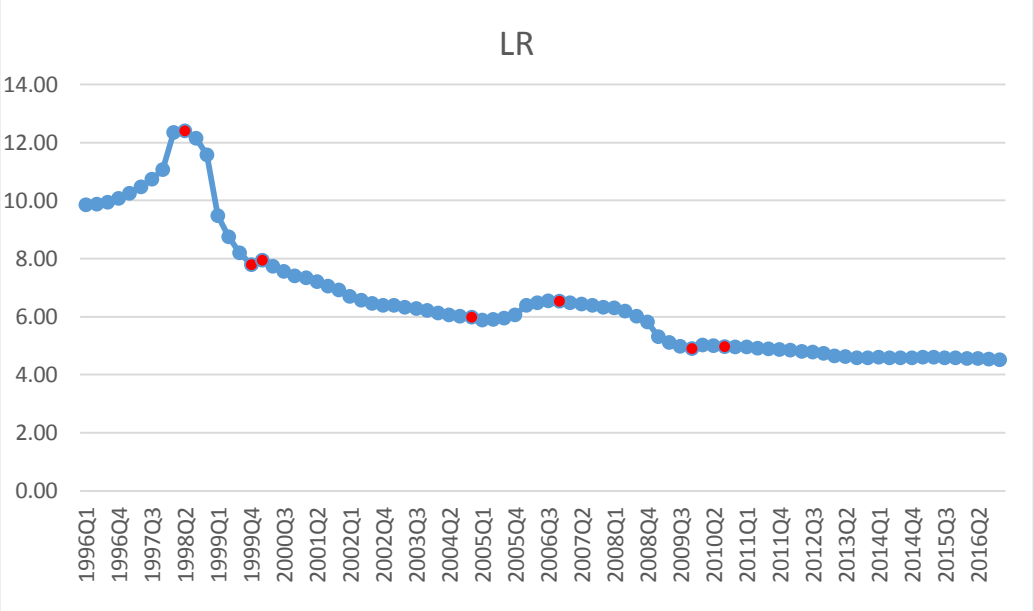
Although there is a downturn at the year 1998, but the GDP growth shoot back suddenly at the year 1999 and the GDP growth turn back to a positive percentage figure which is 8.84% in the fourth quarter of 1999. The graph continues to fluctuate at the following years .There is another obvious decrease from 2008 quarter 1 to 2009 quarter 2 which the GDP growth drops from 5.57% (Q1 2008) to -3.23% (Q2 2009). The trend went up after second quarter of 2009 and reached a positive GDP growth in the year 2010. The GDP growth moves steadily after the year 2010 which do not consist any steep increase or decrease.

As comparison between the two variables, change in housing transaction volume, PCIHTV and GDP growth, GDPG. The graphs shown a similar trend between both of the variables as there are few similar trends in the graphs shown above. For example, the GDPG faced a downturn at year 1998, 2001 and 2009. It is similar to the PCIHTV which also faced a downturn in both of the years. Both of the graphs have also increase in the year 1999 which after the sudden downturn of 1998. According to Zheng, (2018) consumption has a huge impact on China's economic development because it provides more than 60% in GDP growth.

As conclusion, there is a positive relationship between PCIHTV and GDPG which when percentage change in housing transaction volume increase, Gross domestic product growth will increase at the same time. As both of the graphs have shown similar trend.

1.1.3.3 Trend of Lending Rate in Malaysia

Figure 1.6: Lending rate from year 1996Q1-2016Q4, Source from Datastream - International Monetary Fund (IMF)



Lending rate is an indicator or benchmark for lender to refer in determines charges liable by borrower. Lending rate carries similar meaning with the term of interest rate. Any adjustments or changes in rate could adversely affect the cost of borrowing. According to the information above, the flow of Malaysia's lending rate initially increase and then slowly decrease.

The following lending rate performance will be divided into three phases to clarify. Phase one duration begin form year 1996 to 2000. Year 2001 to 2010 will take part in phase two. Sample size involve in phase three from 2011 to 2016.

At beginning, Malaysia lending rate in 1996Q2 has grew rapidly from 9.86% to 12.42% and hit the peak in 1998. After that, lending rate started slowly decline to lowest point (7.81% 1999Q4) in the twenty century. However, interest rate has

recover few decimal point (7.95%, 2000Q1) and it is the highest rate in twenty one century.

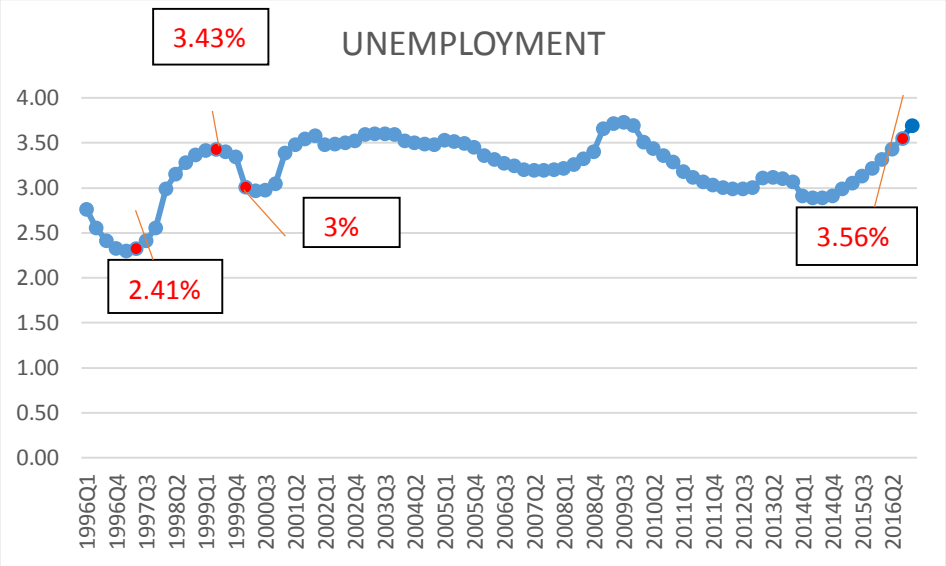
The unstable symptom has kept repeating after few years in the second stage. Firstly, the lending rate start to mitigate in continuous from year 2001Q1 (7.34%) to year 2005Q1 (5.89%). Until 2005Q2, interest rate rebound. It rise steadily toward peak point at 6.56% during 2006Q4, sequentially the rate diminish to the bottom line 4.91% in 2009Q4.

In the last stage, the performance of lending rate shows downward sloping from initial to ending stage.

Lending rate and housing is inter-relation among others. Any adjustment in lending rate will direct influence the people's capability and affordability to own a house. Borrower needs to repay more, since cost of borrowing turns higher and vice versus.

1.1.3.4 Trend of Unemployment Rate in Malaysia

Figure 1.7: Unemployment Rate in Malaysia from year 1996Q1-2016Q4, Source from Datastream - The World Bank



Unemployment rate stands for the measurement of a country's unemployed workers, but it only takes into consideration the individuals who are currently in the labour force. It is computed as unemployed individuals divide total individuals in the labour force and in term of percentage figure. During recession, the possibility of a higher unemployment rate is even greater.

As refer to the figure above, Malaysia's unemployment rate being fluctuated between 2% to 4% from year 1997 to 2016. Unemployment rate in Malaysia was 2.41% 1997 and it increased in large percentage which was 3.28% in the coming year, 1998. It continues to increase to 3.43% in 1999 and reduce to 3% in 2000.

There was change slightly in Malaysia's unemployment rate during year 2001 to 2005. From year 2009 to 2014, Malaysia' unemployment rate was obviously facing

downward trend which means the unemployed individuals is reducing. It is good for Malaysia as lower unemployment rate increases consumer purchasing power because everybody got jobs and get paid now. However, unemployment rate in 2014 increased steadily to 3.56% in 2016.

1.1.3.5 Trend of Population Growth in Malaysia

Figure 1.8: Malaysia's Population Growth from year 1996Q1-2016Q4 (%), Source from Datastream - The World Bank.

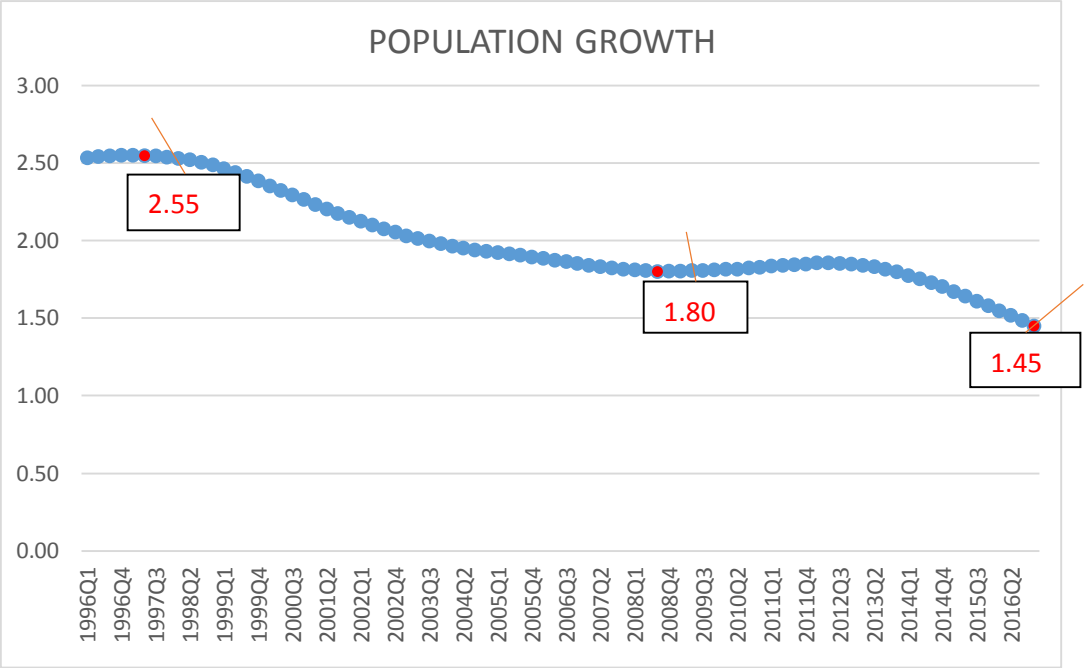
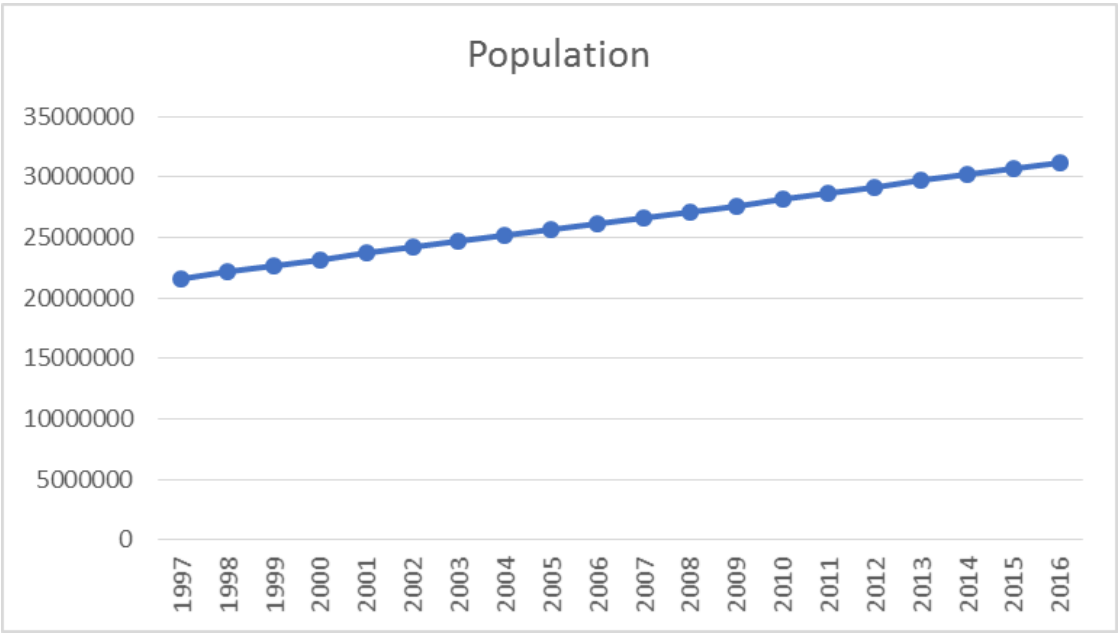


Figure 1.9: Malaysia's Population growth from year 1996Q1-2016Q4 (volume), Source from Datastream – The World Bank.



Population growth rate can be defined as the different between birth rate and death rate and added the migration entered a nation (Central Intelligence Agency, 2015).

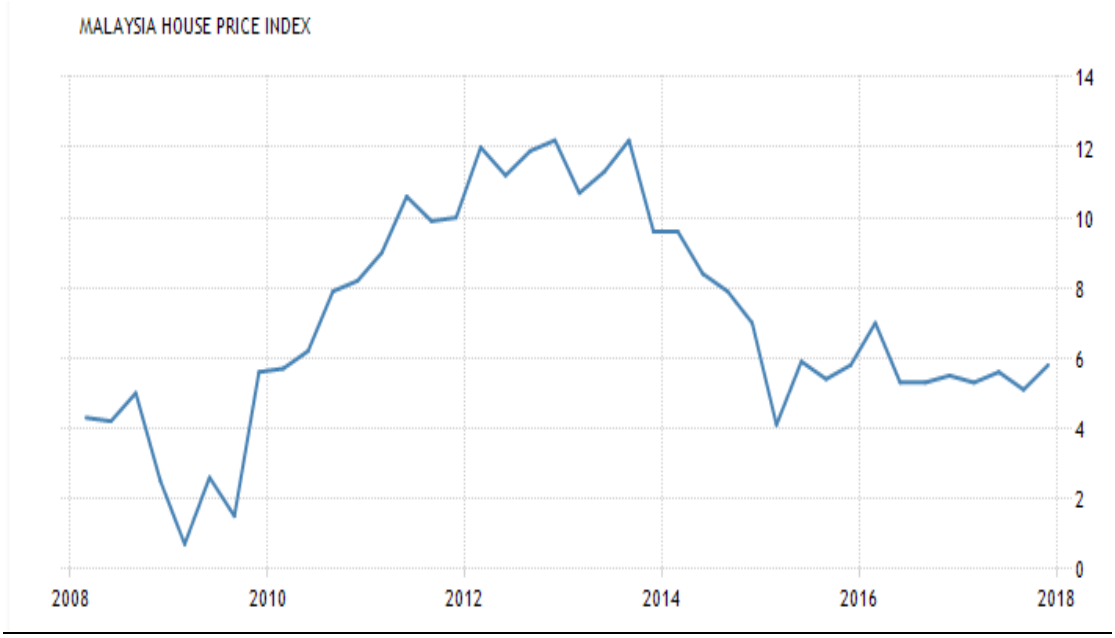
Referring to the Figure 1.5 which source from The World Bank showed that the population growth rate in Malaysia is sloping down from 2.55% in year end of 1996 and beginning year of 1997 to 1.80% in year end of 2008. After that, it declines again to 1.45% in the year end of 2016. Despite the trend of Malaysia's population growth rate were downward sloping, but they were still remain positive. And according to the Figure 1.5 is show that the number of population from 21,565,325 in 1997 increase to 31,187,265 in year 2016.

In 2016, the Department of Statistic Malaysia stated that the state has the most population aggregation is Selangor which have 19.9% of total. The second larger is Sabah which attain 12% of total and followed by Johor which have 11.5% of total.

There is a mutual relationship between the housing and population. When the population change will direct affect the demand of the housing and housing transaction volume. Due to the Malaysia population growth year by year, it will lead the number of household become larger, and also influence the demand for the housing become higher (Mulder, n.d.).

1.2 Problem Statement

Figure 1.10: Malaysia House Price Index, from source, Central Bank of Malaysia



Shelter is defining as a basic need important to enhance a person's quality of life (Kamal, Hassan, & Osmadi, 2016). People only could think about achieving their wants after fulfil their needs. Nowadays, housing affordability remain a critical issue faced by many developed and developing countries. According to figure 1.2.1 has indicated the housing price index dramatically increase since year 2010. Hence, the housing price rise has also affected housing become more unaffordable to many office workers. This could be explain by the growth rate on housing price is much more than income growth. Although there is no consistent definition on affordable house, but it can be measure by price-to-income ratio which is frequent applying by bank sectors. Follow Housing Cost Burden approach states housing cost cannot be more than 30 percent of the buyer's gross income (Nancy, & Hud, 2002). On the other hand, Demograohia International has developed Median Multiple Methodology to examine urban property market. This approach define a houses price cannot excess three times of a median annual income individual. In 1980 or 1990, the historical movement in 6 countries where housing affordability ranged

among 2.0 to 3.0 has explained 3.0 as benchmark fixed by this approach. (Cheah & Almeida, 2016). After 2010, Malaysia housing prices increases continuously and over taken the income level. This factors lead to middle and low income groups being unable to purchase a property as housing prices grow more than the incremental in household income.

The second problems is lack of affordable houses supply. This is because few issues that is significant affect developer fail to build reasonable houses. The first point is cost of acquisition, price of a land value move in floating. Which means a land value can be determined or influenced easily by factor like shortage geographical supply, location situated, regulation barriers in construction and others (Kamal, Hassan, & Osmadi, 2016). For example, Georgetown named as a World Heritage Site has not only increased image of Penang, but also attracted high demand buyer from local and international to invest in Penang. A high demand but scarcity land available in Penang Island indicate an unhealthy match. Increase selling price is the easiest way to diminish over demand (MacDonald, 2011).

From the feedback of developer, the main obstacle to build affordable housing is material cost (Chan, Lee, 2016). For instance, Soult Africa power cuts and coincidences at mines and smelters has affected the price of steel hike to 150% in year 2008 (Macalister, 2017). The increase in price of building material will directly affect the cost of production increase. Another way to encourage the construction industry to supply more reasonably priced houses is by apply in advanced technologies like Industrialized Building System (IBS). IBS able to enhance efficiency on construction be done. However, the challenges face by adopting IBS in Malaysia is demand and supply sides (Halim, A Razak, & A Hamid, 2017). Datuk Abdul Raman Dahlan the Housing and local Government Minister said, this phenomena can affect construction expenses from the perspective in Urban Wellbeing.

The third problems is the imperfection of government policy in term of comprehensive and enforcement. One of the implementation of government

"Rumah mampu-milik" policy to build 30% affordable houses to the low-income group are to carry out by developer (Chan & Lee, 2016). The government should reconsider the percentage or legal action to those developer do not meet the minimum requirement. According to Bank Negara Malaysia only 21% during 2016 to 2017Q1 new houses with priced less than RM250,000 (Cheah, Almeida, & Shukri, 2017).

Last but not least, the sign of demand and lead to oversupply. During economic recovery, number of migrator from village to city for work has increased (Martin, 2009). With the symptom (interstate migration, changing status on economic and more) support the need for housing is expected to rise (Olanrewaju, Aziz, Tan, Tat, & Mine, 2016).This phenomenon has also affected price and demand on houses increase too. Developer has taken this opportunity to increase supply to fulfil market limited want. Meanwhile, this scenario also attract speculator join in. Since housing offer a tremendous value of appreciation compared to other investment tools and also explains why speculator invest houses (M Razif, Samsulkamal, & Halim, 2017).

According to Bank Negara Malaysia, most of the unsold property price are set at RM 250,000 and above which is beyond reasonable to most of Malaysians. While the property supply-demand imbalance symptom have increase since 2015, cause housing vacancy rate remain high. Over the observation on several states, Johor represents largest portion. It property market has occupied 27% in total unsold residents. Next state fall to Selangor at 21%, followed by Kuala Lumpur at 14% and Penang property market at eight percent (Cheah, Almeida, & Shukri, 2017). Based on an article from New Straits Time, 108,000 of 130,000 high-end properties are unsold because the demand for premium properties is low. Malaysians who demand for affordable housing stood at 42%, but the supply was only 24%. Datuk Seri Johari Abdul Ghani Second Finance Minister said housing bubble could be created if the issue was left unattended (Permananthini, 2017). The above means the supply did not fit demand of housing properties and it causes an imbalance and surplus of properties in the market.

In short, developer fail to offer reasonable houses not only because of government does not perform their role well to maintain market balance, but it is also the income growth rate dedicate slower than inflation. The challenge face by all parties including , rapid rise in housing price, inflation rate exceeding income rate growth, high in cost of production, lack of regulation, and unwilling attitude in supply of budget houses has caused high volumes of unsold properties. Simultaneously, the inefficiency in housing transaction also caused a housing glut. Last but not least, this research aims to verify the variable effect bring to housing glut, affordability and housing price.

1.3 Research Question

In this research, few research questions are suggested and listed below:

1.3.1 General Research Question

I. What are the determinants that influence the housing transaction volume in Malaysia?

II. How does housing transaction volume explain the nexus between housing price, affordability, and housing glut?

1.3.2 Specific Research Questions

I. What is the nexus between lending rate and housing transaction volume in Malaysia?

II. What is the relationship between population and housing transaction volume in Malaysia?

III. What is the connection between unemployment rate and housing transaction volume in Malaysia?

IV. What is the link between gross domestic product and housing transaction volume in Malaysia?

V. What is the nexus between housing transaction volume and housing price?

VI. What is the nexus between housing transaction volume and affordability?

VII. What is the nexus between housing transaction volume and housing glut?

1.4 Research Objective

This research is to study the determinants that affect the volume of housing transaction in Malaysia. Hence, the independent variables are lending rate, population, unemployment rate, and gross domestic product in Malaysia. The dependent variable is housing transaction volume in Malaysia. In another hand, there will be explanation on the nexus between housing price, affordability and housing glut by housing transaction volume. The following research objectives are proposed:

1.4.1 General Objective

I. To ascertain the nexus between the housing price, affordability and housing glut by using housing transaction volume.

II. To ascertain the factors that affect housing transactions volume in Malaysia.

1.4.2 Specific Objectives

I. To investigate the link between lending rate and housing transactions volume in Malaysia.
II. To study the nexus between population and housing transactions volume in Malaysia.
III. To study the link between unemployment rate and housing transactions volume in Malaysia.
IV. To identify the association between gross domestic product and housing transactions volume in Malaysia.
V. To study the nexus between housing transaction and housing price.
VI. To study the nexus between housing transaction and affordability.
VII. To study the nexus between housing transaction and housing glut.

1.5 Hypotheses of this Study

1.5.1 Gross Domestic Product Growth, GDPG

H_0: GDP growth is insignificantly affect the housing transaction volume in Malaysia.

H_1: GDP growth is significantly affect the housing transaction volume in Malaysia.

Gross Domestic Product, GDP is an instrument or indicator used to estimate and gauge the country's economic growth. In this research, GDP used as one of the factors that will affect the percentage change in housing transaction volume in Malaysia.

GDP growth is the main factor which influences the house price, their relationship with each other affects the housing market (Ting, 2017).

Besides that, according to the journal from Hellenic Observatory, an Europe institute mentioned a lot of studies (Davis & Heathcote, 2003; Goodhart & Hofmann, 2008; Madesen, 2012) conclude that a powerful short term nexus of housing market and the GDP.

Based on the graph 1.4 and 1.5 shown, both of the GDP and housing transaction volume in Malaysia is upward slopping since 1997. Thus, there are in positive relationship. Null hypothesis will be rejected to expect the GDP is the significant factors to the housing transaction volume in Malaysia.

1.5.2 Lending rate

H_0: Lending rate is insignificantly affect the change in housing transaction volume of Malaysia.

H_1: Lending rate is significantly affect the change in housing transaction volume of Malaysia.

Through intervention of hire purchase law, everyone able to overcome their difficulty to withdraw large portion of cash in order to purchase any commodities. Credit market provided a forum to each and every one in obtain homeownership easier via credit purchase (Acolin, Bostic, An, & Wachter, 2015). Homeownership accept loan offer by financial institution with interest fees. Obligor must fulfil contract obligation by repay his or her mortgage amortization within upon period. So, lending rate is playing a significant roles in determining housing market elasticity.

Individual can maximum obtain up to 90% loan on property value measure by fixed or floating rate charges on loan applicant with maximum 35 years housing loan tenure according to Bank Negara Malaysia (Lim, 2017). So, household can easily own a house by paying 10% out of sum value of housing price (The Malaysian Bar, 2005).

The volume of housing demand is essentially determined by the commodities price and lending rate. This is because the negative relation between the mortgage rate and housing sale efficient. If financial interest charges are low, then it can stimulate citizen intensive and intention to buy a house (Tze, 2013).

Malaysia lending rate keep decrease from year to year. However, the circumstance in market remain silence. Besides, more than 60% loan applicant was reject by financial institution according to Bank Negara Malaysia annual report 2017.

Hence, previous researches have showed negative related between lending rate and change in housing transaction volume in Malaysia. This study will reject the null hypothesis to prove the lending rate is significant which affect the change in housing transaction volume.

1.5.3 Unemployment Rate

H_0: Unemployment rate are insignificantly affect the change in housing transaction volume in Malaysia.

H_1: Unemployment rate are significantly affect the housing transaction volume in Malaysia.

Individual is consider unemployed only when he or she reached at least 16 years old, currently not working but ready for work, and also trying his or her best to seek for works more than four weeks. Meeting the requirements above, individual is only considering in the labour force and takes into consideration when computing unemployment rate. Other than that, an individual is not treated as unemployed although he or she is currently not working. In this research, unemployment rate is used as one of the factors which will affect the change in housing transaction volume in Malaysia. According to Gan, Wang and Zhang (2018), Unemployment rate definitely can influence the housing demand market. It can affect the market in two sides, demand and supply sides of housing market. Let looks at the effect on demand side first, higher unemployment rate mean that more individuals are not working, they cannot obtain mortgage loan as they don't have income. Financial institution will not approve the loans to unemployed individual as it facing high risk of default. At the end, it reduces the number of buyer in housing market as a result of high unemployment rate in the country.

Now looks at the effect on supply side, a high unemployment rate reduce the homeowners' tendency to move because they may not be affordable to buy a new house. Seller is facing hard times to sell a house when economic conditions is bad and unemployment rate is high in the country. At the end, it reduce the number of seller in housing market as a result of high unemployment rate in the country. In this research, null hypothesis will be rejected as unemployment rate will significantly affect housing transaction volume in Malaysia.

1.5.4 Population Growth

H_0: Population growth is insignificantly affect the change in housing transaction volume in Malaysia.

H_1: Population growth is significantly affect the change in housing transaction volume in Malaysia.

Population can be recognize that the studied of entire number of individuals or tenants out of a nation or district. This study is taking the sample to explore the itemized examination.

Population is one of the vital factor that affecting the change in housing transaction volume. It isn't only the quantity of individuals however statistic changes. For example, increasing the number of single individuals living alone has prompted expanding the housing demand (Pettinger, 2017).

According to the Parliament of Australia stated that when the average household has become diminished due to expanded occurrence of partition and divorce, late marriage and so on. This will lead the individual households become larger and increase the demand for housing.

Since the Malaysia population is keep growing every year and the population have positive relationship with the change in housing transaction volume, thus in this research will reject the null hypothesis to expect the population is the significant factor that affect the change in housing transaction volume.

1.6 Significant of this study

A house act as a shelter and it is a basic necessity for humans. According to Yip, Wong and Woo (2016) there are more than half of Malaysian own a house while the rest of them rent for living. Besides, housing becomes a market commodity that is able to bring a return or increment in value of the asset (Yip, Woo, Oon, Aminaddin, & Hasan, 2017). Nowadays, housing price in urban area is seriously unaffordable to many office worker. Policy makers should reconsider the existing policy or introduce new policy that able to improve current property market statues.

Housing sector has a major contribution to economic development; it improves the economic performance (Glossop, 2008). Agreements among the economists and policy makers on the housing price play a significant element in economy. For example, the United State economy stock market crash in 2001 was saved by the strong housing market in United State and it prevented the crisis from further recession (Miller, Liang, & Skarz, 2009). The association between property investment and economic growth is a famous topic and well discussed by economists and researchers in the economic development.

Since 1970s, there is an increment in housing investment and it contribute to the growth of the economic. The reasons of economic growth include the home building business or construction company found as the major economic activity with large multiplier effect. People tend to believe that there are many external social and economic advantage of the housing investment (Chen & Zhu, 2008). There are pros and cons in the housing market. Although housing market can lead to economic growth but on the other hand, it will bring a recession and cause financial crisis in the economy. For example, during the United State financial crisis at 2007-2009, most of the researchers and economists attribute this crisis to the incident of the housing price bubble and the default of Lehman Brothers (Thakor, 2015).

Housing investment is popular as there are some striking returns and benefits which attract investors. The returns and benefits of housing investment are as follow: An investor who invest in housing or property able to obtain profit or regular income from the property asset which is the rental. Next, the investor of the property can get a profit when they sell their properties or houses as the value of the asset or property might appreciate, thus the profit derived from the margin between the selling and buying price (Klimczak, 2010).

In conclusion, property market has a two side effect. In positive view, housing market acts as a significant sector in the economy as it will affect the health of the market. On the other hand, the origin of subprime crisis was initiated by houses. Housing market is also an investment which will derive a good return and it act as another alternative of investment instrument. Lastly, this study aim to find out the impact of current property market to Malaysia economic and carry out some information policy maker to solve this problem.

1.7 Chapter Layout

This study would be conducted orderly and followed the sequence that planned. After the first chapter above, it would be followed by Chapter two which to discuss the change in housing transaction volume and the factor that affect the change in housing transaction volume by given literature review. The chapter followed is to talk about the methodology used, which had included research design, data collection, targeted of the sample data and so on. Then, the result of the hypothesis testing and the data analysis would show it on Chapter four. At last, this research Chapter five would discuss findings, implications of the study, limitations of study and the recommendations for the future research. The minutiae of overall chapter layout are recounted below:

1.7.1 Chapter 1: Research Overview

In chapter one, discuss the research introduction and explain the influential background. Moreover, this chapter also consists of the problem statement and objective constructed; and clearly stated the hypotheses as well as the significance of the research. The significance of study would indicate the purpose of the research.

1.7.2 Chapter 2: Literature Review

This chapter aims to reference the published literature in order to explore the way or approach to conduct the research; such as to explore the theories applied and the way to present the research. In addition, this chapter focus more on the result that came out from different past researchers, and at the end would compare the result from past researchers and this research.

1.7.3 Chapter 3: Methodology

The third chapter is to explain the methodology used in this research. This chapter content includes the research design which is to illustrate the data collect and the sources of the data in this research. Furthermore, the sampling design is included as well, which is to illustrate the target population focus and the technique used in this research for running the data.

1.7.4 Chapter 4: Data Analysis

This chapter is running the data using the methodology determine in chapter three. Describe the empirical models, data, and statistics and illustrate the model estimation and interpret the outcome. Other than that, this chapter would also execute the diagnostic checking, to find out whether any problem exists in the model used.

1.7.5 Chapter 5: Discuss Finding, Limitation and Recommendation

The last chapter in this research is to provide the summary for the whole research. Besides, limitations of research will be recounted in it. Lastly, this chapter will provide the recommendation to the government about the policy implementation in order to help enhance this research.

1.8 Conclusion

Chapter one is mainly to discuss the background of the research, construct the objective and illustrate the problem statement in this research. The purpose is to identify the dependent variable of change in housing transaction volume in Malaysia by investigating the determinants which is included population growth, lending rate, GDP growth and unemployment rate. Besides, to set up the significances for the hypotheses on this research for the purpose to determine whether the significant relationship existed between DV which is change in housing transaction volume in Malaysia and four IVs which are lending rate, unemployment rate, population growth, gross domestic product growth.

CHAPTER 2: LITERATURE REVIEW

2.0 Introduction

In chapter two, various journals from different countries, background and political views have been reviewed and all of the journals, thesis and research are related to the topic which is nexus between housing price, housing affordability and housing glut. Not only journal from Malaysia but also from other country such as China, United State and United Kingdom. This chapter will be divided into four parts: first, the review of literature which the summary of researcher studies in order to understand the viewpoint and relationship between the variables. Next, relevant theoretical models are reviewed to support the variables and those theories are closely related to the variables. In the third part of chapter two, a framework shows the nexus of dependent variable and independent variable and following by conclusion of chapter two.

2.1 Review of the Literature

2.1.1 Housing Glut

According to Cambridge dictionary (n.d), 'glut' means a supply of something which is much greater than the amount that can be sold or is needed or wanted. In other words, glut can be defined as oversupply. The term 'housing glut' indicate the condition of housing market that shows the supply is greater than the demand. Housing glut can be defined as the oversupply situation. Housing glut is often used to represent the amount of unsold property or houses in a specific area.

Based on the news article with the title of 'Property imbalance growing wider' (Eugene, 2017), Bank Negara Malaysia quarterly bulletin shows the imbalance in supply and demand in the property market has increased since 2015. The total amount of unsold residential properties stood at 130,690 units which is the highest compared to previous years. Bank Negara mentioned that the total unsold unit were in the price range of RM250,000 and above. Johor is the state that facing most serious housing glut problem as 27 % of the total unsold properties in Malaysia and followed by Selangor (21%), Kuala Lumpur (14%) and Penang (8%).

The reason that lead to increment of unsold property and housing oversupply in the market is easy entry to the housing industry (Hamid, 2017). There are less barriers for housing developer to enter into the industry. The number of housing developers increase as everyone thinks there is opportunity to gain profit. The number of developers increase leads to increment in housing projects which ends up with unsold property because house buyers have more choices and limited by many considerations such as ability and price.

Bank Negara and government has implemented some policy to reduce the housing glut in Malaysia before this issue goes serious and unable to be control. Housing

glut will affect the housing price and profitability of housing developers. Housing glut should not be neglected as housing market will affect the economy growth. If housing glut getting serious, the economy might be affected.

2.1.2 Housing Affordability

Affordability can be explained by the accessibility of home ownership, or the ability for household to gain access to home ownership (Richard, 2008). In other words, housing affordability indicate individual's purchasing power towards the houses. Household with higher affordability tends to have greater access to higher price houses.

Affordability will be affected by the selling price. If the selling price is too high, household affordability will decrease which means the ability to own a house will decrease (Olick, 2018). Bank Negara Malaysia mention one of the reasons why housing glut happens is because the mismatch between the prices of new housing projects and households' affordability. Moreover, Bank Negara Malaysia also mention the median house price in Malaysia is being five times of the annual median income of Malaysian (Mahalingam, 2017). The housing price makes individual hardly to get a house nowadays as it is unaffordable as the income are not able to cover with the mortgages loan and other expenses.

Affordability index are often used to measure the level of affordability for the household to own a house or qualify for a mortgage loan. Housing affordability are normally compared with household's gross income. There is concern of the increasing of inaccessibility of housing especially for individual fall between 20-30 age groups as the purchasing capacity are closely related with the disposable income (Mak, 2017).

The housing affordability issue created due to increasing of lag between household income and housing price as the housing price increase continuously while the household income unable to increase accordingly. Since there is difference between the housing market price and individual, affordability issue happens and will be worsen if the gap between is getting larger (Mak, 2017).

2.1.3 Housing Price

Pricing is the method to identify the value of the goods or services. Producer will set the price higher than the expenses such as cost of production in order to gain profit and producer or firms are looking for profit in every business and market. Housing price referring to the selling price of a house set by the developers or the company.

Housing price is the total amount of cost of production and profit margin for the specific houses or projects. Although higher housing price will bring higher income to the firm but higher housing price will decrease the affordability and ability for individuals to purchase a house in Malaysia. According to Khazanah Research Institute (2015), Malaysian housing market is an overprice as a result of fermented and inefficient where Kuala Lumpur and Penang. Which shows housing price and housing affordability is related to each other. Individual and household will make decision based on the housing price and compare with their ability or capability to buy the house.

Housing glut, housing affordability, housing price and housing transaction are closely related to each other as one change will lead to another. Thus, in order to test for the relationship, Granger causality test will be conducted in part 4.4.1 in order to investigate and determine the relationship between these macroeconomics variables that are reflecting the current housing market condition.

2.1.4 Housing transaction volume

Housing transaction volume in Malaysia is recorded by NAPIC every year. This statistic is to let people know clearly about all the transactions of property in the country and even the difference between states. Besides, the statistics provided by NAPIC also included the volume of unsold properties, so that the overall performance of Malaysia's property market can be known and the further movement can be estimate.

Based on the table and graph shown by NAPIC, the overall performance of property market of Malaysia is getting worse and the unsold properties had increasing continuous. From the figure 1.4 presented above, the volume of housing transaction is declined from year 2014 to 2016 and had been estimates to decrease continuous in the next year. To respond this situation, Bank Negara Malaysia stated that Malaysians are unable to afford the new launches of residential properties due to the price of houses getting higher (Cheah, Almeida, & Ho, 2017). The imbalance between demand and supply is getting serious in property market and in year 2016, states that serious housing glut happened in Johor, Selangor and Kuala Lumpur (Cheah, Almeida, Shukri, & Lim, 2017).

In this research, test statistics used to investigate the correlation between the housing transaction volume and those independent variables. Before running the tests, some relevant literatures had been found and read through to have a brief understanding about this relationship. According to the analysis by Panagiotis and Printzis (2015), it has a highly negative nexus between the volume of housing transaction and lending rate. Since this variable can lead to an increasing in the housing price therefore the volume of transaction will be decrease. Moreover, from the study of Oskooee and Ghodsi (n.d.) stated that, the volume of housing transaction and unemployment rate have a negative correlation due to the unemployed being unable to afford a house. For the variable of population and GDP, they have a positive relationship to the housing transaction volume. This is because

in the population variable, the higher population leads to a higher demand (Bujang, Zarin, & Jumadi, 2010); in the side of GDP, higher GDP means a better economic situation, so people are more able to purchase housing. Therefore, higher GDP has higher housing transaction volume.

2.1.5 Gross Domestic Product, GDP

The gross domestic product is a common indicator used to know the well-being of the country. Researchers will use it as the reflection of economic conditions (Maclennan & Pryce, 1996). In United State economy, GDP is a tool that is used to access the economy productivity capacity, household spend on final goods and services, and military spending used by government (Landefeld, Seskin, & Fraumeni, 2008).

The Gross Domestic Product (GDP) is a measurement of the total market value of final goods and services made and provided in a particular country. The formula of GDP is equal to the total consumer, investment and government spending plus the value of exports minus the value of imports. (Hii, Latif, & Nasir, 1999). A higher GDP is derived from a higher amount of production and therefore more labour power is needed. In this case, citizens tend to have a higher income. It leads to increase in spending power and savings.

GDP= C + I + G + (X – M)

GDP= Gross Domestic Product

C= Consumption

I= Investment

G= Government Expenditure

X= Exports

I= Imports

(X -M) = Net Exports

(Horton & Ganainy, 2009)

There are agreements from researchers which supporting the positive relationship between GDP and housing market. According to Pettinger (2017), higher GDP can increase the spending and saving power of consumer. Thus, consumer tend to have greater ability and affordability to purchase a house when the economy of the country is good or in other words. According to Zhu (2003), increase in property price tends to have a positive impact on real GDP in many countries, but the magnitude of the impact is different for every country and sector. Housing price, sales and the housing project starts and permits will lead the growth in GDP (Ferrara & Vigna, 2009).

While according to Ma (2010), for each percent increase in the housing industry, there will about 0.188 percentage point increase in the GDP and therefore increase the investment in the real estate sector will stimulate the economic growth in China. Increase in housing investment can significantly increase the GDP growth rate according to the formula of GDP. Besides, China government encourages developers on the real estate development in order to get a higher GDP growth rate. Banks in China offer an easy credit in order to encourage and boost the development in housing market (Liu, Yun, &, Zheng, 2002). Based on The Monetary Policy Analysis Group of People's Bank of China (2002), the real estate sector has contributed 1.3% directly while 1.9 - 2.5% was directly or indirectly affect the GDP growth of the year 2001 (7.3%).

As conclusion, based on the past research and have found out that many authors have determined and identified a powerful bond and nexus between the economic growth rate and housing market. There are in parallel position where one increase in one will have an increment in another at the same time.

2.1.6 Lending Rate

Freddie Mac Primary Mortgage Market Survey (PMMS) has stated interest rates more than 10-100 basis point of prevailing prime rate fulfil the criteria as high cost loans. Higher lending rate means borrower obligation in mortgage repayment increase as defined by Goodman and Bai (2017). Hence, interest rates adjustment can bring direct impact on home prices. Several impacts could affect borrowing rate mark up. From the positive news, it is good economy prospect; this assumption will indirectly stimulate household salary rise and boost up capacity in owning a property. This is a mutual relation associated on inflation and interest rate, which is when interest rate increase simultaneous inflation occur. The real assets price will also rise which define the cons side (Goodman & Bai, 2017).

Based on the research by Gerlach and Peng (2003), it stated that the housing price is positively correlated to interest rate and credit growth. According to Goodhart (1995), United Kingdom housing price are majorly affected by the credit growth. Meanwhile, a number of Asia economies residential property value has resulted the same effect by credit growth (Collyns & Senhadji, 2002). So, a contemporaneous effect on both elements explains the adjustment to assets prices. In another hand, the raise of interest rate is able to boost up home proprietorship rates (Follain, 1986). Might be consumer future expectation (wider gap to own an assets), the benefit of tax deduction, investment purpose, ownership (compare to rent). Since interest rate is usually associated with inflation, the trend occurs an opportunity in perceiving higher return in the future value by investor (Peiser & Smith, 1985).

Based on Ortalo-Magne and Rady (2001), when interest rate yields decrease, it leads to an increase in the housing price and transactions, vice versa. Therefore, it shows that interest rate and housing volume is negatively related. According to Catte, Girouard, Price and Andr é (2004), interest rate and dwelling volume is negatively related. The decrease or increase in interest rate significantly affects the movements of housing price based on their speed and strength of different countries;

this relates to housing price affecting the housing volume. It stated that the volume will down turn if the housing price is out of their cyclical movements. Therefore, the price of the house will change depending on the strength of each country when interest rate is increasing. Hence decrease the demand of investing in residential mortgage. Based on Barakova, Bostic, Calem and Wachter (2003), when housing interest rate decrease, the citizens will demand more in the housing investment. Therefore, interest rate and housing volume is negatively related. In addition, followed by the economic theory explain inverse correlation among property price verses lending rate, assets price will increase by the low interest rate symptom (Dumičić, Časni, & Šprajaček, 2012).

In short, the relationship between housing transaction volume and interest rate are ambiguous based on the previous researcher's studies. Some of the researches showed that the association between housing volume and interest rate is positively related while some also stated that they are negatively related.

2.1.7 Unemployment Rate

Unemployment represents those unemployed individuals in the labour force. In order to be a part of the labour force, the individual has to be 16 years old or above. The individual must be available for work but currently not working, but trying to seek for jobs in past four weeks.

According to past studies, the unemployment rate significantly affects the sizes of housing market, showing negative relationship between them (Gan, Wang, & Zhang, 2018). When the country's unemployment rate is high, each individual is said to have a higher unemployment risk as well. One of the past studies shows that individuals are less likely to purchase a house when they have high unemployment risk, negative relationship between unemployment risk and home ownership (Gathergood, 2011).

According to Gathergood (2011), employed households with greater unemployment risk are less willing to get mortgage loan, thus reducing the housing transaction volume.

However, according to the perspective from Dohmen (2018), positive relationship between unemployment rate and homeownership rate might be exist. Due to the higher moving costs and lower mobility of home owners, they are less likely to leave their home region for other jobs and reduce the job offer acceptance rate. In short, the higher the homeownership rate, the higher the chance of house owners reject the job offered abroad. It is possible to lead to a higher unemployment rate. Positive relationship between unemployment rate and home ownership was concluded according to Dohmen's research.

2.1.8 Population Growth

Population growth can use the time unit to gauge the changes of the individual number as time goes on. The population growth is the expressed statistic that is referring the human population growth included death and birth rate, income level, age and so on. Generally, the formula used is (death + emigration) (birth rate + immigration) to calculate the population growth within the state or country.

According to the Unconventional Economist (2013) stated that population growth undoubtedly is the one of the main factor that will pressed the housing of demand which is upward pressed the housing transaction volume. The population growth has the direct impact the trend to the property market (Wong, 2016). Moreover, the change in population, no matter change in positive or negative, it will change the scale of the demand (Chung, 2013). In another hand, population growth will lead the real estate rates rise, because of the demand of the real estate increases (Yaduwanshi, 2016).

2.2 Review of Relevant Theoretical Models

2.2.1 Housing Transaction Volume

2.2.1.1 Income and Substitution Effect

Income effect is when an individual changes his or her consumption habit when there is a change in his or her purchasing power if a price of an item is remain constant (Chia, 2007). According to Karl, John and Robert (2005), an exogenous change in wealth upon consumption behaviour will lead to wealth effect. This means that when an individual has a higher income level, so that he or she will consume more normal products. On the other hand, if individual has a lower income level, they might consume more inferior products. In this case, if an individual has a higher income, then he or she can choose to own a property instead of renting a house. Therefore, if more individuals are willing to purchase houses, it can boost the volume of housing transactions, and may slightly reduce the housing glut problem in Malaysia. This effect can not only increase the volume of housing properties but also boost the GDP (Charles, 2009). When the individual is able to consume more, hence the economic growth of Malaysia will improve.

Substitution effect is when price of a product is expensive, consumers will want to find a substitution product which has a lower price (Chia, 2007). This effect can be used in this research because nowadays the developers in Malaysia prefer to construct high quality and luxurious residential properties. Therefore, they can offer a higher price and attract more foreign direct investments. However, this kinds of residential properties are not affordable for Malaysians with their current income levels. According to the Development of Statistics Malaysia (2017), the average income of a household is RM6,958, with the average expenditure of RM4,033, thus even if a household has extra savings but it is still not enough to them if need to

purchase a house. So, for those individuals they found a 'substitution product' which is the "Perumahan Rakyat 1Malaysia" (PR1MA) since they are unaffordability to the high quality and luxurious houses.

PR1MA is a project that is promoted by the Malaysia government which can let middle-income households enjoy high living standards with low price in 2012. PR1MA has numerous types and sizes of houses and the price range from RM100,000 to RM400,000, while the luxurious residential properties are from RM500,000 to RM1 million (Abas, 2017). To buy houses under PR1MA individuals have four requirements to be fulfilled:

- Applicants must be a citizen of Malaysia.
- Applicants have to be 21 years or above.
- The income of a household or individual must be from RM2,500 to RM15,000 per month.
- Couples cannot own more than one property.

2.2.2 Gross Domestic Product

2.2.2.1 Fiscal Policy

The economy of a country might not always maintain at a stable condition all the time, it will be affected by many factors and caused economic recession. During the economic recession, parties such as policymakers and government will try to implement some solutions in order to overcome the recession. One of the policies to overcome the economic downturn is implement fiscal policy.

Fiscal policy is the method often used by government in order to stabilize the economy growth, GDP and reduce poverty (Horton & Ganainy, 2009). It is the government efforts to affect the direction of the economy for the specific country. There are two tools that government use in fiscal policy which are the taxes and government expenditure. Fiscal policy can be future divided into two parts, expansionary fiscal policy and contractionary fiscal policy (Fatas & Mihov, 2012). Expansionary fiscal policy intended to encourage the growth of the economy, GDP growth while the contractionary fiscal policy designed to slow down the economic growth.

In **expansionary fiscal policy**, government will either raise its expenditures or decrease its taxes income in order to increase the aggregate demand. A federal tax cut will encourage the demand and consumption, at the same time (Ali & Ahmad, 2010). During recession, unemployment rate will increase and the household demand will decrease as there is no surplus for them to spend (Pettinger, 2017).

Fiscal policy might increase the government spending. When the government spending increase, it creates more job opportunities to the citizen and decrease the unemployment rate (Pettinger, 2017) For example, government increase their spending such as spend more money on infrastructure projects. Thus, more workers

are needed and the unemployment rate will decrease. When there is a disposal income for individual, the demand for goods as service will rise at the same time.

On the other hand, tax reduction will have the same effect to recover the recession of the economy. Reduction in tax affect individual and household's behaviour as they able to get a higher after-tax reward, which the amount of salary after tax increase compare to previous (Gale & Samwick, 2014). When the tax rate decreases, citizen tends to spent more on goods and services as they able to get more money after the tax deduction. As the aggregate demand increase, it able to recover the economy recession and increase the GDP growth rate of the specific country.

Contractionary fiscal policy will react in another way round which decrease in government spending and increase taxes. Policymakers and government will use the contractionary fiscal policy to slow down the economy growth such as avoiding the inflation for growing too rapidly (Rivera, 2018). As conclusion, expansionary fiscal policy can be used to stimulate the aggregate demand and thus increase the purchasing in goods and services that able to improve the economy condition, GDP will increase at the same time.

2.2.3 Lending Rate

2.2.3.1 Expectations Theory and Term Structure Theory

Even the previous studies carry out diverse outcomes, but there is relation among lending rate and housing transaction volume stated by the researcher. This allow us to make an assumption, when alter on the borrowing rate will bring direct or indirect effect to housing price and transaction volume (Russell, 1992).

Term structure theory clarifies the differences in interest rates bear by borrower may be dissimilarities on its length and term to maturity. Rational thinking, bank will charge greater rate on the buyer who take longer time to repay the mortgage loan. The more time the debtors take to pay back the loan, the higher the uncertain. Observable is the primary motives describe economists are curious on the concept as people dislike uncertain. Easy to spot allows market participants to make prediction and evaluation. Secondly, this theory is explainable in the mechanism of player respond in long-term or short-term interest rate by monetary policy. Crusade in long-term rate could substantial effect decision making in economic, includes intention to purchases a durable goods (houses) now or later (Russell, 1992).

Economists found out information on expectations elements of market participants provided by term structure theory. The expectations theory look into market player mind set on future event may occur, the present decision made aid in determine, develop and design the actual upcoming event (Russell, 1992). Interest rate play a main role in distributing fund by market participant in financial market is almost same across the price concept that decide individual allocating their funds in goods and services market (Russell, 1992). To sum up, future perspective of consumer behaviour is determine by their current action. Hence, build the real market scenario by what individual suspect in earlier.

2.2.4 Unemployment Rate

2.2.4.1 Rural-Urban Theory

The incorporation of rural-urban migration and the theory of urbanization is commonly used in determining the unemployment level. If the rural-urban migration is increasing then it is one of the bad impacts on the economy. The more rural-urban migration cases happen, the more the number of people there will be coming to the urban areas from the rural areas. It will create pressure on the demand for more housing (Baqutaya, Ariffin, & Raji, 2016). In the Malaysian economy, the indulgence of the unemployment among the graduates is one of the important areas of concern for the government. The Malaysian economy is more or less veteran-type in nature which is more agro-based. In the recent period however, with the continuous development of the economy, the incorporation of the various manufacturing industries in the economy is gradually absorbing the labour force in these sectors (Ramli, Zainal, & Ali, 2016). Moreover, the increase in the migration of labour force from the rural to urban areas means that the urban economy is facing continuous pressure. Urbanizations theory claims that when one economy starts to develop, then the labour migration becomes a big deal in the sense that it starts creating pressure on the government as more employees start to come to town. Along with the urbanisation theory, the government policies that are prevailing in the economy are also helping in increasing the level of unemployment (Baqutaya, Ariffin, & Raji, 2016).

In 2007, the unemployment rate in Malaysia was about three percent. Along with the prevailing theories, the cyclical nature of unemployment penned by Keynes prevails almost in every economy. According to this theory, the employees who are in the labour force will continuously search for the jobs available in the market based on his/her skill set. Moreover within cyclical nature of unemployment some part of labour force will never get ready to search for jobs. Moreover, the agro-based economy suffers from another problem and that is the problem of disguised

unemployment (Khan, 2017). Since Malaysian economy is mainly based on the agriculture prior to the development of the economy will also be going through a natural cycle of unemployment.

2.2.5 Population Growth

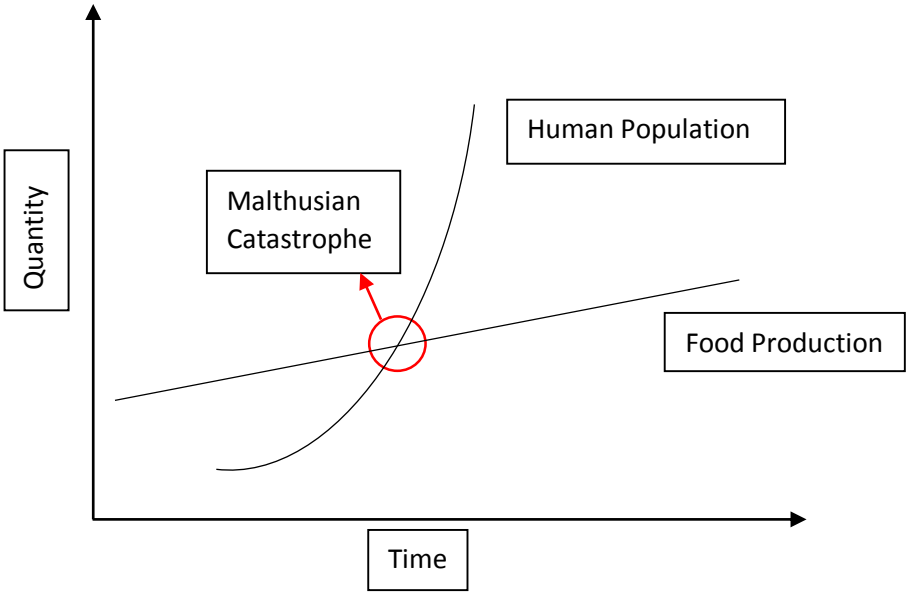
2.2.5.1 The Malthusian Theory of Population

The Malthusian Theory is the most common theory of the population written by Thomas Robert Malthus in 1798 (Seth, n.d.). Another version of this theory was improved by Malthus in 1803, after the previous edition was criticized for its pessimistic view (Smriti, n.d.).

The theory is discussing about the limits of the Earth's carrying capacity, because of the universal development leading the population growth. These limits generally can be recognizing as life necessities such as food, land and the non-renewable resources (Siedl & Tisdel, 1998). The carrying capacity serves as important role to push forward the consciousness and understanding the existing limits to public (Siedl & Tisdel, 1998).

Malthus' theory also assume that which food is the major important necessities for human survive, however is also a factor that limits the human population growth. Moreover, another assumption would be human population grow geometrically since the humans had unchanging force of erotic feeling given by the God (Siedl & Tisdel, 1998). The last assumption in Malthus' theory is that there would be scarcity of the resources due to the increase in population growth (Siedl & Tisdel, 1998). This is because the resource could only increase sequentially but population growth increased exponentially (Siedl & Tisdel, 1998). According to this third assumption, only when approaches to regulate the human population growth, otherwise the world will face the scarcity of resource availability and thus cause the population collapse, which is known as the Malthusian catastrophe (Tschakert, n.d). Refer to Figure 2.1 below.

Figure 2.1: The Malthusian Growth Model, source from: Penn State College of Earth and Mineral Sciences



In the second edition of the theory Malthus began to accept the restrains on population growth and influenced by the institutional, known as moral restraints. Moral restraint would be offset by the suggestion of income equality and common ownership of property, thus bring him did so (Bowen, 1954). The carrying capacity is the factor that restrict the exponential population growth slowed (Siedl & Tisdel, 1998). Therefore, the population growth will lead to demand increase since the houses are the shelter for the human.

2.2.5.2 The Law of Demand

In general, the term “demand” is also known as desire need and want. In economies perspective, the term “demand” has different meaning, when the person who possess the ability and willingness to buy a goods, it only consider as demand (Hussain, 2010).

The law of demand normally is to present the function of the money prices. But even when money is not involved, the law of demand still would stay true (Ross, n.d). The population size had impact on the supply and demand in the market-oriented economic system (Li, 1996).

According to Nitisha (n.d.), the number of population increase would direct affect the demand increase because of the increase the number of buyer. Therefore, the larger the population size, the more the house buyers, further causing the demand for the houses to be increase.

2.3 Proposed Theoretical/ Conceptual Framework

Figure 2.2: Framework for the Factors of housing transaction volume in Malaysia.

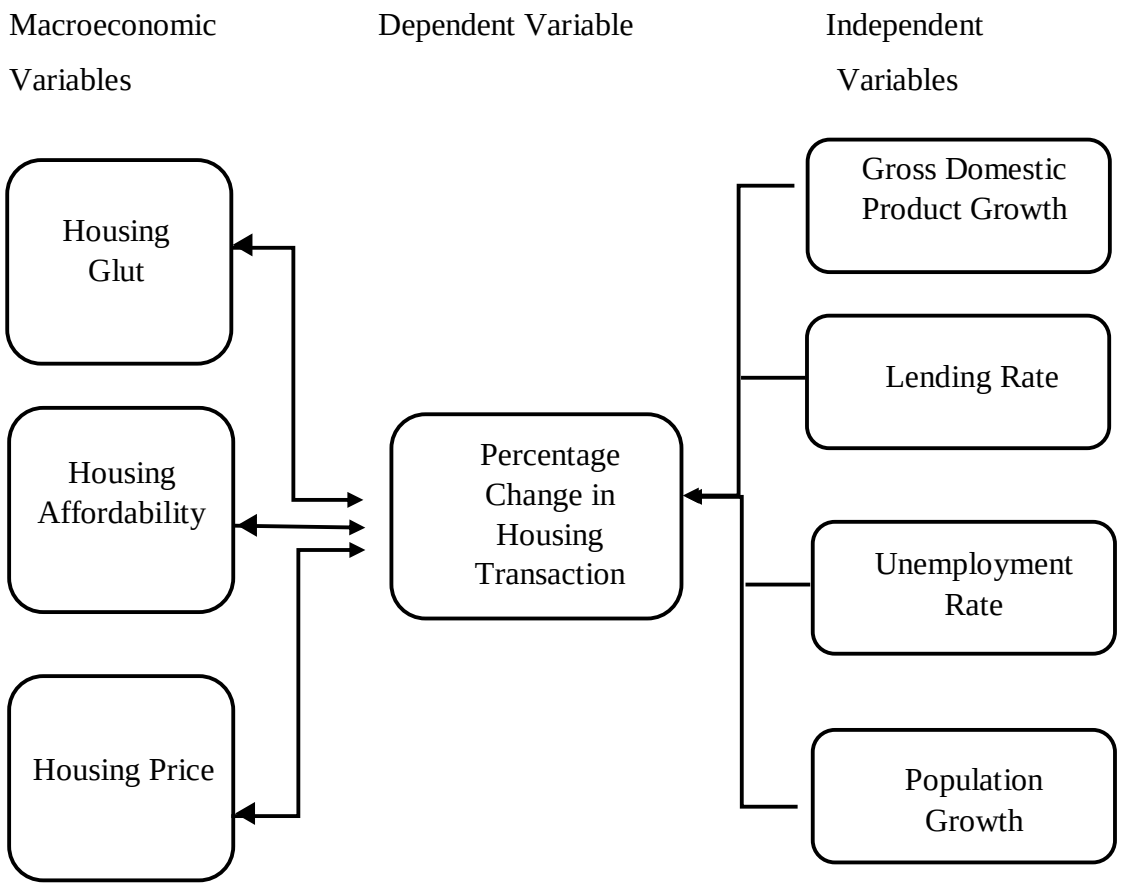


Figure 2.2 mentions that the four independent variables which are gross domestic product, lending rate, unemployment rate, population growth would have impact on the dependent variable which is housing transaction volume in Malaysia.

2.4 Conclusion

As conclusion, in chapter two, the four independent variables are examined by the respective researchers' thesis and research. There are reviews and ideas from different researchers and the abstract are concluded in the first part of this chapter. In addition, the framework as in figure 2.2 is developed for a clearer figure of the association between dependent variable and independent variable.

CHAPTER 3: METHODOLOGY

3.0 Introduction

Research methodology is an approach to methodically solve the problem of the research. It can be acknowledged as a science of studying to determine the research to be carried out scientifically (Kothari, 1985). The research methodologies are the works that responsible for illustrating and forecasting the phenomena (Rajasekar, Philominathan, & Chinnathambi, 2006). To having the perfect research methodology knowledge is important for the valid of research and it would also intensify and advance their own profession by applies the research methodology (Kumar, 2011).

The research methodology had wider range than the research method; therefore research methodology would take into account for the both research methods and logic behind the methods instead of only discuss the methods (Kothari, 1985). Therefore, the chosen of methodology is depends on variance of reason and cases to decide whether using quantitative, qualitative or both of it (Holden & Lynch, 2004).

This chapter would be through the research design, data collection, sampling design, data processing and the data analysis to carry out the outcome. To do this is to ensure that can be enhancing the effective and accurate for the result presented.

3.1 Research Design

According Dulock (1993) mention that research design is a schedules design to react the research question and variance control. The main research purpose in research is to answering the question that enactment and testing the hypothesis in the research. In another hand, variance control is to concern the research result influence by the factor or confuse the result interpretation (Dulock, 1993). Research design can be separate by quantitative or qualitative. But in this research is found that quantitatively based is more suitable to enhance the degree of precise.

3.2 Data Collection Method

Data collection is one of the importance step in doing a research which provided information to let readers understand and can found the solutions of the research questions by this step (Blankenship, n.d). For investigate and define the relationship between the percentage changes in housing transaction volume in Malaysia and the four independent variables which are GDPG, unemployment rate, lending rate and population growth. These data also can help researchers in the methodology part to run all tests. This research had decided to use the data for 20 years quarterly which from year 1996Q1 to 2016Q4. The data of percentage changes in volume of housing transaction and unemployment rate were found on the NAPIC while the other three variables are obtain from World Bank database and International Monetary Fund database. The table below had shown the proxy and some explanations in the variables.

Table 3.1: Sources and explanation of data

Variable	Proxy	Unit measurement	Source	Definition
Percentage Change in housing transaction volume	PCIHTV	Percentage (%)	National Property Information Centre (NAPIC)	The changes of housing transaction volume that had sold in Malaysia year to year.
Gross Domestic Products Growth	GDPG	Percentage (%)	World Bank	GDP is a broad measurement of a nation's overall economic activity.

Lending Rate	LR	Percentage (%)	International Financial Statistics – IMF	The benchmark on weighted average lending rate is follow by average standard rate on loans extended by financial institution (commercial and investment banks).
Unemployment Rate	UR	Percentage (%)	National Property Information Centre (NAPIC)	Share of unemployed labor force measured in percentage over a given time.
Population Growth	PG	Percentage (%)	World Bank	Population can be recognizing the entire number of individuals or tenants out of a nation or district measured in percentage.

3.2.1 Secondary Data

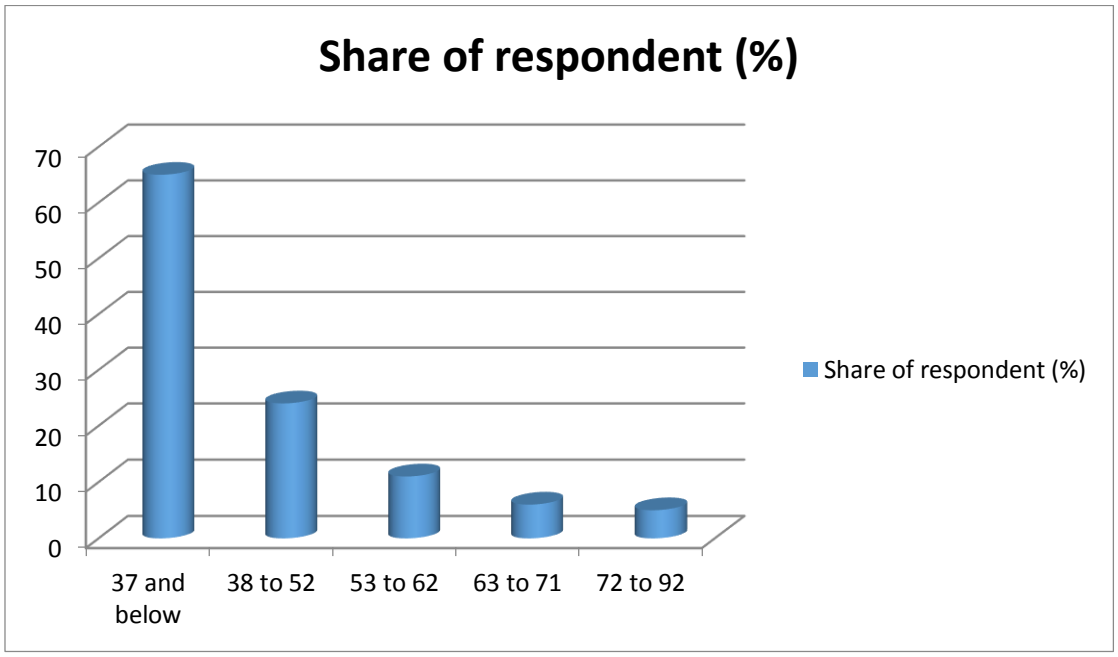
Data collection can divided into two types which are primary data and secondary data. Primary data had included survey, interview or some have doing experiments which need a lot of preparations and more efforts to get (John, n.d.). By this method, all the data get will be more accurate but may easily get an inappropriate result in the methodology part. When the primary data had been announced, it will become a secondary data. Imdadullah (2014) stated that the secondary data is collected by others and can easily get on the network, journal articles or some government official websites. Therefore, compare to primary data, secondary data is more efficient since this study can get all the data from the database and not need spend time in prepared the questionnaires. In this research, the secondary data had been used since all data are getting from the NAPIC and World Bank.

3.3 Sampling Design

3.3.1 Target Population

Target population refers to respondents who meet certain requirement. In this research, target population is Malaysian who is able and qualifies to purchase a property and thus affecting housing transaction volume in Malaysia. There are some factors which will influence the purchase decision of property buyer; the factors are price, location and design, view and ventilation, type of neighbourhood, facilities and amenities, Feng Shui and prestige, luxury and style (Salleh, 2015). According to Saw and Tan, there are three key players in the Malaysian property market which are homeowner, speculator, and investor. Each of them has their own purpose to exist in the market. Homeowners purchase property for own dwelling. Investors purchase property hoping to earn financial return. Speculators purchase property expecting to earn a huge capital return over a short period.

Figure 3.1: First time home buyer in U.S in 2017, source from The Statistics Portal



The graph above refers to the first time home buyer in U.S in 2017, by age group (first time home buyers in the United States in 2017, 2018). Although the survey is done in U.S base, but it can use as a reference when considering Malaysia 'different age group buyers 'behaviour against property purchasing. Based on the graph, demand against property at the age stage of 37 and below is the highest among others age group.

3.3.2 Sampling Technique

In order to carry out the analysis of data, E-views 10 will be used in the research. The reasons to choose E-views 10 instead of other software are the followings, easy to use and master it within short period, provide good analysis in evaluating time-series data, cross-sectional data, and panel data. It helps researchers to analyse economic and financial data, build an economy-problem free model.

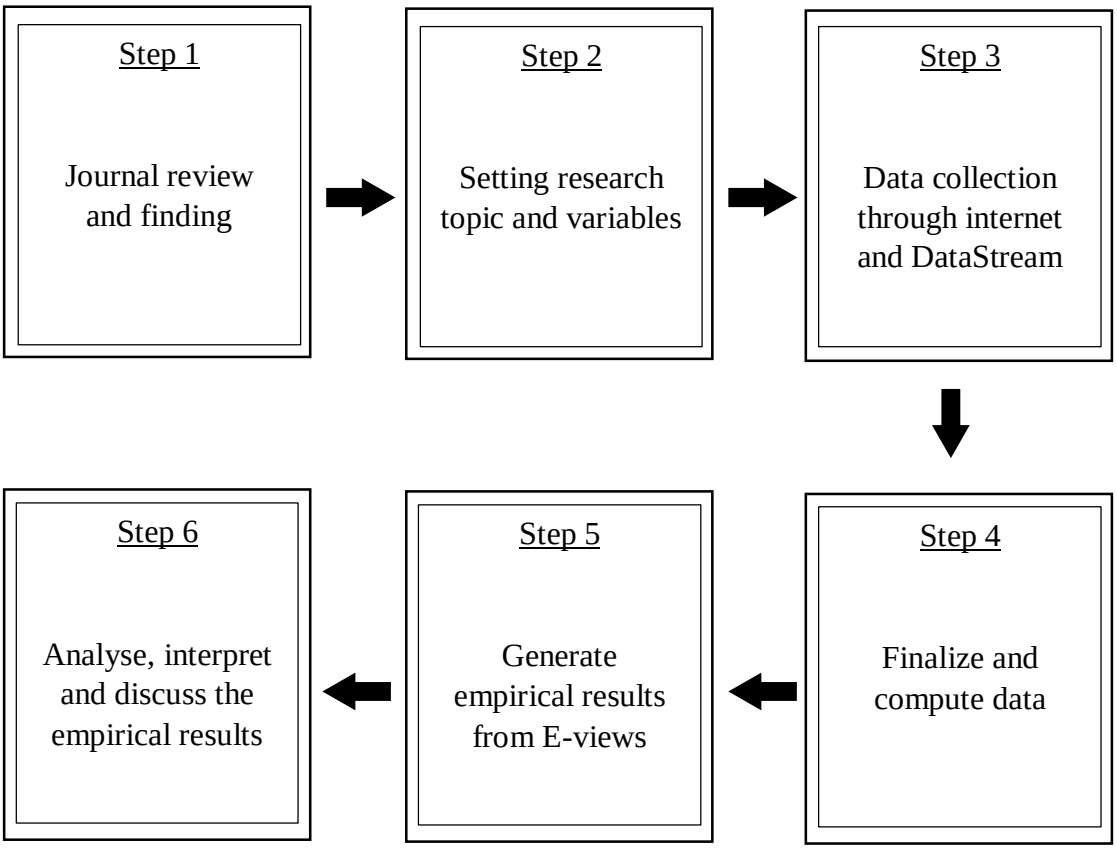
E-views do offer many tools in analysing time different type of data. Example of tools provided is basic descriptive statistic, tests of equality, co integration diagnostic and so on. Several tests can be done by using E-views 10 such as ordinary least square, granger causality test, multicollinearity tests, Jarque Bera test and Ramsey RESET test, Breusch-Godfrey LM test, autoregressive conditional heteroscedasticity test, and so on. Those tests are useful as they can make sure the model in this research is completely not interrupted by economic problems such as multicollinearity, model specification errors, and so on. Tests will be conducted in the coming chapter 4 to examine the existence of economic problem in the model in this research.

3.4 Data Processing

As per 3.2 data collection methods mentioned, the analysis conducted by using secondary data. Thus, data processing is one of the key elements and it is significant for the research. Data processing is the process of the research which turns ideas, raw data into information. Data is the elements which can represent the relationship of the variables of the research and generate the nevus between housing glut, housing affordability and housing price in Malaysia.

There are six parts in data processing which will be elaborate future in the following. Step one, journal review and finding; Step two, setting research topic and variables; Step three, data collection through internet and data stream; Step four, finalize and compute data; Step five, generate empirical results from E-views 10. Step six, analyse, interpret and discuss the empirical results.

Figure 3.2 Data Processing steps



Step 1: Journal review and finding

A group of researchers were formed and come out with a brief idea regarding housing sector research. Thus, the first step is to find latest issues, news and related journal. Most of the journals were found from the database and journal library such as ScienceDirect, Google Scholars, JSTOR and others. These journals and thesis consist of different countries housing related issues. After the numbers of journals were found and the situation and conditions of housing sector were determined, then proceed to the following step.

Step 2: Setting research topic and variables

After understanding the current situation and issues, the next step is to set the title and variables. The title of this research is Nexus between Housing Price, Housing Glut and Housing Affordability in Malaysia. Besides, independent variable and dependent variable are important to determine the relationship for every element. Change in housing transaction volume is the dependent variable and Lending rate while Gross Domestic Product Growth, Lending Rate, Unemployment Rate and Population Growth are the independent variables for this research.

These variables are closely related to each other as increase in one will affect another at the same time. This step is very important as it acts as a starting point for the whole research, if the research topic and variables are not set accordingly, the research unable to proceed as there is no element for researchers to investigate. After the title and variables have been set, then is the step for data collection process.

Step 3: Data collection through internet and DataStream

In step three, various data are collected based on the dependent variable and independent variables. The data are downloaded from internet website or DataStream such as The World Bank website, National property information centre (NAPIC) and International Financial Statistics IMF.

Step 4: Finalize and computing data

The data were found and gathered for a final checking to ensure they are applicable and suitable for this research. Some data were replaced as it does not suit the research topic the best. In this step, double checking is always important to prevent mistakes as data is key element in the research and minor mistake will cause consequences in the following parts. After this step, the data will be placed in the system to test for the results.

Step 5: Generate empirical results from E-views

The empirical results have been analysed by using E-views 10. Various testing was conducted to generate the outcome and empirical results. They were Multicollinearity test, Jarque-Bera test, Breusch-Godfrey serial correlation LM test, White test, Autoregressive Conditional Heteroscedasticity (ARCH) test and Ramsey RESET test.

Step 6: Analyse, interpret, compare and discuss the empirical results

After generating the empirical result, the results were then analyzed and independent variables significant level to the research topic was identified. In addition, making comparison of the empirical results with other researchers past studies to compare the result and to check whether the results and outcome are consistent and suit the hypothesis as mentioned in chapter one.

3.5 Multiple Linear Regression Model

Multiple liner regression is named when there is excess of one independent variable appear in a regression model with only one dependent variable. (Uyanık & Güler, 2013). One single independent variable apply in a regression is christened as univariate regression analysis and more than one independent variable exist in a regression is titled as multivariate regression analysis (Köksal, 1985; Tabachnick, 1996; Büyüköztürk, 2002)

The simple principle of linear equation is to examine the unknown constants of equation variable in regression model (B. Jackson, 1943). According to Pindyck and Rubinfeld (1998) emphasise on regression analysis uses to investigating the nexus between the dependent and independent variable.

A trustworthy regression outcome must take into account of four assumptions, which are variables must in normal distributed form, homoscedasticity, linear relationship on between the variables and reliability assessment (Osborne & Waters, 2002). Freedman (2005) also mentioned the role of error term take part in regression measurement is to snap the omitted variables.

Economic Function:

= f (Gross Domestic Product, Lending Rate, Unemployment Rate, Population Growth)

Economic Model:

$PCIHTV_t = \beta_0 + \beta_1 GDP_t + \beta_2 LR_t + \beta_3 UR_t + \beta_4 PG_t + \varepsilon_t$

N =84 Observations t = 1996Q1 – 2016Q4

Where,

$PCIHTV_t$ = Percentage Change in Housing transaction volume in Malaysia from 1996Q1 to 2016Q4 (%)

GDP_t = Gross Domestic Product of Malaysia from 1996Q1 to 2016Q4 (%)

LR_t = Lending Rate in Malaysia from 1996Q1 to 2016Q4 (%)

UR_t = Unemployment Rate in Malaysia from 1996 Q1 to 2016 Q4 (%)

PG_t = Population Growth in Malaysia from 1996Q1 to 2016Q4 (%)

3.6 Data Analysis

3.6.1 Ordinary Least Square (OLS)

OLS is a method that used in the linear regression model for evaluation the unidentified parameters and can help the regression model become more accurate when using in detect some problems. However, to use this OLS method, there are a few assumptions had to be fulfilling which are stated as below (Gujarati, & Porter, 2009):

i. The error terms in regression model must be mean zero.
ii. The linear functional form is correctly specified.
iii. The parameter of the regression must be linearity.
iv. Error terms must in homoscedasticity.
v. Error terms must in no autocorrelation.
vi. Normal distribution in error terms.
vii. X values independent of the error terms.
viii. No multicolinearity between independent variables.
ix. No specification bias.
x. N > k, this means the number of observations must greater than the number of parameters.

When fulfil all the assumptions on above, the regression model will consist satisfy the theory of Gauss-Markov which will make model become BLUE and the result will precise. BLUE is the short form for best linear unbiased estimator (Gujarati & Porter, 2009). It can explained as an estimator must have smallest variance, linearity and the estimated value can closed to actual, thus, lead to a consistent and reliable result.

If the assumptions unable to fulfil, this will mislead the results such as multicolinearity, autocorrelation, heteroscedasticity, normality and other tests. Researchers may get an inconsistent and inappropriate result therefore this will make them lost in the correct direction in further process.

3.6.1.1 T-test Statistics

H_0: $\beta_1 = 0$; $\beta_2 = 0$; $\beta_3 = 0$; $\beta_4 = 0$

H_1: $\beta_1 \neq 0$; $\beta_2 \neq 0$; $\beta_3 \neq 0$; $\beta_4 \neq 0$

β_1 = Gross Domestic Product Growth, GDPG

β_2 = Lending Rate, LR

β_3 = Unemployment Rate, UR

β_4 = Population Growth, PG

T- test is a famous hypothesis testing method and frequently used by researcher in order to generate the statistical testing. T- test can be used to identify the means of two sets of data (Kim, 2015). T-test can be divided into two types which are one sample t-test and two sample t-test. For one sample t-test, it is often used to compare the sample average. One sample t-test can be applied when the data sample size is more than 40 as it will generate a mean which is near to the normal distribution (Skaik, 2015).

Two sample t-test is only suitable to compare the quantitative variable mean and it can be used to compare the unknown mean for two groups of data which are not related to each other or independent. Next, paired t-test is suitable for the samples which in pairs such as the data which consisting before and after, measurement of the same item (head or tail of coin). Although t-test is the basic hypothesis testing and it is easy to conduct, but there are some scenarios and situations which one sample t-test is not suitable as the statistical testing method. First, the sample size have to be more than 15 and the one sample t-test is also not suitable to be used when the data contain outliers or it is clearly skewed (Skaik, 2015).

The t-test consists of few steps which are setting the hypothesis, H_0: there is no significant relationship between the exogenous and endogenous variables; H_1: there is significant relationship between the exogenous and endogenous variables. Step two which is decision rule, H_0 will be rejected when the p-value is lower than the significant level $\alpha = 0.05$. Then, the decision will be making based on the result from E-views. Lastly, conclude the hypothesis testing by reject H_0 or vice versa.

3.6.1.2 F-test Statistic

H_0: $\beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$ (insignificant)

H_1: At least one of β_i is not equal to zero (significant to Y), $\beta_i \neq 0$, where i = 1, 2, 3 & 4

Where, Y= Percentage Change in Housing Transaction Volume $(PCIHTV)$

β_1 =Gross Domestic Product growth of Malaysia (GDPG)

β_2 =Lending Rate (LR)

β_3 =Unemployment Rate (UR)

β_4 =Population Growth (PG)

The objective of F-test examine overall variable's significance in the regression model through Analysis of Variance (ANOVA) technique and identify each variable incremental contribution (Pindyck & Rubinfeld, 1998) .The assumption must be met when F-test is applying which is population from sample must in normal distributed form and equal of variances. Actual size test and assumed level may result greatly deviation form if distribution under an un-normal form. Equal variance will strengthen test statistic to against heterogeneity arise. (Bradley, 1980) (Frutos, 2012). This could explain the high sensitive on same variance affect to normal distribution. (Shoemaker, 2003).Furthermore, the sample size not only must be large ($n \geq 30$) but also randomly selected. Large sample size provide a high power to reject null hypothesis in normality test (Hosken, Buss, & Hodgson, 2018).

Each and every independent variable have no significant effect to dependent variable indicate in null hypothesis. For alternative hypothesis will be inversed, at lead one exogenous variable will be significant to endogenous variable. Level of significance state in five percent, null hypothesis will be rejected if F-test statistics more than critical value. The result shows there is at least one independent variable associate with dependent variable. If reject on null hypothesis, means the study will be not reliable.

Last but not least, this study will test the significance of the entire model on percentage change in housing transaction volume via F-test in this research.

3.6.2 Diagnostic Checking

3.6.2.1 Granger Causality

H_0: Models do not have granger causality.

H_1: Models do have granger causality.

Granger Causality test is to determine the causal relationship between variables in a time series. In short, it is to determine whether a variable's past data is useful in determining another variable's future data.

Granger causality test will be used to determine the causality relationship among housing transaction, housing price, housing affordability, and housing glut in Malaysia. In this research, four IVs which are lending rate, unemployment rate, population growth and gross domestic product growth will be analysed on each of them how to affect DV which is changes in housing transaction volume in Malaysia. In order to link the DV which is changes in housing transaction volume back to the housing affordability, housing price, and housing glut, a causal relationship between housing transaction and each of them which are housing affordability, housing glut and housing price have to be identified. This test will be conducted in chapter four.

Granger Causality test is used to find out causality between variables in a time series or said to determine whether one variable's past data is useful in predicting another variable's future data. If a variable X is said to granger-cause another variable Y, then past data of variable X consists of information to help predicting variable Y. This test has been broadly used since 1960s. Granger Causality is not talking about the cause-and-effect; however it is almost the same. It is what a particular variable comes before another one.

This test is implying something that is useful. If variable X granger-cause the variable Y, it means X must be occurred before Y but it is not necessary implied that X caused Y. If X occurs after Y, X is impossible to cause Y as future values cannot influence the past or present values. Variables in the model have to fail to granger-cause the others in order to be justified as independent of each other variables. Thus, the model is reliable and more accurate in providing any other information.

3.6.2.2 Multicollinearity

Ragnar Fisch is the founder of term "Multicollinearity". Multi refer to more than one, collinearity inherent meaning of association. In sum up, multicollinearity define an existence correlation among some or all multiple predictor variable (Gujarati & Porter, 2009). Exact linear relationship is rare occur in practice, this lead to highly correlated by applicator's the regression. Consequences of multicollinearity include individual regression coefficients (t-test) are insignificant, extraordinary goodness of fit, standard errors of the estimates inflates and estimates will be still unbiased. (Slinker & Glantz, 2008; Gujarati & Porter, 2009).

As a result, there are four approaches to detect the problem of multicollinearity. First and foremost, is the feature of high R-squared combine with none or some partial regression coefficient will statistically not equal to zero (Gujarati & Porter, 2009).

Second way to detect the problem is high pair-wise correlation between regressors (X's). This regression occurs when the zero order correlation and pair wise coefficient between the two regressors are high. When the regressor is more than 0.80, there is a serious multicolinearity problem occur. It is not necessary to have collinearity problem when there is high regressor between both. It is sufficient to have high zero order correlation but not a must condition to have a multicollinearity problem. This is because multicollinearity problem will occur when there are low zero order and simple correlation.

The last two techniques to indicate multicollinearity is via variance inflation factor (VIF) or tolerance (TOL) factors (Gujarati & Porter, 2009). VIF will be increases without a limit, if the regressors is perfect collinearity (R^2 =1). Variable is supposed be highly collinear when VIF exceeds ten, while R^2 more than 0.90 state by rule of thumb. Meanwhile, the VIF will become one if there is no collinearity (R^2 =0) exist.

$$\text{VIF} = \frac{\mathbf{1}}{(\mathbf{1} - \boldsymbol{R}^2)}$$

TOL is an inverse of VIF. If there is a perfect collinearity (R^2=1), the TOL_j will be zero.Meanwhile, if there is no collinearity (R^2=0), the TOL_j will be one. In short, the smaller the VIF will prove greater the evidence to support X's does not collinear with others regressors, vice versa.

$$\text{TOL}_j = \frac{1}{VIF_j}$$

In this research, the four methods mentioned on above will be applied on each independent variable to find out whether any linear relationship that is hidden between each other.

3.6.2.3 Heteroscedasticity

H_0: The error term is homoscedasticity.

H_1: The error term is heteroscedasticity

Heteroscedasticity is that if there are error terms which are different by the difference across the observations, for example do not have constant variances (Downs & Rocke, 2004). If the heteroscedasticity problem is occur, the ordinary least squares (OLS) would be still remains the unbiased, but not efficient anymore and become inconsistent for the standard errors (Long & Ervin, 1998). Furthermore, the estimates of regular standard errors would be wrong thus making the wrong judgment (Gelfand, 2013).

The problem of heteroscedasticity is the popular problem when the data is the cross-sectional (Long & Ervin, 1998). The heteroscedasticity occur by several reasons such as misspecification, skewness, measurement error and the incorrect data transformation or the incorrect functional and so on. In additional, the error will increase follow by the independent variable value increase. More than that, if there are any other interaction effects or some subpopulation differences will bring the Heteroscedasticity occur (Williams, 2015).

For this heteroscedasticity frequently have the side effect from the other violations of assumption and these can deal with some consequences. First consequence is that ordinary least squares (OLS) are still unbiased and consistent. When heteroscedasticity presented, the standard errors are biased and also do not result in biased parameter estimates. Auspiciously, OLS estimator still can be used without regard of serious distortion since the significant test is unaffected unless the Heteroscedasticity has been “marked” (Williams, 2015).

According to Long and Ervin (1998) mention that if the form and size is known, standard econometrics texts can be considered as method used and these method is import for weighting observation. But these method is impractical due to the heteroscedasticity is little to known.

Therefore, there are commonly use Breusch-Pagan-Godfrey and White test to detect the problem of heteroscedasticity. Breusch-Pagan is to test the null hypothesis whether the error variances is all alike (Williams, 2015). The feature of the Breusch-Pagan is based on the sufficient condition and necessary for consistency of the F-test in the linear regression model. But in this section is allowing for present a lot of misspecification (Zaman, 1995).

White test, is the test for heteroscedasticity in linear forms for specified the default Breusch-Pagan. If the errors is not a normality distribution would have problem for the default test (Williams, 2015). White's test used the large sample to do the test, or call as asymptotic test. But the problem is if the equal of the variance of the errors would be also returning a significant result, this is because the only have one model and it may collect other issue in data. The White test is ordinary; the one of the reason is because of the terms added can be test for more diversify of the heteroscedasticity (Willaims, 2015).

But this research is found that more suitable to apply Autoregressive Conditional Heteroscedasticity (ARCH) test because it can avoid the heteroscedasticity problem existed in the model (Engle, 1982). Thus, this research will conduct the ARCH test to detect the heteroscedasticity problem in the model. If heteroscedasticity exists, then White's Heteroscedasticity-Corrected Variances and Standard Error will be used to solve the problem.

The effect of the ARCH explained the variance of the current error term is associated with the size of the previous periods' error terms, and in this research regression model is time series based, thus this ARCH is suitable to this research (Engle, 1982).

3.6.2.4 Autocorrelation

H_0: There is no autocorrelation.

H_1: There is autocorrelation.

Autocorrelation is a mathematical representation of the similarity between time series data and it is the same as calculating the correlation between two different time series data. In another way, Autocorrelation can be called as "lagged correlation" or "serial correlation" which refers to the disturbance term for any observations. Besides, Autocorrelation can lead to underestimates of the standard error.

In order for researchers to detect the presence autocorrelation, there is a very famous test called the Durbin Watson test. Durbin Watson test consist of few assumptions which are the error are normally distributed with mean of zero. And the errors are stationary. In Durbin Watson test, the formula is as followed.

$$d = \frac{\sum(\widehat{e_t} - \widehat{e_{t-1}})^2}{\sum \widehat{e_t}^2}$$

The Durbin Watson test will produce an outcome with the value from zero to four, where outcome of two means there is no autocorrelation; outcome with zero to less than two means there is a positive autocorrelation problem which is more common in time series data; outcome with more than two to four is negative autocorrelation problem and it is less common in time series data. (Stephanie, 2016)

- 2 = There is no autocorrelation
- 0 to < 2 = There is positive autocorrelation
- > 2 to 4 = There is negative autocorrelation

There is another method to detect the autocorrelation, which is Breusch-Godfrey LM test. Breusch- Godfrey LM test is easier and more accurate as Durbin- Watson test has limitations such as providing inconclusive outcome and it is only applicable for first order series correlation. In Breusch-Godfrey test, null hypothesis (H0: There is no autocorrelation) will be rejected if the test statistics is greater than critical value or p-value is less than critical value. Otherwise null hypothesis will not be rejected.

3.6.2.5 Normality Test

H_0: Error terms are normally distributed.

H_1: Error terms are not normally distributed.

The normality test is using to determine whether all the variables data are normal distribution. The result of normality test is importance to us continuous following tests due to a normal distributed model can lead us to a more accurate and perfect result in other methodology tests, otherwise, the result may mislead (Mordkoff, 2011). Therefore, the few assumptions should be followed before start in the normality test to make sure can get standard normal distribution.

In this test, there are two different ways to detect the normality which are graphical and statistical methods (Stephanie, 2016). Graphical method had included Q-Q plot, boxplot and normal probability plot (Stephanie, 2016) while statistical method have Shapiro-Wilk W Test, Kolmogorov-Smirnov Test, D'Agostino Skewness Test, Jarque-Bera test and others (NCSS, n.d.). In this research, Jarque-Bera test are used to determine whether there is normal distributed by using E-views 10. Jarque-Bera test is examining the normality by using the sample skewness and kurtosis (NIST, 2015), the test statistic is shown as below:

$$\text{Jarque-Bera test} = \frac{N}{6}\left(S^2 + \frac{(K-3)^2}{4}\right)$$

With,

N = Sample size

S = Sample skewness

K = Sample kurtosis

In this investigation, the null hypothesis and alternative hypothesis had stated before. Hence for the decision making in this test, the null hypothesis will be reject when the test statistic higher than the critical value, otherwise, do not reject.

3.6.2.6 Model Specification

H_0: Model is perfectly specified.

H_1: Model is not perfectly specified.

Model specification is to decide whether independent variables should be involved or disqualified from a regression equation (Frost, 2017). According to Dr. Jon Starkweather, model specification error can occurred due to omission and inclusion errors. These errors refer to fail to include some important variables from the model or comprise some inadequate variables into the model. In consequence, due to severely in model specification error will cause multicollinearity, simultaneous equation problems and heteroscedasticity to happen and lead to inappropriate and mislead results.

According to Ramsey (1969), Regression Equation Specification Error Test (RESET) is used to identify the model specification error. It is a common test that is used to analyse the accuracy of functional form. In this case, E-views software will be used to execute the Regression Equation Specification Error Test. Alternative hypothesis shows that the model is not perfectly specified while null hypothesis shows that the model is perfectly specified. In addition to that, the null hypothesis will be rejected if the p-value is below the significant level of 0.05 or F-test is more than the critical value. Otherwise, the null hypothesis will not be rejected.

3.7 Conclusion

In summary, several tests will carry out in order to find out the independent variable (GDP, LR, UR, and PG) correlation with percentage change in housing transaction volume. Time Series fall under secondary date category is the data of this investigation. Duration in this study from 1996Q1 to 2016Q4, quarter data. 84 observations has taken into account on each independent and dependent variable dependent data collect form NAPIC, while independent data from IMF, NAPIC and World Bank. Moreover, data processing will be provided to ensure information able convert to knowledge and send to everyone by using E-views 10. In another hand, OLS, T-test and F-test will be used to discover the connection, importance, trustfulness among independent and dependent variables. Afterward, diagnostic checking (JB, LM, ARCH and more) will be proceeded to identify and solve whether any econometric problems exist. Empirical result will be demonstrated in chapter 4.

CHAPTER 4: DATA ANALYSIS

4.0 Introduction

As declared in chapter three, OLS method has been used in regression model and those diagnostic testing. The hypothesis testing is to check whether all the independence variables are significant to the percentage change in housing transaction volume; diagnostic testing are used to check whether the model is having economic problems. This methodologies of hypothesis and diagnostic testing had included the Granger Causality test, t-test, f-test, Autocorrelation, heteroscedasticity, multicollinearity, normality and model specification.

Therefore in this chapter, the first will using the Granger Causality Test to test the nexus between housing glut, housing affordability and the housing prices. In additional, this study will be conduct all other testing as support by using the OLS method with the 84 observations that collected from the first quarter of 1996 to the last quarter of 2016. All the diagnostic checking will be based on the estimated economic model, if there is any economic problems occurred in the testing some methods or tests will be used such as the BGLM test and White test to solve it.

Economic Model:

$PCIHTV_t = \beta_0 + \beta_1 GDPG_t + \beta_2 PG_t + \beta_3 LR_t + \beta_4 UR_t + \varepsilon_t$ (Model 4.1)

Estimated Economic Model:

$\widehat{PCIHTV}_t = \hat{\beta}_0 + \hat{\beta}_1 GDPG_t + \hat{\beta}_2 PG_t + \hat{\beta}_3 LR_t + \hat{\beta}_4 UR_t + \hat{\varepsilon}_t$ (Model 4.2)

N= 84 t= 1996Q1 to 2016Q4

Where,

$PCIHTV_t$ = Percentage change in housing transaction volume in Malaysia (%)

$GDPG_t$ = Gross Domestic Price growth in Malaysia (%)

PG_t = Population growth in Malaysia (%)

LR_t = Lending rate in Malaysia (%)

UR_t = Unemployment rate in Malaysia (%)

In this model, the percentage change in housing transaction volume is the dependent variable and this variable means that the percentage change year to year in Malaysia's housing transaction volume. Whereas, the Independent variables are GDP growth, population growth, lending rate and unemployment rate. The lending rate and unemployment rate are original measured in percentage while the population and GDP are the percentage that growth in year to year.

4.1 Description of the Empirical Models

In this research, there are some economic models will be applied to analysis and evaluate the relationship between percentage change in housing transaction volume in Malaysia with gross domestic growth in Malaysia, population growth in Malaysia, lending rate, and unemployment rate in Malaysia from 1996 Q1 to 2016 Q4.

The empirical model is referring to the model 4.2.

Estimated Economic Model:

$\widehat{PCIHTV}_t = \hat{\beta}_0 + \hat{\beta}_1 GDPG_t + \hat{\beta}_2 PG_t + \hat{\beta}_3 LR_t + \hat{\beta}_4 UR_t + \hat{\varepsilon}_t$ (Model 4.2)

N= 84 t= 1996Q1 to 2016 Q4

Where,

$PCIHTV_t$ = Percentage change in housing transaction volume in Malaysia (%)

$GDPG_t$ = Gross Domestic Price growth in Malaysia (%)

PG_t = Population growth in Malaysia (%)

LR_t = Lending rate in Malaysia (%)

UR_t = Unemployment rate in Malaysia (%)

Model 4.1 is a fundamental economic model. Percentage change in housing transaction volume in Malaysia is estimated by referring to the four exogenous variables which are GDPG, PG, LR, and UR. All of these variables is measured in percentage form. Random error that may be come out during the test will be denoted as ε in the equation.

4.2 Data and Descriptive Statistics

Table 4.1: Descriptive Statistics (By referring to Appendix 4.1)

	PCIHTV	GDPG	LR	UR	PG
	%	%	%	%	%
Mean	1.880314	4.870388	6.570476	3.224571	1.999046
Median	1.793961	5.463315	6.152188	3.279687	1.869385
Maximum	26.47176	10.87306	12.41781	3.728125	2.550271
Minimum	-36.24698	-8.314086	4.510312	2.300375	1.449979
Std. Dev	11.99110	3.980106	2.110424	0.337593	0.301229
Skewness	-0.760340	-1.506461	1.250387	-0.957402	0.594804
Kurtosis	4.541979	5.581151	3.700406	3.625584	2.293452
Observation	84	84	84	84	84

Where,

$PCIHTV_t$ = Percentage change in housing transaction volume in Malaysia (%)

$GDPG_t$ = Gross Domestic Price growth in Malaysia (%)

PG_t = Population growth in Malaysia (%)

LR_t = Lending rate in Malaysia (%)

UR_t = Unemployment rate in Malaysia (%)

In this part, the main explanation is about the skewness, kurtosis and the average which know as mean. Besides, standard deviation is one of the measurement used and it is the indicator to estimate variability, if the standard deviation falls within a number of two, it means the variable is normal distributed (Altman, 2005). A brief introduction about these terms are ass followed. The meaning of skewness is lack of symmetry or imbalance shape in the data distribution. There are three types of skewness which happens when the curve of the distribution is imbalance. When the curve is stretched towards right side, it is a positive skewness while if the curve is stretched towards left side, it is a negative skewness (Kothari, 2014). If the value is

zero in skewness, that means there is no skewness present as the mean and median are equal to each other (Lind, Marchal, & Wathen, 2005).

Besides, kurtosis is another important tool to measure the characteristics of the data set. By using Kurtosis, it interprets the shape of the distribution curve either is flat or peak. Leptokurtic distribution is the data consist of positive excess kurtosis and it is known as "fat-tail risk' which implies the data set are ignored for normal distribution (Nihlen & Malm, 2014). When the kurtosis is greater than three, it means the data is concentrated around the mean and higher probability to observe an extreme values on either side (Geyer, n.d).

In this study, 84 observations of time series data were collected. There are quarterly data from the year 1996 quarter 1 to 2016 quarter four. And the data included the Percentage change in housing transaction volume (PCIHTV) which means the changes in the housing transaction volume, Gross domestic product growth (GDPG) and it represent as the indicator of economy performance. Lending rate (LR), the borrowing interest rate from the bank. Following by the unemployment rate (UR), the indicator for the people who do not have a job and last but not least the population growth (PG), the changes or difference of Malaysian.

Base on the table 4.1, it shows the mean, median, mode, minimum, maximum, standard deviation, skewness and kurtosis in every single variable (dependent variable and independent variables). For percentage change in housing transaction volume (PCIHTV), the average as known as mean is 1.88%. It means the average changes in the housing transaction volume in at 1.88%. The lowest percentage change in housing transaction volume is at -36.24698% while the highest changes hits 26.47176%. The skewness of Percentage change in housing transaction volume is -0.760340 which means the skewness stretched to left and it is a negative skewness. Kurtosis for the percentage change in housing transaction volume is 4.541979, it means the data is volatile as it is greater than the benchmark of three.

Next, gross domestic product growth (GDPG), the mean of 4.870388 indicates the average of the data set is at 4.870388%. The maximum percentage change in GDPG is 26.4716% while the lowest is -36.24698%. The standard deviation in Gross domestic growth is 3.980106 and the skewness for Gross domestic product growth is -1.506461 which means the skew is stretching to the left side as it is a negative figure. For kurtosis of Gross domestic product growth, it shows 5.581151 which represent the data of Gross domestic product growth is fluctuate and volatile.

Following by Lending rate (LR), the average of this data set is 6.570476% and the maximum of the lending rate hits 12.41781% while the lowest hits 4.510312%. The skewness of Lending rate is 1.250387 means it is a positive skewness which the graph stretched to right side. The kurtosis of lending rate 3.700406, it is near to the benchmark of three which means it is less volatile than GDPG and PCIHTV.

Next, for the average of Unemployment rate (UR) is 3.224571% and the maximum of the rate hits at 3.728125% while having a minimum rate of 2.300375%. The standard deviation for unemployment rate is 0.337593 and it is normally distributed as the standard deviation is within the benchmark of two. Unemployment rate graph is left side stretched as the skewness shows a negative figure of -0.957402. The kurtosis is 3.625584 which is near to benchmark of three and shows a minor volatile in the data.

Lastly, the Population growth (PG). The mean of population growth is 1.999046% and the maximum of the growth rate is 2.550271% while minimum growth rate is 2.550271%. The standard deviation of 0.301228 shows the data is normally distributed as the figure is within the benchmark of two. The skewness for Population growth is right side stretched as the figure is 0.594804. The kurtosis is 2.293452 and it is not volatile as the figure did not exceed the benchmark of three.

4.3 Model Estimation and Interpretation

This research will be taking the Model 4.1 to tested by using the OLS regression model, also, using the E-Views 10 to further testing the hypothesis and the diagnostic checking. The Table 4.1 (refer to Appendix 4.1) is the output from conduct the E-View testing for the Model 4.1.

$\widehat{PCIHTV_t} = \widehat{\beta_0} + \widehat{\beta_1}\ GDPG_t + \widehat{\beta_2}\ PG_t + \widehat{\beta_3}\ LR_t + \widehat{\beta_4}\ UR_t + \widehat{\varepsilon_t}$ (Model 4.1)

Table 4.2: Initial Regression Output (By referring to Appendix 4.2)

Variables	Coefficient	Standard Error	t-statistics	P-value
$\widehat{\beta_0}$	-80.59549	15.96857	-5.047134	0.0000
$GDPG_t$	2.0276125	0.289457	7.172476	0.0000
PG_t	27.57976	8.241445	3.346471	0.0013
LR_t	-3.203683	1.244693	-2.573874	0.0119
UR_t	11.87159	3.419490	3.471742	0.0008

R-squared (R^2)	0.557433
Adjusted R-squared ($\overline{R^2}$)	0.535025

Where,

$PCIHTV_t$ = Percentage change in housing transaction volume in Malaysia (%)

$GDPG_t$ = Gross Domestic Price growth in Malaysia (%)

PG_t = Population growth in Malaysia (%)

LR_t = Lending rate in Malaysia (%)

UR_t = Unemployment rate in Malaysia (%)

4.3.1 Interpretation of Beta

$\widehat{\beta_0}$ = -80.59549

Assuming all the independence variables are equal to zero, on average, the Malaysia's percentage change in housing transaction volume will drop by 80.59549%.

$\widehat{\beta_1}$ = 2.0276125

When the gross domestic product growth increase by one percent, on average, the percentage change in housing transaction volume will increase by 2.0276125%, by holding other variables constant. There are positive relationship between percentage change in housing transaction volume and GDP growth.

$\widehat{\beta_2}$ = 27.57976

When the population growth increase by one percent, on average, the percentage change in housing transaction volume will increase by 27.57976%, by holding other variables constant. There are positive relationship between percentage change in housing transaction volume and population growth.

$\widehat{\beta_3}$ = -3.203683

When the lending rate increase by one percent, on average, the percentage change in housing transaction volume will decrease by 3.203683%, by holding other variables constant. There are negative relationship between percentage change in housing transaction volume and lending rate.

$\widehat{\beta_4}$ = 11.87159

When the unemployment rate increase by one percent, on average, the percentage change in housing transaction volume will rise by 11.87159%. There are positive relationship between percentage change in housing transaction volume and unemployment rate.

4.3.2 Interpretation of R-squared (R^2) and Adjusted R-squared ($\overline{R^2}$)

$R^2 = 0.557433$

According the Eview output shows that R^2 is 0.557433. This could be indicates that 55.7433% of the variation in Malaysia's percentage change in housing transaction volume may be described by the variation of gross domestic product, population growth, lending rate and unemployment rate,

$\overline{R^2} = 0.535025$

According the E-views output shows that $\overline{R^2}$ is 0.557433. This could be indicates that 55.7433% of the variation in Malaysia's percentage change in housing transaction volume may be described by the variation of gross domestic product, population growth, lending rate and unemployment rate, after the number of independence variables and degree of freedom are counted into account.

4.3.2.1 The Acceptable R-squared (R^2) Value

R-squared is the coefficient of the determination, which is based on the independent variable can be explained the proportion of variance in the dependent variable. Thus, researcher could be based on the R-squared value to interpreting the strength of relationship between independent and dependent variable.

Most of the researcher would said that if the R^2 equal to one is perfect and if the R^2 equal to zero is terrible, even though the highly trained professional statistician could be also confidently tell you the same view, but it can't present anything more (Leamer, 1999).

To refer other public journal, founded that different scholars would have different view for the standard of the acceptable of R-squared. Based on the recommendation of Falk and Miller (1992), they said that when the R-squared is equal to 0.10 or greater than 0.10 is able to explained of particular endogenous would be consider as adequate. In another hand, Cohen (1988) suggest the standard of the acceptable R-squared which 0.02 is weak, 0.13 consider as moderate, 0.67 or above consider as substantial. According the Zikmund and William (2000) provide the rule of thumb to interpreted the strength of relationship, which is when the R-squared value is lower than 0.3 is considered a none or very weak effect size. If the R-squared is between 0.3 and 0.5 is considered as weak or low effect size. If R-squared between 0.5 and 0.7 is considered as moderate effect size. If the R-squared is above 0.7 would be considered as strong effect size.

Based on the different scholars of recommend and view, the R-squared in this research 0.557433 may be considered as the moderate effect size. Since it at least conform of the moderate effect size, thus can be conclude that this study is reliable.

4.4 Hypothesis Testing

4.4.1 Granger Causality Test (GC Test)

Hypothesis:

H_0: Models do not have granger causality.

H_1: Models do have granger causality.

Decision rules:

Reject H_0 if the p - value is lower than significant level (0.05). Otherwise, do not reject H_0.

Table 4.3: Relationship between Each Variable for Granger Causality Test (Referring to appendix 4.18)

Variable Y	Variable Y	Significance Level (α)	P-value	Decision Making	Conclusion
Housing Glut	Affordability	0.05	0.0282	Reject H_0.	Granger Cause
Housing Price	Housing Glut	0.05	0.0227	Reject H_0.	Granger Cause

Diagram 4.5 showed that macroeconomic variables (Housing Glut, Housing Affordability, Housing Price and Housing Transaction) involve in a granger causality correspondingly. The relationship between housing glut, housing price,

housing affordability and housing transaction conducted by Granger Causality Test (GC Test) has fuel up the evidence in this study.

The Granger Causality Test's outcome have identified there is direct relationship between housing glut and housing affordability. Hosing glut will be happened when supply is greater than demand. The housing affordability will increase when there is housing glut as the price of houses will decrease when the supply is greater than demand (Burke & Pinnegar, 2007). Since the housing price is lower, the house buyer will have ability to afford the property.

Granger Causality test shows there is another direct relationship between housing price and housing glut. The outcome shows there is a relationship where the housing price increase, the housing transaction volume will decrease. Housing glut will happen when the demand and supply are imbalance. Thus, the relationship between housing price and housing glut can be identified through GC test.

From the explanation above, there are relationship between the housing gluts, housing affordability and housing price which the major finding and research topic can be supported by Granger Causality testing

4.4.2 T- test

4.4.2.1 Gross Domestic Product (GDP)

Hypothesis:

H_0: Volume of transaction and gross domestic product have no significant relationship.

H_1: Volume of transaction and gross domestic product have significant relationship.

Decision Rule:

If p-value of test-statistics less than significant level $\alpha = 0.05$, reject H_0. Otherwise, do not reject H_0.

Decision Making:

Reject H_0 since the p-value is 0.0000 which is less than significant level $\alpha = 0.05$.

Conclusion:

Volume of transaction and gross domestic product have significant relationship.

4.4.2.2 Lending Rate (LR)

Hypothesis:

H_0: Volume of transaction and lending rate have no significant relationship.

H_1: Volume of transaction and lending rate have significant relationship.

Decision Rule:

If p-value of test-statistics less than significant level $\alpha = 0.05$, reject $H0$. Otherwise, do not reject H_0.

Decision Making:

Reject H_0 since the p-value is 0.0119 which is less than significant level $\alpha = 0.05$.

Conclusion:

Volume of transaction and lending rate have significant relationship.

4.4.2.3 Unemployment Rate (UR)

Hypothesis:

H_0: Volume of transaction and unemployment rate have no significant relationship.

H_1: Volume of transaction and unemployment rate have significant relationship.

Decision Rule:

If p-value of test-statistics less than significant level $\alpha = 0.05$, reject H_0. Otherwise, do not reject H_0.

Decision Making:

Reject H_0 since the p-value is 0.0008 which is less than significant level $\alpha = 0.05$.

Conclusion:

Volume of transaction and unemployment rate have significant relationship.

4.4.2.4 Population Growth

Hypothesis:

H_0: Volume of transaction and population have no significant relationship.

H_1: Volume of transaction and population have significant relationship.

Decision Rule:

If p-value of test-statistics less than significant level $\alpha = 0.05$, reject H_0. Otherwise, do not reject H_0.

Decision Making:

Reject H_0 since the p-value is 0.0013 which is less than significant level $\alpha = 0.05$.

Conclusion:

Volume of transaction and unemployment rate have significant relationship.

4.4.3 F-test

F-test has taken into account on each variables to investigate the overall significance of a regression models.

Hypothesis Testing:

H_0: $\beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$ (Model is insignificant)
H_1: At least one of the β_i is different from zero, where i = 1,2,3,4 (At least one exogenous variable is important to the model)

Decision Rule:
Reject null hypothesis, if F-test statistic's p-value result is less than the significance level of 5%. Otherwise, do not reject H_0.

Decision-Making:
Reject H_0, since the p-value (0.000000) is less than the significance level of 5%.

Conclusion:

Sufficient evidence to conclude there is at least one βi not equal to zero at 5% significant level. Which means percentage changes in housing transaction volume is significantly affect by either one variable (GDP growth, lending rate, unemployment rate, and population growth) at least.

4.5 Diagnostic Testing

4.5.1 Multicollinearity Test

Table 4.4 Corelation Analysis (referring to appendix 4.3)

	GDPG	LR	PG	UR
GDPG	1.000000	-0.198642	-0.038153	-0.393302
LR	-0.198642	1.000000	0.920341	-0.400620
PG	-0.038153	0.920341	1.000000	-0.422741
UR	-0.393302	-0.400620	-0.422741	1.000000

Where,

GDPG = Gross Domestic Price growth in Malaysia (%)

PG = Population growth in Malaysia (%)

LR = Lending rate in Malaysia (%)

UR = Unemployment rate in Malaysia (%)

*r value among 0 and 0.3(0 and -3) = weak +ve (-ve) linear relationship

*r value among 0.3 and 0.7 (-0.3 and -0.7) = moderate +ve (-ve) linear relationship

*r value among 0.7 and 1.0 (-0.7 and -1.0) = strong positive linear relationship

Karl Pearson was created “correlation coefficient” in 1896. Correlation coefficient is a tools which is used to measure straight-line’s strength and linear association between two variables, represented by *r*. The ranges of correlation coefficient is negative one to positive one. When r equal zero illustrates no linear relationship. If r is positive one indicates a perfect positive linear relationship. Positive correlation coefficient means growth in one variable value will affect subsequent variable will

growth. In contrast, negative one shows perfect negative linear relationship. Negative correlation denoted adverse relation among the variable, increase in one variable's value will lead to other variables value drop (Ratner, 2009).

Pindyck and Rubinfeld (1998) has mentioned high potential possibility of serious multicollinearity problem if *r* exceed 80%. Since table show that Lending Rate and Population Growth *r* more than 0.8, so there is a high pair wise correlation between both of the variable. Lastly, the research will conduct Variance Inflation Factor and Tolerance (TOL) to prove multicollinearity exist in the model.

Table 4.5: Result of Variance Inflation Factor (VIF) & Tolerance (TOL)

Refer to Appendix	VIF $(1/1-R^2_{aux})$	TOL (1/VIF)
GDPG *(Appendix 4.4)*	(1/1-0.393108) = 1.6477739	(1/1.6477739) = 0.606879
LR *(Appendix 4.5)*	(1/1-0.883264) = 8.5663321	(1/8.5663321) = 0.116736
PG *(Appendix 4.6)*	(1/1-0.869302) = 7.651215	(1/7.651215) = 0.130698
UR *(Appendix 4.7)*	(1/1-0.395551) =1.654398	(1/1.654398) = 0.604449

Where,

GDPG = Gross Domestic Price growth in Malaysia (%)

PG = Population growth in Malaysia (%)

LR = Lending rate in Malaysia (%)

UR = Unemployment rate in Malaysia (%)

Based on information listed on table above, the model does not suffer on serious multicollinearity problem. This could be explain by the degree of VIF, due to all the independent variables is fall within one to ten regions. Furthermore, the degree of TOL is near to zero to support multicollinearity problem does not exist. If econometric problem does not appear, the result are unbiased, efficient and consistent.

4.5.2 Heteroscedasticity

Heteroscedasticity is that if there is error terms which are different by the difference across the observations. The problem of heteroscedasticity is the popular problem when the data is the cross-sectional.

Hypothesis:

H_0: The error term is homoscedasticity.

H_1: The error term is heteroscedasticity

Decision Rule:

Reject H_0, if the p-value of the Chi-square is lower than the significant level (α=0.05).Otherwise do not reject the H_0.

Table 4.6: Autoregressive Conditional Heteroscedasiticity (ARCH), (refer to appendix 4.8)

Prob. Chi-Square(1)	0.0000

Decision Making:

Reject H_0, since the p-value of the Chi-squared (0.0000) is lower than the significant level (α = 0.05).

Conclusion:

There is enough evidence to conclude that there has heteroscedasticity at 5% significant level.

4.5.2.1 White's Heteroscedasticity-Corrected Variance and Standard Error (HCSE)

The HCSE is the highly attracting method of minimize the effects of the heteroscedasticity (Hayes & Cai, 2007).

Hypothesis:

H_0: The error term is homoscedasticity.

H_1: The error term is heteroscedasticity

Decision Rule:

Reject H_0, if the p-value of the Chi-square is lower than the significant level (α=0.05).Otherwise do not reject the H_0.

Table 4.7: White's Heteroscedasticity-Corrected Variance and Standard Error (HCSE), (refer to appendix 4.17)

Prob (F-test)	0.000000

Decision Making:

Reject H_0, since the p-value of the F-statistic (0.0000) is lower than the significant level (α=0.05).

Conclusion:

According to the result above show that it may be still existed the heteroscedasticity problem in the model when the significance level at 5%. In theory, White's and Standard Error could be reducing the effect of the heteroscedasticity Heteroscedasticity-Corrected Variance. However, after the test done is showed that there are different between the real result and the theory.

4.5.3 Autocorrelation

Hypothesis:

H_0: There is No autocorrelation problem

H_1: There is autocorrelation problem

Decision rule:

Autoregressive Distributed Lag Model (ADRL)

If p-value of Chi-square less than significant level $\alpha = 0.05$, reject H_0. Otherwise, do not reject H_0.

Durbin-Watson test

If Durbin-Watson is 2, there is no autocorrelation problem; if the DW is 0 to < 2, there is a positive autocorrelation problem; if the DW is > 2 to 4, there is a negative autocorrelation problem.

Table 4.8: Result of ADRL test (Referring to appendix 4.11)

Durbin-Watson	1.171704	Prob.Chi-Square(1)	0.0000

Decision-Making:

Since the significant value of $\alpha = 0.05$ is greater than p-value of Chi-Squared 0.0000 Reject H_0.

Conclusion:

There is Autocorrelation problem among the error terms at significant level of 5%. Since there is an autocorrelation problem, Autoregressive Distributed Lag Model (ARDL) and Durbin Watson test will be conducted to solve the autocorrelation problem.

4.5.3.1 Autoregressive Distributed Lag Model (ADRL)

Autoregressive distributed lag model (ADRL) is the popularity of error-correction model, which is used to solve the autocorrelation problem (Hassler & Wolters, n.d.). There have few advantage by using ADRL, and the major advantage for this model is that it does not require to integrate same order for all of the variables (Belloumi & Alshehry, 2018). Thus this model is appropriate to applied into time series econometrics, because it result for nonstationary variables that correction is same level to an error-correction mechanism (Engle & Granger, 1987). Furthermore, if there are small and limited sample sizes, ARDL would more productive in this case. Lastly, ARDL would also able to provide the unbiased estimates of long-run model (Belloumi, 2014).

However, there are one criticism for the ARDL model, if the data is random trend, the ARDL model dynamics would be approximating instead of real dynamics (Oxera, 2010). Moreover, the model of the number of exogenous variables increases, it lead the consequences of dropping the degree of freedom (Belloumi, 2014).

The reason for choosing ARDL model is to eliminate the econometric problems. The enhanced model attached at *appendix 4.14*.

Hypothesis:

H_0: No autocorrelation among the error terms

H_1: Autocorrelation among the error terms

Decision rule:

If p-value of Chi-square less than significant level $\alpha = 0.05$, reject H_0. Otherwise, do not reject H_0.

Table 4.9: Result of ADRL test (appendix 4.12)

Prob.Chi-Square(1)	0.1056

Decision-Making:

Since the significant value of $\alpha = 0.05$ is lower than p-value of Chi-Squared 0.1056 Do not reject H_0.

Conclusion:

There is no autocorrelation among the error terms at significant level of 5% .The model is free from econometrics problem after the improvement.

4.5.3.2 Durbin-Watson Test

Hypothesis:

H_0: No autocorrelation among the error terms

H_1: Autocorrelation among the error terms

Decision rule:

If Durbin-Watson is 2, there is no autocorrelation; if the DW is 0 to < 2, there is a positive autocorrelation; if the DW is > 2 to 4, there is a negative autocorrelation.

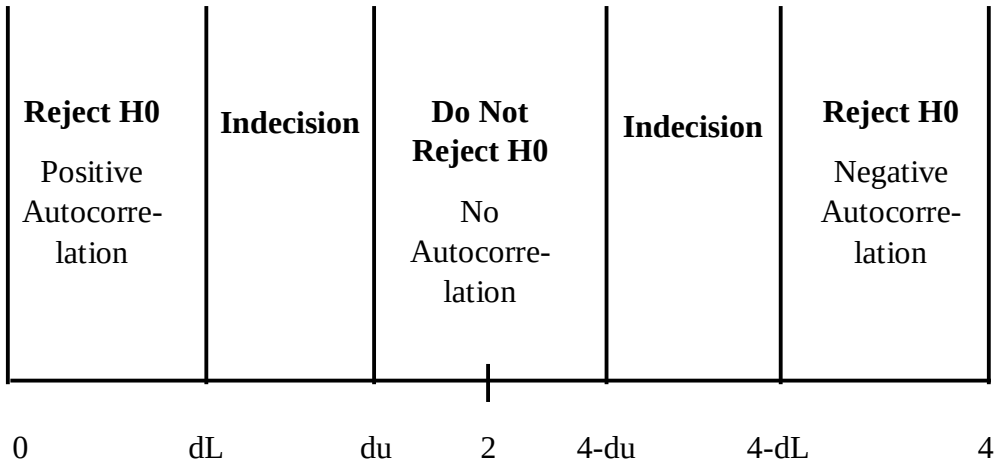


Table 4.10: Result of Durbin-Watson test (appendix 4.12)

Durbin-Watson stat	2.009176

Decision-Making:

Since the DW is 2.009176 and near to the figure '2'. Thus, there is no autocorrelation problem.

Conclusion:

There is no autocorrelation among the error terms at significant level of 5% the model is free from autocorrelation problem after the improvement.

4.5.4 Normality test

This normality test is to determine whether there is normal distribution in the regression model. In this part, Jarque-Bera test had been used in to detect the normality distributed by using E-views 10.

Hypothesis:

H_0: Error terms are normally distributed.

H_1: Error terms are not normally distributed.

Decision rule:

If the p-value of Jarque-Bera test is smaller than the 5% of significant level, reject H_0. Otherwise, do not reject H_0.

Table 4.11: result for Jarque-Bera test (from appendix 4.14)

Probability	0.289800

Decision making:

Since, the probability of JB test is 0.289800, which is greater than the significant level 0.05. Therefore, do not reject H_0.

Conclusion:

There is sufficient evidence to conclude that the error terms are normally distributed in the significant level of 5%. Since there is normal distribution, so nothing to further solving.

4.5.5 Model Specification Test

Ramsey RESET test is used to check whether the model is reliable or not.

Hypothesis:

H_0: The model is precisely specified

H_1: The model is not precisely specified

Decision rule:

Reject H_0 if the p-value is less than the α. Otherwise, do not reject H_0.

Table 4.12: Result of Ramsey RESET test (Referring from appendix 4.15)

P-value of F-statistic	0.1497

Decision making:

Since the p-value (0.1497) is greater than the α (0.05), so do not reject H_0.

Conclusion:

There is enough evidence to conclude that the model is precisely specified at 5% significant level.

4.6 Conclusion

As mentioned in the introduction part of this chapter, the main purposes of this chapter is test the estimated model whether it is significant and BLUE by using those data had found from the NAPIC, World Bank and International Monetary Fund. Based on the all results that get from the tests run in chapter four shown, there have direct relationship between housing glut and housing affordability, and there is another direct relationship between housing price and housing glut. All the four independent variables have significant relationship with the volume of housing transaction in the 5% of significant level.

All the diagnostic checking in this chapter have been detected by E-views 10. The diagnostic checking are including model specification, normality of error term, heteroscedasticity, autocorrelation and multicollinearity, all this can be said as econometric problems. Even though there are autocorrelation and heteroscedaticity problems occurred, but had overcome all problems. Autocorrelation problem has solved by Durbin-Watson test and ARDL test; while the heteroscedasticity problem still occur after using White test. For the multicollinearity test, there is multicollinearity problem arise but no serious, normally distributed in error terms and model is precisely specified.

CHAPTER 5: DISCUSSIONS, IMPLICATIONS AND CONCLUSION

5.0 Introduction

This is the last chapter of the research, we will be provided the framework for the overall study from chapter one to four. In addition, we also prepared the summary for the major finding and the analysis in chapter four in a tabulate form, therefore, the reader can see and compare the relationship that stated in the chapter one objective whether there is positive or negative relationship between the percentage changes in housing transaction volume and the four independent variables. The suggestion of the policies or implications and limitations will be discussed in following parts to let the readers more understand about this study. Last of all, there are some recommendations will be provided to researcher for their further investigation.

5.1 Summary of Statistical Analysis

The objective of this research is to analyse the significant relationship between the percentage changes in in housing transaction volume with the GDP growth, population growth, lending rate and unemployment rate. This exploration had used 80 observations which get from the online databases and had the timeline between Quarter 1 of year 1997 to Quarter 4 of year 2016.

Based on the chapter four result, we can know that all of the independent variables have the relationship with the percentage changes in in housing transaction volume in Malaysia at the significant level of 5%. While the population growth, unemployment rate and GDP growth will having the positive relationship; lending rate is having the negative relationship with the percentage changes in in housing transaction volume in Malaysia.

Table 5.1: Summary of diagnostic checking

Econometric Problems	**Results**
Multicollinearity	Multicollinearity not occur
Heteroscedasticity	Have heteroscedasticity problem
Autocorrelation	There is autocorrelation among the error terms, however, solved by Durbin Watson test and ADRL test.
Normality	Error terms are normality distributed.
Model Specification	The model is precisely specified.

Based on the theory and assumptions of the OLS that we had discussed before in Chapter 3, we can know that all of the results are reliable and dependable. As conclusion, we can said that the estimated model that had used in this study are free from the econometric problems and had satisfy all the assumptions of OLS and BLUE. This is because from the table 5.1 can know that, the estimated model in this research have heteroscedasticity and autocorrelation problem occurred however we had solved both of them with the White test and ADRL test. This model is precisely specified and have normal distribution in the error terms. This model has no multicollinearity problem.

5.2 Discussions of Major Findings

Table 5.2: Summary of the Results and Theories

Dependent Variable	Independent Variables	Significance Level	Expected Sign (Theoretical)	Result
Percentage Change in Housing Transaction Volume	Gross of Domestic Product Growth	5%	Positive, Supported by **Pettinger (2017);** Zhu (2003)	Positive and significant
Percentage Change in Housing Transaction Volume	Population Growth	5%	Positive, Supported by **Pettinger (2017);** Parliament of Australia (n.d.); Yaduwanshi (2016)	Positive and significant
Percentage Change in Housing Transaction Volume	Lending Rate	5%	Negative, Supported by Tze (2013); Catte (2004); Barakova (2003)	Negative and significant
Percentage Change in Housing Transaction Volume	Unemployment Rate	5%	Negative, Supported by Gan, (2018)	Positive and significant

The table 5.2 shows the differences of expected and actual result between the independent and dependent variable. Based on the table above, there are minor differences between the expected and actual results. The relationship between the change in housing transaction volume and gross domestic product growth, lending rate and population growth are positively related to each. The actual results for those variables mentioned above are same with the expected result.

The only unexpected difference is the relationship between change in housing transaction volume and unemployment rate. The expected relationship between the variables were in negative sign while the actual result shows a positive relationship. When unemployment rate increase, it means more individuals would be losing their job and income. Bank will reject the loans application to an individual which does not have income as there will be a higher default risk in their monthly instalment. Thus, it will reduce the housing market sale and reduce the volume of transaction (buying) at the same time.

On the other hand, the actual result for the relationship between the change in housing volume transaction and unemployment rate is in positive relationship as shown in the table above. With the positive relationship, it means that when the unemployment rate increase, the change in housing transaction volume will increase, vice versa. Although the result is different from the expectation but it can still be supported by the explanation below. Based on the Cambridge dictionary, the term ‘transaction’ means the occasion when someone buys or sells something. Which can be link back to the term ‘change in housing transaction volume’, it can be described as change in number of housing buying or selling volume.

Based on Cambridge dictionary, the term ‘liquidation’ can be define as a scenario when assets are sold in order to get cash. According to Geoff Egan (2015), unemployment and credit card debt are the key factors that cause bankruptcy which will lead an individual to go into insolvency, a scenario which an individual does not have the ability to fulfil the obligation such as paying debts and buying goods.

Foreclosure Property liquidation might be happened when a homeowner unable to pay their monthly housing instalment. The bank has the right to take back their property or house and hold an auction to liquidate or sell the house in order to regain the capital (Leonard, 2018). Thus, the volume of transaction (selling) will increase when the unemployment rate increase.

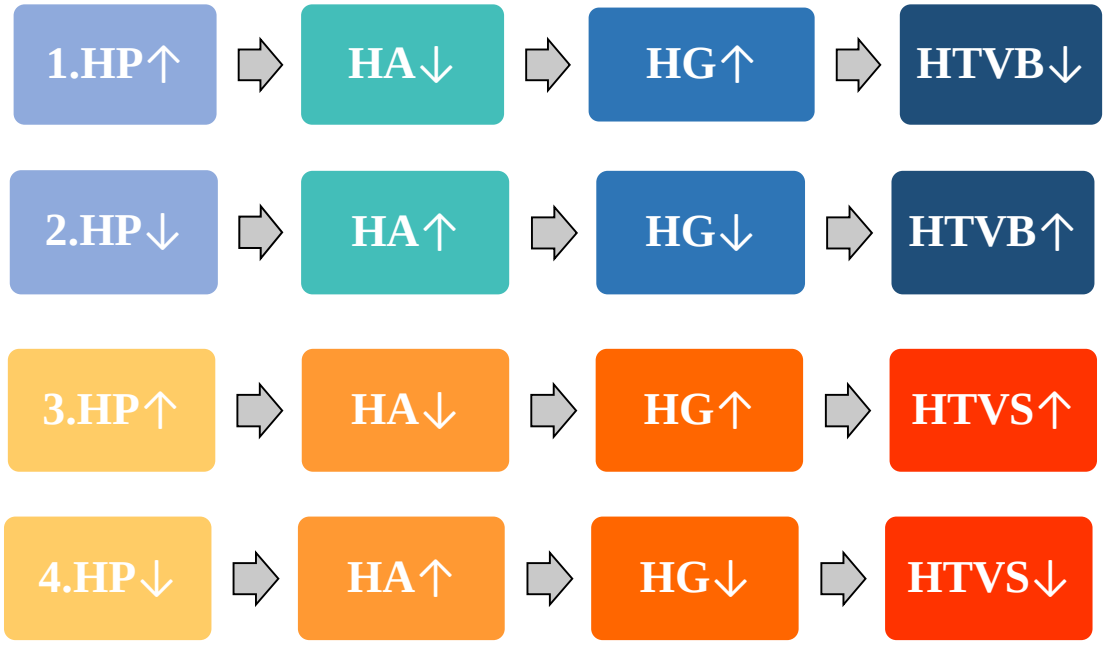
As the above shows, the housing transaction volume is not fixed and it will change accordingly based on the specific independent variable. For example, the change in housing transaction volume will increase when it is comparing with gross domestic product growth (positive relationship) while housing transaction volume will decrease when the lending rate increase (negative relationship). Based on these example, it determines there are two possible outcomes for housing transaction volume, it can be increase or decrease.

In the conceptual framework of this research, the change in housing transaction volume was set as the tools to represent the nexus between the housing glut, housing affordability and housing price. Since the volume of transaction can be increase or decrease, there will be future explanations to the consequences and relationship to the housing glut, housing affordability and housing price in Malaysia.

There are some concepts that have to be remember before the nexus explanation in the following part. The factors which affect the consumer affordability on housing are housing price, household income and housing choice. (Zyed, Aziz, & Hanif, 2016). Based on a research from Khazanah Research Institue (2015), the imbalance between the demand and supply in housing market is the factors that causing unaffordability issue. The demand will increase when price of a goods decrease, demand will greater than supply.

When price of a product increase, the demand will drop and the ability to buy are restricted (Whelan & Msefer, 1996). Housing market are considered as a perfect competitive market which there low or nearly none of the barriers for firms to enter into the market. Perfect competition market means all the firms are selling similar products and they can set their own price. Number of seller (developer) will increase when they realize the market is profitable and they can enter into the market easily as there is no barriers to enter. (Jovio, 2017)

Figure 5.1: The nexus between housing glut, housing affordability and housing glut & the role of housing transaction volume (buying/selling) in representing the elements.



Where,

HP= Housing Price

HA= Housing Affordability

HG= Housing Glut (Unsold Houses)

HTVB= Housing Transaction Volume (Buying)

HTVS= Housing Transaction Volume (Selling)

In the viewpoint of home buyer

1. When housing price increase, housing affordability decrease. Higher price decreases the demand and housing glut increase. In other word, housing transaction volume for buying will decrease when the housing price is high, housing affordability is low and housing glut will increase as there is less home buyer.

2. When housing price decrease, housing affordability increase. Lower price increases the demand and decrease the housing glut. In other word, housing transaction volume for buying will increase when the housing price is low, housing affordability is high and housing glut will decrease as there are more home buyer.

In the viewpoint of home seller/ developer

3. When housing price increase, there will have more seller in the market in order to share the profit. Higher housing price decrease the demand and affordability of buyer. Oversupply of houses cause housing glut to increase. In other words, housing transaction volume for selling increase when the housing price increase, housing affordability decrease and housing glut will increase as supply is more than demand in the market.

4. When housing price decrease, there will have less seller in the market to share the profit. Lower housing price increase the demand and affordability of buyer. Higher demand of houses causes housing glut to decrease. In other words, housing transaction volume for selling decrease when the housing price decrease, housing affordability increase and housing glut will decrease as demand is more than supply in the market.

5.3 Implication of the Study

This part will focus and discuss on what the study implies or signifies. Housing glut, affordability, housing price and housing transaction volume in Malaysia are the main concern in this research. There were some macroeconomic factors which are gross domestic product growth, lending rate, unemployment rate, population growth that affect the percentage change in housing transaction volume in Malaysia.

Since this research is mainly focus in housing glut and what can influence on this housing glut problem therefore this may can provided some information to the readers especially for developers. This is because the developers can know what cause this glut happen and the buyer's intention. For example, from the chapter 2 literature review, developers can know that how the independent variables affected to housing transaction volume; how the relationship between the housing transaction volume and housing glut, affordability and housing price. Thus, the developers can understand about the condition of housing market, and how to construct some properties that suitable to Malaysians not just build those high price properties for high profit only but unable to sold out.

Government had designed some programs in order to stimulate the housing transaction volume such as Perumahan Rakyat 1Malaysia (PR1MA), First Home Deposit Scheme, and Youth Housing Scheme. These programs allow citizens of Malaysia to purchase a property easier with financial help and incentives. Different requirements are needed for respective programs in order to get the financial help of government. For example. PR1MA only helps citizens which are categorized under income level of RM2,500 to RM10,000. However, there are still consider low property demand compare to the proportion supplied.

According to Lum (2018) stated that these programs had being launched in the housing market but there is no official department to monitor and control it so that

there is not sure whether these programs is appropriate to the selected portion of the housing market. So that, the low demand compared to the supply happened although these programs launched. Government also not sure whether there is an oversupply in PR1MA as the Program Perumahan Rakyat (PPR), government should monitor in these all programs to prevent the wastage. As suggestion, government can having some discussions with the private developers or constructors to prevent the oversupply. Actually, there had oversupply occurred in certain locations (Ho, 2018), so the discussion may decrease the construction and supplies in that places. Those private constructors also can distribute their working in different locations in the discussion so that the PR1MA program can benefit to all Malaysian not just focus in certain places and cause wastage.

5.4 Limitation of the Study

Obviously, there are few limitations has observed in this study. The main weakness of the research facing is *limited data available* on NAPIC to analyse PCIHTV. One of the objective in this study is to identify housing glut. However, data of unsold property or resident occupation rate are incomplete and insufficient. So, PCIHTV has choose as substitution data in represent dependent variable.

Moreover, *sample size scarce* is another restriction. It fail to provide sufficient secondary data. The study able to obtain 20 years data only. According Central Limit Theorem assumption, big sample size (at least 30) offer capability convert OLS estimators from non-normal to normal distributed. To prevent econometric problem, the data has been converted from annual to quarter by E-views 10.

In another hand, the unsold property investigate coverage rely on entire Malaysia. That means it fail to identify or capture the degree of seriousness each state and region suffering in housing glut.

The drawback still exist although four independent variables has used to examine the nexus with PCIHTV. The outcome might be better if quantitative variable add into the estimated regression model, such as consumer behaviour. For instance, Malaysia government execute goods and service tax (GST) held on 1 April 2015. The change in government policy will directly or indirectly stimulate household response.

Last but not least, the biggest challenge in study is dealing with econometric problem. Base on theoretical, heteroscedasticity could be solve by White's Heteroscedasticity-Corrected Variance and Standard Error (HCSE).

5.5 Recommendation for Future Research

After days and nights, this research progress is near to the end. Although we have done the research with fully effort, yet there is some recommendation or some improvement can be done for the other researcher who are interested in the housing sector research. These recommendations contain some details which can be added in the future studies in order to improve the research quality.

First, in this research, quantitative research has been used for the data analysis. In future, researcher can try to use qualitative data which is data collection as known as primary data. By using primary data, researcher able to know the latest situation, current issue, behaviour of every parties and also some details which cannot represented by the secondary data. For example, survey form can be sent to the developers to know which the unsold property (housing glut) price range is, unsold property location and the reason behind for those unsold property. On the other hand, survey can also be delivered to consumers who are interested to buy a house, to understand the budget to purchase a house (housing affordability), their expectation of the developers and the locations of their desire house. A clearer picture of the issue and current situation will be delivered to the researcher by using primary data.

Besides, researcher can involve some independent variables which did not mentioned in this research. Although the independent variables and dependent variable are good enough to be used for data analysis as the outcome did not create any issue, yet future researcher can still use some latest issue to link to the research topic. By using the latest issue as the independent variables, it can make the research more interesting and attractive to the audience. For instance, the research independent variable which link to current issue is the cancelation of goods and services tax (GST) and the implication of Sales and services tax (SST) (Surendran, 2018). This latest issue might affect the action or demand of people who are going

to own a house in near future, they might buy the house even earlier as the cancellation or abolishment of GST.

Lastly, in order for researcher to understand the market and the current housing situation, an interview can be conducted. Researcher can organize and approach to few housing developers which different in project locations and promote strategy. By interviewing the housing developer's management, researchers can get a clearer figure and know what strategy they going to use in order to decrease the housing glut and balance the price and the profit of the housing project. By knowing more details about the housing sector, researcher able to produce a better research which is closely related and fit into the current housing market situation.

In a nut shell, researcher unable to produce an attractive and high-quality research without others to help. In this research, we have referred to many journals and come out with the variables and the methods to overcome the previous studies' limitation. Thus, by closing to the end of this research, hoping other researchers who interested to have a future study in this housing sector able to get some advice and recommendations from this research in order to increase the research performance and quality.

5.6 Conclusion

Lastly in chapter five, this study have provided the conclusion and showed the nexus between housing glut, housing affordability, housing price and housing transaction. The summary and discussion of statistical analysis and the major finding that had done in chapter four also given and stated. All the result are trustable and collected from the estimated model, so as conclusion the model is exempt from the econometric problems and have significant relationship among the dependent variable and independent variables. While the GDP growth, population growth and unemployment rate will having the positive relationship; lending rate is having the negatively correlation with the percentage changes in housing transaction volume in Malaysia.

The policies and implications had discussed and presented in the part 5.3 in this chapter. Besides, the limitations that faced in this study also been stated so that researcher will not face again the limitations and some recommendations are suggested for those researchers who are the interested in this topic.

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Appendices

Chapter 1: Research Overview

Appendix 1.1: Data of PCIHTV, GDPG, LR, UR, PG. Source from Worldbank, NAPIC and IMF, From 1996Q1 to 2016 Q4

Year	PCIHTV,%	GDPG,%	LR,%	UR,%	PG,%
1996Q1	3.47	8.38	9.86	2.76	2.53
1996Q2	7.26	9.96	9.88	2.56	2.54
1996Q3	9.29	10.79	9.95	2.42	2.55
1996Q4	9.58	10.87	10.07	2.33	2.55
1997Q1	8.12	10.20	10.24	2.30	2.55
1997Q2	4.91	8.78	10.47	2.33	2.55
1997Q3	-0.04	6.61	10.74	2.41	2.54
1997Q4	-6.75	3.69	11.07	2.56	2.54
1998Q1	-33.26	-6.26	12.36	2.99	2.53
1998Q2	-36.25	-8.17	12.42	3.16	2.52
1998Q3	-33.77	-8.31	12.16	3.28	2.50
1998Q4	-25.82	-6.70	11.58	3.37	2.49
1999Q1	12.02	2.76	9.48	3.42	2.46
1999Q2	21.13	5.46	8.75	3.43	2.44
1999Q3	25.95	7.49	8.20	3.41	2.41
1999Q4	26.47	8.84	7.81	3.34	2.39
2000Q1	10.39	9.57	7.95	3.01	2.35
2000Q2	7.23	9.56	7.75	2.97	2.32
2000Q3	4.69	8.85	7.57	2.98	2.29
2000Q4	2.77	7.46	7.41	3.05	2.27
2001Q1	3.10	1.58	7.34	3.39	2.23
2001Q2	1.77	0.32	7.20	3.48	2.20
2001Q3	0.41	-0.11	7.06	3.55	2.18
2001Q4	-0.99	0.28	6.91	3.58	2.15
2002Q1	-4.92	4.26	6.70	3.48	2.12
2002Q2	-5.37	5.20	6.57	3.49	2.10
2002Q3	-4.86	5.86	6.47	3.50	2.08
2002Q4	-3.38	6.24	6.39	3.52	2.05
2003Q1	0.64	5.55	6.39	3.59	2.03
2003Q2	3.44	5.68	6.33	3.61	2.01
2003Q3	6.58	5.86	6.27	3.61	1.99
2003Q4	10.06	6.07	6.21	3.59	1.98
2004Q1	21.22	6.79	6.12	3.52	1.97
2004Q2	22.45	6.89	6.07	3.50	1.95
2004Q3	21.09	6.83	6.02	3.49	1.94

2004Q4	17.14	6.62	5.99	3.48	1.93
2005Q1	-1.28	5.61	5.89	3.53	1.92
2005Q2	-5.66	5.35	5.90	3.52	1.91
2005Q3	-7.89	5.20	5.96	3.49	1.90
2005Q4	-7.96	5.16	6.05	3.46	1.89
2006Q1	-0.15	4.93	6.38	3.36	1.88
2006Q2	1.82	5.22	6.48	3.32	1.87
2006Q3	3.66	5.73	6.54	3.28	1.86
2006Q4	5.37	6.46	6.56	3.25	1.85
2007Q1	7.47	9.54	6.48	3.21	1.84
2007Q2	8.72	9.88	6.44	3.19	1.83
2007Q3	9.63	9.60	6.39	3.19	1.82
2007Q4	10.20	8.69	6.33	3.21	1.82
2008Q1	11.39	5.57	6.31	3.22	1.81
2008Q2	10.91	4.06	6.18	3.26	1.81
2008Q3	9.71	2.56	6.02	3.32	1.80
2008Q4	7.79	1.09	5.81	3.40	1.80
2009Q1	-0.17	-2.73	5.31	3.66	1.80
2009Q2	-1.40	-3.23	5.12	3.72	1.81
2009Q3	-1.21	-2.78	4.98	3.73	1.81
2009Q4	0.38	-1.36	4.91	3.70	1.81
2010Q1	8.32	5.16	5.03	3.51	1.81
2010Q2	10.75	6.84	5.01	3.44	1.82
2010Q3	12.62	7.82	4.99	3.36	1.82
2010Q4	13.91	8.10	4.97	3.29	1.83
2011Q1	15.99	5.63	4.95	3.18	1.84
2011Q2	15.60	5.33	4.92	3.12	1.84
2011Q3	14.09	5.14	4.90	3.07	1.85
2011Q4	11.47	5.07	4.87	3.03	1.85
2012Q1	4.19	5.56	4.84	3.01	1.85
2012Q2	0.75	5.54	4.81	2.99	1.85
2012Q3	-2.39	5.47	4.77	2.99	1.85
2012Q4	-5.23	5.33	4.73	3.01	1.85
2013Q1	-10.44	4.66	4.65	3.11	1.84
2013Q2	-11.62	4.59	4.62	3.12	1.83
2013Q3	-11.44	4.66	4.59	3.10	1.82
2013Q4	-9.90	4.86	4.58	3.07	1.80
2014Q1	-0.76	5.87	4.59	2.91	1.78
2014Q2	1.01	6.06	4.59	2.89	1.75
2014Q3	1.66	6.10	4.59	2.89	1.73
2014Q4	1.17	6.00	4.59	2.91	1.70
2015Q1	-3.39	5.37	4.60	2.99	1.67
2015Q2	-4.97	5.13	4.59	3.06	1.64
2015Q3	-6.51	4.91	4.59	3.13	1.61
2015Q4	-8.00	4.70	4.58	3.22	1.58

2016Q1	-9.45	4.50	4.57	3.32	1.55
2016Q2	-10.85	4.30	4.55	3.43	1.52
2016Q3	-12.21	4.12	4.53	3.56	1.48
2016Q4	-13.53	3.95	4.51	3.69	1.45

Appendix 1.2: Data of unsold property, HA and HPI

Year	PCIHTV	Unsold units	HPI	Affordability
2006Q1	-0.15	27174.4375	-0.2	195.3901293
2006Q2	1.82	25990.5625	1.4	162.689771
2006Q3	3.66	25053.0625	2.7	171.8742339
2006Q4	5.37	24361.9375	3.8	204.5152524
2007Q1	7.47	23917.1875	4.7	225.543913
2007Q2	8.72	23718.8125	5.3	212.2478341
2007Q3	9.63	23766.8125	5.6	221.3828116
2007Q4	10.20	24061.1875	5.7	245.1547274
2008Q1	11.39	26092.875	5.3	239.4352927
2008Q2	10.91	26283.625	5	170.6594561
2008Q3	9.71	26124.375	4.5	158.614224
2008Q4	7.79	25615.125	3.9	172.6240871
2009Q1	-0.17	23259.3125	1.4	184.8476837
2009Q2	-1.40	22648.6875	1.1	157.7909042
2009Q3	-1.21	22286.6875	1.4	156.5047575
2009Q4	0.38	22173.3125	2.1	213.9494703
2010Q1	8.32	23565.59375	5.1	187.8099875
2010Q2	10.75	23446.65625	6.2	118.0263453
2010Q3	12.62	23073.53125	7.3	107.3656298
2010Q4	13.91	22446.21875	8.2	108.9763777
2011Q1	15.99	21083.9375	8.9	138.7535129
2011Q2	15.60	20140.5625	9.6	119.567944
2011Q3	14.09	19135.3125	10.3	119.2801243
2011Q4	11.47	18068.1875	10.8	123.995799
2012Q1	4.19	16320.125	11.4	143.1148729
2012Q2	0.75	15376.875	11.8	112.2458722
2012Q3	-2.39	14619.375	12	121.0207146
2012Q4	-5.23	14047.625	12.1	135.7795639
2013Q1	-10.44	14480.6875	12	152.2348109
2013Q2	-11.62	13952.8125	11.8	125.5262862
2013Q3	-11.44	13283.0625	11.5	132.5776891
2013Q4	-9.90	12471.4375	11.1	131.9826206
2014Q1	-0.76	10481.0625	10.2	138.0237579
2014Q2	1.01	9800.4375	9.7	104.2235627
2014Q3	1.66	9392.6875	9.1	95.09565733

2014Q4	1.17	9257.8125	8.6	88.89404971
2015Q1	-3.39	9460.03125	7.9	92.63426933
2015Q2	-4.97	9845.21875	7.5	67.15266528
2015Q3	-6.51	10477.59375	7.2	65.59871004
2015Q4	-8.00	11357.15625	7	63.75042658
2016Q1	-9.45	12483.90625	6.9	66.18149894
2016Q2	-10.85	13857.84375	6.8	65.82573992
2016Q3	-12.21	15478.96875	6.9	68.22137252
2016Q4	-13.53	17347.28125	7	70.49950999

Chapter 4: Data Analysis

Appendix 4.1: Descriptive Statistic

	PCIHTV	GDPG	LR	UR	PG
Mean	1.880314	4.870388	6.570476	3.224571	1.999046
Median	1.793961	5.463315	6.152188	3.279687	1.869385
Maximum	26.47176	10.87306	12.41781	3.728125	2.550271
Minimum	-36.24698	-8.314086	4.510312	2.300375	1.449979
Std. Dev	11.99110	3.980106	2.110424	0.337593	0.301229
Skewness	-0.760340	-1.506461	1.250387	-0.957402	0.594804
Kurtosis	4.541979	5.581151	3.700406	3.625584	2.293452
Jarque-Bera	16.41559	55.09014	23.60553	14.20241	6.700322
Probability	0.000273	0.000000	0.000007	0.000824	0.035079
Sum	157.9463	409.1126	551.9200	270.8640	167.9199
Sum Sq.Dev	11934.28	1314.823	369.6727	9.459432	7.531323
Observation	84	84	84	84	84

Appendix 4.2: Regression Output, (Source: Developed for research via EViews 10)

Dependent Variable: PCIHTV
Method: Least Squares
Date: 06/05/18 Time: 19:23
Sample: 1996Q1 2016Q4
Included observations: 84

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDPG	2.076125	0.289457	7.172476	0.0000
LR	-3.203683	1.244693	-2.573874	0.0119
POPULATION	27.57976	8.241445	3.346471	0.0013
UNEMPLOYMENT	11.87159	3.419490	3.471742	0.0008
C	-80.59549	15.96857	-5.047134	0.0000

R-squared	0.557433	Mean dependent var	1.880314
Adjusted R-squared	0.535025	S.D. dependent var	11.99110
S.E. of regression	8.176620	Akaike info criterion	7.098113
Sum squared resid	5281.712	Schwarz criterion	7.242805
Log likelihood	-293.1208	Hannan-Quinn criter.	7.156278
F-statistic	24.87605	Durbin-Watson stat	0.311049
Prob(F-statistic)	0.000000		

Appendix 4.3: Result of VIF & TOL

	GDPG	LR	PG	UR
GDPG	1.000000	-0.198642	-0.038153	-0.393302
LR	-0.198642	1.000000	0.920341	-0.400620
PG	-0.038153	0.920341	1.000000	-0.422741
UR	-0.393302	-0.400620	-0.422741	1.000000

Appendix 4.4: Regression Analysis (Gross Domestic Product Growth)

Dependent Variable: GDPG
Method: Least Squares
Date: 06/05/18 Time: 20:54
Sample: 1996Q1 2016Q4
Included observations: 84

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LR	-2.089288	0.420204	-4.972087	0.0000
PG	10.09591	2.976431	3.391950	0.0011
UR	-6.061138	1.133691	-5.346377	0.0000
C	17.96039	5.831866	3.079699	0.0028

R-squared	0.393108	Mean dependent var	4.870388
Adjusted R-squared	0.370349	S.D. dependent var	3.980106
S.E. of regression	3.158235	Akaike info criterion	5.184352
Sum squared resid	797.9560	Schwarz criterion	5.300105
Log likelihood	-213.7428	Hannan-Quinn criter.	5.230884
F-statistic	17.27304	Durbin-Watson stat	0.221576
Prob(F-statistic)	0.000000		

Appendix 4.5: Regression Analysis (Lending Rate)

Dependent Variable: LR
Method: Least Squares
Date: 06/05/18 Time: 20:56
Sample: 1996Q1 2016Q4
Included observations: 84

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDPG	-0.112991	0.022725	-4.972087	0.0000
PG	6.034697	0.304623	19.81038	0.0000
UR	-0.752035	0.295420	-2.545644	0.0128
C	-2.517864	1.406466	-1.790206	0.0772

R-squared	0.883264	Mean dependent var	6.570476
Adjusted R-squared	0.878886	S.D. dependent var	2.110424
S.E. of regression	0.734457	Akaike info criterion	2.267078
Sum squared resid	43.15420	Schwarz criterion	2.382831
Log likelihood	-91.21728	Hannan-Quinn criter.	2.313610
F-statistic	201.7686	Durbin-Watson stat	0.094304
Prob(F-statistic)	0.000000		

Appendix 4.6: Regression Analysis (Population Growth)

Dependent Variable: PG
Method: Least Squares
Date: 06/05/18 Time: 20:56
Sample: 1996Q1 2016Q4
Included observations: 84

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDPG	0.012454	0.003672	3.391950	0.0011
LR	0.137649	0.006948	19.81038	0.0000
UR	0.025275	0.046303	0.545859	0.5867
C	0.952471	0.188649	5.048915	0.0000

R-squared	0.869302	Mean dependent var	1.999046
Adjusted R-squared	0.864401	S.D. dependent var	0.301229
S.E. of regression	0.110924	Akaike info criterion	-1.513495
Sum squared resid	0.984330	Schwarz criterion	-1.397742
Log likelihood	67.56681	Hannan-Quinn criter.	-1.466964
F-statistic	177.3657	Durbin-Watson stat	0.090190
Prob(F-statistic)	0.000000		

Appendix 4.7: Regression Analysis (Unemployment Rate)

Dependent Variable: UNEMPLOYMENT RATE
Method: Least Squares
Date: 06/05/18 Time: 20:57
Sample: 1996Q1 2016Q4
Included observations: 84

Variable	Coefficient	Std. Error	t-Statistic	Prob.
PCIHTV	0.011150	0.003212	3.471742	0.0008
GDPG	-0.060832	0.009116	-6.673096	0.0000
LR	-0.050729	0.039301	-1.290770	0.2005
PG	-0.180146	0.269125	-0.669377	0.5052
C	4.193313	0.306844	13.66596	0.0000

R-squared	0.475564	Mean dependent var	3.224571
Adjusted R-squared	0.449010	S.D. dependent var	0.337593
S.E. of regression	0.250591	Akaike info criterion	0.127689
Sum squared resid	4.960870	Schwarz criterion	0.272380
Log likelihood	-0.362939	Hannan-Quinn criter.	0.185854
F-statistic	17.90948	Durbin-Watson stat	0.119182
Prob(F-statistic)	0.000000		

Appendix 4.8: Autoregressive Conditional Heteroscedasticity (ARCH) Test.

(Source: Developed for research via EViews 10)

Heteroscedasticity Test: ARCH

F-statistic	98.07883	Prob. F(1,81)	0.0000
Obs*R-squared	45.45787	Prob. Chi-Square(1)	0.0000

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 06/05/18 Time: 20:42
Sample (adjusted): 1996Q2 2016Q4
Included observations: 83 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	17.27693	6.892511	2.506624	0.0142
RESID^2(-1)	0.740444	0.074766	9.903476	0.0000

R-squared	0.547685	Mean dependent var	63.40513
Adjusted R-squared	0.542101	S.D. dependent var	68.40116
S.E. of regression	46.28585	Akaike info criterion	10.53135
Sum squared resid	173532.8	Schwarz criterion	10.58964
Log likelihood	-435.0511	Hannan-Quinn criter.	10.55477
F-statistic	98.07883	Durbin-Watson stat	1.205566
Prob(F-statistic)	0.000000		

Appendix 4.9: Autoregressive Conditional Heteroscedasticity (ARCH) Test.

(Source: Developed for research via EViews 10)

Dependent Variable: PCIHTV
Method: Least Squares
Date: 06/10/18 Time: 22:54
Sample: 1996Q1 2016Q4
Included observations: 84
White heteroskedasticity-consistent standard errors & covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP	2.076125	0.253567	8.187690	0.0000
LR	-3.203683	1.160332	-2.761005	0.0072
PG	27.57976	7.760480	3.553872	0.0006
UR	11.87159	3.300697	3.596691	0.0006
C	-80.59549	15.72526	-5.125224	0.0000

R-squared	0.557433	Mean dependent var	1.880314
Adjusted R-squared	0.535025	S.D. dependent var	11.99110
S.E. of regression	8.176620	Akaike info criterion	7.098113
Sum squared resid	5281.712	Schwarz criterion	7.242805
Log likelihood	-293.1208	Hannan-Quinn criter.	7.156278
F-statistic	24.87605	Durbin-Watson stat	0.311049
Prob(F-statistic)	0.000000	Wald F-statistic	38.84591
Prob(Wald F-statistic)	0.000000		

Appendix 4.10: Ordinary Least Square Test.

Dependent Variable: PCIHTV
Method: Least Squares
Date: 06/12/18 Time: 17:00
Sample: 1996Q1 2016Q4
Included observations: 84

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP	2.076125	0.289457	7.172476	0.0000
LR	-3.203683	1.244693	-2.573874	0.0119
PG	27.57976	8.241445	3.346471	0.0013
UR	11.87159	3.419490	3.471742	0.0008
C	-80.59549	15.96857	-5.047134	0.0000

R-squared	0.557433	Mean dependent var	1.880314
Adjusted R-squared	0.535025	S.D. dependent var	11.99110
S.E. of regression	8.176620	Akaike info criterion	7.098113
Sum squared resid	5281.712	Schwarz criterion	7.242805
Log likelihood	-293.1208	Hannan-Quinn criter.	7.156278
F-statistic	24.87605	Durbin-Watson stat	0.311049
Prob(F-statistic)	0.000000		

Appendix 4.11: Breusch-Godfrey Serial Correlation LM Test (Source: Developed for research via EViews 10)

Breusch-Godfrey Serial Correlation LM Test:
Null hypothesis: No serial correlation at up to 1 lag

F-statistic	192.5000	Prob. F(1,78)	0.0000
Obs*R-squared	59.77819	Prob. Chi-Square(1)	0.0000

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 06/06/18 Time: 20:23
Sample: 1996Q1 2016Q4
Included observations: 84
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.438319	8.630325	-0.166659	0.8681
GDP	0.130255	0.156709	0.831189	0.4084
LR	0.635798	0.674214	0.943021	0.3486
POPULATION	-3.284025	4.460111	-0.736310	0.4638
UNEMPLOYMENT	0.956438	1.849240	0.517206	0.6065
RESID(-1)	0.855175	0.061637	13.87444	0.0000

R-squared	0.711645	Mean dependent var	-1.91E-14
Adjusted R-squared	0.693161	S.D. dependent var	7.977160
S.E. of regression	4.418793	Akaike info criterion	5.878360
Sum squared resid	1523.007	Schwarz criterion	6.051989
Log likelihood	-240.8911	Hannan-Quinn criter.	5.948157
F-statistic	38.50000	Durbin-Watson stat	1.171704
Prob(F-statistic)	0.000000		

Appendix 4.12: Breusch-Godfrey Serial Correlation LM Test (Source: Developed for research via EViews 10)

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	100.7319	Prob. F(68,9)	0.0000
Obs*R-squared	82.89109	Prob. Chi-Square(68)	0.1056

Test Equation:

Dependent Variable: RESID
Method: Least Squares
Date: 06/06/18 Time: 21:57
Sample: 1996Q2 2016Q4
Included observations: 83
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	90.33584	17.30422	5.220451	0.0005
UR	-3.218482	4.614259	-0.697508	0.5031
PG	-45.05981	15.23803	-2.957063	0.0160
LR	1.775701	2.399629	0.739990	0.4782
GDPG	2.175945	0.516706	4.211187	0.0023
LAGV	-1.276958	0.066382	-19.23645	0.0000
RESID(-1)	0.968341	0.079017	12.25490	0.0000
RESID(-2)	0.900828	0.076951	11.70657	0.0000
RESID(-3)	0.836522	0.074914	11.16649	0.0000
RESID(-4)	0.334254	0.083175	4.018701	0.0030
RESID(-5)	0.348601	0.077787	4.481469	0.0015
RESID(-6)	0.333865	0.082693	4.037415	0.0029
RESID(-7)	0.322079	0.089486	3.599230	0.0058
RESID(-8)	0.639815	0.128005	4.998366	0.0007
RESID(-9)	0.536534	0.120815	4.440957	0.0016
RESID(-10)	0.426420	0.119917	3.555958	0.0062
RESID(-11)	0.337939	0.122971	2.748114	0.0225
RESID(-12)	0.064140	0.096259	0.666333	0.5219
RESID(-13)	0.189107	0.095773	1.974532	0.0798
RESID(-14)	0.285246	0.102285	2.788730	0.0211
RESID(-15)	0.360247	0.110541	3.258944	0.0099
RESID(-16)	0.630385	0.111520	5.652668	0.0003
RESID(-17)	0.570878	0.105898	5.390848	0.0004
RESID(-18)	0.547014	0.111299	4.914835	0.0008
RESID(-19)	0.531592	0.115836	4.589185	0.0013
RESID(-20)	0.916890	0.124526	7.363067	0.0000
RESID(-21)	0.853119	0.125888	6.776799	0.0001
RESID(-22)	0.802091	0.126207	6.355382	0.0001
RESID(-23)	0.747737	0.122103	6.123809	0.0002
RESID(-24)	0.300053	0.119484	2.511234	0.0332
RESID(-25)	0.424007	0.124517	3.405211	0.0078
RESID(-26)	0.546609	0.128362	4.258336	0.0021

RESID(-27)	0.672133	0.131857	5.097432	0.0006
RESID(-28)	0.676290	0.126960	5.326790	0.0005
RESID(-29)	0.635580	0.126312	5.031809	0.0007
RESID(-30)	0.604994	0.126639	4.777315	0.0010
RESID(-31)	0.587820	0.127653	4.604827	0.0013
RESID(-32)	0.818988	0.138053	5.932405	0.0002
RESID(-33)	0.917254	0.141751	6.470863	0.0001
RESID(-34)	0.971759	0.142466	6.820997	0.0001
RESID(-35)	0.996063	0.142387	6.995449	0.0001
RESID(-36)	1.015717	0.158207	6.420180	0.0001
RESID(-37)	0.983982	0.159578	6.166144	0.0002
RESID(-38)	1.001422	0.161610	6.196518	0.0002
RESID(-39)	1.063299	0.166802	6.374606	0.0001
RESID(-40)	1.225038	0.193285	6.337980	0.0001
RESID(-41)	1.319546	0.193275	6.827300	0.0001
RESID(-42)	1.396474	0.198844	7.022982	0.0001
RESID(-43)	1.457870	0.204735	7.120767	0.0001
RESID(-44)	1.305994	0.178482	7.317229	0.0000
RESID(-45)	1.449829	0.187474	7.733496	0.0000
RESID(-46)	1.590583	0.194738	8.167827	0.0000
RESID(-47)	1.707191	0.200848	8.499906	0.0000
RESID(-48)	1.751394	0.208675	8.392909	0.0000
RESID(-49)	1.677537	0.214712	7.812983	0.0000
RESID(-50)	1.620300	0.211224	7.670987	0.0000
RESID(-51)	1.613563	0.210247	7.674599	0.0000
RESID(-52)	1.387876	0.209694	6.618570	0.0001
RESID(-53)	1.485545	0.216422	6.864113	0.0001
RESID(-54)	1.522078	0.218311	6.972070	0.0001
RESID(-55)	1.519243	0.221464	6.860002	0.0001
RESID(-56)	1.529257	0.219380	6.970815	0.0001
RESID(-57)	1.521066	0.207428	7.332980	0.0000
RESID(-58)	1.532133	0.207140	7.396613	0.0000
RESID(-59)	1.511931	0.215333	7.021367	0.0001
RESID(-60)	1.904832	0.236612	8.050431	0.0000
RESID(-61)	1.687466	0.207218	8.143444	0.0000
RESID(-62)	1.491717	0.212804	7.009829	0.0001
RESID(-63)	1.250493	0.231785	5.395057	0.0004
RESID(-64)	0.959082	0.215465	4.451220	0.0016
RESID(-65)	0.849509	0.155647	5.457918	0.0004
RESID(-66)	0.830243	0.176108	4.714395	0.0011
RESID(-67)	0.738678	0.199382	3.704842	0.0049
RESID(-68)	0.171049	0.095263	1.795550	0.1061

R-squared	0.998688	Mean dependent var	4.71E-15
Adjusted R-squared	0.988045	S.D. dependent var	5.591549
S.E. of regression	0.611387	Akaike info criterion	1.415342
Sum squared resid	3.364141	Schwarz criterion	3.571898
Log likelihood	15.26332	Hannan-Quinn criter.	2.281725
F-statistic	93.83249	Durbin-Watson stat	2.009176
Prob(F-statistic)	0.000000		

Appendix 4.13: Lag model

$$VOT_t = \beta_0 + \beta_1 GDP_t + \beta_2 LR_t + \beta_3 UR_t + \beta_4 PG_t + \beta_1 GDP_{t-1} + \beta_2 LR_{t-1} + \beta_3 UR_{t-1} + \beta_4 PG_{t-1} +$$

$$\log \beta_1 GDP_{t-2} + \beta_2 LR_{t-2} + \beta_3 UR_{t-2} + \beta_4 PG_{t-2} + \beta_1 GDP_{t-3} + \beta_2 LR_{t-3} + \beta_3 UR_{t-3} + \beta_4 PG_{t-3} + \beta_1 GDP_{t-4} + \beta_2 LR_{t-4} + \beta_3 UR_{t-4} + \beta_4 PG_{t-4} + \beta_1 GDP_{t-5} + \beta_2 LR_{t-5} + \beta_3 UR_{t-5} + \beta_4 PG_{t-5} + \beta_1 GDP_{t-6} + \beta_2 LR_{t-6} + \beta_3 UR_{t-6} + \beta_4 PG_{t-6} + \log \beta_1 GDP_{t-7} + \beta_2 LR_{t-7} + \beta_3 UR_{t-7} + \beta_4 PG_{t-7} + \beta_1 GDP_{t-8} + \beta_2 LR_{t-8} + \beta_3 UR_{t-8} + \beta_4 PG_{t-8} + \log \beta_1 GDP_{t-9} + \beta_2 LR_{t-9} + \beta_3 UR_{t-9} + \beta_4 PG_{t-9} + \beta_1 GDP_{t-10} + \beta_2 LR_{t-10} + \beta_3 UR_{t-10} + \beta_4 PG_{t-10}$$

$$\beta_1 GDP_{t-11} + \beta_2 LR_{t-11} + \beta_3 UR_{t-11} + \beta_4 PG_{t-11} + \beta_1 GDP_{t-12} + \beta_2 LR_{t-12} + \beta_3 UR_{t-12} + \beta_4 PG_{t-12} + \log \beta_1 GDP_{t-13} + \beta_2 LR_{t-13} + \beta_3 UR_{t-13} + \beta_4 PG_{t-13} + \beta_1 GDP_{t-14} + \beta_2 LR_{t-14} + \beta_3 UR_{t-14} + \beta_4 PG_{t-14} + \beta_1 GDP_{t-15} + \beta_2 LR_{t-15} + \beta_3 UR_{t-15} + \beta_4 PG_{t-15} + \beta_1 GDP_{t-16} + \beta_2 LR_{t-16} + \beta_3 UR_{t-16} + \beta_4 PG_{t-16} + \beta_1 GDP_{t-17} + \beta_2 LR_{t-17} + \beta_3 UR_{t-17} + \beta_4 PG_{t-17} + \beta_1 GDP_{t-18} + \beta_2 LR_{t-18} + \beta_3 UR_{t-18} + \beta_4 PG_{t-18} + \beta_1 GDP_{t-19} + \beta_2 LR_{t-19} + \beta_3 UR_{t-19} + \beta_4 PG_{t-19} + \beta_1 GDP_{t-20} + \beta_2 LR_{t-20} + \beta_3 UR_{t-20} + \beta_4 PG_{t-20} +$$

$$\beta_1 GDP_{t-21} + \beta_2 LR_{t-21} + \beta_3 UR_{t-21} + \beta_4 PG_{t-21} + \beta_1 GDP_{t-22} + \beta_2 LR_{t-22} + \beta_3 UR_{t-22} + \beta_4 PG_{t-22} + \beta_1 GDP_{t-23} + \beta_2 LR_{t-23} + \beta_3 UR_{t-23} + \beta_4 PG_{t-23} + \beta_1 GDP_{t-24} + \beta_2 LR_{t-24} + \beta_3 UR_{t-24} + \beta_4 PG_{t-24} + \beta_1 GDP_{t-25} + \beta_2 LR_{t-25} + \beta_3 UR_{t-25} + \beta_4 PG_{t-25} + \beta_1 GDP_{t-26} + \beta_2 LR_{t-26} + \beta_3 UR_{t-26} + \beta_4 PG_{t-26} + \beta_1 GDP_{t-27} + \beta_2 LR_{t-27} + \beta_3 UR_{t-27} + \beta_4 PG_{t-27} + \beta_1 GDP_{t-28} + \beta_2 LR_{t-28} + \beta_3 UR_{t-28} + \beta_4 PG_{t-28} + \beta_1 GDP_{t-29} + \beta_2 LR_{t-29} + \beta_3 UR_{t-29} + \beta_4 PG_{t-29} + \beta_1 GDP_{t-30} + \beta_2 LR_{t-30} + \beta_3 UR_{t-30} + \beta_4 PG_{t-30} +$$

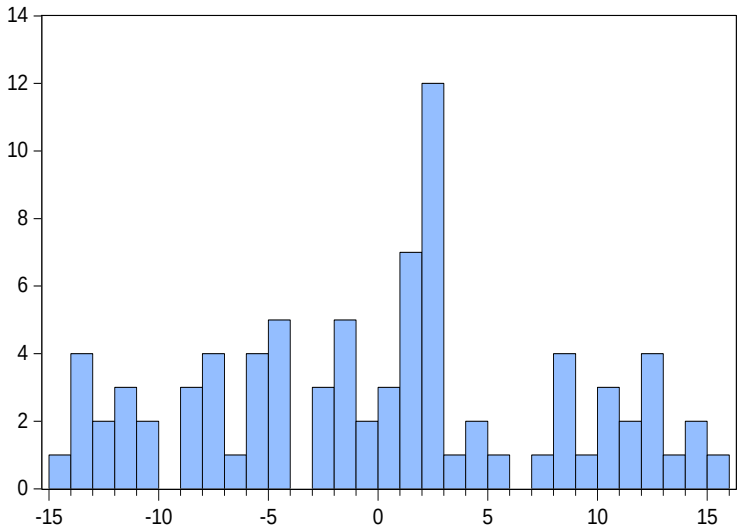
$$\beta_1 GDP_{t-31} + \beta_2 LR_{t-31} + \beta_3 UR_{t-31} + \beta_4 PG_{t-31} + \beta_1 GDP_{t-32} + \beta_2 LR_{t-32} + \beta_3 UR_{t-32} + \beta_4 PG_{t-32} + \beta_1 GDP_{t-33} + \beta_2 LR_{t-33} + \beta_3 UR_{t-33} + \beta_4 PG_{t-33} + \beta_1 GDP_{t-34} + \beta_2 LR_{t-34} + \beta_3 UR_{t-34} + \beta_4 PG_{t-34} + \beta_1 GDP_{t-35} + \beta_2 LR_{t-35} + \beta_3 UR_{t-35} + \beta_4 PG_{t-35} + \beta_1 GDP_{t-36} + \beta_2 LR_{t-36} + \beta_3 UR_{t-36} + \beta_4 PG_{t-36} + \beta_1 GDP_{t-37} + \beta_2 LR_{t-37} + \beta_3 UR_{t-37} + \beta_4 PG_{t-37} + \beta_1 GDP_{t-38} + \beta_2 LR_{t-38} + \beta_3 UR_{t-38} + \beta_4 PG_{t-38} + \beta_1 GDP_{t-39} + \beta_2 LR_{t-39} + \beta_3 UR_{t-39} + \beta_4 PG_{t-39} + \beta_1 GDP_{t-40} + \beta_2 LR_{t-40} + \beta_3 UR_{t-40} + \beta_4 PG_{t-40} +$$

$$\beta_1 GDP_{t-41} + \beta_2 LR_{t-41} + \beta_3 UR_{t-41} + \beta_4 PG_{t-41} + \beta_1 GDP_{t-42} + \beta_2 LR_{t-42} + \beta_3 UR_{t-42} + \beta_4 PG_{t-42} + \beta_1 GDP_{t-43} + \beta_2 LR_{t-43} + \beta_3 UR_{t-43} + \beta_4 PG_{t-43} + \beta_1 GDP_{t-44} + \beta_2 LR_{t-44} + \beta_3 UR_{t-44} + \beta_4 PG_{t-44} + \beta_1 GDP_{t-45} + \beta_2 LR_{t-45} + \beta_3 UR_{t-45} + \beta_4 PG_{t-45} + \beta_1 GDP_{t-46} + \beta_2 LR_{t-46} + \beta_3 UR_{t-16} + \beta_4 PG_{t-46} + \beta_1 GDP_{t-47} + \beta_2 LR_{t-47} + \beta_3 UR_{t-47} + \beta_4 PG_{t-47} + \beta_1 GDP_{t-48} + \beta_2 LR_{t-48} + \beta_3 UR_{t-48} + \beta_4 PG_{t-48} + \beta_1 GDP_{t-49} + \beta_2 LR_{t-49} + \beta_3 UR_{t-49} + \beta_4 PG_{t-49} + \beta_1 GDP_{t-50} + \beta_2 LR_{t-50} + \beta_3 UR_{t-50} + \beta_4 PG_{t-50} +$$

$$\beta_1 GDP_{t-51} + \beta_2 LR_{t-51} + \beta_3 UR_{t-51} + \beta_4 PG_{t-51} + \beta_1 GDP_{t-52} + \beta_2 LR_{t-52} + \beta_3 UR_{t-52} + \beta_4 PG_{t-52} + \beta_1 GDP_{t-53} + \beta_2 LR_{t-53} + \beta_3 UR_{t-53} + \beta_4 PG_{t-53} + \beta_1 GDP_{t-54} + \beta_2 LR_{t-54} + \beta_3 UR_{t-54} + \beta_4 PG_{t-54} + \beta_1 GDP_{t-55} + \beta_2 LR_{t-55} + \beta_3 UR_{t-55} + \beta_4 PG_{t-55} + \beta_1 GDP_{t-56} + \beta_2 LR_{t-56} + \beta_3 UR_{t-56} + \beta_4 PG_{t-56} + \beta_1 GDP_{t-57} + \beta_2 LR_{t-57} + \beta_3 UR_{t-57} + \beta_4 PG_{t-57} + \beta_1 GDP_{t-58} + \beta_2 LR_{t-58} + \beta_3 UR_{t-58} + \beta_4 PG_{t-58} + \beta_1 GDP_{t-59} + \beta_2 LR_{t-59} + \beta_3 UR_{t-59} + \beta_4 PG_{t-59} + \beta_1 GDP_{t-60} + \beta_2 LR_{t-60} + \beta_3 UR_{t-60} + \beta_4 PG_{t-60} +$$

$$\beta_1 GDP_{t-61} + \beta_2 LR_{t-61} + \beta_3 UR_{t-61} + \beta_4 PG_{t-61} + \beta_1 GDP_{t-62} + \beta_2 LR_{t-62} + \beta_3 UR_{t-62} + \beta_4 PG_{t-62} + \beta_1 GDP_{t-63} + \beta_2 LR_{t-63} + \beta_3 UR_{t-63} + \beta_4 PG_{t-63} + \beta_1 GDP_{t-64} + \beta_2 LR_{t-64} + \beta_3 UR_{t-64} + \beta_4 PG_{t-64} + \beta_1 GDP_{t-65} + \beta_2 LR_{t-65} + \beta_3 UR_{t-65} + \beta_4 PG_{t-65} + \beta_1 GDP_{t-66} + \beta_2 LR_{t-66} + \beta_3 UR_{t-66} + \beta_4 PG_{t-66} + \beta_1 GDP_{t-67} + \beta_2 LR_{t-67} + \beta_3 UR_{t-67} + \beta_4 PG_{t-67} + \beta_1 GDP_{t-68} + \beta_2 LR_{t-68} + \beta_3 UR_{t-68} + \beta_4 PG_{t-68} + \varepsilon_t$$

Appendix 4.14: Jarque-Bera Test (Source: Developed for research via EViews 10)



Series: Residuals
Sample 1996Q1 2016Q4
Observations 84

Mean	-1.85e-14
Median	0.866670
Maximum	15.06782
Minimum	-14.53817
Std. Dev.	7.977160
Skewness	0.031477
Kurtosis	2.161080
Jarque-Bera	2.477125
Probability	0.289800

Appendix 4.15: Ramsey RESET Test (Source: Developed for research via EViews 10)

Ramsey RESET Test
Equation: UNTITLED
Specification: VOLUME C UNEMPLOYMENT POPULATION LR GDP
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	1.455063	78	0.1497
F-statistic	2.117208	(1, 78)	0.1497
Likelihood ratio	2.249674	1	0.1336

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	139.5766	1	139.5766
Restricted SSR	5281.712	79	66.85711
Unrestricted SSR	5142.135	78	65.92481
Unrestricted SSR	5142.135	78	65.92481

LR test summary:

	Value	df
Restricted LogL	-293.1208	79
Unrestricted LogL	-291.9959	78

Unrestricted Test Equation:
Dependent Variable: VOLUME
Method: Least Squares
Date: 06/07/18 Time: 16:29
Sample: 1996Q1 2016Q4

Included observations: 84

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-82.98312	15.94151	-5.205473	0.0000
UNEMPLOYMENT	12.59694	3.431961	3.670477	0.0004
POPULATION	25.79439	8.275253	3.117052	0.0026
LR	-2.354000	1.366987	-1.722036	0.0890
GDP	1.886757	0.315523	5.979784	0.0000
FITTED^2	-0.012604	0.008662	-1.455063	0.1497

R-squared	0.569129	Mean dependent var	1.880314
Adjusted R-squared	0.541509	S.D. dependent var	11.99110
S.E. of regression	8.119409	Akaike info criterion	7.095141
Sum squared resid	5142.135	Schwarz criterion	7.268771
Log likelihood	-291.9959	Hannan-Quinn criter.	7.164939
F-statistic	20.60572	Durbin-Watson stat	0.289252
Prob(F-statistic)	0.000000		

Appendix 4.16: Result of Granger Causality Test

Pairwise Granger Causality Tests
Date: 07/12/18 Time: 21:57
Sample: 2006Q1 2016Q4
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
AFFORDABILITY does not Granger Cause PCIHTV	42	2.90558	0.0673
PCIHTV does not Granger Cause AFFORDABILITY		0.24910	0.7808
HPI does not Granger Cause PCIHTV	42	1.63858	0.2080
PCIHTV does not Granger Cause HPI		0.52537	0.5957
UNSOLD_UNITS does not Granger Cause PCIHTV	42	3.15511	0.0543
PCIHTV does not Granger Cause UNSOLD_UNITS		0.59483	0.5568
HPI does not Granger Cause AFFORDABILITY	42	0.73793	0.4850
AFFORDABILITY does not Granger Cause HPI		1.66112	0.2038
UNSOLD_UNITS does not Granger Cause AFFORDABILITY	42	3.93795	0.0282
AFFORDABILITY does not Granger Cause UNSOLD_UNITS		1.75905	0.1863
UNSOLD_UNITS does not Granger Cause HPI	42	2.07015	0.1405
HPI does not Granger Cause UNSOLD_UNITS		4.20239	0.0227

Appendix 4.17: White heteroskedasticity-consistent standard errors & covariance

Dependent Variable: PCIHTV
Method: Least Squares
Date: 06/10/18 Time: 22:54
Sample: 1996Q1 2016Q4
Included observations: 84
White heteroskedasticity-consistent standard errors & covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP	2.076125	0.253567	8.187690	0.0000
LR	-3.203683	1.160332	-2.761005	0.0072
PG	27.57976	7.760480	3.553872	0.0006
UR	11.87159	3.300697	3.596691	0.0006
C	-80.59549	15.72526	-5.125224	0.0000

R-squared	0.557433	Mean dependent var	1.880314
Adjusted R-squared	0.535025	S.D. dependent var	11.99110
S.E. of regression	8.176620	Akaike info criterion	7.098113
Sum squared resid	5281.712	Schwarz criterion	7.242805
Log likelihood	-293.1208	Hannan-Quinn criter.	7.156278
F-statistic	24.87605	Durbin-Watson stat	0.311049
Prob(F-statistic)	0.000000	Wald F-statistic	38.84591
Prob(Wald F-statistic)	0.000000		

Appendix 4.18: Relationship between Each Variable for Granger Causality Test

Variable Y	**Variable Y**	**Significance Level (α)**	**P-value**	**Decision Making**	**Conclusion**
Affordability	PCIHTV	0.05	0.0673	Do not reject H_0.	No granger cause.
PCIHTV	Affordability	0.05	0.7808	Do not reject H_0.	No granger cause.
Housing Price	PCIHTV	0.05	0.208	Do not reject H_0.	No granger cause.
PCIHTV	Housing Price	0.05	0.5957	Do not reject H_0.	No granger cause.

Housing Glut	PCIHTV	0.05	0.0543	Do not reject H_0.	No granger cause.
PCIHTV	Housing Glut	0.05	0.5568	Do not reject H_0.	No granger cause.
Housing Price	Affordability	0.05	0.485	Do not reject H_0.	No granger cause.
Affordability	Housing Price	0.05	0.2038	Do not reject H_0.	No granger cause.
Housing Glut	Affordability	0.05	0.0282	Reject H_0.	Granger Cause
Affordability	Housing Glut	0.05	0.1863	Do not reject H_0.	No granger cause.
Housing Glut	Housing Price	0.05	0.1405	Do not reject H_0.	No granger cause.
Housing Price	Housing Glut	0.05	0.0227	Reject H_0.	Granger Cause