THE MACROECONOMIC FACTORS AFFECTING MOVEMENTS OF PROPERTY PRICE: EVIDENCE FROM JAPAN

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DECLARATION

We hereby declare that:

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

(2) No portion of this 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 completing the research project.

(4) The word count of this research report is 25874 words.

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LIST OF ABBREVIATIONS

ANOVA	Analysis of Variance
ARCH	Autoregressive Conditional Heteroscedasticity
ARDL	Autoregressive Distributed Lag Model
ASEAN	Association of Southeast Asian Nations
BLUE	Best Linear Unbiased Estimator
BOJ	Bank of Japan
CLT	Central Limit Theorem
CNLRM	Classical Normal Linear Regression Model
CPI	Consumer Price Index
DV	Dependent Variable
DW	Durbin-Watson
GDE	Gross Domestic Expenditure
GDI	Gross Domestic Income
GDP	Gross Domestic Product
INF	Inflation Rate
IR	Interest Rate
IV	Independent Variables
JB	Jarque–Bera
NIPA	National Income and Product Accounts
NPL	Non-Performing Property Loan
OECD	Organisation for Economic Co-operation and Development
OLS	Ordinary Least Square
OPAC	Online Public Access Catalogue
PP	Property Price
PPI	Property Price Index
PPP	purchasing power parity
RESET	Ramsey Regression Equation Specification Error Test
SSRN	Social Science Research Network
TOL	Tolerance
UR	Unemployment Rate
UTAR	UniversitiTunku Abdul Rahman
VIF	Variance Inflation Factor

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PREFACE

In Japan, property activities are essential for adjusting cyclical movements and sustaining macroeconomic policies for economic growth. This study mainly determinant the macroeconomic factors affecting movements of property price in Japan. The macroeconomic variables in this research of study include Gross Domestic Product (GDP), Inflation Rate (INF), Interest Rate (IR), and Unemployment Rate (UR).

This study is based on guidelines consists of 3 major 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 content of the research
Chapter 1: Research Overview
Chapter 2: Literature Review
Chapter 3: Methodology
Chapter 4: Data Analysis
Chapter 5: Discussions, Conclusion and Implications

Third Section: The end materials consist of references and appendixes

Complete the above 3 major criteria of this research study. This study provides different kind of information about the property in Japan that will be useful for future researchers.

ABSTRACT

The main purpose of this study is to measure the significant relationship between macroeconomic factors and movements of property price in Japan from period year 1993 Quarter 1 to year 2015 Quarter 4, which consist of quarterly data of 92 observations. Japan property prices are continuous decline for the remaining months of year 2015, therefore it becoming one of the hot issues discussed now a days. This paper examines empirically whether the decreasing trend of property price in Japan is related to changes in the Gross Domestic Product (GDP), Inflation Rate (INF), Interest Rate (IR), and Unemployment Rate (UR). Ordinary Least Square (OLS) method is implemented to this study, is to capture the effect of independent variables. The data of the variables in this study are obtained through the secondary sources. This paper is useful for the speculators, public sector, investors and home buyers to know which factors is most affected the movement of property price investment decision. Thus, this paper can serve as a guide for the government in stabilizing the residential property price in Japan. The general results of the study obtained found that Inflation Rate (INF), Interest Rate (IR), and Unemployment Rate (UR) have the positive relationship in determining the property price index, whereas the Gross Domestic Product (GDP) have the negative relationship in determining the property price index.

CHAPTER 1: RESEARCH OVERVIEW

1.0 Introduction

From the study of this research, Japan's property price condition will be discussed in the first chapter. The aimed of this research is to explore the movements of property price performance for Japan in quarterly, which influenced by the macroeconomic variables from year 1993 Quarter 1 to year 2015 Quarter 4. The macroeconomic variables in this research of study include Gross Domestic Product (GDP), Inflation Rate (INF), Interest Rate (IR), and Unemployment Rate (UR).

This study is essential to investigate the background and magnifies the understanding of macroeconomic variables that influenced the property price. An increase or decrease of the property price can affect the efficiency and effectiveness of the movement in Japan's economy. However, it can affect the decision making of the investors or speculators and also the wealth of the households in Japan. Therefore, property price is very important in the perspective of households, investors and policy makers. Thus, in order to magnify the forecasting skills in the property market, a cavernous awareness on the significant correlation between the movements of the property price and its determinants variables would be most useful and important.

This chapter is comprised of the research background, follow by the problem statement which provides readers in more depth and quality of understanding for this research. The research objectives, research questions, hypotheses and significance of the study for the research along with the chapter layout is presented as well as the conclusion will be briefly outlined.

1.1 Research Background

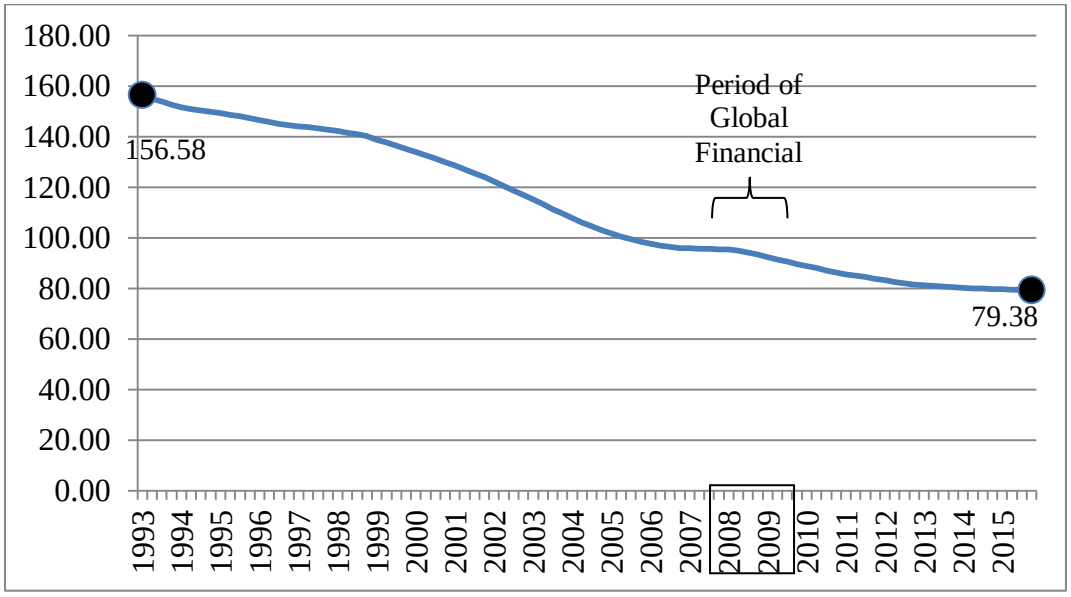
A property is considered as then necessities of life that allows users to live and work in a protected environment. This is because the property became the major asset for the purpose of long-term physical well-being. Properties not only serve as shelter and protection, it also can be used for investment purpose. Thus, this phenomenon led to the creation of the property market (Chohan, the Che-Ani, Abdullah Tawiland Kamaruzzaman, 2011). According to Guirguis, Giannikosand Anderson (2005), the property market has main impact on global economy. Therefore, it is a reason why investors and policy makers usually monitors property prices to observe structural changes and economic fluctuationsin the property market.

According to Schneider and Kirchgassner (2009), financial crisis and the global economy that began in the United State in middle of 2007 had much impact on the property market and the stock market. The rapid increase in the mortgage credit raises the property prices in United States (Hashim, 2010). In the event of uncertainty, households are likely to feel the financial panic and this situation would lead to the fluctuations in the property and labor market. Moreover, investors have the opportunity to speculate in order to earn more money. This also proved that fluctuations in property prices significantly affect the regional economic activity (Lean, 2013).

Generally, the price of property is an important milestone for the country (Guirguis, Giannikos and Anderson, 2005). This is because it not only affects the residents in this country, but it would also affect the country's economy. Therefore, this study aims to examine the movement of property prices in Japan and macroeconomic variables, like Gross Domestic Product, Inflation Rate, Interest Rate and Unemployment Rate.

1.1.1 Trend of Property Price in Japan

Figure 1.1: Japan Property Price Index Changes from year 1993-2015 Quarterly 2005=100)



Adapted from: International Property Price Database

The property price in Japan have experienced slightly price depreciation from the index of 156.58 in year 1993 to 79.38 in year 2015 as shown in Table 1.1.According to International House Price Database, the property price from the year 1993 Quarter 1 to 2015 Quarter 4 shows decreasing index. In year 1986 to 1991 the property and stock market price are highly inflated by the economic bubble in Japan, which cause property price increase. This bubble is characterized by the rapid rise in the property prices, credit expansion and money supply are uncontrolled. During that time, investors too much confidence and speculation in property and share price have been associated with the excessive of monetary policy.

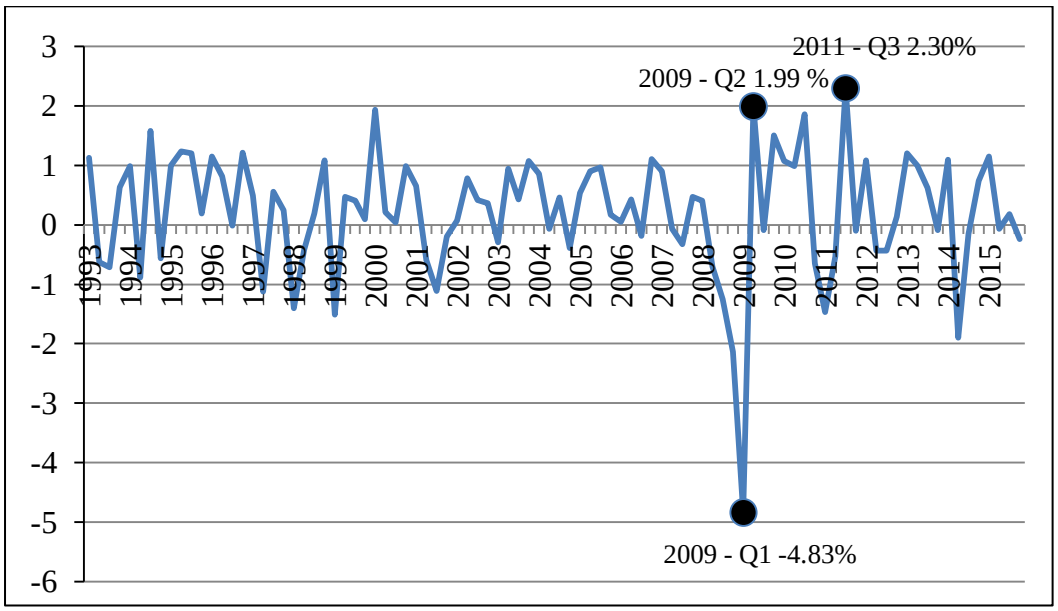
In year 1993, asset prices began to decline. The economic downturn continued for more than a decade. This led to a substantial decline in the non-performing property loan (NPLs), which cause the difficulty for most of the financial institution. The Lost Decade happen is due to the exploded of asset price bubble in Japan. Although the Japan's economy overcame this period, it does so at a much

slower rate than other industrialized countries. During this period, the Japanese economy experienced both the credit crunch and the liquidity trap.

There was a shock of property price. This adverse situation is caused by the occurrence of the housing bubble phenomenon (Helleiner, 2011). As a result, this has led many researchers to look into the variation in property prices in Japan from 1993 to 2015 and to find decisive macroeconomic factors that influence decreased in prices in order to get a better understanding on this subject.

1.1.2 Trend of Gross Domestic Product in Japan

Figure 1.2: Japan Gross Domestic Product from year 1993-2015 Quarterly (%)



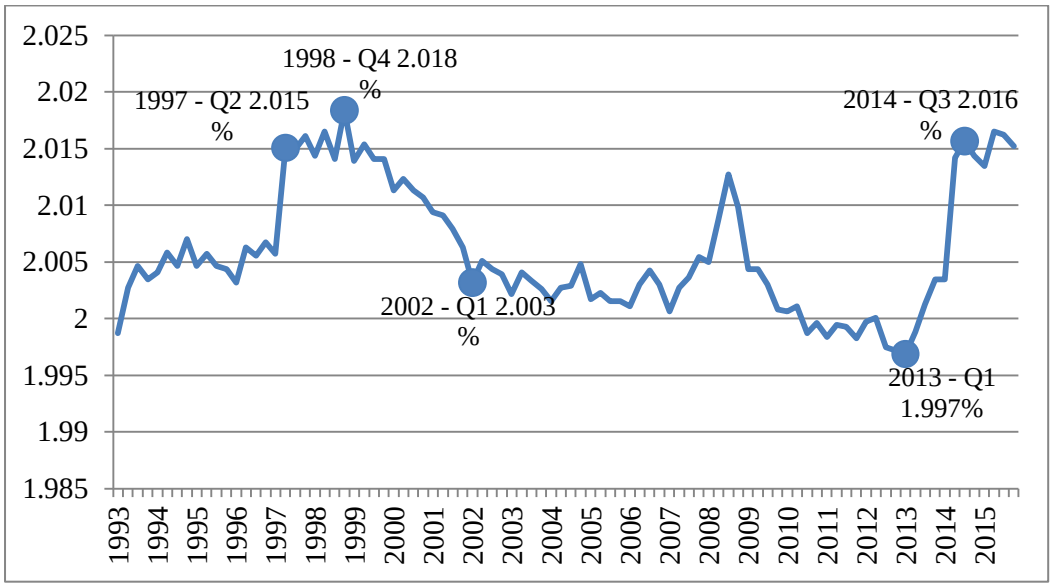
Adapted from: OECD Economic Outlook Database

Gross Domestic Product (GDP) in the Japan has been going through ups and downs. The growth in GDP in the Japan fluctuating from year 1993 Quarter 1 to 2015 Quarter 4 and it started to decrease gradually until the year 2009. Figure 1.2 shows that the Japan achieved the highest GDP in 2011 and the lowest point in 2009.

According to statistics done by the OECD, GDP growth rates have a -4.83% for the Japan economy in 2009 Quarter 1, followed by a recovery to 1.99 % growth rate in 2009 Quarter 2. While it may not have a V-shaped recovery, the world economy should begin to raise in year 2009 Quarter 2, supported by emerging economies and developing countries such as Brazil, Russia, India and China. The level of Japanese exports will largely be determined by the trend in Asia, especially in countries and regions such as China, South Korea, Taiwan, ASEAN members and India.

1.1.3 Trend of Inflation in Japan

Figure 1.3: Japan Inflation from year 1993-2015 Quarterly (%)



Adapted from: OECD Economic Outlook Database

Inflation in Japan shows upward over the next five years until the year 1997 Quarter 2, it reached 2.015% but over the next few years it had decrease in year 2002 Quarter 2, which registered a inflationary 2.003%. Figure 1.3 shows that the Japan has the highest inflation in 1998 and the lowest in 2013.

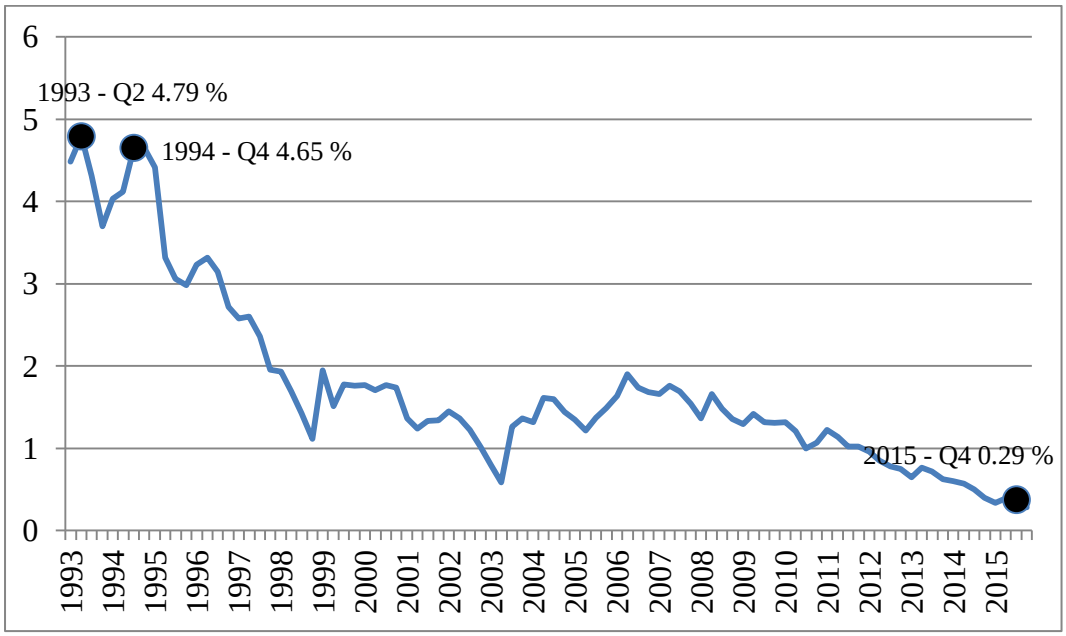
Over more than 20 years of steady fall in property price and unstable of economies, the resident of Japan are tired of Abe which for improving in the

Japan's economy through inflationary policies and an increased government spending to reduce unprecedented finance. This method has been labeled as "Abenomics" and this leading to a surge in inflation of 2.016 % in 2014 Quarter 3.

In the short term, Japan's resident can accept the loose money condition, but if the inflation level is during the time 1970, they will long for a return of price stability for the "lost decade". Inflation increases the purchasing power at the expense which were affected the future saving and stability.

1.1.1 Trend of Interest Rate in Japan

Figure 1.4: Japan Interest Rate from year 1993-2015 Quarterly (%)



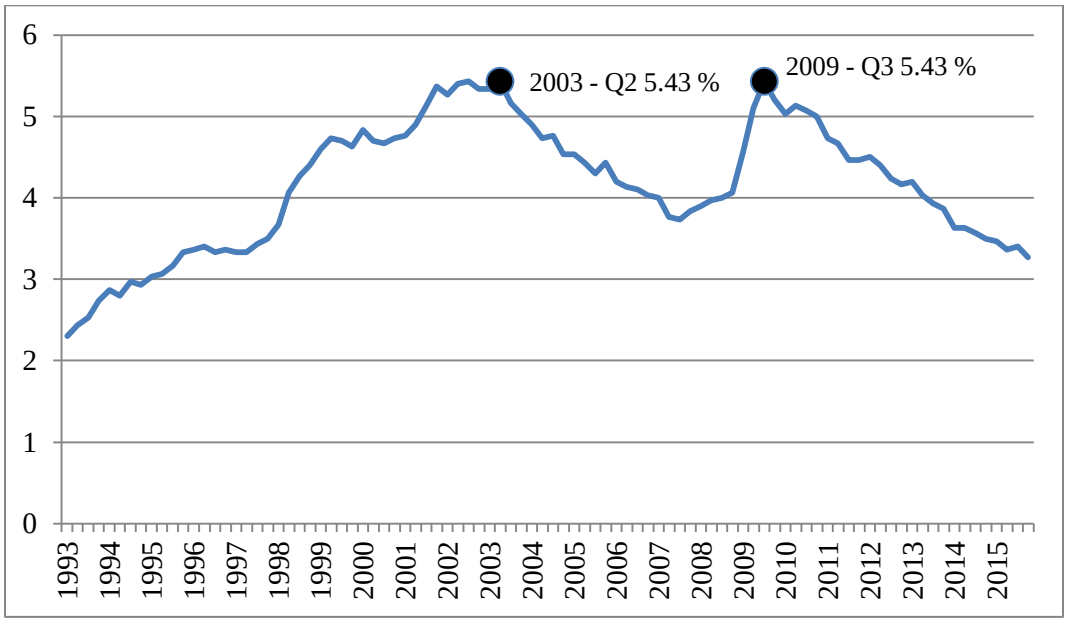
Adapted from: OECD Economic Outlook Database

Figure 1.4 shows interest rate from year 1993 Quarter 1 until year 2015Quarter 4. In this graph, we can see the interest rate decreased gradually start from 1994 Quarter 4 to 2015 Quarter 4. According to statistics done by the OECD, the highest interest rate in the Japan was in 1993 and it reached the lowest point in 2015. Interest rate in Japan is a fluctuation model, and also a downward trend. Poole and Wheelock (2008) and Drakopoulos (2011) stated that the government's

monetary policy for the interest rates in 2004 is aimed at increasing the employment rate. Mayer-Foulkes (2010) showed that interest rates are one of the factors that triggered the housing crisis when interest rates are low, it will lead to the occurrence of the housing crisis.

1.1.4 Trend of Unemployment Rate in Japan

Figure 1.5: Japan Unemployment Rate from year 1993-2015 Quarterly (%)



Adapted from: OECD Economic Outlook Database

According to the statistic done by the OECD, the unemployment rate in the Japan increased steadily from the year 1993 to 2003 Quarter 2 and dropped gradually after that. Figure 1.5 shows that the unemployment rate in the Japan has increased over the years since 1993. The country is experienced a peak in unemployment in 2003 and 2009.

An action by the Bank of Japan (BOJ) and the Stock Market cause the strong economic growth in 1970 ended abruptly in the early 1990s. As a result, unemployment rate rising which due to the fall in property price. The unemployment rate is high, but is not reach the crisis level. There is less effect

toward the Japan's family, because Japan's people are more emphasis on the saving, so their living standard does not decline significantly in the year 1980.
During the 'lost decade', some of the commentaries comment that the Japanese are do better than the United States and others country. Instead, Blanco, Martin and Vazquez (2015) found that high employment rate is one of the factors associated with the housing bubble.

1.2 Problem Statement

During 1980s, banks in Japan increased their property loans due to the neglecting of the property bank credit. As a result, decrease in the interest rates cause the increase in demand of property loan lead to the overall rise in property prices. This has been proved in the past research; the price of the property price is increase during the year 1986 to year 1992. However, the raise in the property price situation is no longer fixed because central bank of Japan takes an action to increase the interest rate too aggressive in the economic. Japan experienced one of the largest real estate market fall down in the history at the end of the 1992. This situation cause the stock and property markets rapid downward spiral because investors sold stocks to recover the losses in the property market, and vice versa. During a asset price bubble, people don't expect that property prices will drop. In reality, this has been proved incorrect in the past researcher many times. This also cause by the human nature that makes us unable to learn from the history. Since end of the 1992, Japan's property price fall gradually until end of 2015.

According to Kiyotaki and Moore (1997) give a useful reference, they give a double role to the asset: they are not only factor in the production, but also the collateral for the loan. Therefore, the credit limit is affected by the price of the property. Thus, the personal loan capacity and credit demand will be affected by changes in asset prices. Positive productivity shocks lead to increasing the property prices and higher corporate net worth. Furthermore, the national unemployment rate is another factor affect the property price index in Japan. The world economic crisis has greatly changed the property market prices in most

countries. The financial crisis that arises in year 2007 slowly shifted to the real sector and became an economic crisis. In 2008, the similar trend can also be seen in Japan, the economic recovery from the 1991 recession ceased. This has affected the labor market, and wage changes have undergone significant changes compared to 2007. During 2009, the Japanese government to react the crisis by takes a stimulus of $173 billion, greater than the aggregate value of every survey adopted in 2008. Such actions affect the real GDP growth rate on Japan. In year 2008 and 2009, minute a sharp decline in Gross Domestic Product (GDP). In 2010, GDP recorded an increase in anti-crisis measures taken by the government. Wong and Hiu (2006) also demonstrate a significant conclusion. They concluded that 95% of Japanese participants replied that the key factors in determining the purchase of property were economic, interest and household income. They argue that the unemployment rate is of little importance, even when the survey is conducted.

Hence, the principal object of the research is to examine macroeconomic factors which are Gross Domestic Product, inflation, interest rate, and unemployment rate with the property price in Japan. The researchers will be capable to deduce how these elements correlate with the Japan property market by determining the correlation between these macroeconomic factors and the Japan property price. Consequently, it is vital to conduct this research have a better understanding and acquire more knowledge about the Japan property price.

1.3 Research Objectives

Research objectives are stimulated by research questions to achieve several objectives and form a survey examination.

1.3.1 General Objective

Mainly determinant the macroeconomic factors affecting movements of property price in Japan.

1.3.2 Specific Objectives

(i) To examine the significant between the Gross Domestic Products (GDP) and the property price in the Japan.

(ii) To examine the significant between the inflation rate and the property price in the Japan.

(iii) To examine the significant between the interest rate and the property price in the Japan.

(iv) To examine the significant between the unemployment rate and the property price in the Japan.

1.4 Research Questions

1. Is there any significant relationship between Gross Domestic Product (GDP) and the property prices in Japan?
2. Is there any significant relationship between inflation rate and property prices in Japan?
3. Is there any significant relationship between interest rate and the property prices in Japan?
4. Is there any significant relationship between unemployment rate and the property prices in Japan?

1.5 Hypothesis of the Study

According to the research, there are four hypotheses will be carried out to examine the relationship between the macroeconomic factors and the fluctuation of property prices in the Japan.

1.5.1 Gross Domestic Product (GDP)

Many studies try to explain the relationship between the property prices and the macroeconomic by using a variety of tools as well as macroeconomic factors mostly involve in Gross Domestic Product (GDP), interest rate, unemployment rate, inflation rate and so on. Allen and Carletti (2011) find that the property price and the macroeconomic environment are in associated movement which may influence the fluctuation of the property prices. Hence, there is a correlation between residential investment, interest rate and GDP. According to Juan Li and Xuemin Chen (2015), residential investment or property prices play an important role which shows that there is significantly affects GDP. This is because a good economic development condition and high income will lead to a higher GDP which can increase the demand for the property. An increase in the demand will encourage more people to spend more on houses and at the same time increases the property prices. The result indicates fluctuation of property price index will affect the changes in GDP will rejects the null hypothesis, thus supporting the notion that they are linked (Ray, 2011).

H_0: There is no significant relationship between Gross Domestic Product (GDP) and the property prices in Japan.

H_1: There is a significant relationship between Gross Domestic Product (GDP) and the property prices in Japan.

1.5.2 Inflation Rate (IR)

The theoretical model denotes property prices are positively correlated with inflation rate. Inflation rate define as the increase in level of prices for goods and services which measured by Consumer Price Index (CPI). According to Weida and Peng Liu (2015), property price has a greater impact against inflation in which property prices definitely hedge inflation. This is because an increase in money supply will eventually causes a greater inflation and property prices to increase. Kenny (1999) also indicates that inflation affected the increase in property price.

As a result, higher inflation and property prices not only affected household consumption but also economic growth.

It is crucial to investigate the relationship between property price and inflation rate. Goodhart and Hofmann (2000) highlighted property prices are typically conductive by making predictions of the future inflation. In addition, property prices have been utilized to specify inflation expectation as well as in the target inflation function. Inflation is most likely than economic growth to occur as it turned out of higher asset prices.

H_0: There is no significant relationship between inflation rate and the propertyprices in Japan.

H_1: There is a significant relationship between inflation rate and the property prices in Japan.

1.5.3 Interest Rate (IR)

Based on the study of De Vries and Boelhouwer (2005), they indicates that housing price is strongly affected the macroeconomic factors such as interest rates and anticipated price. Interest rate will generate directly influence the demand and supply in the property prices. This can be said that a period of high interest rate relatively will attract more people to buy and this may increase cost of mortgage payments. As the cost of mortgage payment become higher, people will less to purchase a house or property and at the same time this will decrease the demand for a property. On the other hand, increase of prices will cause the decrease in interest rate which enabled a purchase of real property despite low financial resources of a buyer (Bojan and Darja, 2016). Greiber and Setzer (2007) also found that monetary policy was linked to the development in the real estate market through interest rate and liquidity.

According to Ong (2013), Zeren, Erguzel and Ass (2015), their studies indicated the higher real interest rate will reduce the demand for property which

consequently lead to a decline in property price. However, some studies found that the real interest rate and property prices are negatively related (Choudhury,2014) whereas some proved that the real interest rates are strongly and positively related (Tse, Rodgers and Niklewski,2014). Hui (2013) indicates that the property price is granger caused by interest rate by using the Granger-Causality test.

H_0: There is no significant relationship between interest rate and the property prices in Japan.

H_1: There is a significant relationship between interest rate and the property prices in Japan.

1.5.4 Unemployment Rate (UR)

Real property market and real property prices are closely linked with general economic cycles. Numerous researches as Ludwig and Slok (2004), Case, Quigley and Shiller (2005), Bardham, Edelstein and Tsang (2007), Goodhard and Hofmann (2008) have revealed that unemployment rate may influence the fluctuation of the property prices. Besides Gross Domestic Product (GDP), the outcomes of the research have shown that unemployment are the most important factors linked to the property prices because unemployment were statistically significantly connected with the prices of property.

As an instrument for property prices, we investigate that there is significant impact of property prices on unemployment fluctuations. Francois and Thomas (2014) stated the negative relationship between house prices and unemployment rate can however accommodate very different interpretations which is house prices con move positively and unemployment negatively with the business cycle. Due to reduction of consumption on all goods and services, rising in unemployment rate will reduce the property prices. Consequently, unemployment may prevent people from engaging in the property market as less people will not have ability to pay for a house.

H_0: There is no significant relationship between unemployment rate and the property prices in Japan.

H_1: There is a significant relationship between unemployment rate and the property prices in Japan.

1.6 Significance of Study

The property market in most countries is a popular topic of study recently, especially in Japan. This study would be able to provide people of the idea on how the changes of the Gross Domestic Product (GDP), Inflation Rate, Interest Rate, and Unemployment Rate will alter the movements of property price in Japan. Thus, these will benefits to the consumers, because consumers will have more knowledge about the most factors causing the property bubble to happen these days. In many countries around the globe, which included the country of Japan, property markets have accomplished large recurrent variations in prices and volumes, with these cycles being characterized by an increasing in prices, followed by a falling in prices. By doing this research study, we can disclose more about what causing the generation nowadays having low house affordability.

From the speculators or investors perspectives, this study may be contributed to them, by well-known what actually affecting the property price, so that they could have come out with more precise of the property price evaluation and determine the optimal time to be involved in investment on property markets. Thus, they would have higher possibility in getting large capital gain at the end. The more exhaustive property speculation during the boom may have brings to be more serious housing price decrease and economic recession during the succeeding property bust through few channels.

From the public sector perspective, it composes a major part of government revenue, through taxes on home ownership and stamp duties imposed on the transactions in the property market (Christos, 2015). In addition, according to

Zainal (2010), in market economy condition, property price like other goods and services, which are resolute by the interactions of the demand and supply. Moreover, this study may able to give great signals to the governments. Government by viewing this research, the authorities may have realization on these issues hence create alternatives or solution to solve the appearance problem. Hence, it is essential to understand the consumers' consumption decisions that will influence by these fluctuations of property price.(Campbell and Cocco, 2007).

For high purchasing power of home buyers and investors, both users' interest may be different. For potential home buyers, they will prefer property price decrease in the future as they can purchase lower property price. For investors, the property price drop is unfavorable for them because it will influence the property values and reduced their wealth. In addition, property price is also an important component for home owners, which act as their non-pension wealth. The decrease of property price will affect home owner in future to receive less money when they sell their property at certain time. The decision to buy a property or investment in real property is a major decision because it involved a higher cost and potential of a substantial loss. The young households will benefit from lower house price while this situation will hurt the home owners (Nakajima, 2011).

In conclusion, this research will provide and discuss great solution or recommendation for the property investors to judge the suitable timing for them to have their own investment planning by purchasing property in Japan. Moreover, the outcomes of this study would contribute to speculators, investors, public sector, home buyers, property developers on future planning or investment that have significant relationship with the movements of Japan property price.

1.7 Chapter Layout of the Study

1.7.1 Chapter 1: Research Review

Chapter 1 consist an overview of the introduction of the topic which is related to the fluctuation of property prices over the years in Japan and explains the research problem. Besides, the research background of Japan and the relationship between macroeconomic factors are discussed in this chapter. This chapter also discussed about the problem statement, research objectives, research questions, hypotheses and followed by the significance of the study. Lastly, the summary of this study will also be figured out in this chapter.

1.7.2 Chapter 2: Literature Review

In the second chapter of this study, it mainly focuses of a comprehensive review of the past relevant studies and existing literature in this study. Chapter 2 also provides the discussion of the relationship between the property prices and each of the determinants through their findings, theories used as well as results on their studies. The literature review presents clear and logical presentation of the relevant theoretical models or conceptual frameworks of property prices and concludes with a summary of the literature review.

1.7.3 Chapter 3: Methodology

Chapter 3 will exhibits the methodology and research method applied in this study. This chapter explains the model of this research been carried out such as research design, data collection methods, sampling design, research instrument and constructs measurement. In addition, the techniques applied and the scale of measurement of each independent variables are summarized and conclude with

the method and tests that will be utilized in this entire research for the purpose of analyzing the date are clearly discussed as well.

1.7.4 Chapter 4: Data Analysis

Chapter 4 presents the significance of independent variables, the statistical outcome of the model specification test as well as the empirical results with an interpretation. The trends of each independent variable will be discussed and a few tests such as unit root tests will be tested in order to study the correlation and causality relationship between the independent variables and property prices which will affect the fluctuation of property prices in Japan. Lastly, the results generated will be used for analysis and comparison with the outcomes that generated by past researchers.

1.7.5 Chapter 5: Discussion, Implications and Conclusion

In the last chapter, conclusion and policy implication will be implementing by the government and other parties to improve this study. It is also to summarize all findings from chapter 4 and interpret the results consistent with the objective of this study. Besides, limitations also will be stated throughout this study and some recommendations which may be useful for policy makers or investors will be explained in this chapter. Lastly, we will discuss about the future study of this research.

1.8 Conclusion

The property had become a major complication throughout most of the postwar duration for Japan. However the complication of absolute lead to an insufficiency of residence no longer exists, the fluctuation of property prices remain

tremendously undesirable nowadays although Japan has become one of the world's largest to create sufficient productive capital. As a result, the property prices become more expensive than other countries due to some factors especially insufficient social infrastructures and inconvenient locations and spaces are narrow. The property prices remain serious in Japan and rise continuously for each year during the latter half of the 1980s. It is widely recognized that the property price problem also be the one of the most serious economic and social problems of present-day in Japan. It is important to analyze whether the four exogenous variables such as Gross Domestic Product (GDP), inflation rate, interest rate and unemployment rate have significant relationship towards the property prices in Japan. This is because to accumulate more information about the understanding of the function of macroeconomic variables toward the property prices in Japan. Therefore, it will able to determine the main reason behind the irrational rise of the property price index in Japan in recent years so that to provides the knowledge for households, investors as well as policy makers when planning for a detailed property investment decision.

CHAPTER 2: LITERATURE REVIEW

2.0 Introduction

In chapter 2, there are various points of view on the relationship between the independent variables with the property prices in Japan. Therefore, this chapter will summarize the literature review regarding the correlation between dependent variable (Property Price) and independent variables namely the Gross Domestic Product (GDP), inflation rate, interest rate and unemployment rate will be further discussed in detail. Hence, the literature review primarily concentrate on the movement of property price in Japan to ensure better understanding on how past or other researchers towards the research. It is also important to identify the correlation between dependent variable and independent variables throughout this study. In addition, review of relevant theoretical framework will be the next which is study the theories and concept applied on the property price with macroeconomic factors. The last part of this chapter will be the proposal of theoretical model of this study and the brief summary of this chapter.

2.1 Review of the Literature

2.1.1 Property Price Index (PPI)

For decade, Japanese property price were volatile, they do not include provisional stage of economic crisis following the oil crisis in the mid-1970s, the property prices from the end of World War II durable to rise consistently until fall of the bubble in first half of the 1990s. At beginning of the 1980s, the speed of growth to increase, assemble momentum during second half of the decade, attain a peak in 1991, and then suddenly entered a downward stage. At beginning of the 2000s,

property prices are showing signs of bottom out and in the middle of the period, they entered a stage of recovery are known as "mini-bubble". Moreover, it entered a phase down again following the global financial crisis in 2008.

In macroeconomic variables, such as Gross Domestic Product (GDP), Inflation, Interest Rate and Unemployment Rate will affect property prices and the construction of property in Japan. In particular, Apergis (2003) showed that the increase in inflation will reduce people's incentive to invest in property, which in turn reduces the demand for property. According to Kearl (1979), say that inflation will affect the property payments increase that implies lower property demand. Construction activity boosted by higher employment growth (Smith and Tesarek, 1991), but the characteristics of certain regional employment plays avital in decision-making of investors, and determining the price of the property. Because there are many possible ways to carry out empirical analysis on the determinants of property prices and the results vary widely.

2.1.2 Gross Domestic Product (GDP)

Gross domestic product can be defined as inflation adjusted price of goods and services of nation’s business cycle over year. It is usually recognized that GDP is the main driver of macroeconomic that influence property prices. According to Lisa Mataloni (2016), GDP can be defined as the sum of personal consumption expenditures (C), investment (I), government consumption expenditures (G) and net exports of goods and services (NX). Most of the past researchers suggested using quarterly data due to rising in the sample size for GDP (Hott, 2009).

$$GDP = C + I + G + NX$$

However, GDP is the most broadly measure of economic performance and GDP data is also frequently available for every year. The study of Case, Goetzmann, and Rouwenhorst (2000) and Wit and Dijk (2003) also indicate that GDP is the main determinants of the fluctuation of property prices. There are some various

inputs in a country GDP such as foreign direct investment, population growth, unemployment rate, import and export, inflation rate and others. Zhu (2004) states that, GDP growths contain some information in more direct measures of household income that includes unemployment and wages. Zull and Masron (2011) also researched expansion of prices of real estate and GDP. They comparatively studied the relationship between property prices, growth of foreign investments and GDP in Malaysia and South Korea. For instance, Japan's GDP was 475.7 trillion yen in 2012 and this value of GDP will be converted into 5.96 trillion USD by using the exchange rate of 79.8 in that year. As a result, Japan was recorded as the third largest economy after United States and China country. Recently, Martin and Chen (2007) studied that property prices continuously increasing plus the correlation between the economic variable with property price fluctuation that bring more than 50 percent large impact to the property market.

Regarding to Valadez (2010), he determined that there was a statistically significant connection between price index of property price and GDP, on the other hand, showed that GDP linked to the price of business property price. Sutton (2002), and Otrokand Terrones (2005), have studied macroeconomic have an effects on property prices and specified that property market is highly correlated with GDP and other independent variables. Based on the real estate investment market in Japan, the results shows that the price of the real estate increases from year 2001 to year 2007 before the price of real estate declines and become fluctuates throughout the year 2008 until year 2013. This result indicates that GDP will have an impact on the value of property investment market in Japan. In addition, Sutton (2002) also indicates the strength of GDP to property price depends on the openness of the country and the relationships of GDP were found at range on average 0.33 to 0.44. Thus, it is reasonable to determine that property prices will have a leading relationship to GDP due to the consumption contributes a large portion to GDP.

Ong (2013) concluded main driver of property prices in Malaysia is caused by GDP. There has a direct effect from property prices found in consumption, property prices and collateral constraints by using the Euler equation for consumption (Iacoviello, 2003). In this literature, the strong relationship between

GDP and the property price has been determined. Greater GDP will lead to a higher economic growth for a country and consequently level of income also will increase as people has the ability on spending to buy a house therefore demand of the house will increase. As a result, many people will tend to make loans from banks to buy a house and this could help to improve the prices of real estate. For instance, this may cause fierce competition among commercial banks as many people believe that there are too many banks in Japan.

Besides that, few researchers also stated GDP as the one of the independent variables which shows the positive relationship with the property price in a country either in short run, long run or both (Bekhet and Othman, 2011).The property price will increase as the GDP increases. On the other hand, a directional causality with a strong positive impact of housing investment on the GDP as well. Some studies by Adams and Fuss (2010) shows similar result showed that the positive relationship between GDP and property prices and it was supported by theoretical equilibrium models. On the other hand, other researchers (Pour, Khani, Zamanian and Barghandan, 2013) found different result indicates that GDP is negatively related to the property price. As a result, different country will have difference trend of relationship between GDP and property price. According to Dumicic, Casniand Petra (2012), Croatia which is an Eastern European country shows that the GDP and inflation will be the main drivers in the fluctuation in property prices.

2.1.3 Inflation (INF)

Inflation is typically a broad measure or the rate of increase in prices at a given period of time in a country. According to Ceyda (2010), inflation represents the value of the relevant of goods and services and is used to determine the level of economic stability of host country. A body of literature finds that inflation significantly impact property prices in the short term and long term (Duan, 2007). Thus, unbalanced increase in prices will reduce the purchasing power of consumers in an inflationary environment and this lead to an erosion of real

income which is the single biggest cost of inflation. Inflation also distorts purchasing power over time especially during the 1980s, Yukio Noguchi (1994) highlighted the extraordinary land price inflation in the Tokyo and Osaka areas have substantially reduce the house-purchasing power of wage income.

Some researchers also argue that property price such as land price inflation was caused by the structural changes in the Japanese economy especially the application of new economic activities in Tokyo during 1980s. On the other hand, inflation rate can indicate the purchasing power of consumers on goods and services for a country's economy. Prior studies discuss whether property prices should be considered in the inflation index. For example, Alchian and Klein (1973) argued that the correct inflation index should encompass asset prices because asset prices review the current price and future consumption. Furthermore, Kent and Lowe (1997) indicate that property price inflation could lead to an increase to appreciation expectation regarding future product and services prices. Shiratsuka (1999) studied that property prices are the Grange cause of inflation whereas Chen, Kontonikas and Montagnoli (2012) documented property price is extremely correlated with future consumption price variation.

Based on the study by Qiu (2011), he found that property sales price index such as housing price causes the Consumer Price Index (CPI) due to Granger by using quarterly data from property sales price index and the CPI during the period of 1998 to 2010. It is very important to be control by the government and central bank because the level of inflation rate will directly influence the country economy condition. For example, higher inflation rate brought a sign of macroeconomic imbalances and will lead to dawdling of economic growth whereas lower inflation rate will cause the decrease in economic growth. As a result, this can be shows that inflation rate become one of the main concerns for government and central bank in order to maintain the stability of economic growth for a country. According to Frappaand Mesonnier (2010), there is strong relationship exists between the impact of inflation and the real payments on long term fixed-rate mortgage. The financing mortgage will decreases will cause an increase in property price if the inflation happens. Hence, current financing conditions will influence the level of inflation which directly impact on the

housing demand so it is common for households to reduce their risks by investing in property other than financial instrument. This is because high inflation condition able to attract investors by level of uncertainty and this will leads to increase in house price. Zainuddin (2010) also found that a positive relationship between inflation and property price in Malaysia.

Moreover, Rogers (2001) revealed that price level and inflation rate in Europe in year 1999 were negative correlated. It mentioned that inflation will happen in certain country that have lower price initially when levels of price are not similar across the euro area. Similarly with the result above, Ong (2013) investigate the macroeconomic variables of property in Malaysia especially inflation rate is not a significant determinant for property price during the period of 2000 until end of 2012. Meanwhile, Ong (2013) observed there is no significant relationship between inflation and property prices in Malaysia. Due to the period of 10 years studied by Ong, different results have been figured out as well as the study also use the similar measurement which is CPI . Therefore, different level in inflation is quite important economically explained by the price level coverage. Tsatsaronis and Zhu (2004) also have supported the negative impact hypothesis between inflation rate and property price.

In a nutshell, inflation rate shows different results which may have positive or negative affect and significant or insignificant towards property price. Due to researchers, one thing that is undeniable is inflation rate become one of the main factors affecting the fluctuation of property price especially low inflation will increase the standard of living and reduce the unemployment rate over a year-long period in Japan.

2.1.4 Interest Rate (IR)

In the US, interest rates are determined by the Federal Reserve (Fed). Generally, interest fall, there will be many borrowers to borrow money to buying property. Base on the Hewett (1930) state that is a significant relationship between the property price increases and interest. Result that the consumers have even more money to use or spend buying the necessarily basis, will cause the inflation is rising and economy growing. For the opposite, rising the interest rate users tend to keep can get the higher returns. With the less disposal earning to spend or use will due to increase in deposits, the economic is slowing and inflation is reduce. Base on the Brueggeman and Fisher (2008) say that property price and interest rate have a very strong association. According to the Brueggeman and Fisher (2008) interest rates contain the demand and supply for loanable funds as the economy enlarge and Federal Reserve policy in the course of its administration of interest rates. Mortgage loan funds is a part market for funds borrowed, supplying of property is rely on supply and demand for loanable funds. However, interest rates and property income can be support the debt interest payments are important in real property investment.

According to the Shiller (2007) state that Gordon Growth Model cannot clarify the relation among the interest rates and property price. Shiller's analysis of property does not carry out any formal analysis and also do not take into account whether the movement of the lease or mortgage market trends.

2.1.5 Unemployment Rate (UR)

Unemployment rate is related to economic growth, while unemployment rate is higher, fewer people are afford to buy a house will reduce the level of demand for residential property. While job growth is important, the quality of employment and wages and salaries earned in the job is also important. According to the Brueggeman and Fisher (2008), dispute that the relationship between property prices and unemployment rate shows a very strong relationship. Smith and

Tesarek (1991) studied the effect of the decline in property activity and found that the indicators for employment growth rate decreases.

Blanchflower and Oswald (2013) resume labor mobility and homeownership rates and show of negative external property market in the labor market. They argue that the increase in homeownership rates have an impact on the labor movement and led to increased unemployment. When unemployment is high, gross domestic product is not created to its full potential, so that national economy will bad. Unemployment and employment is macroeconomic factors that influence demand in the property market. The lowest prices in the property market is means the high rate unemployment.

2.2 Review of Relevant Theoretical Models

2.2.1 Property Price

2.2.1.1 Wealth Effect Model

Wealth effect refer to the previous evidence shows that consumers tend to increase their spending when stock portfolios increases due to escalating stock prices that make them feels more secure and wealthy. In another way, the wealth effect can be defined as the psychological effect of property value increases during a bull market on spending patterns. Therefore, changes in the property prices can affect other parts of the economy especially the wealth effect able to increase the economy growth of a nation during bull markets. According to Karl, John and Robert (2005), they found that changes in property prices are related with changes in national consumption. As a result, appropriate regression and the coefficient need to carry out to measure the wealth effect so that the causal effect of independent changes in wealth upon consumption behavior.

Case, Shiller and Quigley (2005) stated that an increase in property price will

cause the households increase their spending but there is no significant decrease in consumption when house prices decline. Due to this situation, it is necessary to provides data on expenditure of individual households before and after in order to set apart the pure housing wealth effect. It can be concluded that those household who on property react to changes in property price with changes in consumption within a couple of years by using the information on individual households in Consumer Expenditure Survey (Dynan and Maki, 2001). Empirical analysis suggests that wealth effect may reduce the private consumption growth due to the decline in the property price. There is every reason to expect that household behavior will affect the changes in housing wealth as well as the differentials between the tendency to consume out of stock market wealth and housing wealth. Ando and Modigliani (1963) largely used various measures of wealth that underline the stock market.

2.2.1.2 Neighbourhood Effect Theory

Krupka and Nooman (2009) highlighted the neighborhood effect become of a complicated interaction between housing supply, residential choice and the effect of a metropolitan system on its component parts. Jenks and Mayer (1990) stated that the neighborhood effect is defined as the independent causal effect of neighborhood. In order to explore the nature of demand for neighborhood preferences of households, the research will examine the spatial variations in the property values and seek explanation through neighborhood attributes (Aluko, 2011). Besides that, Rosen (1974) further discussed that housing properties can be divided into three characteristics such as location, neighborhood and structural. Hence, social interaction theory also stated the reason how neighborhood characteristics will influence property prices. There are some arguments occurs between Liu and Li (2014) and Xu and Chen (2012) about whether there is social classification in urban communities but pay little to the neighborhood effect.

Furthermore, Ioannides (2010) studied that neighbors will influence the behavior of maintenance and valuations of individual on their properties. This researcher also states that real estate or property prices tend to be affected by externalities

more strongly compared to other economic goods and services due to its physical immobility. This can be supported by Appraisal Institute (2008) as the notion of externalities indicates that external factors can either have positive or negative relationship on its property prices in real estate parlance. Wilson (1987), Jencks and Mayer (1990) also found that an extensive evaluation of existing research on the causes of rising in the neighborhood poverty. After the publication of Wilson (1987), there is a sharply increase on the neighborhood effects due to the latter articles that provided the reason towards the level of neighborhood effects will rises in the 1990s.

2.2.1.3 Domino Effect Theory

Domino effect theory can be defined as the cumulative effects that occur from a chain of undesirable events with severe consequences (Kardell and Loof, 2014).In another way, domino effect typically refers to any changes in behavior will activate a chain reaction that may influence a shift in related behaviors as well. Domino effects categorize into two types which are internal and external domino effects. Internal domino effect refers to the escalation of accident that are happen within the boundaries of an industry whereas external domino effect refers to the escalation that are happen outside the boundaries. For instance, it was very huge business and also the stepping stone for Domino's into Asia as Japan became one of the top 10 markets outside the United States for domino effect.

Based on the studies by Ho, Ma and Haurin (2008), they argued that shocks occur in property market are transmitted through the hierarchy of quality tiers within a property market due to the forecast for the value of property price. They also indicate that the shock in wealth to the property market result in domino effects in price and transactions will increase the transactions of market for both low tier and high tier. Thus, it is important to have a healthy property market because the domino effect will probably affect the property prices as the implications of continued rising prices will cause the residents stopped buying homes. Domino effect of widespread mortgage defaults was resulted from the reduction in property price index and the peak of property market (Choudhury, 2014).

2.2.1.4 Life Cycle Model

The theory of life cycle was first introduced by Franco Modigliani and his student Richard Brumberg in the 1950s to explain about the consumption in the fundamental of how people spend at each stage of life with the limited resource available (Modigliani and Brumberg, 1954). The life cycle model refers to the wealth of the country in which individuals had save little amount of money since they are younger and become rich before retirement. According to Deaton (2005), the length of retirement span affected the wealth of the country. The life cycle model is assumed that the life time resources are directly proportional to consumption. A property life cycle classify into two segments which is the turnover process and the periodic tenancy. The turnover process refers to the time period in which tenants do not occupy a property which became a common term amongst property managers and real estate investors. For the periodic tenancy which refers to a notification given by tenancy to landlord that he or she wants to end the tenancy.

Yang (2006) highlighted that young people will plan to buy a house and other property during the young time and then they will start to focus on interest rate along the life cycle at retirement age. The reason for young people to buy a house is not only for investment purpose no matter the housing price rise or decline but also to save the life span risk in order to have a better life during retirement. According to Attanasio, Bottazzi, Lo, Nesheimand Wakefield (2012), the fluctuations of property price, income and interest rate lead the people to prefer own a house rather than to rent. In order to obtain extra income from investment, young people should be encouraged to sell their house at higher price during economic boom. Economic boom refers to the duration of rapid economic expansion resulting in lower unemployment, higher Gross Domestic Product (GDP) and rising property prices. At the same time, Japan rapidly became the second largest economy in world by the 1960s. Japan had risen from the World War II in order to achieve complete economic recovery.

2.2.1.5 Model of Property Supply and Demand

Property is one of the biggest assets for individuals, so this is why the age-based demographic group has an impact on demand for property. According to Saita, Shimizu and Watanabe (2015), which find that the rate of property ownership in Japan is likely to increase significantly from age 35 through 45, for this age group is more demand for property.

An estimation of property demand in Japan is the same as that proposed by Mankiw and Weil (1989), shows that demographic changes have an effect on fluctuations in property prices in the short run, where property supply are no elastic for changes in prices. However, in the long term demographic factors will not affect the price of property by increasing when supply of property in response to rising in demand.

For the assumptions identified that the property buyers is accordance with the affordability principle while the supplier property acting on the principles of a strong economy may show asymmetrical in the sense because property buyers do not optimizes inter temporally while the builders are doing, so effect demand and supply of property. Before buying consumer will compare prices of the identical product, consumer will buy the cheapest or low prices and quality products and willing to spend of time compare price to save a few money (Thaler and Sunstein, 2008).

If the property demand is downward sloping means that property price increases. So consumer will lower affordability to buy property, therefore encourage home buyers to purchase a smaller unit property to save a small portion of the income for incoming mortgage payments and vice versa for demand upward sloping.

2.2.1.6 Price Effect, Income Effect, and Substitution Effect Theory

2.2.1.6.1 Price Effect Theory

The effect of demographic changes on property prices has recently been restarted by Nishimura (2011) debate that in the late 1980s the Japanese property bubble and the fall apart in the early 1990s are very closely linked to demographic changes in Japan. According to Nishimura and Tak'ats (2012), state that theoretical model show that the demographic changes associated with property prices and demand for money. Increases the property price will cause the supply of property because investors only willing invest in sector high return.

Nishimura and Tak'ats (2012) by trial and error examine the relationship between macroeconomic changes and property prices using panel data for 21 countries, indicating between the two presences of a statistically significant correlation. For the change of property price are affected by the interest rates, unemployment, inflation and income.

2.2.1.6.2 Income Effect Theory

According to Mayo (1981), state that consumer makes property decisions based on their monthly income. The permanent income is the characteristics value related to human capital. However, the total income as imputed rent for owner and average current income and instrument as the fitted current income on human.

Disposable income is a proxy capability in the property stock. Property prices positively with disposable income means that higher earning means a increases demand for property, the stock reduction will lead to an increase in property prices (Barot and Yang, 2002). On the other hand, the income of human is the factor in determinant of property prices in the UK. Other than that, income is the most significant effect of property price.

2.2.1.6.3 Substitution Effect Theory

This the change in the relative price of property led to the substitution effect. Substitution effects occur when opportunity costs or prices vary. The substitution effect of price changes if alter in conduct resulting purely from changes in opportunity costs and not from changes in the income.

If the property prices higher will lead to increases value property endowments that will also cause income and substitution effects due to the relative price of property services increased and they take a loan through collateral constraints. Moreover, if someone is interested in understanding the effects of strictly linked together the basic model of income, and collateral substitution effects cancel, so that only remains of the endowment effect.

2.2.2 Gross Domestic Product

2.2.2.1 The Solow Growth Model

The Solow Growth model is an economy's potential growth rate by looking at capital accumulation and population growth to explain long run economic growth set within the economics structure or given the flexible prices and existing real factors of production. The Solow Growth model was developed independently by Robert Solow and Trevor Swan in 1956 and also is a dynamic general equilibrium model. Harrod-Domar model was introduced by Roy Harrod and Evsey Domar which known as the instruments for the economic growth built on the model that emphasized potential dysfunctional aspects of economic growth. On the other hand, the main reason of this model was not an appropriate way to start is due to the center of the Solow Growth model, the Harrod-Domar model is the neoclassical aggregate production function.

The Solow Growth model consists of important feature that is a simple and abstract representation of a complex economy. This model related to the

procedure of growth especially Gross Domestic Product of a nation through the different incomes, tastes and abilities of household and individuals. As a result, the Solow Growth model will construct a simple one-good economy through these complications with little reference to individual decisions. Therefore, the Solow Growth model also can be known as the Solow-Swan Neo-Classical Growth model which can be defined as an exogenous growth model based on different types of capital whereby Robert Solow separated factors in economic growth into increases in labor and capital inputs. The Solow Growth rate will influence the property price by considering the rate of economic growth for a country. For instance, if markets are working well and property prices are perfectly flexible, the economy will grow at the potential growth rate that will move the Solow Growth curve to the right which represents a higher real growth. According to David (2005), the Solow Growth model predicts that real per capita GDP will increase during the transition period even as the population continues to grow.

2.2.2.2 Income Approach Model

Income approach model can be defined as the market price of goods or services that used to determine the purchasing power and the financial status of business income. GDP can be measured by using the income approach that will reflect all of the profits and costs incurred in production through market price. According to McConneand Brue (2008), income approach is defined as the level of worker's compensation, income of a particular business, rent and tax of a produced goods and import level. In other words, the National Income and Product Accounts (NIPAs) also present the income approach to measuring GDP is based on the accounting reality that total income earned should be equivalent with the expenditures in an economy.

The income approach starts with the income earned such as rents, wages, interest and profit from the production of goods and services. At the same time, it can be expressed into gross domestic income (GDI) and personal income. Gross Domestic Income (GDI) is defined as:

$$GDI = L + R$$

GDI is the most comprehensive measure of nation's income generated by domestic factors of production that can be divided into two categories which is capital and labor. L represents the income generated by labor whereas R represents the income generated by capital. Personal income is the one predictor of future spending and is closely monitored as an indicator of economy activity. Personal income also can be explained as the income received in production especially proprietors' income, dividend income, compensation and interest. Brian (2015) highlighted that it is important to ensure that income measures in the NIPAs do not include profit or losses due to the changes in the property prices. This is because a change in the price of property does not represent income from production.

2.2.2.3 Expenditure Approach Model

GDP can be determined by the expenditure approach as the total of expenditure components especially consumption expenditure, gross capital formation and net exports. In the expenditure approach, GDP is estimated by adding up the market value of all domestic expenditures made on final goods and services in a year. Intermediate goods and services are not included in the expenditure approach to GDP because those are included in the market value of expenditures made on final goods and services as well as to avoid double counting and an exaggeration of the true market value of GDP.

According to David (2005), expenditure approach focuses on the uses of GDP across various economy sectors especially household sector, business sector, government sector and foreign sector. Hence, gross domestic expenditure (GDE) can be expressed into:

$$GDE \equiv C + I + G + NX$$

C is represents the expenditures of the household sector on consumption including imports whereas I is the expenditures of the business sector or investment. G is the expenditures by the government spending on goods and services and NX is represents the net exports which equal to exports (X) minus imports (M) of goods and services. Saiz (2010) examines the effect of the property price especially housing price variation move in a higher speed and county level measures of expenditures. Thus, this study also indicates that housing supply instrument separate plausibly exogenous changes in housing prices. It is important to use expenditure approach to estimate GDP in order revised estimates of balance of payments were incorporated in imports and exports of goods and services.

2.2.3 Inflation

2.2.3.1 Fisher Effect Theory

The Fisher effect is an economic theory which has been introduced by Irving Fisher that determines the relationship between inflation rate, real interest rate and nominal interest rate (John Boyd and Abu Jalal, 2012).On the other hand, Fisher basically argued that the real interest rate is the total of the nominal interest rate minus the expected inflation rate. Frappaand Mesonnier (2010) also supported that inflation rate represent one of an important indicator in affecting property price. Therefore, inflation can increase the property prices and this will lead to many potential buyers does not have afford to buy a property when inflation rate arise in a nation. Authorities implemented lower interest rate policy to increase the inflation rate due to the lower cost of borrowing that increased demand of money in economy. Hence, this means that only a slight rising in demand can cause a proportionally significant increase in property prices.

Fisher effect indicates there is a proportional relationship between the inflation rate and the nominal interest rate. As a result, the nominal interest rate will increase less than proportionally on private debt as inflation increases. Meanwhile,

the quantity theory of money is real and predictable based on the Fisher effect. This will lead to the changes in the money stock such as inflation and deflation which only have nominal economic effects but leave real unemployment, consumption and Gross Domestic Product (GDP) unaffected. For instance, Ceyda (2010) proved that Japan is the one country of nearly no economic growth with a long period due to deflation. Thus, inflation rate plays an important role in manipulating nominal interest rate which influenced by the money supply demand (Alvarez, Lucas and Weber, 2008).

2.2.3.2 Purchasing Power Parity Theory

Purchasing Power Parity can be said that is the respective prices of goods and services after converted into common currency is the only basis when choosing local and foreign goods under assumption of same price level. In economics, inflation will reduces the purchasing power of a nation's currency based on the general level of price of the goods and services. The theory of purchasing power parity (PPP) requires that movement of nominal exchange rates in order to equalize the price of goods and services across countries. Purchasing power parity (PPP) divided into two categories which is the relative version and the absolute version which know as law of one price. According to Kenneth (1996), law of one price states that equal price should be set for the same products among different countries once prices are converted to a common currency.

In order to ensure the purchasing power ratio between two countries remains constant, the relative PPP theory implies that an inverse changes in the nominal exchange rate able to differentiate the inflation rate between two countries are offset. Ong (2013) mentioned that the cost of raw materials will be increased during inflation period. In another way, a decrease in local inflation rate will increase its home currency based on the Purchasing Power Parity (PPP).Besides that, inflation rate can indicate the purchasing power of consumers on goods and services in a nation's economy. Thus, PPP are also an instrument to measure the size of economies and Japan become one of the largest economies on the basis of

each country's GDP as a percentage of total GDP among all countries (Paul and Francette, 2002).

2.2.3.3 Wage-Price Model

Blanchard, Cerutti and Summers (2015) introduced the modeling of wage-price dynamics where monopolistically competitive firms and employees face each other in the labor and product market. Wage-Price model which also known as wage-price spiral is a macroeconomic theory used to elaborate the spillover effects of nominal adjustments across product markets and labor. David (2016), highlighted that the Japanese economy has been stuck in a liquidity trap for more two decades now. This is because Japan's real GDP grew on average less than one percent per year and CPI inflation hovered around zero between 1992 and 2014 with prolonged periods of falling prices.

The wage-price model explains that an increase in wages will slightly increase disposable income for labor and this may lead to the rise in aggregate demand for goods and causing prices to move upward. The causality relationship between rising wages and rising price or the wage-price spiral deals with the causes and consequences of inflation will leads to higher production costs and further increase the pressure on prices which creating a conceptual spiral. According to Magda (2003), wage-price spiral does not produce a desirable relationship between output and real wage adjustments to demand shocks.

Furthermore, the varying degree of monopoly power between product markets and labor is likely to highlight asymmetry in real wage adjustments to demand shocks. As the level of monopoly power rise in the labor market, the larger is in the increase in the real wage during expansions and the smaller is the decrease during contractions. Wage guidelines were liberalized as workers and employers are given greater freedom for maximum compensation by increase the cost of living in wage negotiations. As a result, the changes in the cost of living will influence the wage price model reflected by the inflation rate as the wage guidelines give consideration to productivity and performance. Japan has long been known for its

life-time employment model as Japan has higher growth rate. However, major changes have taken place in Japan's labor market during the last two decades.

2.2.4 Interest Rate

2.2.4.1 Purchased and Prepayment Affordability Theory

These rule has long assert literature on the provision of loans (Weicher, 1977). From this relationship it shows that property prices are determined by the rate of mortgage interest, repayment of principal, the down payment, the disposable income of property buyers and property owners, and net flow potential property owner into the property market. In the long term that are assume the property prices were determined by the restoration fees of the property under the principle that property buyers and developers have an incentive to build a new property when the property prices exceed the cost of replacing.

Model behavior reimbursement is in the sense that the property buyer fails to acknowledge that inflation lowers the real value of outstanding payment. Therefore, is constant with the notion of money (Shafir, Diamondand Tversky, 1997).Thereby, property buyer are willing to the loan in the period lower inflation and lower interest rates rather than loan in the period of higher inflation and higher interest rate since mortgage loan spending of borrow are lower. Thus, the reimbursement model deviates from the conventional model property prices where property prices are determined solely by the purchaser or consumer "results between periods, the present value of rental services or property services, or the restoration fees of the property. The marginal rate of change is typically regarded as a positive function of earning and demographic variables in the short and long term (Gallin, 2006). For the measure of the cost of capital repayment model is the nominal mortgage interest rates after the current tax added principal repayments. According to the Buckley and Ermisch (1982) and also Himmelberg, Mayer and Sinai (2005) the current value of the property price according to conventional

stock assessment model where the underlying asset is the discounted value of future lease or services in property occupied by the owner. Therefore, property price is positive relationship rental value of the property and inversely relationship between the actual value costs minus of growth in the rental values. Model repayment is not only different from the purchaser or consumer "model optimization between the period and the present value model by assume that the property demand rely on interest rate after tax and principal repayment in short term while also making the property prices are determined by provide in the long term.

According to Hwang and Quigley (2006), interest rates maybe as part of a vast system of equation, while causation is frequently considered to occur from the impact on borrowing costs property of builders. Meen (2005) argue that the interest rate is probably the most important factor of property price elasticity of supply itself and may justify for example, "price elasticity has fallen to null in all area since the 1990s" not only in areas where the loudest planning control. Interest rate is examines the intersection or crossing of the demand and supply curve of capital. Classical theory omits the financial element in determining interest rates. It is pure theory that takes into account the importance of factors such as real-time priority and marginal productivity of capital. For this theory also omit consequence of investment of the level of revenue. The increase in interest rates that will bring a reduction in investment by making little profitable and decline of credit extended by commercial banks. This is because higher interest rates in the market will reduce investment in the actual property market, except for the investor is able to pass higher costs to buyers of actual property.

2.2.5 Unemployment Rate

2.2.5.1 Rural Urban Migration Urbanization Theory

The main causes for the expansion in urban population is migration of cities, international migration, and the reclassification or developing of the existing city boundaries to contain people who were previously classified as residing external the city area. The pattern of rural urban migration may in particular reflect and changes in the economic base of the city, and the age structure of the labor market. Other than that, rural urban migration also cause change in the social, political and economic situation in the region and the country and is influenced by economic factors in rural areas surrounding and distant, like the construction of the landowners, agricultural practices and general rural productivity.

However, increase in earning and education level of the rural population and speed up the migration phenomenon, bind with greater entry to urban areas, and will cause the certain increase in rural population seeking jobs in urban areas. And steady rising the level of urbanization would reflects the reality the size of the global income has grown up by a lot and also has changed from one allocate by a comparatively closed national. Trading blocs to one in which most nations have a more open economy and where production and services, and also including the monetary services, day by day integrated internationally level. This trend arise to be strengthening, reinforced mainly by a freer and quickly information and knowledge effect of new information technology. Technology has increased that already leading economic part and significance of urban areas around the world, which shows the growing significant of cities in the global economy.

Other cause to use the unemployment rate to capture the impact of regional labor markets on property prices is that unemployment is likely to complicate the movement of labor between regions. This narrowing of labor mobility between regions covered by Rabe and Taylor (2010) found that the unemployed are not likely to migrate to a location of employment is higher and wages is high, because

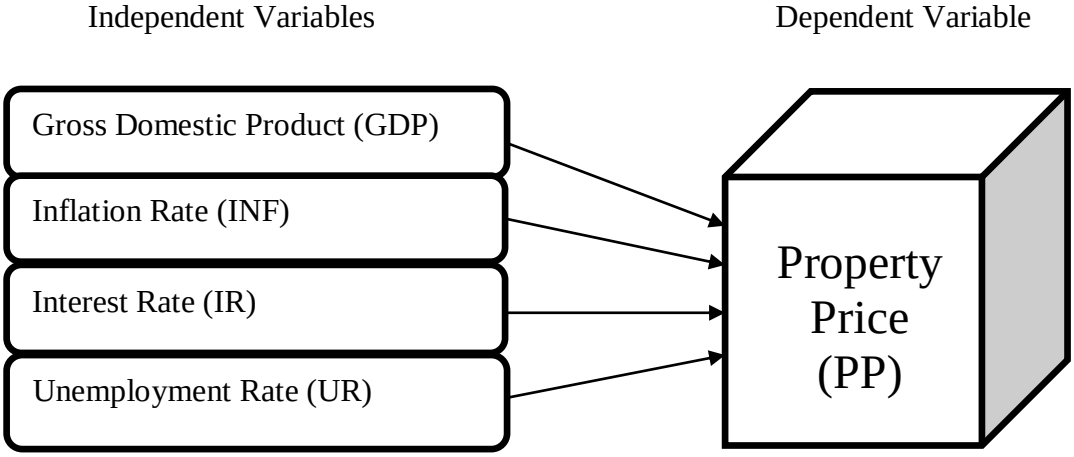
the jobless are less easily to make a step speculative. Factors that affect people to move to rural areas of urban centers may be a result of urban congestion, traffic, health problems, increase of unemployment, rising crime rates and property problems.

Thus, high unemployment levels also can function to dampen down the growth of actual salary, with clear consequences for property prices, and this theory is the cause for including the unemployed like a variable. Other than that, Cameron and Muellbauer (2001) state that higher wages might offset high unemployment or high property prices in developed countries. This suggests that the high unemployment rate is unlikely to affect the actual salary growth and unemployment rate link to the price of the property will be broken.

There are significant relationship between a country's level of development and urbanization human level, while the cities attack the development of their national economies, to transform society through a tremendous growth in the productivity of labor and promised to free the people from poverty, hunger, disease and early death. Moreover, rapid urban growth includes increasing unemployment, short of urban services, infrastructure burden and short of access to territory, finance and sufficient shelter existing, increasing violent crime and environmental degradation and sexually transmitted diseases. Despite increasing national output, the deterioration in the quality of life of the majority of the population that offset the interest of economic growth was often seen.

2.3 Proposed Theoretical Framework

Figure 2.1 Framework for the Macroeconomic Factors Affecting Movement of Japan's Property Price



Adapted from: Małgorzata and Radosław (2014). *Journal of Department of Land Management and Regional Development*: 149-166

Figure 2.1 show that four exogenous variables will affect the endogenous variables. The four independent variables which are Gross Domestic Product (GDP), inflation rate, interest rate and unemployment rate that would affect macroeconomic factors and movements of property price in Japan. According to Małgorzata and Radosław (2014). they use various variables to determine the property price in Japan. Based on the theoretical models applied for each independent variable, life cycle model is the most relevant that support all the theoretical models that may influence the dependent variables of property price in Japan. This is because life cycle model plays an important role which determines the wealth of the country due to their financial planning in early stage in order to increase the standard of living of citizen during retirement.

2.4 Conclusion

In conclusion, in chapter 2 each of the independent variable were examined by study investigators before. Each of the independent variables is also supported by the findings of previous researchers. This study will focus on the macroeconomic factors and movements of property price in Japan from period year 1993quarter 1 to year 2015 quarter 4, that are includes of quarterly data have 92 observations. Form chapter 2.3 Proposed Theoretical Framework a conceptual framework shows a clearer picture of the relationship between property price in Japan and the Gross Domestic Product (GDP), Inflation Rate (INF), Interest Rate (IR), and Unemployment Rate (UR).

CHAPTER 3: METHODOLOGY

3.0 Introduction

In this chapter, this study essentially aimed to dictate the relationship between the movements of property price in Japan and its macroeconomic variables. Hence, this condition is significance to have a perfect designed and planned forthe research methodology that includes macroeconomic variables in order to boost the degree of the accuracy or correctness and provided an extraordinary contribution to the study for this research. Therefore, this chapter comprises of the research design, data collection method, sampling techniques, data processing, and data analysis methods to clarify the results of the research. Through the research process, this study attempts to satisfy the primary objective which is to ascertain the relationship between of the Independent Variables (Gross Domestic Product, Inflation Rate, Interest Rate, and Unemployment Rate) and the Dependent Variable (Property Price).

3.1 Research Design

The study is applied of research design by quantitative approach. Three major purposes of research design, which is to assemble answers to the research of study questions, in order to produce a map for organizing a study by using a diagram and conscious toward that authority of the quantitative variation or systematic qualitative observations. Research designs can be divided into either qualitative or quantitative in nature. The research design helped the researcher on the research questions and planned an orderly based on the question toward the collection, inspection, and explanation of data. Moreover, research design also used to determine the methods of collection and utilization of data to ascertain the validity of the hypothesis (Greener, 2008). However, the foundation of the whole research work was creates by the research design, and it will help to accomplish the

specific task easily and in an organized way (Rajasekar, Philominathan and Chinnathambi, 2013). From the scope of this investigation, a quantitatively-based on the research design is found to be more suitable and appropriate way to boost the degree of accuracy or correctness and to produce an extraordinary contribution to the study. As a result, this research design is formed in order to quantitatively investigate and analyses the data collected.

3.2 Data Collection Method

Naturally, all the researchers are work with the data to inspect something that they wish to know and in order to find out. To collect the data, different data collection strategies been used by social scientists, such as experiments and quasi-experiments, surveys used structured questionnaires and lastly which is collecting a huge amount of data rather than small amount (Joopand Hennie, 2005). In addition, some fundamental part of the research design is means of gathering or collection the data. Therefore, it is principal when selecting the satisfactory independent and dependent variables. Thus, to study the determinants of movement of property price in Japan, this investigation is to evaluate the significant correlation between macroeconomics factors, which included Gross Domestic Product, Inflation Rate, Interest Rate, and Unemployment Rate with relation to the property price. This is measured by Japan property price which obtained from International House Price found in website. In addition, secondary data of independent variables are acquired from the OECD Economic Outlook Database. This study used the quarterly time series secondary data in order to carried out the regression model from the period of year 1993 Quarter 1 until year 2015 Quarter 4 with 92 observations.

Table 3.1: Sources and Explanation of Data **(by refer Appendix 3.2)**

VARIABLE	UNIT MEASUREMENT	SOURCE	DEFINITION
Gross Domestic Product (GDP)	In percentage, %	OECD Economic Outlook Database	The total amount of the entire thing manufactured by all the manufacturer or people and companies in the country, which is citizens or foreign-owned companies measured in percentage.
Inflation (INF)	In Index	OECD Economic Outlook Database	In general level, the prices for the goods and services is increases, will influence the purchasing power of the currency value to fall, and measured in percentage form.
Interest Rate (IR)	In percentage, %	OECD Economic Outlook Database	The amount billed, can be explained as the percentage of the principal, from a lender to a borrower used the assets is refer to interest rate.
Unemployment Rate (UR)	In percentage, %	OECD Economic Outlook Database	The unemployment rate is the share of the work forces that is unoccupied, measured in percentage form.
Property Price (PP)	In Index	Internatio-nal House Price Database	Annual change in property prices index is the property index.

3.2.1 Secondary Data

This study used secondary data as it can saves time and it is more accurate and effective compared to use the monotonous collection of primary data. Besides, there are six steps of market research process if the collection of data to be done primarily and it is higher collection cost. All of the exogenous variables (Gross Domestic Product, Inflation Rate, Interest Rate, and Unemployment Rate) are obtained directly from the OECD Economic Outlook Database, while the dependent variable (Property Price) is obtained from International House Price Databasewhich found in websites and is analyzed based on time-series data. The total 92 observations of this research, which sample size covers 23 years of quarterly data, from period of year 1993Quarter 1 until year 2015 Quarter 4 for both dependent and independent variables.

In this study of research, time series data is applied, because time-series data is more convenient in forecasting as historical data reliability is extraordinarily higher when the data ranges is wide. Besides, time series is a timeline of can be well explained as the data points which measured at uniform of the time intervals among the period of time. However, it also helped the researcher to understand the underlying forces foremost to a specific trends that in the time series data points.

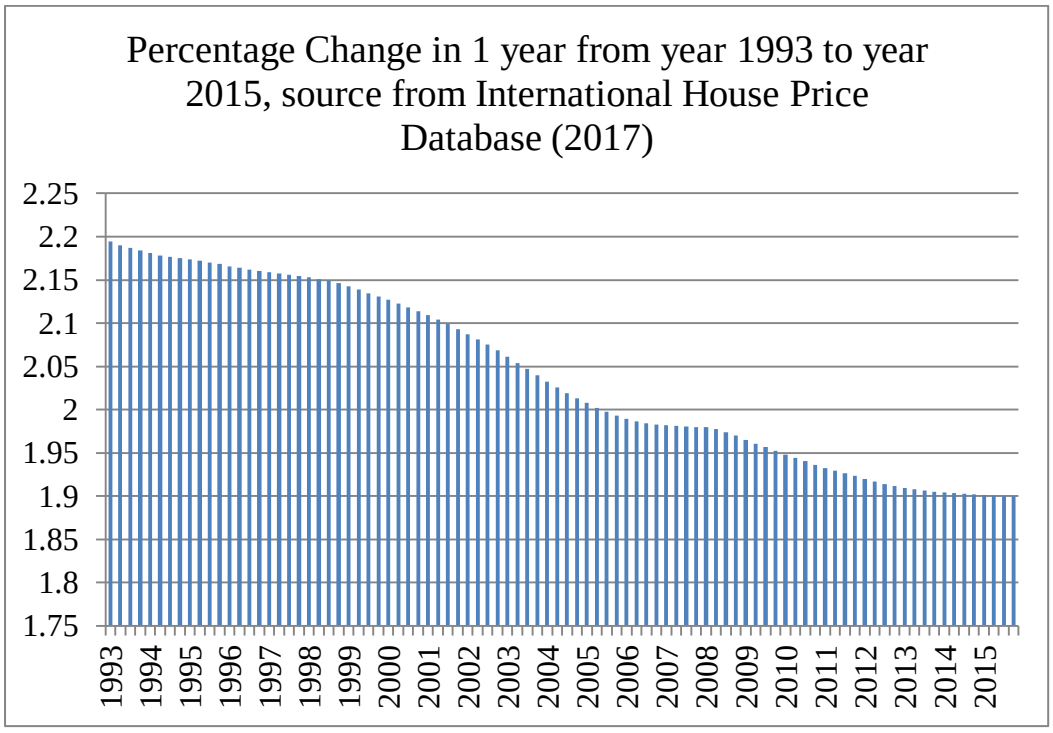
3.3 Sampling Design

3.3.1 Target Population

Target population also referred to target audience, which is the entire market of potential customers your nosiness identities (Neil Kokemuller, n.d). Target population also known as the whole group of individuals to which researchers are attentive in generalizing the final outcomes. Target population which is also known as the respondents that fulfill some of the specific benchmark set by the

researches. This study targets the Japan property price, and analyses the significant correlation between the property price and its macroeconomic variables in the Japan. This study also targets the entire Japanese citizens who are qualified to purchase a property. Thus, this study will be providing depth coverage of knowledge of what drives the property price in Japanese property market particularly.

Figure 3.1: Percentage Change in 1 year from year 1993 to year 2015



Adapted from: International House Price Database (2015). **(refer to the Appendix 3.1)**

Recently, according to Global Property Guide (2009), conclude that Japan's residential property price accelerated during year 2009, due to seriously influenced of the global financial crisis. Thus, in year 2006, prices of land increase by 208% in real terms, increase 8.1% in real terms in year 2007 and 1.1% in real terms in year 2008. In Japan, price of land is a significant proxy of the property prices. In addition, prices of land used to quantify the value of the residential property, due to the Japan is earthquake-prone country, therefore value of land is important than the value of house built in Japan (Global Property Guide, 2009).

Based on figure above, the bar chart showed that the percentage change from year 1993to year 2015 has been fluctuating and not stable, it is noticeable that the percentage change decreases from year 1993 to year 2007. On the other hand, Japanese are frightened that their annual income unable to cover the excessive property prices, because of the unpredictable trend of property prices change.

3.3.2 Sampling Technique

In this study, in order to use the results to examine the findings of this study of research, hence E-views 9.5 software will be used for getting experiential result, as it is most satisfactory in evaluating time-series data. Data analysis is significant in order to solve the problem, thus it is occur used to expose the problems that might exist in the model. The functions of E-views software such as analyzing time-series data, cross-sectional data, and also the panel data, thus due to its function offers, it is more suitable for this study.

For this study is to inspect the important association between property price and its macroeconomics variables, thus E-view 9.5 software will be used to perform the ordinary least square (OLS), Multicollinearity tests (Variance Inflating Factor, Tolerance and Correlation Analysis), Autoregressive Conditional Heteroscedasticity (ARCH) test, Breusch-Godfrey LM test, Ramsey RESET test and Jarque-Bera test.

Furthermore, in order to securing the empirical model of this study of research is free from the econometric problems, such as multicollinearity problems among independent variables, which means correlated among independent variables, autocorrelation and heteroscedasticity problems among error terms, error terms have normal distribution and misspecification in the model. It discover these problem with diagnostic checking such as Variance Inflation Factor, Tolerance, Correlation Analysis, Autoregressive Conditional Heteroscedasticity (ARCH) test, Breusch-Godfrey LM test, Ramsey RESET test and Jarque-Bera test. Hence, E-

views would be profitable and advantageous in identifying the factors and ensuring the regression model is avoid and free from the econometric problems.

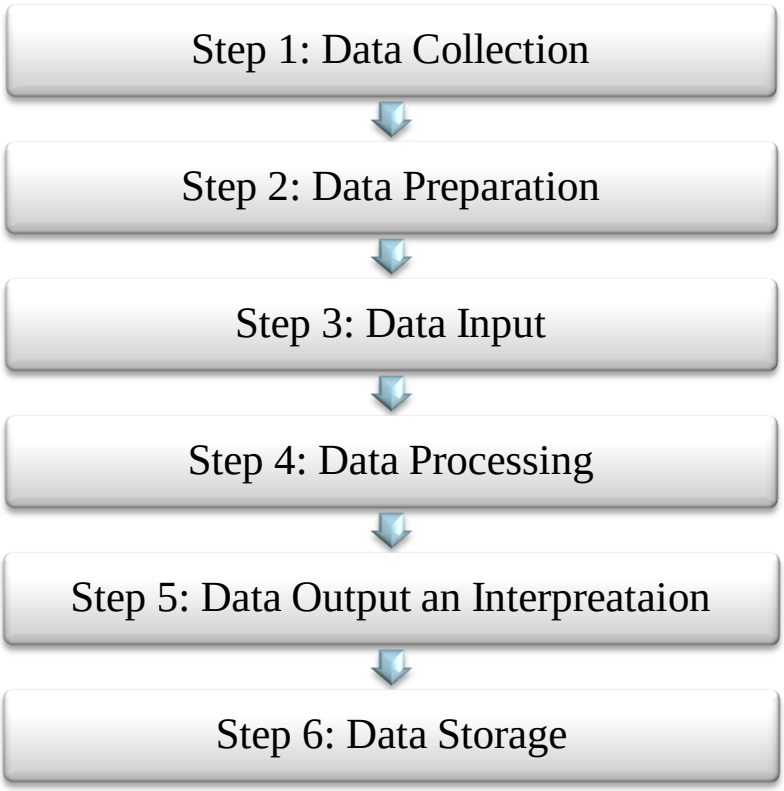
3.4 Research Instrument

This study of research employ E-views 9.5 software to examine the data collected from the International House Price Databasesubscribed using internet website, whereas secondary data of independent variables are acquired from the OECD Economic Outlook Database. On the other hand, in order to identify the problems that might occur in the model, therefore data analysis is very important. E-views software with a simple steps, as it is easy to learn and comprehensible within the short period. In academics, enterprise, and government, for time series data analysis, E-views 9.5 software is the most commonly used by the researcher to get the empirical results. Moreover, E-views software has major advantage which is, it allowed the person to save the empirical outcome and also to redeem these outcome for the supplementary investigation. In addition, another function of the E-views software, which is E-views able to construct graphs and bar charts that, can distinctly manifest the trend and outcome.

3.5 Data Processing

Based on Rudo (2013), the author carried out the theory and mentioned that the conversion from initially of raw data to relevant and useful information through six steps of data processing cycle, this is known as simple data processing. In addition, data is operated to the manufacture the results that leading to an intention of a problem or betterment of the current condition. In order to effectively excerpt the pertinent and functional information from the data collection, the six steps of data processing cycle that is foremost steps must involve in data collection. The six steps of the data processing cycle composed of the data collection, data preparation, data input, data processing, data output and interpretation, and the data storage.

Figure 3.2 Data Processing Cycle



Step 1: Data Collection

The data of independent variables are collected from the data stream of OECD Economic Outlook Database and the dependent variable is composed from the International House Price Database which is internet websites. Furthermore, for this study need to composed data and information, such as journal articles from UTAR Library Database (OPAC), Social Science Research Network (SSRN) and Google Scholar.

Step 2: Data Preparation

Preparation is about the manufactured and created a dataset from collected data to be used for further inspection and processing process. In order to avoid producing misleading results, thus data needs to be cautiously broadcast and screened for possible problems. Hence, collected data cannot be processed and must be checked for precision. Thus, it can ensure the data with high quality and therefore the results contributed will be more reliable and dependable.

Step 3: Data Input

Collected the data from various sources, and ensuring the model has no problem, inspect the data by using the E-views 9.5 software to run the OLS, in order to acquire the empirical results. Therefore, T-test, F-test can be run and can be acquired. Empirical results is free from the econometric problems, such as multicollinearity problems among independent variables, autocorrelation problems and heteroscedasticity problems among the error terms, which error terms have normal distribution and misspecification in the model.

Step 4: Data Processing

By using E-views 9.5 software, miscellaneous tests can be supervised including testing for overall significance of model (F-test), testing for each individual variables (T-test), testing for high pair-wise correlation approach, Breausch-Godfrey serial correlation LM test, Autoregressive Conditional Heteroscedasticity (ARCH) test, Ramsey RESET test and normality residuals test (Jarque-Bera Test).

Step 5: Data Output and Interpretation

Data processing's output is showed to the readers in miscellaneous report formats, such as tables, graphs and figures. Besides, to formulate the relevant and useful information to the readers, and this will supervise for the future decision or for the future researchers, therefore the data output needs to be clarified and presented clearly.

Step 6: Data Storage

In order for high-speed access and retrieval of the processed information, thus the user must store the data, commandment and information in computers for future used purpose. This also allows it to be passed on to the next stage directly when there is a needed.

3.6 Multiple Regression Model

Multiple Regression Models can be defined as the one type of regression analysis that used to examine the relationship between dependent variable and independent variables. For more than one independent variable, the process is known as multiple linear regressions. According to Shakil (2008), multiple linear regressions called as a variable technique to determine the correlation between an endogenous variable and some combination of two or more exogenous variables. It also is the one of the most widely used statistical techniques in research. In addition, linear regression was the first type of regression model as well as the variables are measured on interval or ratio scale and the relationships among the variables are linear and additive. Hence, multiple regression models determine the relationships between variables for both of the magnitude and statistical significance.

Furthermore, Gujarati and Porter (2009) highlighted that there is an error term existed in the regression model that used to capture the factors that cannot be

explained by independent variables, omitted variables, randomness of human behaviors and errors of measurement in dependent variable. David A Freedman (2005) indicates that error term represents the effect of the variables that were omitted from the equation in a regression model. In another way, error term can be known as residual or disturbance term which refers to variable in a statistical model that provides an explanation for the differences of actual results and expected results between dependent variable and independent variables at a particular time. There are few assumptions on error terms which are independent variables must be uncorrelated with error term, homoscedasticity, the normality of error term or error terms must be normally distributed and linear in the parameters. Multiple regression models will be formed in this study in order to determine the relationship between property price index with Gross Domestic Product, Inflation Rate, Interest Rate, and Unemployment Rate.

Economic Function:

PP = f (Gross Domestic Product, Inflation Rate, Interest Rate, Unemployment Rate)

Economic Model:

$\text{Log PP}_t = \beta_0 + \log \beta_1 \text{GDP}_t + \beta_2 INF_t + \beta_3 IR_t + \beta_4 UR_t + \varepsilon_t$

N = 92 observations t = 1993 Quarter 1 – 2015 Quarter 4

Where,

PPI_t = Property Price in Japan from year 1993 Quarter 1 to year 2015 Quarter 4 (Index)

GDP_t = Gross Domestic Product in Japan from year 1993 Quarter 1 to year 2015 Quarter 4 (%)

INF_t = Inflation Rate in Japan from year 1993 Quarter 1 to year 2015 Quarter 4 (Index)

IR_t = Interest Rate in Japan from year 1993 Quarter 1 to year 2015 Quarter 4 (%)

UR_t = Unemployment Rate in Japan from year 1993 Quarter 1 to year 2015 Quarter 4 (%)

This study uses logarithm to standardize the unit of measurement for all variables into percentage form and avoid outliers existed in the model. As a result, there will not be huge gap in the data.

3.7 Data Analysis

Data analysis is the process of evaluating the data by applying different types of tests so that to make sure the whole model and individual independents variables are significant. Thus, there are several tests will be carried out to investigate the relationship between GDP, INF, IR and UR to achieve the objectives of this study.

Those tests are Ordinary Least Squares (OLS) and diagnostic checking including Multicollinearity Test, Heteroscedasticity, Autocorrelation, Normality Test and Model Specification.

3.7.1 Ordinary Least Square (OLS)

Ordinary Least Squares (OLS) is a method for estimating the unknown parameters in a linear regression model and also provides the Best Linear Unbiased Estimator (BLUE). Hence, OLS helps to explore the association between dependent variable and independent variables. Based on the Gauss-Markov theorem, the fully ideal conditions of OLS have to be met in order to ensure OLS to be good estimate which consists of BLUE, unbiased and efficient (Gujarati, 2012). Thus, OLS can only be used when all of the assumptions of Classical Normal Linear Regression Model (CNLRM) are fulfilled, as stated below:

1. Linear in the parameters in regression model.
2. The values of X are independent of the error terms.
3. Zero mean value of error terms.
4. Zero covariance between independent variables and error terms.
5. The number of observation (n) must be greater than the number of parameters to be estimated (k).
6. There must be variation in the values of the X variables.
7. The normality of error term.
8. No exact linear relationship between X variables or no multicollinearity between independent variables.
9. Homoscedasticity among the error terms.
10. No autocorrelation between error terms.
11. There is no specification bias.

The OLS estimators' alpha and beta are BLUE if all Gauss-Markov assumptions are met. The best linear unbiased estimator (BLUE) states in a linear regression model will be met in which the errors are uncorrelated and have expectation zero. It also can be defined as the following:

a) Best represents the estimators have minimum variance.
b) Linear represents that linear in parameters.
c) Unbiased represents the expected values are approximately or equal to the true values.
d) Efficient Estimator represents the estimators are correct, accurate and reliable.

Misleading results are typically exists due to multicollinearity problem, heteroscedasticity, autocorrelation, normality and model specification assumptiondoes not meet. As a result, this study of research employ E-views 9.5 software to perform diagnostic checking to prevent these econometric problems from stemming.

This study will form a regression model on property price with Gross Domestic Product, Inflation Rate, Interest Rate, and Unemployment Rate by using OLS in

E-views 9.5 software.

3.7.1.1 T-test Statistics

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

H_1: $\beta_1 \neq 0, \beta_2 \neq 0, \beta_3 \neq 0, \beta_4 \neq 0$ (significant)

Where,

β_1 = Gross Domestic Product (GDP)

β_2 = Inflation Rate (INF)

β_3 = Interest Rate (IR)

β_4 = Unemployment Rate (UR)

The t-test statistics is first introduced by William Sealy Gosset which is one type of inferential statistics that is used to analyze whether there is a significant difference between two populations. In another way, the t-statistic can be known as the t-distribution which used to determine the probability of difference between two groups. According to Ludbrook and Dudley (1998), a t-test usually used when sample sizes are small (n<30) and the variances of two normal distributions are not known. The purpose of using smaller sample size is because small sample size shows the differences between estimated mean and standard deviation with actual mean and standard deviation (Student's t-test, n.d.).

Besides that, the t-test is a form of hypothesis testing used to conduct a comparison between two groups that are statistically difference from each other. The t-test can be classified into two types especially paired t test which can be used when the two groups under comparison are dependent on each other and the independent t test which is usually used when the two groups under comparison are independent on each other (Kim, 2015). In any statistical hypothesis testing situation, it is a t-test if the test statistic follows a Student's t-test distribution under null hypothesis. The null hypothesis of t-test means there is no relationship

between dependent variable and independent variables whereas the alternative hypothesis means that independent variable is statistically important to dependent variable. If t-test statistics exceeds the critical value, it indicated that the means are significantly different at the level of probability. For instance, it can be concluded to reject the null hypothesis if the p-value is less than the significance level of 5%. Otherwise, null hypotheses will not be rejected in this study.

Therefore, this research will examine the independent variables (Gross Domestic Product, Inflation Rate, Interest Rate, and Unemployment Rate) individually to determine their individual significances on property price index in Japan by using t-test.

3.7.1.2 F-test Statistics

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

H_1: $\beta_i \neq 0$, at least of β_i is different from zero (significant to Y), where i = 1,2,3,4

Where,

Y = Property Price in Japan (PPI)

β_1 = Gross Domestic Product (GDP)

β_2 = Inflation Rate (INF)

β_3 = Interest Rate (IR)

β_4 = Unemployment Rate (UR)

F-test statistic introduced by Sir Ronald Fisher that is used to assess the variances of two groups is equivalent to each other. It also considered as the value you get when an analysis of variance (ANOVA) test runs or regression analysis will be carried out if the means between two populations are significantly different. The ANOVA F-test can be used to control one or more independent variables as well as to examine the equality of means. The population variance that accounts for the degree of freedom will be estimated in F statistics based on the mean squares. The

variability of these estimates can be calculated by degree of freedom and determined by the number of observations and the number of parameters in this research.

Furthermore, F-test also helps to examine the significance of the whole model and the sample size for F-test statistics must be large enough as well as the population must have the same variance. In general, the F-statistic is the test statistic for F-tests that can be represents the ratio of two quantities that are expected to be roughly equal under the null hypothesis. Null hypothesis means that none of the independent variables is significant to dependent variable whereas alternative hypothesis indicated that at least one of the independent variables is significant to dependent variable. For instance, it can be concluded to reject the null hypothesis if F-test statistics is larger than critical value. In another way, if p is less than the significance level of 5%, then the null hypothesis will be rejected. Otherwise, do not reject null hypotheses in this study.

Hence, this research will examine the significance of the whole model on the determinants of movement of property price in Japan by using F-test.

3.7.2 Diagnostic checking

3.7.2.1 Multicollinearity

Multicollinearity happens when relationship between 2 or more regresses variables and when all regression variables are greater influencing with each other. If multicollinearity occur, it is hard to explain which independent variables influencing the dependent variable. According to Neter, Wasserman and Kutner (1989) (1) difference parameter estimates may be illogical big, (2) The estimated parameter not necessarily obvious, (3) the estimated parameter have a sign to distinguish from what was expectation (Efron, 2004). There are few ways to detect the multicollinearity problem.

3.7.2.1.1 High R^2 but few significant of independent variables

If the model have fulfill high R^2 but few significant of regression variables that model maybe have multicollinearity problem.

3.7.2.1.2 High pair-wise correlation among between 2 independent variables.

The pair-wise correlations between the independent variables might be high. The rule is correlations between the independent variables are more than 0.8 then multicollinearity problem may be presence.

3.7.2.1.3 Variance Inflation Factor (VIF)

$$\boldsymbol{VIF} = \frac{\mathbf{1}}{\mathbf{1} + R^2}$$

The large the value of variance inflation factor VIF, means serious multicollinearity problem. If the variance inflation factor (VIF) has higher than 10, this means that model have multicollinearity problem (Gujarati, 2004).

3.7.2.1.4 Tolerance (TOL)

$$\boldsymbol{TOL} = \frac{\mathbf{1}}{\boldsymbol{VIF}}$$

Tolerance (TOL) is inverse relations with variance inflation factor (VIF) method. Tolerance (TOL) has close to 0 means there is little multicollinearity problem, if the value is close to 0 value means that maybe have threat multicollinearity.

3.7.2.2 Heteroscedasticity

H_0: Homoscedasticity among the error terms

H_1:Heteroscedasticity among the error terms

Heteroscedasticity happen when variance of the error term different across the observation. According to Williams (2015), heteroscedasticity has recalled the OLS model makes the assumption that:

$$\text{var}\ (u_i|X) = \sigma^2 \text{ and}$$
$$\text{cov}\ (u_i u_j|X) = 0 \text{ for } i \neq j$$

Thus, the error term are constant variance are call Homoscedasticity. If the error term is not constant variance, they call heteroscedasticity. Errors may rise as the value of regression variable (IV) increases. Measurement error can be cause the heteroscedasticity problem. Consequences of heteroscedasticity assumption that heteroscedasticity no cause the biased parameter estimates. Thus, OLS estimates are no longer to BLUE, this is because unbiased estimators OLS variance does not give the estimate with the minimum variance, and will lead to significance test either too high or too low if they are heteroscedasticity. So that, lead to bias in the confidence interval and test statistics. Thus, the different methods to detect the heteroscedasticity, for example Autoregressive Conditional Heteroscedasticity (ARCH) test, Breusch-Pagan-Godfrey test, White test, Glejser test, Goldfeld-Quand test and Park test.

3.7.2.2.1Autoregressive Conditional Heteroscedasticity (ARCH) Test

Traditional econometric models assume constant variance of the forecast period. The general assumption is implausible, a new stochastic process known as autoregressive conditional heteroscedasticity (ARCH) introduced by Engle (1982).This is a zero mean, serial un-correlation process with no-constant conditional in the past, but the constant unconditionally variances.

For ARCH model:

$$Y_t = \beta_0 + \beta_1 X_t + u_t$$
$$u_t \sim N(0, \alpha_0 + \alpha_1 u_{t-1}^2)$$

This shows that the error term is normal with zero mean and conditional variance depends on the length squared error left a period of time
ARCH model also specifies an equation for the conditional variance:

$$\sigma_t^2 = \text{var}(u_t \backslash u_{t-1}, u_{t-2} \ldots.) = E(u_t^2 \backslash u_{t-1}, u_{t-2})$$

To ensure that $\sigma_t^2 \geq 0$, we need ' ≥ 0, $\alpha \geq 0$.Where the σ_t^2 conditional variance error term.

For an ARCH (1) model:

$$\sigma_t^2 = \alpha_0 + \alpha_1 u_{t-1}^2$$

The variance of $u_t$must be positive, we need $0 \leq \alpha_1 < 1$.This is one ARCH (1) model because it only consist a one lag squared error term, but it is maybe to spread this to any figure of lags. If there is such a q lags, it is called as a model ARCH (q).

3.7.2.3 Autocorrelation

H_0: No autocorrelation among the error terms

H_1: Autocorrelation among the error term

Autocorrelation is a characteristic data in which the correlation of a times series with the future and past value. Other than that, autocorrelation can be call as serial correlation or lagged correlation. This model predicts negative autocorrelation if the trader is a positive feedback drives exploitation patterns during periods of high volatility is high and positive pattern autocorrelation returns generated by traders negative feedback. (Kuttu, 2017) Thus, autocorrelation problem can be detected by Durbin-Watson (DW) statistic and Breusch-Godfrey Serial Correlation LM test.

3.7.2.3.1 Breusch-Godfrey Serial Correlation LM Test

To track for presence is the incident of autocorrelation model, Breusch-Godfrey LM test is used well than Durbin-Watson test and Durbin's h test. Because Durbin-Watson (DW) test has some limitations, example only provide inconclusive outcome and only used first order serial correlation. Other than that, Durbin's h test has lagged the dependent variable problem, and the Breusch-Godfrey LM test can be used for respect for higher order serial correlation when there is a lag dependent variable. By comparing the Breusch-Godfrey Serial Correlation LM test results of the p-values obtained with 5% of significance level. For the decision making is reject null hypothesis when the p-value is lesser than the 5% of significance level and this show there is autocorrelation problem in the model. Otherwise, do not reject null hypothesis that is no autocorrelation among the error terms.

3.7.2.4 Normality Test

H_0: Error terms are normally distributed

H_1: Error terms are not normally distributed

In statistics, normality test is used to examine a set of data that is a normal distribution model. In additional, this is to calculate how likely a random variable is underlying data set to be distributed normally. Assumption of normality is very important in the normality test, and it is unlikely to draw a precise statistical error, if the assumptions do not hold. With the large samples (> 30 or 40), the infringement of the normality assumption might not cause any major issue even the data is not normally distributed. We can just ignore the data distribution, when we have a hundreds sample size. Based on the Central Limit Theorem(CLT), the large samples were cause normal regardless of how the data is a random sample of any distribution will have a normally distribution. (Ghasemi and Zahediasl, 2012). For this study are dealing with large sample size of 92 observations. Thus, the normality test is less important for this study, as long as meet the assumptions to mean and variance-covariance structure of the test. However, this study still will run the following tests to ensure meet the normality assumption.

3.7.2.4.1 Jarque–Bera test

The Jarque–Bera (JB) also known as D'Agostino–Pearson or Bowman–Shenton test, which is a goodness-of-fit test that examines the sample data, has kurtosis and skewness that is same as a normal distribution (Gel and Gastwirth, 2008).

The Jarque-Bera test statistics is defined as:

$$JB = \frac{N}{6}\left(S^2 + \frac{(K-3)^2}{24}\right)$$

Where *N* denotes the sample size, *S* denotes the sample skewness, and *K* denotes the sample kurtosis. The p-value is calculated using a table of distribution

quantiles.

In this study, normality test will be done by E-views 9.5. Null hypothesis indicates that the error terms have a normally distributed, while the alternative hypothesis indicates that the error terms are not normal distributed. Therefore, if the p-value is less than the significance level of 5% or the test statistics is greater than critical value, then will reject the null hypothesis. Or else, the null hypothesis will not be rejected.

3.7.2.5 Model Specification

H_0: Model is precisely specified
H_1: Model is not precisely specified

A model specification is to examine of the exogenous variables should be included or excluded from regression model. The regression model specification should be based on theoretical rather than empirical or methodology considerations. Specification model is one of the most important diagnostic checking in data analysis. According to Gujarati (2012), model specification errors may be caused by the omission of relevant variables, the inclusion of needless variables, and using the wrong function form and measurement error. Serious model specification can lead to biased estimates and multicollinearity, heteroscedasticity and autocorrelation problem. Model specification can be detected through the Ramsey RESET test.

3.7.2.5.1 Ramsey RESET Test

Ramsey Regression Equation Specification Error Test (RESET) is a general test for the linear regression model. Furthermore, it tests whether a non-linear combination of the fitted value helps explain the variable of the reaction. The reasons are when the non-linear combination of descriptive variable has any power in explaining the reaction variables. Therefore, this model is mis-specified.

In this study, Ramsey RESET test will be done by E-views 9.5. Null hypothesis indicates that the model is precisely specified, while the alternative hypothesis indicates that the model is not precisely specified. Hence, if the p-value is less than the significance level of 5% or the F-test statistics are greater than the critical value, and then will reject the null hypothesis. Or else, the null hypothesis will not be rejected.

CHAPTER 4: DATA ANALYSIS

4.0 Introduction

As discussed in chapter three, main method in this study is to judge and measure the property price in Japan from period year 1993 Quarter 1 to year 2015 Quarter 4, therefore Ordinary Least Square (OLS) regression has been chosen to evaluate the study. The analysis of this study consists of quarterly data of 92 observations. This research aims to quantify the important correlation between the macroeconomic factors and movements of the property price in Japan. Therefore, it is essential for the data collection to run, indicate and discussed the outcome of the Multiple Linear Regression model which are acquire from the E-views 9.5 software.

In chapter 4, this study will discuss about the methodologies of hypothesis testing including T-test and F-test, and diagnostic checking such as Multicollinearity, Heteroscedasticity, Autocorrelation, Model Specification and Normality test of the error term. In addition, the diagnostic checking is used to certify the approximate parameters which are unbiased, efficient and consistent. Apart from this, the model must be free of the econometric problems. Moreover, hypothesis testing is used to test the significances of Gross Domestic Product (GDP), Inflation Rate (INF), Interest Rate (IR), and Unemployment Rate (UR) on the property price in Japan.

Economic Model:

$$PPI_t = \beta_0 + \beta_1 GDP_t + \beta_2 INF_t + \beta_3 IR_t + \beta_4 UR_t + \varepsilon_t \quad \textbf{(Model 4.1)}$$

$$\text{Log } JPP_t = \beta_0 + \beta_1 GDP_t + \beta_2 \text{Log}INF_t + \beta_3 IR_t + \beta_4 UR_t + \varepsilon_t \quad \textbf{(Model 4.2)}$$

Estimated Economic Model:

$\text{Log } \widehat{PPI_t} = \widehat{\beta_0} + \widehat{\beta_1}\text{GDP}_t + \widehat{\beta_2}\text{LogINF}_t + \widehat{\beta_3}\text{IR}_t + \widehat{\beta_4}\text{UR}_t + \varepsilon_t$ **(Model 4.3)**

N = 92 Observations t = 1993 Quarter 1 – 2015 Quarter 4

Where,

PPIt= Housing Price Index in Japan from year 1993 Quarter 1 to year 2015 Quarter 4 (Index)

GDPt= Gross Domestic Product in Japan from year 1993 Quarter 1 to year 2015 Quarter 4 (%)

INFt= Inflation Rate in Malaysia from year 1993 Quarter 1 to year 2015 Quarter 4 (Index)

IRt= Interest Rate in Japan from year 1993 Quarter 1 to year 2015 Q4 (%)

URt= Unemployment Rate in Japan from year 1993 Quarter 1 to year 2015 Quarter 4 (%)

Property Price represents both of the property prices of Japan and the Inflation Rate (INF), both are measured in index point (PPI) and is also represents the dependent variable (DV) in this regression model of the study. Gross Domestic Product (GDP), Interest Rate (IR), and Unemployment Rate (UR) are the independent variables (IV) in the regression model of the study, where all are measured in the percentage forms. On the other hand, the diagnostic checking would also be carried out in this chapter is to measure the estimated regression model. Thus, any econometric problems that exist in the estimated model would then be solved by using the various methods and tests available such as the white test, Newey-West test and others Hypothesis Testing would also be conducted. This is to assure that whether the result is consistent with the previous researches and also supported with the theories.

4.1 Descriptive of the Empirical Models

Specific econometric models will be applied to demonstrate and examine the significant relationship between property price index with the movements of GDP, INF, IR, and UR in Japan from year 1993Quarter 1 to year 2015 Quarter 4.

The empirical model that was used to measure and examine the relationship earlier is stated as below:

Log $\widehat{PPIt}$ = $\widehat{\beta 0}$ + $\widehat{\beta 1}$GDPt+ $\widehat{\beta 2}$LogINFt +$\widehat{\beta 3}$ IRt + $\widehat{\beta 4}$URt+ εt **(Model 4.3)**

N = 92 Observations t = 1993 Quarter 1 – 2015 Quarter 4

Where,

PPIt= Housing Price Index in Japan from year 1993 Quarter 1 to year 2015 Quarter 4 (Index)

GDPt= Gross Domestic Product in Japan from year 1993 Quarter 1 to year 2015 Quarter 4 (%)

INFt= Inflation Rate in Malaysia from year 1993 Quarter 1 to year 2015 Quarter 4 (Index)

IRt= Interest Rate in Japan from year 1993 Quarter 1 to year 2015 Quarter 4 (%)

URt= Unemployment Rate in Japan from year 1993 Quarter 1 to year 2015 Quarter 4 (%)

Model 4.2 is the basic model, and Model 4.3 is the estimated models. Property price is forecasted by using the 4 exogenous variables (GDP, INF, IR, and UR). Three of the independent variables (GDP, IR, and UR) are measured in percentage form, whereas independent variable of INF is measured in index form. An error term indicated by ε *t*is installed into the equation to take into account of the random errors that would stem out upon testing.

4.2 Data and Descriptive Statistics

Table 4.1: Descriptive Statistics **(refer to Appendix 4.1)**

	PPI	GDP	INF	IR	UR
Mean	112.5482	0.2286	101.3753	1.7356	4.1543
Median	105.2715	0.3814	101.0101	1.4223	4.2000
Maximum	156.5789	2.2951	104.3253	4.7907	5.4333
Minimum	79.3804	-4.8345	99.2834	0.2867	2.3000
Std. Dev	26.1943	1.0200	1.3183	1.0952	0.7938
Skewness	0.2352	-1.4875	0.6073	1.3428	-0.2675
Kurtosis	-1.5181	5.7089	-0.7581	1.1773	-0.7752
Observations	92	92	92	92	92

For this study of the research, 92 observations and with the time-series of the quarterly data, are taken from the property price index which includes all types of the property in Japan from year 1993 Quarter 1 to year 2015 Quarter 4.

According to table 4.1 above, the outcome analysis that, average property price index in Japan is 112.5482. The maximum reading reached 156.5789 while the minimum reading is 79.3804. This result of the study has led to the large standard deviation of 26.1943 as the property price index. In addition, the standard deviation to be large is mainly can be due to the larger range of sampled data used in the study of the research. However, this does not raised an issue in the study. The median property price index is approximately 105.2715. Moreover, the skewness is 0.2352, the figures is more than zero therefore the property price index is skewed to the left. The data of property price index in Japan is less volatile because the Kurtosis is negative figure and also less than 3, which is only -1.5181.

In addition, the average GDP was 0.2286%. Highest reading peaked to 2.2951% and the lowest reading falls at negative value of -4.8345%. Apart from that, the median of GDP in the study was 0.3814%, whereas the standard deviation was

1.0200%. Moreover, the skewness of GDP is a negatives value and is skewed to the right as the skewness is less than zero, which is -1.4875. The data of GDP which is 5.7089 is more volatile because the Kurtosis is more than 3 of the study of research.

Furthermore, the average inflation rate was 101.3753 in the study. From the year 1993 Quarter 1 to year 2015 Quarter 4, the highest inflation rate was achieved at 104.3253, but the lowest inflation rate was 99.2834. Thus, the median of inflation rate was 101.0101 and the standard deviation was 1.3183. The skewness is more than zero, only 0.6073 therefore the inflation rate is left-skewed. Kurtosis is -0.7581, which is negative values and less than 3, hence the data of inflation rate is less volatile of the study.

Besides, the average interest rate was 1.7356% in this study of research. Besides, the highest and lowest interest rate from year 1993 Quarter 1 to year 2015 Quarter 4 was4.7907% and 0.2867% respectively. The median of interest rate was 1.4223% and the standard deviation was 1.0952%. Next, the skewness of interest rate was 0.6073and the amount is more than zero, thus the skewness of interest rate is left-skewed. The data of interest rate is less volatile because the Kurtosis is less than 3 of the study of research, which is around 1.1773.

Lastly, the average unemployment rate and median of unemployment rate were 4.1543% and 4.2000% respectively. From year 1993 Quarter 1 to 2015 Quarter 4, the highest inflation rate was achieved at 5.4333%, but the lowest inflation rate was 2.3%. Hence, the standard deviation of the study was 0.7938% from year 1993 Quarter 1 to 2015 Quarter 4. In addition, the skewness of the unemployment rate is right-skewed, because the skewness is less than zero, which is -0.2675. Whereas, the data of unemployment rate is less volatile, due to the Kurtosis are less than 3, which is around -0.7752.

4.3 Model Estimation and Interpretation

Model 4.2 will be tested now by using the OLS regression method in order to test the model with E-Views 9.5 for additional hypotheses testing and also for the diagnostic checking by using the data that collected.

Table 4.2 (refer to Appendix 4.2.) illustrates the original regression result conducted by using the E-Views 9.5 which can be used to explain as the economic *Model 4.3*, stated as the following:

$$\text{Log } \widehat{PPI_t} = \widehat{\beta_0} + \widehat{\beta_1}\text{GDP}_t + \widehat{\beta_2}\text{LogINF}_t + \widehat{\beta_3}\,\text{IR}_t + \widehat{\beta_4}\text{UR}_t + \varepsilon_t \qquad \textbf{(Model 4.3)}$$

Table 4.2 Original Regression Output **(refer to Appendix 4.2)**

Variables	Coefficient	Standard Error	t-statistics	P-value
$\widehat{\beta 0}$	-14.5172	(1.6697)***	-8.6944	0.0000
GDPt	0.0077	(0.0044)*	1.7551	0.0828
LOGINFt	8.0487	(0.8273)***	9.7292	0.0000
IRt	0.0994	(0.0053)***	18.8974	0.0000
URt	0.0572	(0.0074)***	7.7746	0.0000

Notes: *** For significance level at 1%

** For significance level at 5%

* For significance level at 10%

$R^2 = 0.8366$ $\bar{R}2 = 0.8291$

4.3.1 Interpretation of Beta

$\widehat{\beta 0}$ = -14.5172

By assuming all the exogenous variables are equal to zero, on average, the Japanese property price index will decrease by -14.5172%.

$\widehat{\beta 1} = -0.0077$

If gross domestic product increases by 1 percentage point, on average, the Japanese property price index will decrease by 0.0077%, by holding other variables constant.

$\widehat{\beta 2} = 8.0487$

If inflation rate increases by 1 percent, on average, the Japanese property price index will increase by 8.0487%, by holding other variables constant.

$\widehat{\beta 3} = 0.0994$

If interest rate increases by 1 percentage point, on average, the Japanese property price index will increase by 0.0994%, by holding other variables constant.

$\widehat{\beta 4} = 0.0572$

If unemployment rate increases by 1 percentage point, on average, the Japanese property price index will increase by 0.0572%, by holding other variables constant.

4.3.2 Interpretation of R-squared, and Adjusted R-squared and Standard Error

Standard Error =0.0419

The sample size for this study is at 92 observations with a standard error of 0.0419 as shown in *Appendix Table 4.2.* The research consist of the sample size which is above thirty sample size is considered large enough to demonstrate the significance of the regression model, which is mentioned by Borg and Gall (1989). In order to support the statement mentioned by Borg and Gall (1989), the standard error-to-mean ratio of this study, is 2.05% (0.0419 / 2.0397). Moreover, the better the regression model which is consist of the lower the standard error-to-mean ratio.

R^2 (Goodness of Fit) = 0.8366

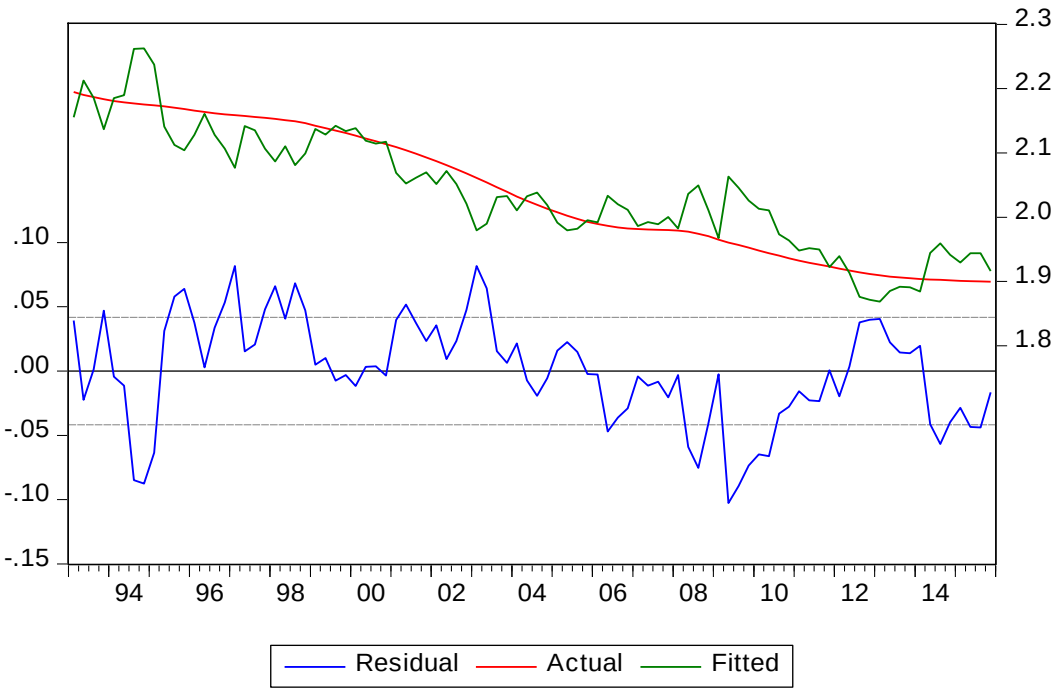
R^2 is estimated to be 0.8366. This indicates that 83.66% of the variation in Japanese property price index may be described by the variation in GDP, INF, IR, and UR.

$\bar{R}^2$= 0.8291

Adjusted $\bar{R}^2$ is estimated to be 0.8291 This indicates that 82.91% of the variation in Japanese property price index may be described by the variation in GDP, INF, IR, and UR, after the number of exogenous variables and degree of freedom are counted into account.

4.3.2.1 Reason of Carrying High R-squared

Figure 4.1: Plot of Residual, Actual and Fitted Lines, from year 1993 Quarter 1 to year 2015 Quarter 4 **(refer to Appendix 4.3)**



According to the Frost (2013) study stated that, the residual is same to the differences between actual values and fitted values. However, the lowest the value between actual and fitted values, which is the better the model fits to the data. Hence, this is mean that the model is can be dependable and unbiased based on the *Figure 4.1* above.

Based on the *Figure 4.1*, it concludes that the residual values are fallen in between the range of 0.08 to -0.10. The values are comparatively small, which means there is no much deviation and verify that the model is can be dependable and unbiased. This is due to the decoration of residual shown was random and fluctuating (Frost, 2013). Hence, the R-squared of this model regression in the study of research is considering high, about 83.66%.

In addition, based on the Frost (2016) theory carried out that, there are few justification of the model which carried high R-squared. Firstly, integrate different

models to reach at the ultimate model. This is because before running the regression analysis, this study has included many feasible variables and tried the different combinations of variables by exploring the past experimentation to recognize among the relationships, such as the coefficient signs and the effect immensity of property price with GDP, INF, IR, and UR to carry out the final model. Next, Frost (2016) theory also mentioned that, there may be the correlation emerged among the variables, but this justification is indisposed. This is due to certain reason which have been proven and stated clearly in section 4.5.1, which is there is no serious multicollinearity occurred among the variables.

Thirdly, by using the time series data will help to create high R-squared, if the endogenous variable and exogenous variables both have the significant trend over the time (Frost, 2016). This is already proven by t-test in session 4.4.1 solution. Meanwhile, INF, IR and UR have significant collision on the property price in Japan over the time. For example, according to Kuang and Liu (2015), property price absolutely influence the price of common utilization products if the central bank reply to property price dissimilarity, as the price of common utilization products absolutely influence the property price in the non-appearance of the central bank. The strong and enduring connected between inflation and property price. Moreover, mostly the things in the economy environments will fall in the price throughout the inflation period. Thus, increase in the cost of the raw material for building a house or any property. In addition, rising in inflation front loads the real payments on a long-term fixed-rate mortgage, and thus decline the value of the property. Therefore, because the global situation that, raising the money supply affect the inflation and property prices to be raised.

On the other hand, based on Ong (2013) theory stated that, for homeowners, aim on the changing in interest rates due to the direct impacts on the real estate prices. However, the availability of capital and the request for the investment also influence by the interest rate. Thus, these capital flows alter that the supply and demand for the property and they transform the property prices at the end. Besides, property price and unemployment rate is significant influence each other. This is because mortgage loan is to regulate the affordable of people to buy or to own a house or a property. Housing affordability is not a characteristic of housing

but a characteristic of housing service in connection to consumer capacity and aspiration to own or buy the houses or property (Suhaida, Tawil, Hamzah, Che-Ani, Basri, and Yuzainee, 2011). Moreover, economic growth and unemployment is interrelated relationship. Meanwhile, when unemployment is increasing, less people will be affordable to buy the property. However, the fear of the unemployment may dishearten people from accessing the property market. Hence, the model of this study will carry a high R-squared is feasible and dependable.

4.4 Hypotheses Testing

Results of hypotheses testing will be interpreted, therefore will be conducted accordingly. In addition, several diagnostic checking tests would be carried out such as multicollinearity, autocorrelation, heteroscedasticity, model specification and normality of the error term. This is to ensure that, the model is significant with the study of the research, and also to reassure that the estimated regression model is free from the econometric problems. On the other hand, every econometric problem that exists in the estimated regression model, solution(s) will then needed to be developed and provided in order to solve them either by lessen or removing the problem(s) completely from the estimated regression model.

4.4.1 T-test

This certain test of the study would pinpoint out that, the significance of each descriptive variable with the property price index by comparing the p-value of t-test at the significance level of 5%.

4.4.1.1 Gross Domestic Product (GDP)

Hypothesis:

H_0: Property price index and GDP have no significant relationship in Japan.
H_1: Property price index and GDP have a significant relationship in Japan.

Decision Rule:

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

Decision Making:

Do not reject H_0, because p-value of the test statistics is 0.0828, which is greater than the significance level of 5%.

Conclusion:

Based to the above outcome, there is sufficient affirmation to decide that the property price index and GDP have no significant relationship in Japan at the significance level of 5%. This is mean that Gross Domestic Product is not statistically important in determine the property price index in Japan. Therefore, GDP is not the supreme component that will attack the Japanese to decide to buy the property. According to the International Monetary Fund study, have been explained that the losses in domestic production is happened after house-price busts and it have been twice losses after the stock market crashes (Ray, 2005).

4.4.1.2 Inflation (INF)

Hypothesis:

H_0: Property price index and INF have no significant relationship in Japan.
H_1: Property price index and INF have a significant relationship in Japan.

Decision Rule:

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

Decision Making:

Reject H_0, because p-value of the test statistics is 0.0000, which is lower than the significance level of 5%.

Conclusion:

Based on the above result, there is strong affirmation to judge that the property price index and INF have a significant relationship in Japan at the significance level of 5%. This is mean that INF is statistically important in determine the property price index in Japan. Therefore, inflation is the significant factor that will affects the Japanese to decide to buy the property. Furthermore, inflation is a type of risks in investing because of its dual threat to purchasing power and financial asset performance. Therefore, it will increase the costs of living and negative real returns for investors on investments which resulting from an inflation shock.

4.4.1.3 Interest Rate (IR)

Hypothesis:

H_0: Property price index and IR have no significant relationship in Japan.
H_1: Property price index and IR have a significant relationship in Japan.

Decision Rule:

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

Decision Making:

Reject H_0, because p-value of the test statistics is 0.0000, which is lower than the significance level of 5%.

Conclusion:

Based on the above result, there are enough authentications to conclude that the property price index and IR have a significant relationship in Japan at the significance level of 5%. This is mean that IR is statistically important in determine the property price index in Japan. Therefore, IR is the important factor that will affects Japanese to decide to buy the property. In addition, the "per cent of premium was pay on money at one or specific date in terms of money to be in hand one year later", this was known as the interest rate. Thus, interest on loans is the price that the borrower will be charged by lender for using the borrowed funds in advance. In short, the higher the interest rate, the higher the property price.

4.4.1.4 Unemployment Rate (UR)

Hypothesis:

H_0: Property price index and UR have no significant relationship in Japan.
H_1: Property price index and UR have a significant relationship in Japan.

Decision Rule:

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

Decision Making:

Reject H_0, because p-value of the test statistics is 0.0000, which is lower than the significance level of 5%.

Conclusion:

Based on the above result, there is enough evidence to surmise that the property price index and UR have a significant relationship in Japan at the significance level of 5%. This is meant that UR is statistically foremost in determining the property price index in Japan. Therefore, UR is the essential factor that will affects Japanese to decide to buy the property. The strong positive relationship between property prices and the UR is a feature and not only for the recent crisis. This is because mortgage loan is used to ascertain the affordable of people to buy a house or other property.

4.4.2 F-test

Different from the t-test, F-test is use to explore the overall important of the whole model by including all the independent variables which are GDP, INF, IR and UR. Hence, below is the result for the test is as the following:

Hypothesis:

H_0: $\beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$ (The 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 variables is important to the model)

Decision Rule:

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

Decision Making:

Do not reject H_0, because p-value of the test statistics is 0.0000, which is lower than the significance level of 5%.

Conclusion:

From the above result, there is strong evidence to decide that at least one of the β_i is different from zero in Japan at the significance level of 5%. This is meant that at least one exogenous variable (GDP, INF, IR and UR) that is significantly dictating the property price index in Japan.

4.5 Diagnostic Checking

Diagnostic checking tests will be conducted to detect whether the model is facing multicollinearity, heteroscedasticity, autocorrelation, normality of the error term, and model specification problem. The objective of carrying out these five tests is to be certain that this model is meets the requirement of the Best Linear Unbiased Estimators (BLUE).

4.5.1 Multicollinearity Test

The multicollinearity test is used to test whether between or among the explanatory or independent variables has a linear or non-linear relationship.

4.5.1.1 High pair-wise correlation coefficients

Hypothesis:

H_o: No Multicollinearity existed among independent variables
H_1: Multicollinearity existed among independent variables

Table 4.3: Correlation Analysis **(refer to Appendix 4.4)**

	LOGPPI	GDP	LOGINF	IR	UR
LOGPPI	1.0000	0.0510	0.2986	0.7766	-0.3014
GDP	0.0510	1.0000	-0.2112	0.0494	0.03213
LOGINF	0.2986	-0.2112	1.0000	-0.0474	-0.1807
IR	0.7766	0.0494	-0.0474	1.0000	-0.6252
UR	-0.3014	0.0321	-0.1807	-0.6252	1.0000

* r> 0, implying that the two variables have a positive correlation.
* r< 0, implying that the two variables have a negative correlation.
* r = 0, implying that the two variables have no correlation.

Correlation is used to examine the direction and strength of the linear associated between two exogenous variables in the scattered plot. The correlation coefficient (r) is between -1 and +1. A positive correlation coefficient shows the direct relationship between two variables. This indicates that the growth in the previous variables will lead to an increase or decrease in the subsequent variable. A negative correlation show an adverse relationship where one variable increases, the other will decrease. The closer the r coefficient approaches to 1, the stronger the unity exists in the two variables, regardless of direction. This indicates a linear relationship between the two exogenous variables, without concern of the direction. According to Gujarati (2012), if the relationship between two variables exceeds 80%, then there is a high possibility that both independent variables are highly correlated and it may consist of the multicollinearity problem.

As shown in the correlation analysis (refer to Table 4.3), there is no any relationship between each of the exogenous variable since the highest value is 0.7766. However, 0.7766 is close to 0.8. Therefore, this study will conduct the Variance Inflation Factor (VIF) and Tolerance (TOL) test for those independent variables to determine whether there is a serious multicollinearity problem in the model.

4.5.1.2 Variance Inflation Factor (VIF)

Table 4.4 : Result of VIF, **(refer to Appendix 4.11)**

Variables	**R^2**	**VIF = [1/(1-R^2)]**	**Low/ High**
GDP & LOGINF ***(refer to Appendix 4.5)***	0.0446	1/(1- 0.0446) =1.0467	Low
GDP & IR ***(refer to Appendix 4.6)***	0.0024	1/(1- 0.0024) =1.0024	Low
GDP & UR ***(refer to Appendix 4.7)***	0.0010	1/(1- 0.0010) =1.0010	Low
LOGINF & IR ***(refer to Appendix 4.8)***	0.0022	1/(1- 0.0022) =1.0023	Low
LOGINF & UR ***(refer to Appendix 4.9)***	0.0327	1/(1- 0.0327) =1.0338	Low
IR & UR ***(refer to Appendix 4.10)***	0.3909	1/(1- 0.3909) =1.6417	Low

According to the result shows in Table 4.4 (see Appendix 4.11), this model has no serious multicollinearity problem in this model. Hence, the problem can be neglected, since the degree of VIF of the five pairs of independent variables is falls between 1 and 10 (no serious multicollinearity). Therefore, the estimated parameters are unbiased, efficient and consistent.

4.5.1.3 Tolerance (TOL)

Table 4.5:Result of TOL, **(refer to Appendix 4.12)**

Variables	VIF	TOL = 1/VIF	Low/ High
GDP & LOGINF ***(refer to Appendix 4.5)***	1.0467	1/1.0467 =0.9554	Low
GDP & IR ***(refer to Appendix 4.6)***	1.0024	1/1.0024 =0.9976	Low
GDP & UR ***(refer to Appendix 4.7)***	1.0010	1/1.0010 =0.9990	Low
LOGINF & IR ***(refer to Appendix 4.8)***	1.0023	1/1.0023 =0.9978	Low
LOGINF & UR ***(refer to Appendix 4.9)***	1.0338	1/1.0338 =0.9673	Low
IR & UR ***(refer to Appendix 4.10)***	1.6417	1/1.6418 =0.6091	Low

According to the result shows in Table 4.5 (refer to Appendix 4.12), this model has no serious multicollinearity problems because the degree of TOL of five pairs independent variable is greater than zero. Therefore, the estimated parameters are unbiased, efficient and consistent.

4.5.2 Heteroscedasticity Test

The heteroscedasticity test examines whether the variance of error term is not constant between one to the other observations in the regression model. The heteroscedasticity problem will occur when the disturbance term has the unequal variance. Normally, it happens in time series and cross-sectional data.

Heteroscedasticity cause the OLS method to underestimate the standard errors and variance, and also cause the value higher than the expected value of F statistic and

t-statistic. Hence, the OLS estimators will no longer BLUE. Therefore, ARCH test is uses to examine whether the model has met the homoscedasticity assumption.Thus, if heteroscedasticity is detected in the model, then White's Heteroscedasticity-Corrected Variances and Standard Error method will uses to solve this economic problem.

Hypothesis:

H_0: Homoscedasticity among the error terms
H_1: Heteroscedasticity among the error terms

Decision Rule:

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

Table 4.6: Autoregressive Conditional Heteroscedasticity (ARCH), **(refer to Appendix 4.13)**

F-statistic	27.4201	Prob.F(1,89)	0.0000
Obs*R-squared	21.4330	Prob. Chi-Square (1)	0.0000

Decision-Making:

Reject H_0, since the p-value of Chi-square is 0.0000, which is less than the 5%.

Conclusion:

Thus, heteroscedasticity is existed in the model at the significance level of 5%. Since there is heteroscedasticity problem in the model, White's Heteroscedasticity-Corrected Variances and Standard Error will used to overcome this economic problem.

4.5.2.1 White's Heteroscedasticity-Corrected Variances and Standard Error Test

Hypothesis:

H_0: Homoscedasticity among the error terms
H_1: Heteroscedasticity among the error terms

Decision Rule:

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

Table 4.7: White's Heteroscedasticity-Corrected Variances and Standard Error Test (WHITE), **(refer to Appendix 4.14)**

F-statistic	1.6897	Prob.F(13,78)	0.0797
Obs*R-squared	20.2159	Prob. Chi-Square (13)	0.0900

Decision-Making:

Do not reject H_0, since the p-value of Chi-square is 0.0900, which is larger than 5%.

Conclusion:

Hence, the model has met the homoscedasticity assumption of error term at 5% level of significance with sufficient evidence.

4.5.3 Autocorrelation

Autocorrelation problems exist when there is a correlation among the error terms. This study will conduct a Breusch-Godfrey LM test to detect whether there is autocorrelation between the error terms.

Hypothesis:

H_0: No autocorrelation existed between the error terms
H_1: Autocorrelation existed between the error terms

Decision rule:

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

Table 4.8: Breusch Godfrey Serial Correlation LM Test, **(refer to Appendix 4.15)**

F-statistic	53.3449	Prob.F(2,85)	0.0000
Obs*R-squared	51.2049	Prob. Chi-Square (2)	0.0000

Decision-Making:

Reject H_0, since the p-value of Chi-Squared is 0.0000, which is less than the 5% significance level.

Conclusion:

Hence, an autocorrelation exists in the model at the significance level of 5%. Since there is an autocorrelation problem exists in the model, the Newey-West HAC Standard Errors and Covariance Test will be used to address this problem.

4.5.3.1 Newey-West HAC Standard Errors and Covariance Test

Hypothesis:

H_0: No autocorrelation among the error terms
H_1: Autocorrelation among the error terms

Decision rule:

Reject H_0, if the p-value of F-test statistics is less than the 5% significance level. Or else, do not reject H_0.

Table 4.9: Newey-West HAC Standard Errors and Covariance Test, **(refer to Appendix 4.16)**

F-statistic	111.3319	Durbin-Watson stat	0.5148
Prob (F-statistic)	0.0000	Wald F-statistic	49.5504

Decision-Making:

Reject H_0, since the p-value of F-test statistics is 0.0000, which is less than the 5% significance level.

Conclusion:

Hence, autocorrelation problem may still exist in the model at the significance level of 5%. According to Gujarati (2012), theoretically, the autocorrelation can be solve by the Newey-West HAC Standard Errors and Covariance Test. However, result show differently with the theory. Therefore, this study will conduct Autoregressive Distributed Lag Model (ARDL) to ensure that the autocorrelation problems are solved. The Autoregressive Distributed Lag Model (ARDL) will be conducted in the next section.

4.5.3.2 Autoregressive Distributed Lag Model (ARDL)

An autocorrelation problem is still exists in the model. Therefore, this research uses the Autoregressive Distributed Lag Model (ARDL) to solve the autocorrelation problem.

An ARDL is a model that provides a commonly distributed lag structure without providing dynamic optimization. Belloumi (2014) uses the ARDL model to solve the autocorrelation problem, because there are several advantages compared to old co integration methods. Firstly, not all the variables need to be integrated in the same order and it applicable when underlying variables is integrated. Secondly, an ARDL model is more productive in terms of small and limited sample size. Finally, unbiased estimates of long-run model can be obtained through the ARDL model.

However, the use of ARDL model also has several disadvantages to be considered in the model. When the number of exogenous variable increases in model, it will cause degree of freedom to fall. This may affect the significance of the predicted parameters and the model will auto-regress the error term of its own, which will bring the existence of technical problem.

The ARDL model is chosen to reform a better model in order to eliminate the econometric problems. This model has added a lag term of 61 periods *(refer to Appendix 4.17)*.LM test is used for this model to detect whether there is still an autocorrelation problem or not.

Below is the hypothesis testing of ARDL:

Hypothesis:

H_0: No autocorrelation among the error terms
H_1: Autocorrelation among the error terms

Decision rule:

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

Table 4.10: Breusch Godfrey Serial Correlation LM Test, **(refer to Appendix 4.18)**

F-statistic	2.8686	Prob.F(61,26)	0.0021
Obs*R-squared	80.0986	Prob. Chi-Square (61)	0.0510

Decision-Making:

Do not reject H_0, because p-value of Chi-Squared is 0.0510, which is larger than the 5% significance level.

Conclusion:

There is enough evidence to shows the model do not have autocorrelation problem among the error terms in the model at the significance level of 5%. Therefore it can be concluded that the model has fulfilled the assumption of no autocorrelation problem in this improved model. Hence, this model is free of econometrics problems.

4.5.4 Normality Test

Normality tests will be conducted to ensure the model is follows the normality assumptions. This study will uses Jarque-Bera test to examine normality distribution of error terms is based on the estimated model. If the error term is normally distributed, β and exogenous variables will also be distributed normally, which may also state that the model is correctly defined.

Hypothesis:

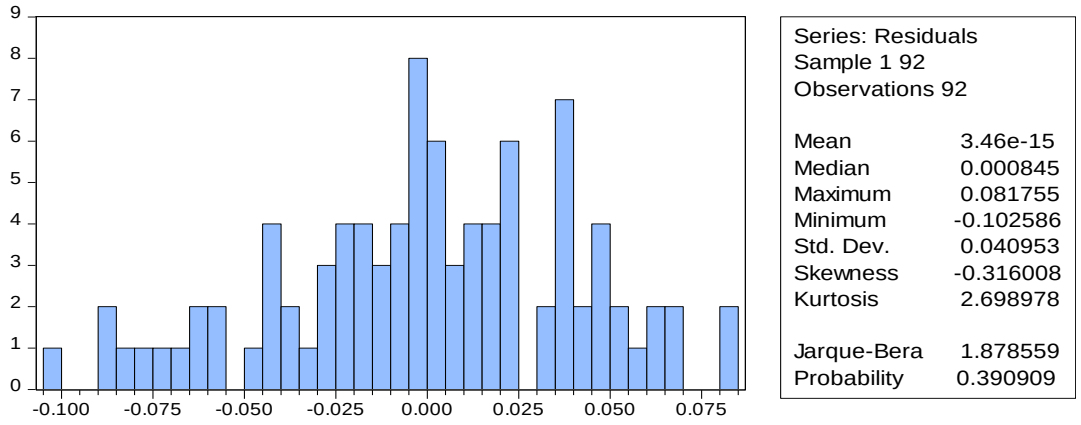
H_0: Error terms are normally distributed

H_1: Error terms are not normally distributed

Decision rule:

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

Table 4.11 Jarque-Bera Test, **(refer to Appendix 4.19)**



Decision-Making:

Do not reject H_0, since the p-value of JB test is 0.3909, which is larger than the 5%significance level.

Conclusion:

Thus, there is sufficient evidence to shows thatthe model has fulfill the normality assumption of error termsat the significant level of 5%.

4.5.5 Model Specification Test

4.5.5.1 Ramsey RESET Test

Model specification test will be used to check whether this model is "reliable or unreliable" model to use Ramsey RESET test.

Hypothesis:

H_0: Model is precisely specified
H_1: Model is not precisely specified

Decision rule:

Reject H_0, if the p-value of F-test statistics is less than the 5% significance level. Or else, do not reject H_0.

Table 4.12: Ramsey RESET test, **(refer to Appendix 4.20)**

	Value	**df**	**Probability**
t-statistic	1.8637	86	0.0658
F-statistic	3.4733	(1, 86)	0.0658
Likelihood ratio	3.6425	1	0.0563

Decision-Making:

Do not reject H_0, because the p-value of F-test statistics is 0.0658, which is larger than the 5% significance level.

Conclusion:

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

4.6 Conclusion

This study found that three independent variables (LOGINF, IR & UR) have important association with the dependent variable (PPI) as the p-value is less than the significance level, α (0.05). Only GDP does not have any significant relationship with PPI as their p-values are larger than the level of significance, α (0.05). Besides that, this chapter has conducted diagnostic checking to detect whether the econometric problems of multicollinearity, autocorrelation, heteroscedasticity, normality of error term, and model specification existed in the model by using E-view 9.5.

The results of these tests indicate that the model specification is correct, errorterms are normally distributed, there is no serious multicollinearity problem, and homoscedasticity. However, there is autocorrelation existed in the models, the problem is already overcome by auto-distributed lag model. In addition, the following chapter will discuss the statistical results, main findings, implications of the policy and limitation of the study. The recommendation for future research will discussed as well.

CHAPTER 5: DISCUSSION, CONCLUSION AND IMPLICATIONS

5.0 Introduction

In this chapter, an overall outline will be provided from previous chapters 1 until the end of chapter 4. The main purpose of this research is to investigate the four macroeconomic factors that affecting the fluctuation of property price in Japan. The comparison will be made among the empirical result from previous chapter to examine the relationship between property price with the independent variables (Gross Domestic Product, Inflation Rate, Interest Rate, and Unemployment Rate) in Japan. Explanation will be given in detail accordingly based on the empirical result. The major findings of the independent variables will be discussed in details with the objectives of this research and the empirical results in chapter 4. Moreover, implications will be suggested followed by the identification of limitations that exist throughout this study. Lastly, recommendations for future researchers will be suggested in order to increase the effectiveness of the study as well as to reduce the obstacle through their research.

5.1 Summary of Statistical Analysis

The purpose of this research is to discover the significant relationship between the Japan property price with Gross Domestic Product, inflation rate, interest rate and unemployment rate. The data are obtained from International House Price Database, Bloomberg data stream and OECD website. This study uses the time range is from 1993 to 2015 compounded quarterly to carry out the regression model and the total observation for this research is 92. The empirical results from previous chapter are managed to meet the objectives and solve the research questions by using the statistical tests. The statistical tests including OLS, multicollinearity tests, ARCH test, Breusch-Godfrey LM test, Ramsey test and Jarque-Bera test.

According to chapter 4, this study indicates that there is no significant relationship between property price index and GDP in Japan at the significance level of 5%. Besides, INF, IR and UR are significantly related with property price in Japan at the significance level of 5%. Further discussion will be carried out in a detailed way in table 5.1.

Table 5.1 : Summary of Diagnostic Checking

Econometrics Problems	**Results**
Multicollinearity	Multicollinearity not existed
Heteroscedasticity	Heteroscedasticity among the error terms, but overcame by White's Heteroscedasticity-Corrected Variances and Standard Error test
Autocorrelation	Autocorrelation existed among the error terms, but overcame by Autoregressive Distributed Lag Model (ARDL)
Normality	Error terms are normally distributed
Model Specification	Model is precisely specified

In order to make sure the results are reliable, diagnostic checking is required to fulfill the ideal condition of OLS. According to the table 5.1, the results concluded that the estimated model has no serious multicollinearity problem, error terms are normally distributed and model is precisely specified.

On the other hand, there are two econometrics problems occurred in the model which is heteroscedasticity and autocorrelation but overcame by their respective method. Heteroscedasticity problem have been overcame by White's Heteroscedasticity-Corrected Variances and Standard Error test whereas autocorrelation problem have been overcame by Autoregressive Distributed Lag Model (ARDL). Therefore, the model is free of econometrics problems.

5.2 Discussions of Major Findings

Table 5.2 Results and theoretical summary

Dependent Variable	Independent Variables	Significance Level	Result
Property Price	GDP	5%	Negative , but no significant
Property Price	INF	5%	Positive , but significant
Property Price	IR	5%	Positive , but significant
Property Price	UR	5%	Positive , but significant

According to table 5.2, showed that the result from chapter 4. From the table above, showed the result is no significant of Gross Domestic Product (GDP) on property price in Japan. But Inflation Rate (INF), Interest Rate (IR), and Unemployment Rate (UR) on property price in Japan are significant.

GDP is a macroeconomic factor affecting the measure value of property price (OECD, 2012). Based on result obtained GDP are insignificant on property price on Japan. GDP impact the domestic demand for the local output and foreign exchange rate. For rising the GDP is because raising the personal consumption. Thus, rising for investment may lead to raising the GDP. According to Arghyrou (1998), it can be regular economic development and consumption that grows as outcome of the raising in spending on consumption.

From the result showed that Inflation Rate (INF) are significant on property price in Japan (Weidaand Peng Liu, 2015). According to Zhu (2004) shows a largeand durable tie between the inflation and property prices. Inflation period, most of the economies will not good and raising their price, the price of the raw material of the property will rise, demand of property will less. The money supply is the sum of financial assets in the economy at a given period (Cummings, 2010). The theory of Keynes is recognized, an raising in the money supply cause to a reduce in the velocity of circulation and the real earnings, the money flow to the part of

production increase, thereby affecting the real property market is positive (Barkham, 2012). Thus, inflation will change the money supply on property price.

Moreover, interest also is a main effect on the property price and the result obtained interest rates are significant on property price in Japan (De Vries and Boelhouwer, 2005). According to Ouma (2015), the changes interest rates may influence a person's ability to purchase a property. This is because lower interest rate, that will lower cost mortgage to buy a property. Which will create increases demand for purchased property, once more pushes the property prices goes up. Basically credit availability will cause to an increased demand for property as property borrow constrained (Barakova, 2014).

However, property price drop quickly, it will decreases the consumption demand good and services in the larger economy, while affecting employment rates. Based on the result unemployment rate on property price in Japan are significant. According to Ludwig and Slok (2004), Case, Quigley and Shiller (2005), Bardham, Edelstein and Tsang (2007), Goodhard and Hofmann (2008), employment are significant with the property price. For the decreases of traditional industry in certain city will lead unemployment and population loss and cause surplus of lower income private and the public property (Power and Mumford, 2003). Other factors such as professional skills and job opportunities are very important, a low-level job can offer some prospects to develop their skills and move people out of poverty. Even though mixed communities frequently have the higher employment rate than mono tenure property, have little proof that the residents have advanced their economic future merely by living in the mixed earning areas. (Fenton and Tunstall, 2006)

5.3 Implications of the Study

5.3.1 For investors and potential homebuyers

Property is an important component of investment, investors or potential homeowners looking to join the property market must be knowledgeable about certain factors before making a decision. As investors of properties aim to make purchases when the property price are low or undervalued, and to sell when the prices are high, it is important for investors and homebuyers to understand the effects of macroeconomic variables like the country's Gross Domestic Product, Inflation, Interest Rate and Unemployment Rate on the property prices. Usually, investors mainly taking into account IR before making an investment decisions. Floating interest rates influence investment decisions made by investors as higher interest rate will increase theborrowing costs. This will reduce the demand of property and property prices thereby hurting the turnover and return on investment.

As the results show that the macroeconomic variables included in this study, Inflation, Interest Rate and Unemployment Rate) are significantly correlated with property prices, investors can utilize this study to evaluate the price of the property. On the other hand, Gross Domestic Product and property price have insignificant relationship.

5.3.2 For the government and policymakers

The property market is an important component for the economy. Since the government plays a major role in determining a country's macroeconomic situation, and is primarily responsible for factor like the Gross Domestic Product, Inflation, Interest Rate and Unemployment Rate of a country, the relationship between these factors and the property market is very important for policymakers.

Governments and policymakers can estimate the value of property prices based on Gross Domestic Product, Inflation, Interest Rate and Unemployment Rate. As a result, this study allows policymakers to gain a better understanding on the property market dynamics. With such understanding, policymakers can determine the situation in which property is more affordable for the general population. In addition, with the implementation of an appropriate set of policies, the government will ensure a stable property market.

5.3.3 For future researchers

There is much debate about the topic of property markets, with researchers coming up with differing conclusions. For example, Leung, Leong and Wong (2006), Levin and Pryce (2009) came up with different conclusions regarding the relationship between IR and property price. On the other hand, this study also provides another perspective for the argument. Thus, this research let future researchers to utilize the findings and examine the relationship among the macroeconomic variables, like Gross Domestic Product, Inflation, Interest Rate and Unemployment Rate on the property prices. As a result, this research can uses as guidance for the future research on the relationship among the property prices and others macroeconomic variable.

5.4 Limitations of the Study

In real life environment, a perfect and idea situation of the research does not always emerge when administer a study of the research. Therefore, move along with this research, there will be some limitations and obstacle during the process of the research, and step forward to become an ideal research sooner. Firstly, the main limitation of this study is the data discrepancies limitations. This study has to appoint the data that covered a longer period which is from year 1993 Quarter 1 to year 2015 Quarter 4, because the empirical test conducted by using the shorter period of data (year 2000 Quarter 1 to year 2015Quarter 4) manifest an invalid

result with facing the econometric problems. Thus, this study distinct to use the longer period of the data, which is start from year 1989 Quarter 1 to year 2015 Quarter 4, in order to avoid the econometric problems in the research. Besides, with a larger sample size of the observation is to make sure that an illustrative distribution of the population then only will be examined consequential to those people and also to whom our results will be move forward and being read.

This study used four macroeconomic variables (Gross Domestic Product, Inflation Rate, Interest Rate, and Unemployment Rate) as the exogenous variables and tests with their significant movements with the Japan property price. However, other macroeconomic variables such as exchange rate, population and real mortgage rate were not taken into deliberation in this research of study. Meanwhile, limited independent variables are not recommended for the future research of study. This is because if the research found that needed to exclude any one or two independent variables, therefore only left few of the exogenous variables in regression model. Thus, this will influence the regression model to be invalid results. Fortunately, this study do not excluded any of the independent variables because the independents variables does not have correlated and relationship among each other of the independent variables.

Furthermore, due to the limited understanding and limited knowledge of econometrics tests, this research was incapable to explore and determined more advanced tests to explore the significant movements between the response variable and the illustrative variables. As a result, it obstructed the improvement regularity and consistency of the empirical results. In addition, there was a limitation for the insufficient theory of all variables in this research of study. In practice application, there are a lot of theories of property prices are based on primary data rather than secondary data, as well as less applicable theories can be found and to be used. Therefore, this study is an inadequate to determine the sufficient review of pertinent theoretical models to prove and support the selected variables in the study.

Last but not least, all the results and findings from this research might only be opportune used in Japan market, as well as become practical for local people and

policy makers. The reason behind was all the data sources of this research are redeem from Japan and focus on the market property price in Japan. Moreover, country is a distinctive individual, there is a lot of miscellaneous in historical background culture and civilization, government policy, economic situation and others in the dissimilar countries. Therefore, the results and the findings from this research can differ from country to country and not allowable or suit to other countries, thus it can only serve as a references for research of other countries.

5.5 Recommendations for Future Research

Research recommendations assemble the general point of view about what is expected in this research and what could future studies practice to comprise the paramount of the information, in order to produce a better study than the current study. Besides, in order to distribute a better future research result, therefore it is foremost part of a project of keep away from mistakes repeated in the future study. Consequently, in order to acquire precise result in testing about the long run and short run correlations among the variables. Therefore, it is highly advocated that the future researches are recommended. This is to ascertain some of the advance test statistics.

On the other hand, future researchers could try more sources such as World Bank database, Yahoo Finance, OECD Economic Outlook Database,International House Price Databaseand other dependable database for data collection, before run the test in the software of E-view 9.5. This is to make sure that the result will be avoided from econometric problem. Whereas, this is good for them in order to inspect the constancy of the data in the test. This is to acquire an excellent outcome and to avoid the econometric problem. Moreover, except the time series data, future researchers may try other data categories such as panel data or cross-sectional data for more divergent feasible results.

Furthermore, the future researchers may counsel to use other types of research method for data collection such as primary research for data method. Primary

research necessitate collecting data about a given specific subject directly from the outside the world. It composed of the information about observations, surveys, interviews, analysis, and others methods. Interviews are classified as qualitative methods which allowed contributing specialist or knowledgeable judgment on a subject and a lot of information from a small group of the people. Next, questionnaire can delivered information about a larger population thinks diversely based on the subject. Besides, observations furnish deeper apprehension about certain of people, events, or place without the inequitable discernment of an interview.

In addition, future researchers are recommended to involve different types of data frequency such as daily, weekly and annually because the fluctuation of each data would be divergent it in different data frequency. This can be showed that, this study excluded the currency exchange rate which is more delicate and fluctuated more frequently than other variables. Therefore, if included the exchange rate as independent variable, it may influenced the result to be valid or invalid. Hence, future researcher may include the exchange rate in the study in order to test the empirical result. Besides, when there are various types of variables, so in order to conserve the reliability of the tests, therefore extra contemplation should be given when choosing the data frequency. Besides, the researchers can try to involved dissimilar methods such as unit root test and hedonic model to scrutinize the data which is other that the OLS method.

Lastly, future researchers can carry out researches on the property prices based on particular geographical areas only because the changes of the property market are highly geographical. For example, they can lessen the extent of study to specific urban or rural areas which having the different income of salary per month. This is to dictate the differentiation in the accomplishment of property price in those specific areas which is high or low income and compared to the overall property prices movements in Japan. Consequently, the result of their study may be more precise to make particular intimation or estimation of the accomplishment of property market in the specific geographical areas.

5.6 Conclusion

The principal purpose of this study is to explore the movements of the property price and its significant relationships with the macroeconomic factors (Gross Domestic Product, Inflation Rate, Interest Rate, and Unemployment Rate)in the Japan markets. Consequently, the empirical model results concluded the Inflation Rate, Interest Rate, and Unemployment Rate have a positive correlation with the property price. However, it is also concluded that the Gross Domestic Product (GDP) has a negatively significant correlation with the property price.

On the other hand, the model of this research is free of econometrics problems by using diagnostic checking, because the problem has been solved. Hence, the results of this study are dependable and can be reliability. In addition, the methodologies of the time series data inspection are explored and explained in an eminent detail. The empirical model outcomes are run by the latest E-view software which is E-view 9.5.

Moreover, in the final inspection and analysis, it is foremost to understand the determinants of macroeconomic and financial factors to the residential property markets, especially for the speculators, policy makers, government, buyers and investors, and public sectors. Therefore, in order to get general picture of the residential property markets, thus this study reviews a precise among of past research paper and journals. Besides, the theoretical framework of the property price also had been explored in the wide range of area. In short, the major findings, implication, limitation and future studies have been discussed in the wide range in the last chapter of this study of research.

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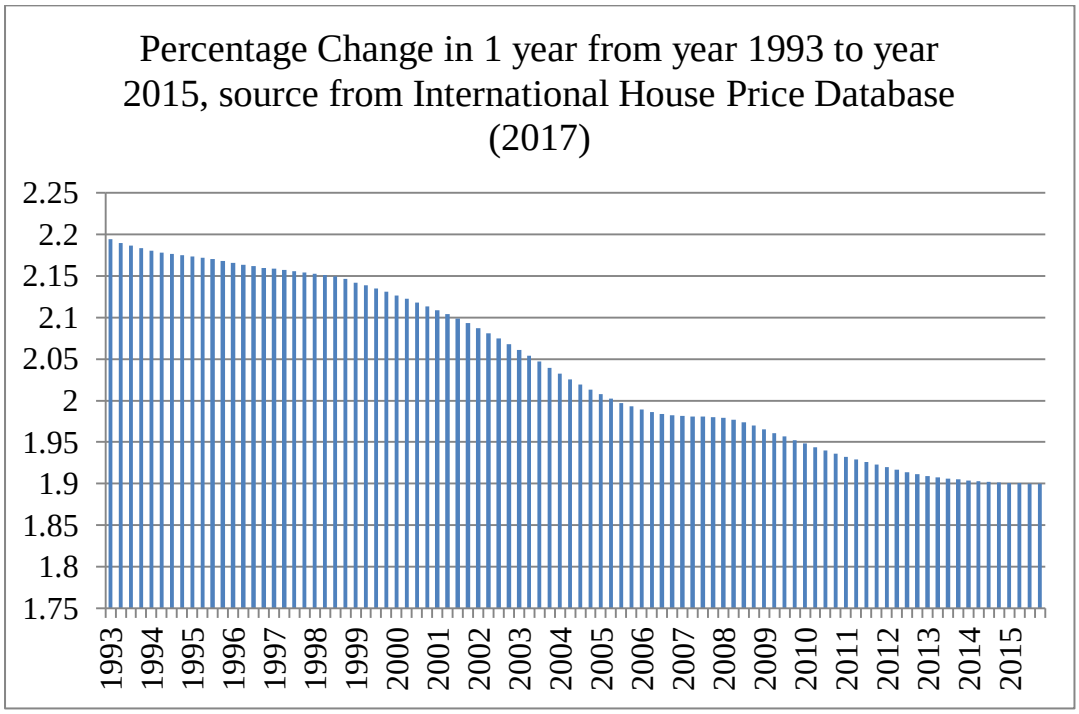
APPENDICES

Chapter 3: Methodology

Appendix 3.1: Percentage Change in 1 year from year 1993 to year 2015, source from International House Price Database (2015).



Appendix 3.2: Sources and Explanation of Data

VARIABLE	UNIT MEASUREMENT	SOURCE	DEFINITION
Gross Domestic Product (GDP)	In percentage, %	OECD	The total amount of the entire thing manufactured by all the manufacturer or people and companies in the country, which is citizens or foreign-owned companies measured in percentage.
Inflation (INF)	In Index	OECD	In general level, the prices for the goods and services is increases, will influence the purchasing power of the currency value to fall, and measured in percentage form.
Interest Rate (IR)	In percentage, %	OECD	The amount billed, can be explained as the percentage of the principal, from a lender to a borrower used the assets is refer to interest rate.
Unemployment Rate (UR)	In percentage, %	OECD	The unemployment rate is the share of the work forces that is unoccupied, measured in percentage form.
Property Price Index (PPI)	In Index	Internatio-nal House Price Database	Annual change in property prices index is the property index.

Chapter 4: Data Analysis

Appendix 4.1: Descriptive Statistics

	PPI	GDP	INF	IR	UR
Mean	112.5482	0.2286	101.3753	1.7356	4.1543
Median	105.2715	0.3814	101.0101	1.4223	4.2000
Maximum	156.5789	2.2951	104.3253	4.7907	5.4333
Minimum	79.3804	-4.8345	99.2834	0.2867	2.3000
Std. Dev	26.1943	1.0200	1.3183	1.0952	0.7938
Skewness	0.2352	-1.4875	0.6073	1.3428	-0.2675
Kurtosis	-1.5181	5.7089	-0.7581	1.1773	-0.7752
Observations	92	92	92	92	92

Appendix 4.2 Original Regression Output (Source: Developed for research via EViews 9.5)

Dependent Variable: LOGPPI
Method: Least Squares
Date: 07/04/17 Time: 19:50
Sample: 1 92
Included observations: 92

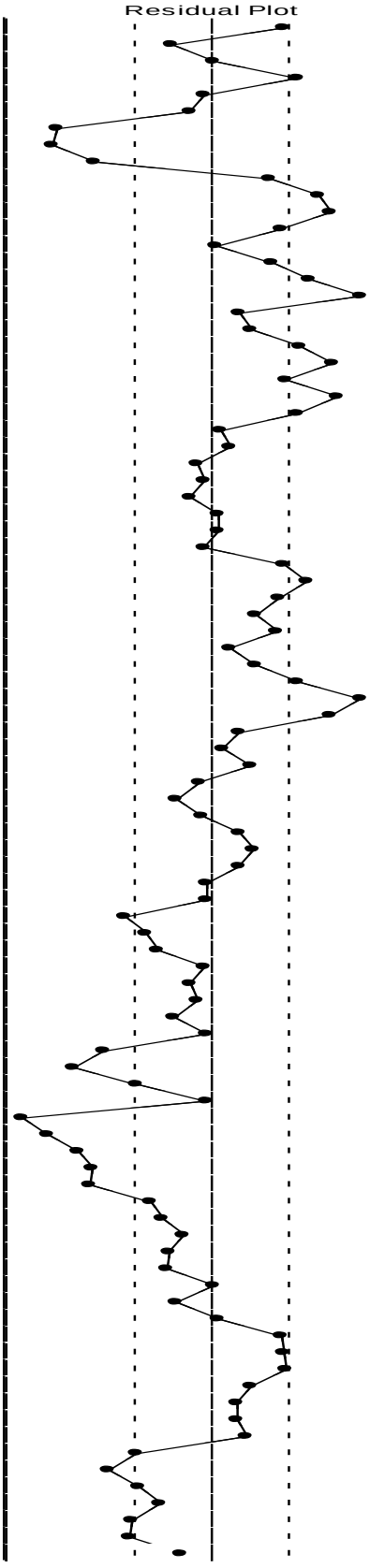
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-14.51722	1.669720	-8.694402	0.0000
GDP	0.007738	0.004409	1.755076	0.0828
LOGINF	8.048703	0.827269	9.729247	0.0000
IR	0.099372	0.005259	18.89741	0.0000
UR	0.057237	0.007362	7.774609	0.0000

R-squared	0.836567	Mean dependent var	2.039667
Adjusted R-squared	0.829053	S.D. dependent var	0.101301
S.E. of regression	0.041884	Akaike info criterion	-3.455030
Sum squared resid	0.152618	Schwarz criterion	-3.317976
Log likelihood	163.9314	Hannan-Quinn criter.	-3.399714
F-statistic	111.3319	Durbin-Watson stat	0.514757
Prob(F-statistic)	0.000000		

Appendix 4.3: Plot of Residual, Actual and Fitted Lines, from 2007 to 2014

(Source: Developed for research via EViews 9.5)

obs	Actual	Fitted	Residual
1993Q1	2.19473...	2.15549...	0.03924...
1993Q2	2.19018...	2.21258...	-0.0223...
1993Q3	2.18694...	2.18577...	0.00117...
1993Q4	2.18373...	2.13677...	0.04696...
1994Q1	2.18079...	2.18511...	-0.0043...
1994Q2	2.17849...	2.18987...	-0.0113...
1994Q3	2.17700...	2.26180...	-0.0847...
1994Q4	2.17536...	2.26279...	-0.0874...
1995Q1	2.17396...	2.23740...	-0.0634...
1995Q2	2.17221...	2.14090...	0.03131...
1995Q3	2.17021...	2.11226...	0.05794...
1995Q4	2.16815...	2.10422...	0.06392...
1996Q1	2.16589...	2.12833...	0.03756...
1996Q2	2.16381...	2.16099...	0.00282...
1996Q3	2.16172...	2.12797...	0.03375...
1996Q4	2.16002...	2.10665...	0.05337...
1997Q1	2.15877...	2.07702...	0.08175...
1997Q2	2.15736...	2.14198...	0.01538...
1997Q3	2.15600...	2.13528...	0.02072...
1997Q4	2.15448...	2.10643...	0.04805...
1998Q1	2.15291...	2.08688...	0.06603...
1998Q2	2.15108...	2.11031...	0.04076...
1998Q3	2.14934...	2.08100...	0.06833...
1998Q4	2.14645...	2.09918...	0.04727...
1999Q1	2.14230...	2.13726...	0.00504...
1999Q2	2.13853...	2.12840...	0.01012...
1999Q3	2.13479...	2.14232...	-0.0075...
1999Q4	2.13084...	2.13395...	-0.0031...
2000Q1	2.12676...	2.13836...	-0.0115...
2000Q2	2.12252...	2.11913...	0.00339...
2000Q3	2.11814...	2.11447...	0.00366...
2000Q4	2.11359...	2.11718...	-0.0035...
2001Q1	2.10895...	2.06915...	0.03980...
2001Q2	2.10397...	2.05229...	0.05167...
2001Q3	2.09870...	2.06136...	0.03733...
2001Q4	2.09313...	2.06976...	0.02336...
2002Q1	2.08719...	2.05154...	0.03565...
2002Q2	2.08111...	2.07180...	0.00931...
2002Q3	2.07489...	2.05144...	0.02344...
2002Q4	2.06826...	2.02078...	0.04748...
2003Q1	2.06116...	1.97942...	0.08173...
2003Q2	2.05406...	1.98977...	0.06429...
2003Q3	2.04679...	2.03120...	0.01558...
2003Q4	2.03958...	2.03312...	0.00646...
2004Q1	2.03219...	2.01078...	0.02141...
2004Q2	2.02542...	2.03257...	-0.0071...
2004Q3	2.01917...	2.03838...	-0.0192...
2004Q4	2.01317...	2.01881...	-0.0056...
2005Q1	2.00752...	1.99166...	0.01586...
2005Q2	2.00223...	1.97974...	0.02249...
2005Q3	1.99716...	1.98222...	0.01494...
2005Q4	1.99292...	1.99517...	-0.0022...
2006Q1	1.98945...	1.99215...	-0.0027...
2006Q2	1.98648...	2.03345...	-0.0469...
2006Q3	1.98401...	2.02032...	-0.0363...
2006Q4	1.98235...	2.01128...	-0.0289...
2007Q1	1.98175...	1.98599...	-0.0042...
2007Q2	1.98100...	1.99236...	-0.0113...
2007Q3	1.98054...	1.98888...	-0.0083...
2007Q4	1.97978...	2.00037...	-0.0205...
2008Q1	1.97933...	1.98236...	-0.0030...
2008Q2	1.97735...	2.03635...	-0.0589...
2008Q3	1.97414...	2.04943...	-0.0752...
2008Q4	1.97028...	2.01056...	-0.0402...
2009Q1	1.96506...	1.96754...	-0.0024...
2009Q2	1.96065...	2.06324...	-0.1025...
2009Q3	1.95667...	2.04597...	-0.0892...
2009Q4	1.95250...	2.02592...	-0.0734...
2010Q1	1.94820...	2.01302...	-0.0648...
2010Q2	1.94411...	2.01040...	-0.0662...
2010Q3	1.94014...	1.97319...	-0.0330...
2010Q4	1.93630...	1.96393...	-0.0276...
2011Q1	1.93252...	1.94824...	-0.0157...
2011Q2	1.92912...	1.95182...	-0.0226...
2011Q3	1.92622...	1.94965...	-0.0234...
2011Q4	1.92312...	1.92260...	0.00051...
2012Q1	1.91992...	1.93960...	-0.0196...
2012Q2	1.91695...	1.91342...	0.00353...
2012Q3	1.91405...	1.87629...	0.03775...
2012Q4	1.91157...	1.87167...	0.03989...
2013Q1	1.90944...	1.86884...	0.04059...
2013Q2	1.90765...	1.88525...	0.02240...
2013Q3	1.90631...	1.89184...	0.01447...
2013Q4	1.90505...	1.89111...	0.01393...
2014Q1	1.90397...	1.88432...	0.01964...
2014Q2	1.90307...	1.94448...	-0.0414...
2014Q3	1.90243...	1.95914...	-0.0567...
2014Q4	1.90171...	1.94145...	-0.0397...
2015Q1	1.90089...	1.92938...	-0.0284...
2015Q2	1.90035...	1.94384...	-0.0434...
2015Q3	1.90007...	1.94403...	-0.0439...
2015Q4	1.89971...	1.91622...	-0.0165...



Appendix 4.4: Correlation Analysis (Source: Developed for research via EViews 9.5)

	LOGPPI	GDP	LOGINF	IR	UR
LOGPPI	1.0000	0.0510	0.2986	0.7766	-0.3014
GDP	0.0510	1.0000	-0.2112	0.0494	0.03213
LOGINF	0.2986	-0.2112	1.0000	-0.0474	-0.1807
IR	0.7766	0.0494	-0.0474	1.0000	-0.6252
UR	-0.3014	0.0321	-0.1807	-0.6252	1.0000

Appendix 4.5: Regression Analysis (GDP & LOGINF) (Source: Developed for research via EViews 9.5)

Dependent Variable: GDP
Method: Least Squares
Date: 07/02/17 Time: 00:12
Sample: 1993Q1 2015Q4
Included observations: 92

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	77.04670	37.46581	2.056454	0.0426
LOGINF	-38.29614	18.67777	-2.050360	0.0432

R-squared	0.044626	Mean dependent var	0.228624
Adjusted R-squared	0.034011	S.D. dependent var	1.019991
S.E. of regression	1.002496	Akaike info criterion	2.864362
Sum squared resid	90.44980	Schwarz criterion	2.919183
Log likelihood	-129.7606	Hannan-Quinn criter.	2.886488
F-statistic	4.203975	Durbin-Watson stat	1.907142
Prob(F-statistic)	0.043238		

Appendix 4.6: Regression Analysis (GDP & IR) (Source: Developed for research via EViews 9.5)

Dependent Variable: GDP
Method: Least Squares
Date: 07/02/17 Time: 00:13
Sample: 1993Q1 2015Q4
Included observations: 92

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.148748	0.200916	0.740347	0.4610
IR	0.046022	0.098051	0.469367	0.6399

R-squared	0.002442	Mean dependent var	0.228624
Adjusted R-squared	-0.008642	S.D. dependent var	1.019991
S.E. of regression	1.024389	Akaike info criterion	2.907570
Sum squared resid	94.44361	Schwarz criterion	2.962391
Log likelihood	-131.7482	Hannan-Quinn criter.	2.929696
F-statistic	0.220305	Durbin-Watson stat	1.866490
Prob(F-statistic)	0.639942		

Appendix 4.7: Regression Analysis (GDP & UR) (Source: Developed for research via EViews 9.5)

Dependent Variable: GDP
Method: Least Squares
Date: 07/02/17 Time: 00:14
Sample: 1993Q1 2015Q4
Included observations: 92

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.057098	0.572436	0.099745	0.9208
UR	0.041288	0.135369	0.305006	0.7611

R-squared	0.001033	Mean dependent var	0.228624
Adjusted R-squared	-0.010067	S.D. dependent var	1.019991
S.E. of regression	1.025113	Akaike info criterion	2.908981
Sum squared resid	94.57703	Schwarz criterion	2.963803
Log likelihood	-131.8131	Hannan-Quinn criter.	2.931108
F-statistic	0.093029	Durbin-Watson stat	1.855918
Prob(F-statistic)	0.761066		

Appendix 4.8: Regression Analysis (LOGINF & IR) (Source: Developed for research via EViews 9.5)

Dependent Variable: LOGINF
Method: Least Squares
Date: 07/02/17 Time: 00:18
Sample: 1993Q1 2015Q4
Included observations: 92

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.006319	0.001108	1810.101	0.0000
IR	-0.000244	0.000541	-0.450379	0.6535

R-squared	0.002249	Mean dependent var	2.005896
Adjusted R-squared	-0.008837	S.D. dependent var	0.005626
S.E. of regression	0.005651	Akaike info criterion	-7.492367
Sum squared resid	0.002874	Schwarz criterion	-7.437545
Log likelihood	346.6489	Hannan-Quinn criter.	-7.470240
F-statistic	0.202841	Durbin-Watson stat	0.178716
Prob(F-statistic)	0.653520		

Appendix 4.9: Regression Analysis (LOGINF & UR) (Source: Developed for research via EViews 9.5)

Dependent Variable: LOGINF
Method: Least Squares
Date: 07/02/17 Time: 00:20
Sample: 1993Q1 2015Q4
Included observations: 92

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.011217	0.003107	647.2555	0.0000
UR	-0.001281	0.000735	-1.742965	0.0848

R-squared	0.032653	Mean dependent var	2.005896
Adjusted R-squared	0.021904	S.D. dependent var	0.005626
S.E. of regression	0.005565	Akaike info criterion	-7.523313
Sum squared resid	0.002787	Schwarz criterion	-7.468492
Log likelihood	348.0724	Hannan-Quinn criter.	-7.501187
F-statistic	3.037928	Durbin-Watson stat	0.183100
Prob(F-statistic)	0.084755		

Appendix 4.10: Regression Analysis (IR & UR) (Source: Developed for research via EViews 9.5)

Dependent Variable: IR
Method: Least Squares
Date: 07/02/17 Time: 00:20
Sample: 1993Q1 2015Q4
Included observations: 92

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.318965	0.479954	11.08224	0.0000
UR	-0.862551	0.113499	-7.599634	0.0000

R-squared	0.390881	Mean dependent var	1.735627
Adjusted R-squared	0.384113	S.D. dependent var	1.095200
S.E. of regression	0.859496	Akaike info criterion	2.556559
Sum squared resid	66.48605	Schwarz criterion	2.611380
Log likelihood	-115.6017	Hannan-Quinn criter.	2.578685
F-statistic	57.75444	Durbin-Watson stat	0.095951
Prob(F-statistic)	0.000000		

Appendix 4.11: Result of VIF

Variables	**R^2**	**VIF = [1/(1-R^2)]**	**Low/ High**
GDP & LOGINF ***(refer to Appendix 4.5)***	0.044626	1/(1- 0.044626) =1.046711	Low
GDP & IR ***(refer to Appendix 4.6)***	0.002442	1/(1- 0.002442) =1.002448	Low
GDP & UR ***(refer to Appendix 4.7)***	0.001033	1/(1- 0.001033) =1.001034	Low
LOGINF & IR ***(refer to Appendix 4.8)***	0.002249	1/(1- 0.002249) =1.002254	Low
LOGINF & UR ***(refer to Appendix 4.9)***	0.032653	1/(1- 0.032653) =1.033755	Low
IR & UR ***(refer to Appendix 4.10)***	0.390881	1/(1- 0.390881) =1.641715	Low

Appendix 4.12: Result of TOL

Variables	VIF	TOL = 1/VIF	Low/ High
GDP & LOGINF ***(refer to Appendix 4.5)***	1.046711	1/1.046711 =0.955374	Low
GDP & IR ***(refer to Appendix 4.6)***	1.002448	1/1.002448 =0.997558	Low
GDP & UR ***(refer to Appendix 4.7)***	1.001034	1/1.001034 =0.998967	Low
LOGINF & IR ***(refer to Appendix 4.8)***	1.002254	1/1.002254 =0.997751	Low
LOGINF & UR ***(refer to Appendix 4.9)***	1.033755	1/1.033755 =0.967347	Low
IR & UR ***(refer to Appendix 4.10)***	1.641715	1/1.641715 =0.609119	Low

Appendix 4.13: Autoregressive Conditional Heteroscedasticity (ARCH) Test

(Source: Developed for research via EViews 9.5)

Heteroskedasticity Test: ARCH

F-statistic	27.42010	Prob. F(1,89)	0.0000
Obs*R-squared	21.43298	Prob. Chi-Square(1)	0.0000

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 07/04/17 Time: 19:51
Sample (adjusted): 2 92
Included observations: 91 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000846	0.000255	3.323446	0.0013
RESID^2(-1)	0.486403	0.092889	5.236421	0.0000

R-squared	0.235527	Mean dependent var	0.001660
Adjusted R-squared	0.226938	S.D. dependent var	0.002186
S.E. of regression	0.001922	Akaike info criterion	-9.649019
Sum squared resid	0.000329	Schwarz criterion	-9.593835
Log likelihood	441.0303	Hannan-Quinn criter.	-9.626755
F-statistic	27.42010	Durbin-Watson stat	1.809010
Prob(F-statistic)	0.000001		

Appendix 4.14: White's Heteroscedasticity-Corrected Variances and Standard Error Test (WHITE) Test (Source: Developed for research via EViews 9.5)

Heteroskedasticity Test: White

F-statistic	1.689728	Prob. F(13,78)	0.0797
Obs*R-squared	20.21592	Prob. Chi-Square(13)	0.0900
Scaled explained SS	15.35728	Prob. Chi-Square(13)	0.2856

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 07/04/17 Time: 19:51
Sample: 1 92
Included observations: 92
Collinear test regressors dropped from specification

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.942855	0.450927	-2.090926	0.0398
GDP^2	2.12E-05	9.63E-05	0.220365	0.8262
GDP*LOGINF	-0.050959	0.047008	-1.084036	0.2817
GDP*IR	0.000457	0.000337	1.357676	0.1785
GDP*UR	0.000193	0.000492	0.391949	0.6962
GDP	0.100982	0.095177	1.061001	0.2920
LOGINF^2	0.231111	0.108781	2.124549	0.0368
LOGINF*IR	0.004066	0.079032	0.051449	0.9591
LOGINF*UR	-0.202695	0.088170	-2.298922	0.0242
IR^2	0.000222	0.000302	0.733792	0.4653
IR*UR	-0.000711	0.000950	-0.748381	0.4565
IR	-0.005962	0.160217	-0.037212	0.9704
UR^2	-0.000332	0.000854	-0.388947	0.6984
UR	0.411445	0.181069	2.272311	0.0258

R-squared	0.219738	Mean dependent var	0.001659
Adjusted R-squared	0.089695	S.D. dependent var	0.002174
S.E. of regression	0.002074	Akaike info criterion	-9.379080
Sum squared resid	0.000336	Schwarz criterion	-8.995329
Log likelihood	445.4377	Hannan-Quinn criter.	-9.224195
F-statistic	1.689728	Durbin-Watson stat	1.284921
Prob(F-statistic)	0.079720		

Appendix 4.15: Breusch-Godfrey Serial Correlation LM Test (Source: Developed for research via EViews 9.5)

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	53.34493	Prob. F(2,85)	0.0000
Obs*R-squared	51.20494	Prob. Chi-Square(2)	0.0000

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 07/04/17 Time: 19:52
Sample: 1 92
Included observations: 92
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.288961	1.160678	1.110524	0.2699
GDP	-0.001145	0.002978	-0.384577	0.7015
LOGINF	-0.630929	0.574755	-1.097736	0.2754
IR	-0.003083	0.003595	-0.857621	0.3935
UR	-0.004302	0.005024	-0.856330	0.3942
RESID(-1)	0.798432	0.107859	7.402564	0.0000
RESID(-2)	-0.063497	0.111462	-0.569674	0.5704

R-squared	0.556575	Mean dependent var	3.46E-15
Adjusted R-squared	0.525275	S.D. dependent var	0.040953
S.E. of regression	0.028217	Akaike info criterion	-4.224779
Sum squared resid	0.067675	Schwarz criterion	-4.032904
Log likelihood	201.3398	Hannan-Quinn criter.	-4.147337
F-statistic	17.78164	Durbin-Watson stat	1.854917
Prob(F-statistic)	0.000000		

Appendix 4.16: Newey-West HAC Standard Errors and Covariance Test (Source: Developed for research via EViews 9.5)

Dependent Variable: LOGPPI
Method: Least Squares
Date: 07/04/17 Time: 19:53
Sample: 1 92
Included observations: 92
HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-14.51722	2.256785	-6.432701	0.0000
GDP	0.007738	0.003979	1.944568	0.0551
LOGINF	8.048703	1.128140	7.134487	0.0000
IR	0.099372	0.008549	11.62371	0.0000
UR	0.057237	0.012061	4.745668	0.0000

R-squared	0.836567	Mean dependent var	2.039667
Adjusted R-squared	0.829053	S.D. dependent var	0.101301
S.E. of regression	0.041884	Akaike info criterion	-3.455030
Sum squared resid	0.152618	Schwarz criterion	-3.317976
Log likelihood	163.9314	Hannan-Quinn criter.	-3.399714
F-statistic	111.3319	Durbin-Watson stat	0.514757
Prob(F-statistic)	0.000000	Wald F-statistic	49.55044
Prob(Wald F-statistic)	0.000000		

Appendix 4.17:Autoregressive Distributed Lag Model (ARDL)- Improved Regressive Model (Source: Developed for research via EViews 9.5)

$$\text{Log } PPI_t = \beta_0 + \beta_1 GDP_t + \log \beta_2 INF_t + \beta_3 IR_t + \beta_4 UR_t + \beta_1 GDP_{t-1} + \log \beta_2 INF_{t-1} + \beta_3 IR_{t-1} + \beta_4 UR_{t-1} + \beta_1 GDP_{t-2} + \log \beta_2 INF_{t-2} + \beta_3 IR_{t-2} + \beta_4 UR_{t-2} + \beta_1 GDP_{t3} + \log \beta_2 INF_{t-3} + \beta_3 IR_{t-3} + \beta_4 UR_{t-3} + \beta_1 GDP_{t-4} + \log \beta_2 INF_{t-4} + \beta_3 IR_{t-4} + \beta_4 UR_{t-4} + \beta_1 GDP_{t-5} + \log \beta_2 INF_{t-5} + \beta_3 IR_{t-5} + \beta_4 UR_{t-5} + \beta_1 GDP_{t-6} + \log \beta_2 INF_{t-6} + \beta_3 IR_{t-6} + \beta_4 UR_{t-6} + \beta_1 GDP_{t-7} + \log \beta_2 INF_{t-7} + \beta_3 IR_{t-7} + \beta_4 UR_{t-7} + \beta_1 GDP_{t-8} + \log \beta_2 INF_{t-8} + \beta_3 IR_{t-8} + \beta_4 UR_{t-8} + \beta_1 GDP_{t-9} + \log \beta_2 INF_{t-9} + \beta_3 IR_{t-9} + \beta_4 UR_{t-9} + \beta_1 GDP_{t-10} + \log \beta_2 INF_{t-10} + \beta_3 IR_{t-10} + \beta_4 UR_{t-10} + \beta_1 GDP_{t-11} + \log \beta_2 INF_{t-11} + \beta_3 IR_{t-11} + \beta_4 UR_{t-11} + \beta_1 GDP_{t-12} + \log \beta_2 INF_{t-12} + \beta_3 IR_{t-12} + \beta_4 UR_{t-12} + \beta_1 GDP_{t-13} + \log \beta_2 INF_{t-13} + \beta_3 IR_{t-13} + \beta_4 UR_{t-13} + \beta_1 GDP_{t-14} + \log \beta_2 INF_{t-14} + \beta_3 IR_{t-14} + \beta_4 UR_{t-14} + \beta_1 GDP_{t-15} + \log \beta_2 INF_{t-15} + \beta_3 IR_{t-15} + \beta_4 UR_{t-15} + \beta_1 GDP_{t-16} + \log \beta_2 INF_{t-16} + \beta_3 IR_{t-16} + \beta_4 UR_{t-16} + \beta_1 GDP_{t-17} + \log \beta_2 INF_{t-17} + \beta_3 IR_{t-17} + \beta_4 UR_{t-17} + \beta_1 GDP_{t-18} + \log \beta_2 INF_{t-18} + \beta_3 IR_{t-18} + \beta_4 UR_{t-18} + \beta_1 GDP_{t-19} + \log \beta_2 INF_{t-19} + \beta_3 IR_{t-19} + \beta_4 UR_{t-19} + \beta_1 GDP_{t-20} + \log \beta_2 INF_{t-20} + \beta_3 IR_{t-20} + \beta_4 UR_{t-20} + \beta_1 GDP_{t-21} + \log \beta_2 INF_{t-21} + \beta_3 IR_{t-21} + \beta_4 UR_{t-21} + \beta_1 GDP_{t-22} + \log \beta_2 INF_{t-22} + \beta_3 IR_{t-22} + \beta_4 UR_{t-22} + \beta_1 GDP_{t-23} + \log \beta_2 INF_{t-23} + \beta_3 IR_{t-23} + \beta_4 UR_{t-23} + \beta_1 GDP_{t-24} + \log \beta_2 INF_{t-24} + \beta_3 IR_{t-24} + \beta_4 UR_{t-24} + \beta_1 GDP_{t-25} + \log \beta_2 INF_{t-25} + \beta_3 IR_{t-25} + \beta_4 UR_{t-25} + \beta_1 GDP_{t-26} + \log \beta_2 INF_{t-26} + \beta_3 IR_{t-26} + \beta_4 UR_{t-26} + \beta_1 GDP_{t-27} + \log \beta_2 INF_{t-27} + \beta_3 IR_{t-27} + \beta_4 UR_{t-27} + \beta_1 GDP_{t-28} + \log \beta_2 INF_{t-28} + \beta_3 IR_{t-28} + \beta_4 UR_{t-28} + \beta_1 GDP_{t-29} + \log \beta_2 INF_{t-29} + \beta_3 IR_{t-29} + \beta_4 UR_{t-29} + \beta_1 GDP_{t-30} + \log \beta_2 INF_{t-30} + \beta_3 IR_{t-30} + \beta_4 UR_{t-30} + \beta_1 GDP_{t-31} + \log \beta_2 INF_{t-31} + \beta_3 IR_{t-31} + \beta_4 UR_{t-31} + \beta_1 GDP_{t-32} + \log \beta_2 INF_{t-32} + \beta_3 IR_{t-32} + \beta_4 UR_{t-32} + \beta_1 GDP_{t-33} + \log \beta_2 INF_{t-33} + \beta_3 IR_{t-33} + \beta_4 UR_{t-33} + \beta_1 GDP_{t-34} + \log \beta_2 INF_{t-34} + \beta_3 IR_{t-34} + \beta_4 UR_{t-34} + \beta_1 GDP_{t-35} + \log \beta_2 INF_{t-35} + \beta_3 IR_{t-35} + \beta_4 UR_{t-35} + \beta_1 GDP_{t-36} + \log \beta_2 INF_{t-36} + \beta_3 IR_{t-36} + \beta_4 UR_{t-36} + \beta_1 GDP_{t-37} + \log \beta_2 INF_{t-37} + \beta_3 IR_{t-37} + \beta_4 UR_{t-37} + \beta_1 GDP_{t-38} + \log \beta_2 INF_{t-38} + \beta_3 IR_{t-38} + \beta_4 UR_{t-38} + \beta_1 GDP_{t-39} + \log \beta_2 INF_{t-39} + \beta_3 IR_{t-39} + \beta_4 UR_{t-39} + \beta_1 GDP_{t-40} + \log \beta_2 INF_{t-40} + \beta_3 IR_{t-40} + \beta_4 UR_{t-40} + \beta_1 GDP_{t-41} + \log \beta_2 INF_{t-41} + \beta_3 IR_{t-41} + \beta_4 UR_{t-41} + \beta_1 GDP_{t-42} + \log \beta_2 INF_{t-42} + \beta_3 IR_{t-42} + \beta_4 UR_{t-42} + \beta_1 GDP_{t-43} + \log \beta_2 INF_{t-43} + \beta_3 IR_{t-43} + \beta_4 UR_{t-43} + \beta_1 GDP_{t-44}$$

$$+ \log \beta_2 INF_{t-44} + \beta_3 IR_{t-44} + \beta_4 UR_{t-44} + \beta_1 GDP_{t-45} + \log \beta_2 INF_{t-45} + \beta_3 IR_{t-45} + \beta_4 UR_{t-45} + \beta_1 GDP_{t-46} + \log \beta_2 INF_{t-46} + \beta_3 IR_{t-46} + \beta_4 UR_{t-46} + \beta_1 GDP_{t-47} + \log \beta_2 INF_{t-47} + \beta_3 IR_{t-47} + \beta_4 UR_{t-47} + \beta_1 GDP_{t-48} + \log \beta_2 INF_{t-48} + \beta_3 IR_{t-48} + \beta_4 UR_{t-48} + \beta_1 GDP_{t-49} + \log \beta_2 INF_{t-49} + \beta_3 IR_{t-49} + \beta_4 UR_{t-49} + \beta_1 GDP_{t-50} + \log \beta_2 INF_{t-50} + \beta_3 IR_{t-50} + \beta_4 UR_{t-50} + \beta_1 GDP_{t-51} + \log \beta_2 INF_{t-51} + \beta_3 IR_{t-51} + \beta_4 UR_{t-51} + \beta_1 GDP_{t-52} + \log \beta_2 INF_{t-52} + \beta_3 IR_{t-52} + \beta_4 UR_{t-52} + \beta_1 GDP_{t-53} + \log \beta_2 INF_{t-53} + \beta_3 IR_{t-53} + \beta_4 UR_{t-53} + \beta_1 GDP_{t-54} + \log \beta_2 INF_{t-54} + \beta_3 IR_{t-54} + \beta_4 UR_{t-54} + \beta_1 GDP_{t-55} + \log \beta_2 INF_{t-55} + \beta_3 IR_{t-55} + \beta_4 UR_{t-55} + \beta_1 GDP_{t-56} + \log \beta_2 INF_{t-56} + \beta_3 IR_{t-56} + \beta_4 UR_{t-56} + \beta_1 GDP_{t-57} + \log \beta_2 INF_{t-57} + \beta_3 IR_{t-57} + \beta_4 UR_{t-57} + \beta_1 GDP_{t-58} + \log \beta_2 INF_{t-58} + \beta_3 IR_{t-58} + \beta_4 UR_{t-58} + \beta_1 GDP_{t-59} + \log \beta_2 INF_{t-59} + \beta_3 IR_{t-59} + \beta_4 UR_{t-59} + \beta_1 GDP_{t-60} + \log \beta_2 INF_{t-60} + \beta_3 IR_{t-60} + \beta_4 UR_{t-60} + \beta_1 GDP_{t-61} + \log \beta_2 INF_{t-61} + \beta_3 IR_{t-61} + \beta_4 UR_{t-61}$$

Appendix 4.18: Breusch-Godfrey Serial Correlation LM Test (ARDL) (Source: Developed for research via Eviews 9.5)

Breusch-Godfrey Serial Correlation LM Test:

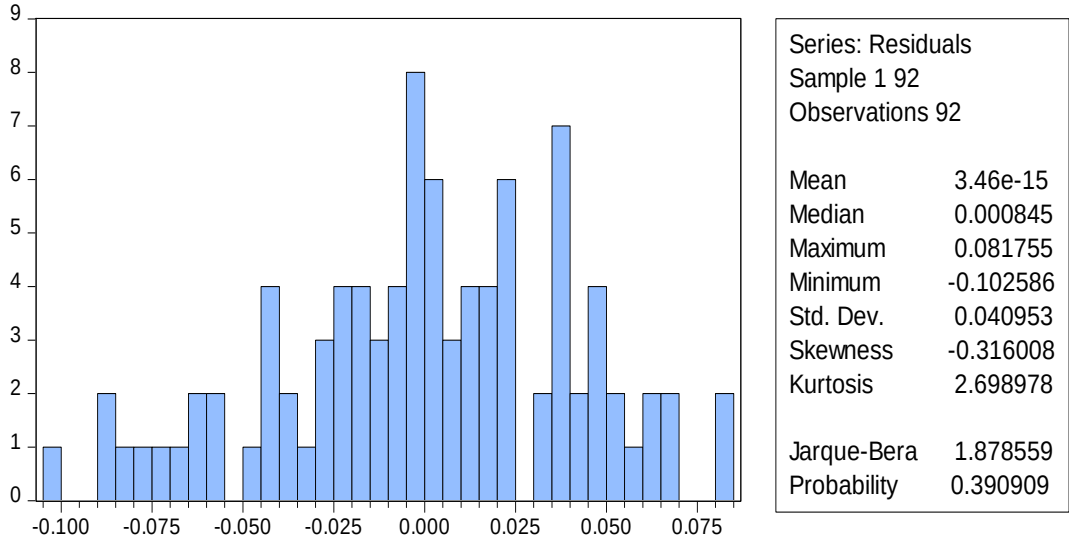
F-statistic	2.868625	Prob. F(61,26)	0.0021
Obs*R-squared	80.09868	Prob. Chi-Square(61)	0.0510

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 07/09/17 Time: 02:21
Sample: 1993Q1 2015Q4
Included observations: 92
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.838298	2.087612	0.880575	0.3866
GDP	-0.007510	0.005717	-1.313556	0.2005
LOGINF	-0.864805	1.038173	-0.833007	0.4124
IR	-0.028450	0.007650	-3.719162	0.0010
UR	0.003407	0.009575	0.355792	0.7249
RESID(-1)	0.337618	0.175241	1.926595	0.0650
RESID(-2)	-0.237054	0.194118	-1.221182	0.2330
RESID(-3)	-0.136976	0.183988	-0.744485	0.4633
RESID(-4)	-0.113703	0.180829	-0.628791	0.5350
RESID(-5)	-0.215591	0.185192	-1.164150	0.2549
RESID(-6)	0.022907	0.188110	0.121776	0.9040
RESID(-7)	-0.183399	0.189105	-0.969829	0.3411
RESID(-8)	-0.225470	0.188182	-1.198153	0.2417
RESID(-9)	-0.074097	0.195855	-0.378328	0.7083
RESID(-10)	-0.228493	0.193082	-1.183399	0.2474
RESID(-11)	0.042361	0.191074	0.221699	0.8263
RESID(-12)	-0.175217	0.190833	-0.918172	0.3670
RESID(-13)	-0.177825	0.205945	-0.863461	0.3958
RESID(-14)	-0.135572	0.201257	-0.673626	0.5065
RESID(-15)	-0.198630	0.197066	-1.007939	0.3228
RESID(-16)	0.095811	0.203692	0.470371	0.6420
RESID(-17)	-0.233196	0.208749	-1.117114	0.2742
RESID(-18)	-0.128393	0.211673	-0.606564	0.5494
RESID(-19)	0.006748	0.209842	0.032157	0.9746
RESID(-20)	0.180081	0.206502	0.872055	0.3912
RESID(-21)	-0.287237	0.212843	-1.349522	0.1888
RESID(-22)	-0.001204	0.215780	-0.005578	0.9956
RESID(-23)	0.018069	0.215565	0.083824	0.9338
RESID(-24)	0.042952	0.227558	0.188753	0.8518
RESID(-25)	-0.089447	0.220876	-0.404965	0.6888
RESID(-26)	-0.100793	0.217908	-0.462548	0.6475
RESID(-27)	-0.062853	0.230183	-0.273058	0.7870
RESID(-28)	0.060344	0.244433	0.246873	0.8069
RESID(-29)	-0.064691	0.232108	-0.278710	0.7827
RESID(-30)	0.014982	0.231104	0.064829	0.9488
RESID(-31)	-0.185287	0.236760	-0.782593	0.4409
RESID(-32)	0.075934	0.238341	0.318595	0.7526
RESID(-33)	-0.077045	0.238563	-0.322954	0.7493
RESID(-34)	-0.019421	0.240073	-0.080895	0.9361
RESID(-35)	-0.155333	0.248936	-0.623986	0.5381
RESID(-36)	-0.167562	0.244726	-0.684693	0.4996
RESID(-37)	-0.025893	0.251030	-0.103149	0.9186
RESID(-38)	-0.061623	0.262298	-0.234933	0.8161
RESID(-39)	-0.341227	0.288496	-1.182776	0.2476
RESID(-40)	-0.099997	0.287028	-0.348389	0.7304
RESID(-41)	-0.121145	0.290538	-0.416967	0.6801
RESID(-42)	-0.409807	0.292409	-1.401483	0.1729
RESID(-43)	-0.308847	0.292280	-1.056681	0.3004
RESID(-44)	-0.167151	0.298889	-0.559241	0.5808
RESID(-45)	-0.309941	0.317388	-0.976535	0.3378
RESID(-46)	-0.361538	0.320240	-1.128957	0.2692
RESID(-47)	-0.233703	0.315475	-0.740796	0.4655
RESID(-48)	-0.261053	0.315299	-0.827954	0.4152
RESID(-49)	-0.362622	0.341232	-1.062684	0.2977
RESID(-50)	-0.471728	0.304268	-1.550371	0.1331
RESID(-51)	-0.298731	0.311332	-0.959527	0.3461
RESID(-52)	-0.361867	0.316497	-1.143351	0.2633
RESID(-53)	-0.453771	0.365346	-1.242032	0.2253
RESID(-54)	-0.403349	0.279919	-1.440950	0.1615
RESID(-55)	-0.143194	0.286826	-0.499236	0.6218
RESID(-56)	-0.345941	0.316451	-1.093190	0.2843
RESID(-57)	-0.364515	0.338187	-1.077852	0.2910
RESID(-58)	-0.231058	0.282169	-0.818864	0.4203
RESID(-59)	-0.002464	0.284437	-0.008661	0.9932
RESID(-60)	-0.230312	0.306273	-0.751983	0.4588
RESID(-61)	-0.159429	0.332089	-0.480081	0.6352

R-squared	0.870638	Mean dependent var	3.46E-15
Adjusted R-squared	0.547232	S.D. dependent var	0.040953
S.E. of regression	0.027556	Akaike info criterion	-4.174082
Sum squared resid	0.019743	Schwarz criterion	-2.364973
Log likelihood	258.0078	Hannan-Quinn criter.	-3.443911
F-statistic	2.692094	Durbin-Watson stat	1.487285
Prob(F-statistic)	0.003281		

Appendix 4.19Jarque-Bera Test (Source: Developed for research via EViews 9.5)



Appendix 4.20: Ramsey RESET test (Source: Developed for research via Eviews 9.5)

Ramsey RESET Test
Equation: UNTITLED
Specification: LOGPPI C GDP LOGINF IR UR
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	1.863673	86	0.0658
F-statistic	3.473276	(1, 86)	0.0658
Likelihood ratio	3.642528	1	0.0563

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	0.005925	1	0.005925
Restricted SSR	0.152618	87	0.001754
Unrestricted SSR	0.146694	86	0.001706

LR test summary:

	Value	df
Restricted LogL	163.9314	87
Unrestricted LogL	165.7526	86

Unrestricted Test Equation:
Dependent Variable: LOGPPI
Method: Least Squares
Date: 07/04/17 Time: 19:53
Sample: 1 92
Included observations: 92
HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-74.29729	62.05404	-1.197300	0.2345
GDP	0.038066	0.031313	1.215655	0.2274
LOGINF	39.04808	32.15942	1.214203	0.2280
IR	0.487413	0.397720	1.225520	0.2237
UR	0.273816	0.223703	1.224019	0.2243
FITTED^2	-0.955117	0.979002	-0.975603	0.3320

R-squared	0.842911	Mean dependent var	2.039667
Adjusted R-squared	0.833778	S.D. dependent var	0.101301
S.E. of regression	0.041301	Akaike info criterion	-3.472884
Sum squared resid	0.146694	Schwarz criterion	-3.308419
Log likelihood	165.7526	Hannan-Quinn criter.	-3.406504
F-statistic	92.29216	Durbin-Watson stat	0.461044
Prob(F-statistic)	0.000000	Wald F-statistic	44.02079
Prob(Wald F-statistic)	0.000000		