MACROECONOMIC EFFECT OF HOUSING PRICE IN 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 research project has been submitted in support of any application for any other degree or qualification of this or any other university, or other institutions 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 16752.

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LIST OF ABBREVIATIONS

ADF	Augmented-Dickey Fuller
AIC	Akaike Info Criterion
ARCH	Autoregressive Conditional Heteroscedasticity
ARDL	Autoregressive Distributed Lag
BGLM	Breush-Godfrey Serial Correlation LM
BOJ	Bank of Japan
CPI	Consumer Price Index
CUSUM	Cumulative Sum of Recursive Residuals
CUSUMSQ	Cumulative Sum of Recursive Residuals of Squares
ECM	Error Correction Model
EMEs	Emerging Economies
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
HP	Housing Price
INF	Inflation
JB	Jarque-Bera
OECD	Organization for Economic Cooperation and Development
POP	Population
UECM	Unrestricted Error Correction Model

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ABSTRACT

This study investigates the short run and long run relationship between housing price and macroeconomic variables such as GDP, inflation and population in Japan over the period from 1967 to 2015. In this paper, the researchers employed Autoregressive Distributed Lag (ADRL) to examine the short run and long run relationship exists between GDP, inflation and population with housing price in Japan over period 1967 to 2015. In short run, the result showed that GDP and population was significantly affect the housing price in Japan. However, inflation found no significant influence on Japan housing price in the short run. Besides, the long run result showed GDP has a positive impact and inflation has a negative impact towards housing price in Japan whereas population have no relationship toward housing price in Japan among the years. Among these three variables, GDP has the highest impact on Japan housing price. This finding suggests that GDP and inflation are detrimental to Japan's housing price in the long run and for policy wise the main concern of policymakers should be participated in open market actively, reduction of property tax and law on securement of table supply of elderly persons' housing provide rental house with elderly care services in order to solve the problem. Based on the test and result that had conducted, it is strongly believe that the dynamic of housing prices had been influenced by the three macroeconomic determinants which is GDP, inflation and population.

CHAPTER 1: RESEARCH OVERVIEW

1.0 Introduction

This study aims to determine the impact of macroeconomic on housing price in Japan from year 1967 until 2015. Three macroeconomic variables have been taken in this study which include gross domestic product (GDP), inflation and population towards the housing price in Japan. This chapter will discuss the movement of housing market in Japan. Secondly, research background of study which includes the general housing market and economic outlook in worldwide. Thirdly, the housing price in Japan followed by trend of GDP, inflation and population. Fourthly, the problems will be discussed. In addition, the general research questions and objectives of this study, the significance of study.

1.1 Background of Study

Every human being needs a basic shelter for their living as housing has become a significant and essential need for everyone. There is no place like home. Housing is a major castle which is not only providing a comfortable living space for everyone but it is also become a preservation of everyone from the sunshine and rainy day. Housing are normally the largest component in playing a central role for the size of financial sector and the wealth-to-income ratios and the key collateral for bank lending (Piketty & Zucman, 2014; Jorda, Schularick & Taylor, 2014). Hence, the movement of housing price has become an important issue which will affect the households' net wealth as well as their ability to borrow and spend which would possess a significant

macroeconomic implication. On the other hand, the housing price and the activity that conduct in the housing price market are connected with the economic development of an individual country (Mavrodiy, 2005). According to Lin and Chen (2011), the prices of housing in the capitals were differed from the housing prices in others small cities. As observed in other countries, the bigger cities had the most expensive housing price.

1.1.1 The Index Price of Real House in Worldwide

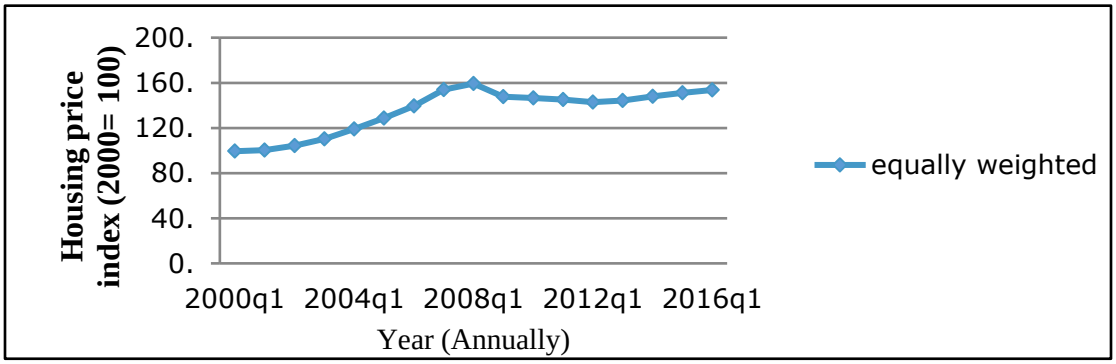

Figure 1.1: Global Real House Price Index

Source: International Monetary Fund, 2017

In recent years, housing markets in emerging economies had increased rapidly with average annual prices around 15 to 20 percent not rare in the developed world (Ciarlone, 2015). The global real house indexes were growing steadily from 2000 first quarter until a peak of 160 points in 2008 third quarter (Figure 1.1). However, it fell to about 145 points in the year of 2009 second quarter. It fluctuated in between 140 point and 155 point from the year of 2009 to 2016. The expansion in risky mortgages to those under qualified borrowers caused a dramatic decrease in 2009. The number of nonprime lending had grown up and the Federal housing administration had loosen the standard of down payment. At the same time, the mortgage lenders have been supported by government to grow own or guarantee about half of the US mortgage market. The credit that contributed these risky mortgages was provided by inexpensive money

policy of Federal Reserve (Lawrence, 2009). Figure 1.2 demonstrated that the housing price index for the 4 countries from first quarter 2000 to first quarter 2016.

1.1.2 Housing Price in The Countries of Australia, Britain, Canada and United States

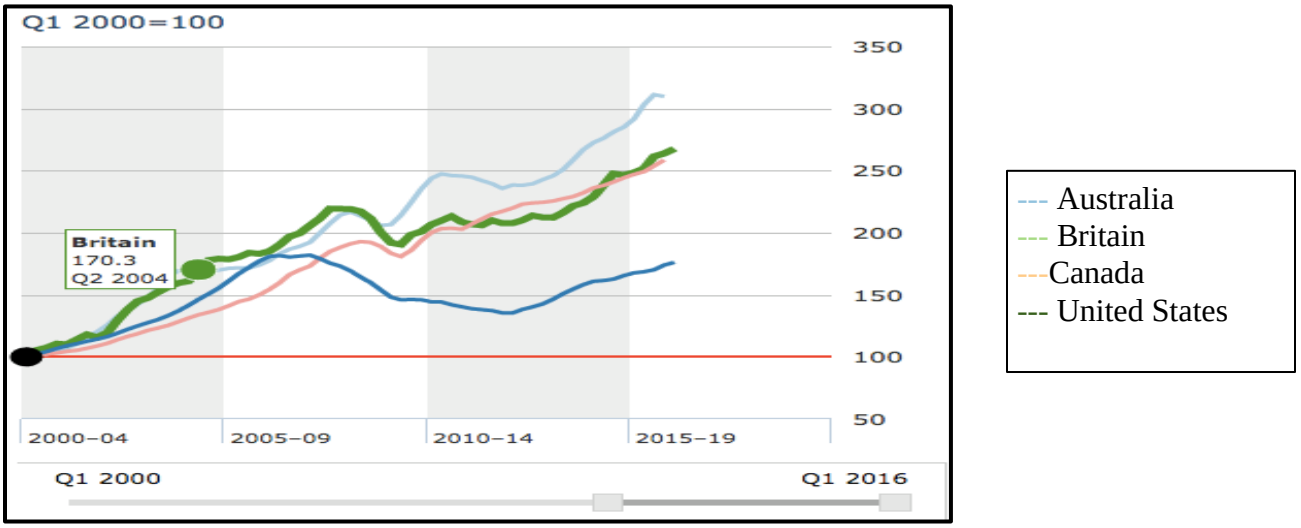

Figure 1.2: The housing prices of Australia, Britain, Canada and United States

Source: Organisation for Economic Co-operation and Development (OECD), 2015

As the Figure 1.2 shown above, British and American house were on a similar track between 2000 and 2006 and increasing by about 80%. While the roof subsequently fell into US housing market, the British housing prices continued to rise rapidly after a brief in 2008 to 2009.Moreover, before the economic downturn, the average housing price of London ranged around 5.3 times the income (Marden, 2015). The housing prices in London have been increased by about 13% per annum. Most of the rise has been driven by the London's attractiveness as one of the pre-eminent world town. At the same time, London's housing has been sold for seven times the city's average annual salary.

In order to determine whether homes are fairly valued, the economist has taken an indicator of affordability which is the relationship between housing price and disposable income as well as housing price and rent. The measure of affordability of the mortgage holders was measured by the ratio of housing prices to the income of holders (Marsden, 2015). When rising price moved these ratios more than their long run average, the income was likely to raise as well and housing price was likely to fall. After falling of American's house price by 25% from the peak between 2007 and 2012, it was currently fair value as compared with the income and rent. On the other hand, the housing appeared to be more than 40% overvalued in Australia, Canada and Britain (Onselen, 2016).

The housing price in Alberta was booming and shooting above the prices in Ontario in 2007. However, the circumstances had contrary and the houses in Ontario had cost more than in Alberta (Schembri & Ontario, 2015). Besides, the Canada's housing prices were modest in 2011 and 2012 and due to new stricter mortgage rule introduced. The prices of housing in Toronto and Vancouver increased steadily in 2013 and 2014. The housing prices in British Columbia had continued to rise in 2015 and 2016 (Schembri & Ontario, 2015).

1.1.3 The Prices and Value of The Residential Land

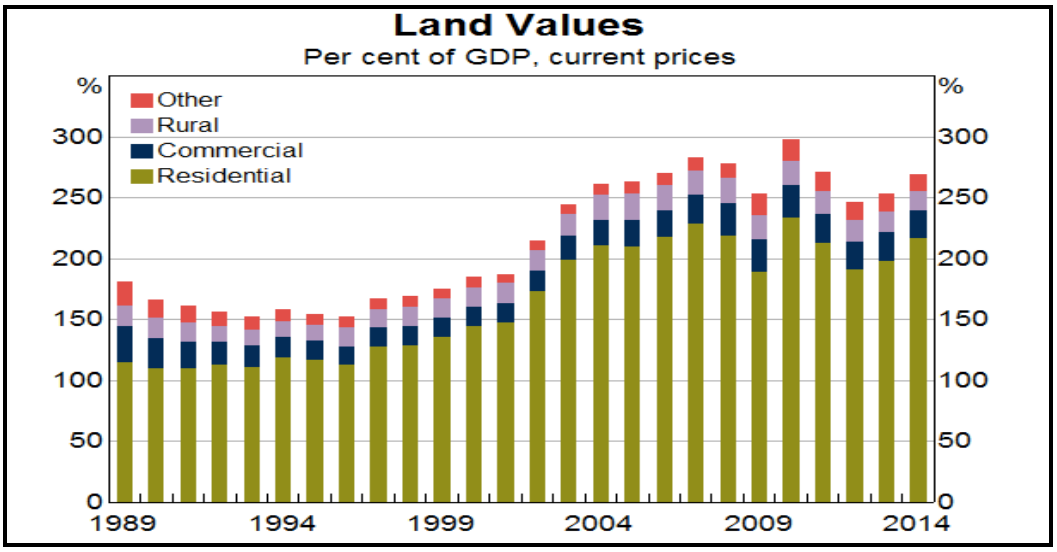

Figure 1.3: The percentage of GDP and prices of the land value

Source: Land Values, ABS, 2015

The regulation of the financial system and high inflation had served to control the land prices in 1980 by limiting the amount that can be borrowed. The capacity of borrowing rose when the financial system has been liberalized and the low inflation became standardize. Much of the Australians borrowed more in order to purchase a better property by taking this advantage (Figure 1.3).

The increasing in the land value could also be explained by the merger of strong population growth and the structural difficulties of raising the effective supply of residential land. The population of American has risen over 40% or about 7 million people which are one of the fastest rate of rising among the advance economies (Lowe, 2015).

The growing of land prices for residential has created a positive externality which brought up more people in competition and productivity together. It reflected an upward revision towards the expectation of people for their income growth in the future. Hence, most of the people prepared an amount to hand over the housing

services. However, the growth of real income had subsequently slowed down from the mid-1990s, seemingly only a small effect on the land prices relative to income (Lowe, 2015).

1.1.4 The Average of Real Housing Prices for The Emerging Countries

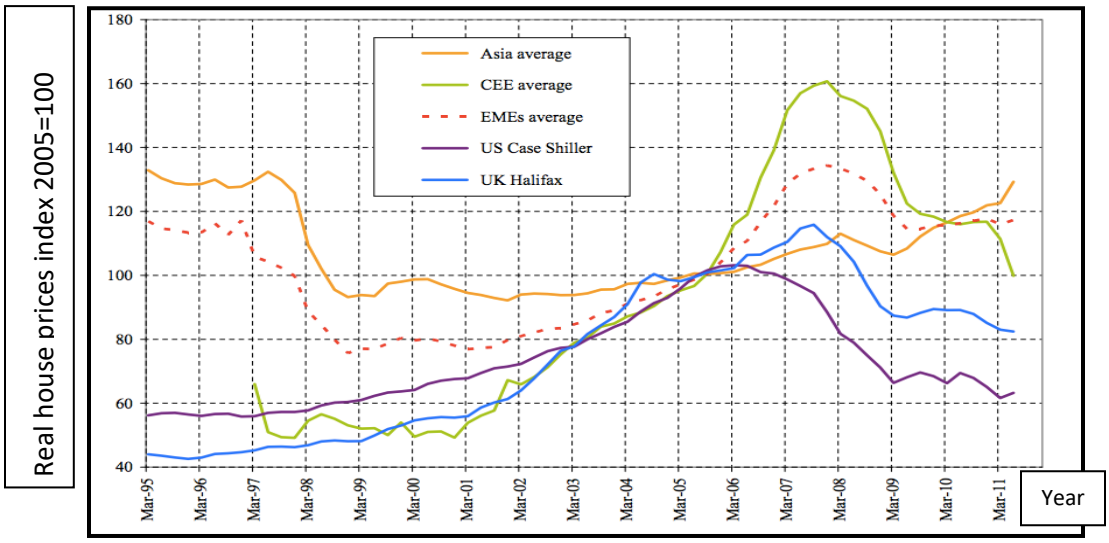

Figure 1.4: Real House Prices Development in Selected Advanced and Emerging Economies

Source: BIS Data Bank, 2015

In emerging economies (EMEs), the housing market has catch up rapidly in the developed world (Girouard, Kennedy, van den Noord & Andre, 2006). Over the past decades, housing markets in EMEs had rapidly emulated with those in the developed world, with average annual price increases. The inflation of housing prices has been fluctuated and became more volatile in the emerging markets (Bianchi, Ferrero & Rebucci, 2016). Housing prices in EMEs has been experienced a downturn from year 1995 until year 2008 (Figure 1.4). It achieved its highest housing prices in year 2008 and had a slight declined afterward. Most EMEs had been suffered substantial house

price swings in real terms since the mid-1990s, a dynamic similar to those experienced in advanced economies (Girouard et al., 2006).

Real house prices in both UK and US regions experienced a substantial rise from year 1995 crisis until the peak in early 2008 and then decreased gradually afterward. The aggregate prices had indices that had suddenly changed the direction towards the other section that may transmit a twisted picture of an average developing. For example, the assessment of the financial risks in mortgage credit which rose rapidly would naturally concentrate on the peak period of the housing prices (Scatigna, Szemere & Tsatsaronis, 2014). Next, housing prices in CEEs had a tremendous increase until it reached a peak in early of year 2008. Asia region has no experienced any significant up or down throughout the years as it only suffered a small downturn (Figure 1.4). During the period from 2000 to 2008, Asian economies demonstrated a middle earning in housing prices. Hong Kong and Singapore had the more volatile market with the highest aggregate rise in real housing prices whereas for Malaysia, Thailand and Korea were encountering the lowest percentage (Ciarlone, 2015).

After attacked from the real financial crisis, the real housing prices has been altered rapidly and dropped dramatically in the emerging countries. Those countries such as Lithuania and Latvia which had formerly experienced the fastest expend and valuations had encountered a largest dip in the year progress (Ciarlone, 2015).

1.2 Background of Housing Prices in Japan

In the late 1980s and early 1990s, the economy bubbles dealt Japan a heavy blow. This economic bubble was due to the surging in the prices of stock and housing market. This phenomenon caused the asset values collapse, affected the growth of economic, banking problems, and deflation (Obstfeld, 2009). The scholars claimed that Central Bank Japan (BOJ) implemented a policy which retained a low-interest rate 2.5%

is the main factor led to economic bubbles happened (Ishikawa, 2011). This low-interest rate attracted investors to involve in speculating of real estate market and the stock market. From the more profit earned in the raised in asset value, the housing prices rose sharply in Japan (Fackler, 2005).

During that time, a lot of Japanese engaged to purchase or invest in the property market. (Fackler, 2005) In 1991, all the land in Japan was worth about $18 trillion, almost four times the value of all property in United State. With the property prices increasing at the climax rate, the value of stock and property started to go inversely due to the speculator lost the desirable of speculating, and it led to the asset holder faced serious losses on their investment. The collapse of the property bubbles brought impact to Japanese to lose confidence in the economy and it caused a negative effect on the population, and aging of society (Kobayashi, 2016).

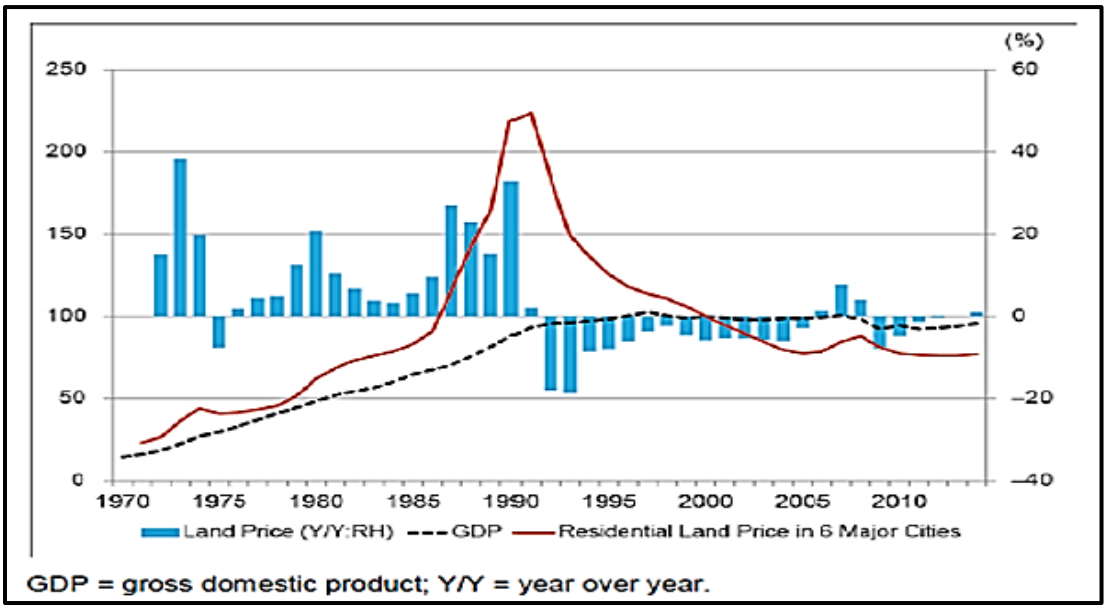

Figure 1.5: Land Price and the Real Economic in Japan

Source: Japan Real Estate Institute; Government of Japan, Cabinet Office, 2016

Figure 1.5, the land prices in Japan remained in the doldrums in these recent times was due to the property economic bubbles happened in the late 1990s. In the end of the economic bubbles, the residential land prices in the major cities started to plummet from the 1990s (Kobayashi, 2016). In view of this reason, the GDP was remaining downturn over these past two decades and went even worst in 2008 because of the financial crisis hit.

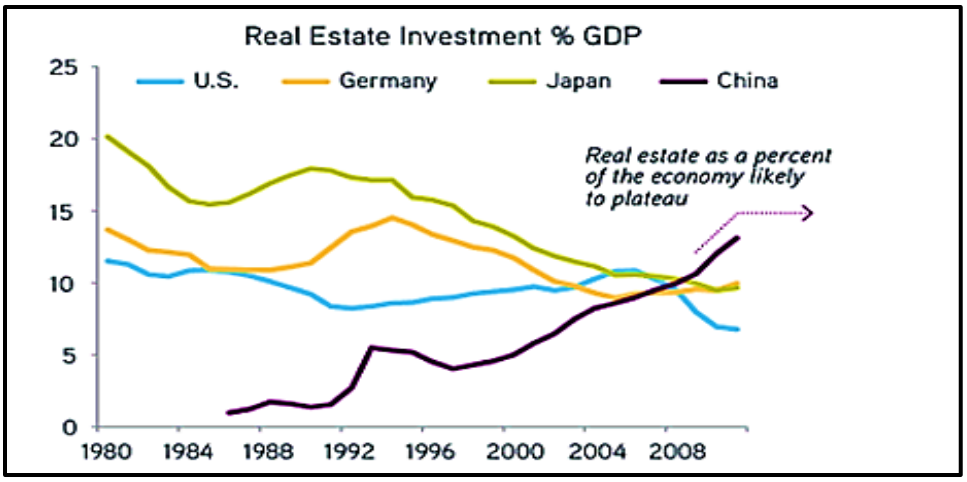

Figure 1.6: Real Estate Investment in Japan

Source: Bureau of Economic Analysis, Statistisches Bundesamt, Cabinet Office of Japan, China National Bureau of Statistics.

Figure 1.6, the same situation happened in the real estate investment market, the stagnation of economic growth and confidence lacking among the citizens caused the real estate investment to have a declining trend in the past decades.

Over the past 20 years, the housing prices in Japan kept at a low rate was because of the housing construction was maintained at a high level in spite the decrease in housing prices and large vacancies in Japan (Kobayashi, 2016). Japanese government were encouraged to build new houses to replace the existing houses to

obtain a benefit (create higher employment and strengthen the GDP) from the new land development, the design and construction of the new building. Conversely, in view of low population in Japan and the economy stagnation in Japan, there is low demand for the new houses (Kobayashi, 2016). Thus, the vacancies houses carried a significant effect on the housing market in Japan.

According (Guirguis, Giannikos & Anderson, 2005), changes in the housing prices in a country will bring a strong influence to its own country economy. Thus, besides of these factors bringing the great impact on housing prices in Japan, there are other impacts could lead to the effect housing prices. The purpose of this study is to look into the relationship between housing price in Japan and the macroeconomic variables, namely GDP, Inflation, and Population.

1.2.1 Trend of Gross Domestic Product (GDP) and Housing Price in Japan

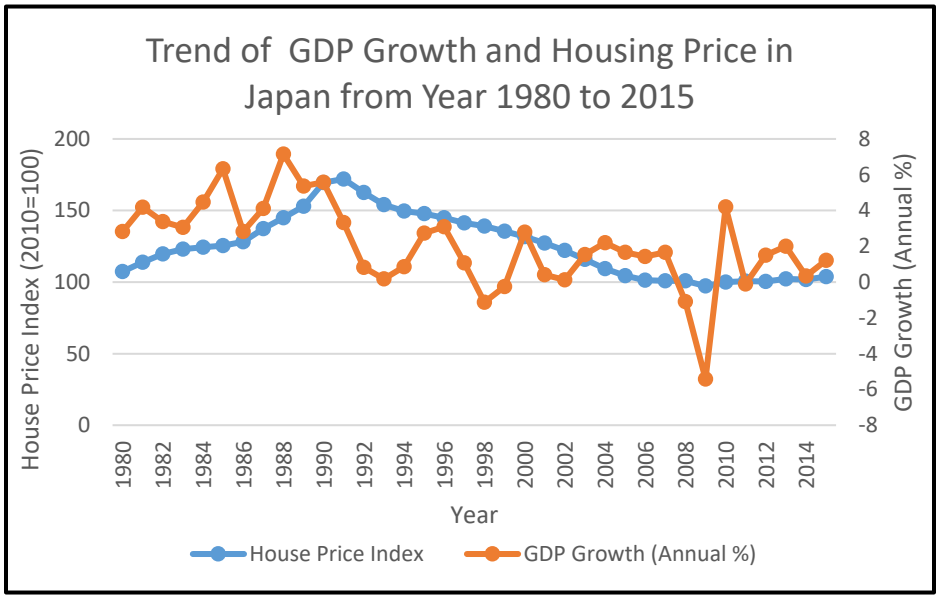

Figure 1.7: Gross Domestic Product (GDP) and Housing Price in Japan from Year 1980 to 2015

Sources: Housing Price adapted from Organisation for Economic Cooperation Development (OECD); Gross Domestic Product (GDP) adapted from World Bank Data, 2017

The economic cycle comprises a country's gross domestic product (GDP) as measured by the fluctuating period of economic expansion and contraction. The housing price would also be affected by the GDP. The economic growth in Japan had a sharp increase about 4.33% from 1980 to 1988. At the same time, this scenario caused the housing price indexes in Japan shoot up about 37.6. From 2000 to 2007, after the "lost decade", the economy of Japan had a slight decrease about 1.13% and then continued contracted to -1.09% in 2008 due to the mortgage and financial meltdown (Delmento, 2016). It had also affected the housing prices index drop continuously from 2000 to 2007. Besides, in 2009, the economic growth had experienced the lowest percentage of GDP as well as the housing price index throughout the year. In 2010, the economic growth rose dramatically to 4.19% whereas the housing price index only escalated about 2.8. The housing price index and GDP continued to rise in 2014.

At first, during 1980s, in Osaka and Tokyo areas the extraordinary land price inflation had caused the GDP and housing price increase. When there is inflation on the land price, the housing price would increase as well. Hence, it had lowered the household purchasing power of wage income (Noguchi, 1994). Japan was experiencing an economic stagnation after its property and stock market burst and the deflation of price which known as "Japan's Lost Decade" from 1991 through 2001. The weak domestic economy had contributed to Japan's government to man the fiscal problem (Kambayashi, 2009). After these bubbles burst, the unemployment rate of Japan had stabilized and moved to a huge temporary based on the employment economy. Some of the worker had work under this new circumstance. It had relatively to the low security with the employers and causes the income become lower and the money to finance the house also lower. In short, GDP had both positive and negative relationship with housing price.

1.2.2 Trend of Inflation and Housing Price in Japan

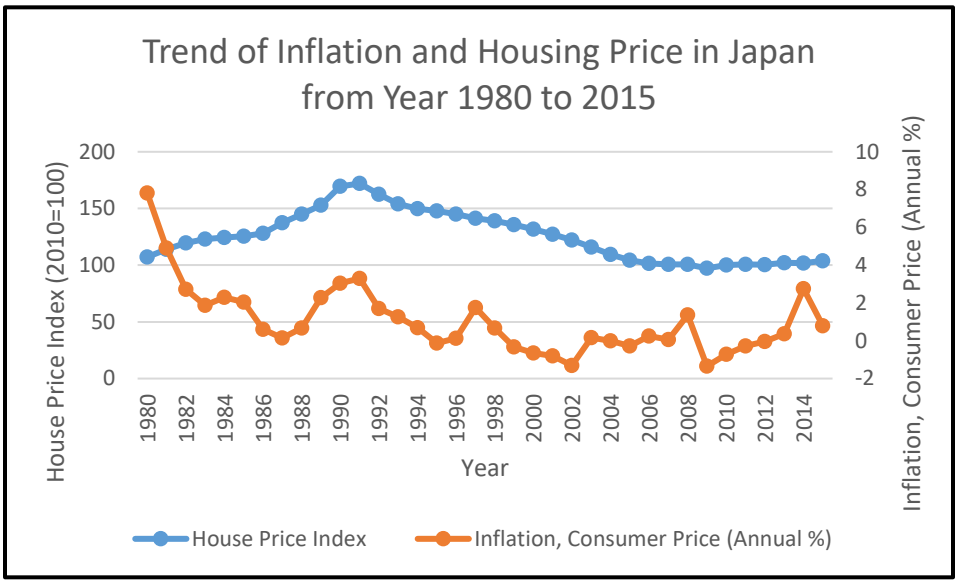

Figure 1.8: Inflation and Housing Price in Japan from Year 1980 to 2015

Sources: Housing Price adapted from Organisation for Economic Cooperation Development (OECD); Inflation adapted from World Bank Data, 2017

According to World Bank (2017), inflation dropped sharply at the beginning of year until year 1983 and experienced fluctuations afterward. Meanwhile housing price rose gradually from the beginning of year until reached peak at index of 169.50 in year 1990 and decreased constantly afterward. Overall, inflation reached two lowest point which are at year 2002 and 2009 and achieved its peak at 7.81% in year 1980. At first, housing price increased due to dropping of inflation and subsequently, an unstable inflation in Japan's economy had caused to a slight drop in housing price. Tsatsaronis and Zhu (2004) analyzed that inflation played critical role in the determination of real house prices in many countries including Japan. In the short run, the impact `brought positive impact on housing price as higher levels of uncertainty about future expectations of high inflation-related bonds and equity investments contribute to the attractiveness of real estate as a tool for long-term savings. On the other hand, inflation

also brought`` negative impact on housing price when impact of inflation causing cost of mortgage financing became greater. In short, inflation has both negative and positive effect on housing price.

1.2.3 Trend of Population and Housing Price in Japan

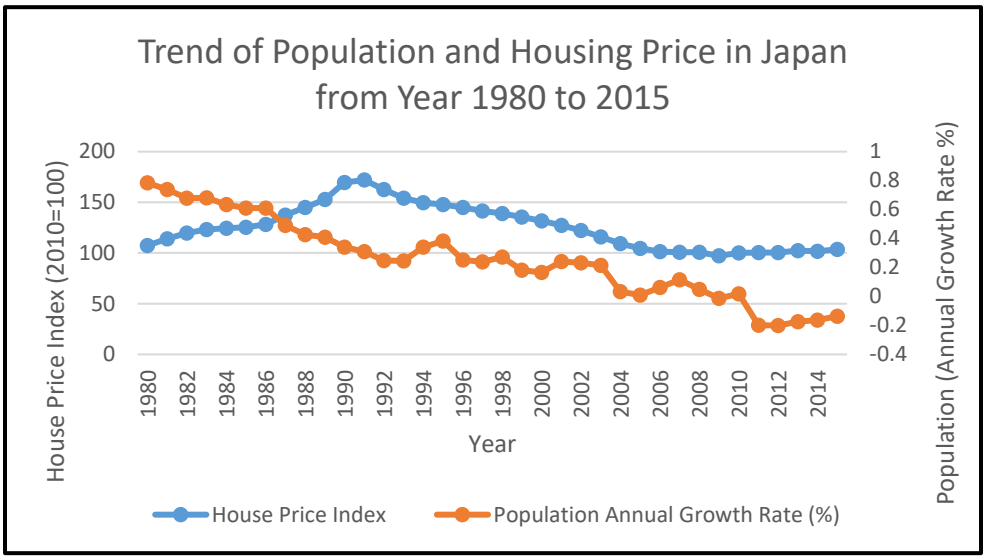

Figure 1.9: Population and Housing Price in Japan from Year 1980 to 2015

Sources: Housing Price adapted from Organisation for Economic Cooperation Development (OECD); Population adapted from World Bank Data, 2017

According to Figure 1.9 shown, population and housing price in Japan from year 1980 to 2015, the overall movement of house price index and the population annual growth rate (%) have been fluctuated. The highest rate of population annual growth rate fall at the year 1980 which was 0.784%. The population annual growth rate declined as the years went by until the minimum point at the year 2012, which is -0.20% and continued to remain negative for the following years until 2015. As for the house price index, it was similar to population annual growth rate. From year 1980 to 1991,

the housing price index increased constantly until the highest point, 172, it started to decrease until the year 2009 and achieved lowest point which is 97.2. When the population annual growth rate first negative at the year 2009, the housing price index also reached its lowest point at 97.2. According to Saita, Shimizu and Watanabe (2016), the total number of population in japan were positively correlated with the house price index. Furthermore, population was positively correlated to house price index because the larger the population, the larger the demand for house, the higher the housing price index (Glindro, Subhanij, Szeto & Zhu, 2011). In short, the population annual growth rate could affect the house price index movement.

1.3 Problem Statement

The dynamic housing prices have attracted much people over the past decade. Japan experiences the bursting and emergence of bubble in the late 1980. Housing price in Japan has increased sharply during the late 1980s. The housing problem is concern with the land prices due to most of the housing cost involve the cost of land purchase (Noguchi, 1994). Besides, the land prices have increase continuously almost every year during the war. The total value of land is estimate around $20 trillion in Japan. At the same time, the population was crowded and peak in Tokyo. Hence, the houses are in great demand. It estimates that one square meter is price at 37.7 million yen in central Tokyo, Japan (Stone & Ziemba, 1993). During 1980s, Osaka and Tokyo has lowered the purchasing houses power of income due to the inflation of land prices (Noguchi, 1994).

However, the housing price in Japan unexpectedly entered into a downturn stage after the World War II. The declining in the housing prices was caused by the economic bubbles incurred in the 1990s. Most of the main cities have loss of 2.6 million houses due to the war. After the economic bubbles breakdown, Japan citizens were

pessimistic about the collapse of property and it has brought a negative impact towards the economy (Kobayashi, 2016). The changes of the population have an influence on the dynamic housing prices in the short term (Mankiw & Weil, 1989). Besides, the increasing rate of the aging society became a serious issue in Japan and it influenced the economy as well as the housing market in Japan. The demand of houses might be affected.

Nevertheless, the housing price has recovery which refers as “mini-bubble” in 2010. Until today, the housing price in Japan still in a slow growth after the recovery. The investment in housing has estimated 3.4% of GDP in 2013. It measures to facilitate the housing such as impose taxes on housing loan. There is 0.98 million unit of houses in Japan in 2013 due to the rush of construction before the impose tax rate which will increase from 5% to 8% in 2014 (Kobayashi, 2016). This matter has adversely influence the domestic demand of houses and thus reduced the housing unit to 0.89 million units within the same year. A part from that, the rate of fertility has decreased and the society begins to age quickly (Ronald & Druta, 2016). The imbalance of economy has also started to reassert the society. The population in Japan is growing along with the average age and brings much of low income household. Hence, the housing policy has restructured to compact with the social pressure.

Excessive housing contract conducted and lower growth in the housing price would cause a feeble economic performance in Japan. The growth of GDP also being affected since it grows in a lower rate due to low housing prices. The several issues shown in above have badly affected the domestic demand of houses. In theoretical, when the supply increase, demand decrease, the housing prices should be fall, nonetheless, in practical, the housing prices in Japan is in increasing even the supply of houses is surplus compare to the demand. To figure out this problem, this research has conducted to estimate the impact of macroeconomic variables on housing prices and hopefully it may provide a clue how does the housing market perform in Japan

1.4 Research Question

1. What are the factors that affect housing prices in Japan?
2. How macroeconomics variable affect the housing prices?

1.5 Research Objective

1. To identify the factor that affects the housing price in Japan.
2. To analyses the effect of macroeconomic on the housing price.

1.6 Significances of Study

The previous studies were mainly concentrated on few years' research for a particular housing price and until today there is no common perspective on the determinants to assemble the real housing price. The essential determinant is the key to assemble the real housing price. However, this study have gained an increasing years which is 49 years data to obtain more accurate and better result in our study. Besides, this research emphasizes the impact of Japan's housing price movement towards the variables which is GDP, inflation, and population. In this regards, the outcome provide supportive view to current studies of how the fundamental variables will affect Japan's housing prices.

In addition, based on the result towards the housing market status, this study recommence an adequate concept or policies to strengthen our study. This study is able

to help the policy maker and public to have a clear vision on the issue of macroeconomic variables affecting the housing prices. Hence, they can design problem solving scheme to handle the effect of increasing in the housing prices from this study. Besides that, most of the citizens facing problems in purchasing house today. The consumers are able to understand the cause of low house affordability throughout this study. This study will provide more information on the economic system on how the housing prices will impact the consumers.

Furthermore, this research conveys advantages to investors and speculators. When they understand which factors or variables actually affecting the housing price, they would able to make more accurate housing price speculation and decision in order to avoid exposure risk. Therefore, they will have higher possibility in gaining more returns. Besides, housing industry marketers are also one of the beneficiaries of this study. They can make a proper decision in coming out with more effective strategy through our study. In this regard, they can attract more consumers with the strategy by changing the consumers concerns, such as housing prices.

In this study, assessed the short term and long term movement of housing price in econometric analysis and evaluate the pattern of housing price. We constituted a composite measure of the fundamental variables on the housing market prices. Besides, further past analysis were extended through our study. Indeed, our research indicated that the fundamental determinants and factors is significant in illustrating the housing prices in Japan.

CHAPTER 2: LITERATURE REVIEW

2.0 Introduction

This chapter discuss several theories and concepts that to support the relationship among the macroeconomic factors and housing price. Besides that, this study also discussed about the theories and concepts applied in macroeconomic factors and follow by the gap of the study.

2.1 Review of Theories and Concepts

2.1.1 Nexus of Macroeconomic and the Housing Prices

This theory was to examine the relationship between several macroeconomic variables and housing prices. The growing admission for the connective nexus between macroeconomic and the market of housing had a significant policy impact. For instance, the phase of the rapid housing price had disclosed in the studies by Kenny (1999), McQuinn (2004), and Fitzpatrick and McQuinn (2004). These studies have shown that the actual housing prices were well interpreted by the economic factors such as GDP, inflation and interest rate. These variables are considered as exogenous variables. These analyses argued that not allowed for the fact that the supply and demand in the housing market had influenced the macroeconomic variables. The researchers, Abraham and Hendershott (1992), had used the pooled time-series cross-section regression analysis to justify the variation of macroeconomic variables in the

housing prices. On the other hand, when the interest rate increased, the bank lending would influence the housing prices through different liquidity effects. The higher the credit availability may cause the demand for housing to rise (Barakova, Bostic, Calem & Watcher, 2003). The increase of demand houses would then reflect a higher housing price.

Some of the researchers also argued that the housing prices played a major role in the economic growth (Meidani, Zabihi & Ashena, 2011). Many economic theories revealed that the changes of housing prices had real effects on the economy. The impacts of the housing prices on the GDP were contributed by the wealth effect of housing prices. When the interest rate on housing finance was cheap, the resident would be able to make investments such as purchasing houses (Ong, 2013). There were possibly certain mechanisms which the housing prices would direct effect the production of the economy. The increase in the GDP would lead to an increase in demand and housing prices. There are two way relationships can be existed which the housing prices could affect the macroeconomic variables as well. The relation between the economic variables and housing price are complicated due to their nature (Meidani et al., 2011). In a rapid economic growth, the other macroeconomic variables such as money supply and inflation could affect the housing prices as well (Shaari, Mahmood, Affandi & Baharuddin, 2016).

A different view has been held and demonstrated that increase in inflation would lead to a decrease in the investment in real estate Feldstein (1992). However, Zhu (2004) indicated that the inflation and housing price had a strong relationship. The goods in the economy would increase during inflation. Nevertheless, the cost of raw material for houses would increase as well. An increase in inflation will also cause the construction and housing payment to increase and it showed a lower demand of housing due to lower quantity of housing (Feldstein, 1992).

2.1.2 User Cost-Rent Equivalence Theory

User Cost-Rent Equivalence theory can be explained and categorized into three group. Firstly, the theory states that limited supply of land played a vital role in affecting housing price (Kiyotaki, Michaelides & Nikolov, 2011). This is supported by Glaeser, Gyourko, and Saks (2005) reveal that tightened housing-supply regulations contribute to positive affect in house prices. Next, second group of theories investigate reason of housing demand increased over time. Mankiw and Weil (1989) argue that house prices are caused by demographic changes such as population, age and income. This is because when population increased, housing demand also increased. Nakajima (2011) points out that the demand for housing, especially housing, increase as income increase. Lastly, last group of theories focus on the role of expectations such as interest rate and income in shaping house-price dynamics (Shiller, 2005). Housing price will go up if people think that housing prices will go up as people expected to earn capital income from owning the house so they tend to buy now and vice versa. Kahn (1990) proposes this theory that high-income growth is expected to be the driving force of rising house prices. Revenue rise may lead to future rent increases. This is because if you buy a house today, you do not need to pay a higher rent in the future. Therefore, today people tend to buy a house, and this house prices rose today because of the future growth of income expectations have been positive changed.

Although there are controversial between the group of theories, but they have different perspective in affecting house price's trend. Nevertheless, in summary from the User Cost-Rent Equivalence Theory, it can conclude that interest rate, income, population restriction of land supply is driving factor in determinant to changes in house prices.

2.1.3 Housing Cycle Theory

Feng, Lu, Hu, and Liu (2010) point out that the trend of housing market are move in cyclical way in nature. They describe the association between vacancy's number and housing prices by using the vacancy rate to measure the intensity of housing used. In the housing cycle theory, owing to strong demand hence the housing market situation began with housing shortage. This will lead to a rise in price and rent and encouraging investment in housing. Many investors involved in such a profitable event will eventually bring to more supply of house, which in turn gradually reducing the prices and rents. As investors stop their involvement in the unprofitable housing construction, housing supply will be in stagnant situation. Eventually, this will lead to a final shortage of housing and an increase in demand. Then, this cycle will be repeated with a higher level of vacancy rate at the stages of surplus supply. Lee (2011) agrees with the existence of house cycle theory and it is housing price can be predicted based on the assumption of theory although there might have unexpected and unpredictable events happened.

In conclude, the influences on housing market cycle can be categories based on demand, supply and expectation. Many experts concern on impact of macroeconomic variable in determinant to fluctuation of housing cycle. Mankiw (1988) illustrates the demographic factors are key factor in affecting house cycle. Poterba (1991) claims the use cost will lead to house price fluctuation. Pyhrr and Born (1994) regard that both macroeconomic factors and the demographic factor bring significant impact on housing cycles. Housing market theory also supported by Thomsen and Flier (2011) where they regard that higher housing prices will stimulate the construction of housing, and these houses can be prepared to sell only when the price drops significantly.

However, an argument may arise when Al-Mayouf and Al-Khayyal (2011) point out according to experience of Saudi Arabic, causing the theory is valid only for the shortage in housing development in early 1970s. This is because the failure of free

market forces effective response to the shortage in house. This failure can be contribute to rising of housing demand in the early 1970s in which the Saudi private sector have no the technical or financial resources to support.

2.1.4 Global Savings Glut Hypothesis

(Mendoza, Quadrini & Rios-Rull, 2007; Caballero, Farhi & Gourinchas, 2008; Caballero & Krishnamurthy, 2009) say that increasing in the saving has the positive impact on the housing prices. They have denote that rises in saving in developing countries, especially China and emerging Asia have found their way to U.S is because of U.S. Treasury and Agency market can provides a sought safe, high-quality financial assets that their own countries cannot offer. The global saving glut occurs is due to the increase in saving in developing countries will cause an increase in worldwide savings. They argue that the low interest rate is a main factor causing to the higher housing prices during the boom. Same explanation carry by Caballero and Krishnamurthy (2009), they identify the surging of demand for U.S risk-free assets resulting the capital inflow increase and lead to the interest rate decline. Hence, the housing prices increase.

Nevertheless, there are some criticism arise to against the surplus of worldwide saving is the factor to cause the capital inflow increase and lead to an increase of housing prices. According to Laibson and Mollerstrom (2010), they have criticize the increase in global savings should lead to a wave of investment in the countries that have a large number of imports capital, obviously the U.S. Instead, the U.S. experiences a consumption boom along with the prosperity of the real estate market, which shows that the global savings is not very high. Laibson and Mollerstrom (2010) present that the housing market bubble has generates the rise in housing wealth lead to higher consumption, which in turn lead to greater borrowing from abroad and a large amount

of net capital inflow to the U.S. Besides, Ferrero (2015) reveal the lower collateral requirements facilities obtain external funding and push up housing prices.

2.1.5 Fundamental Theory of House Prices

The financial innovations made households to borrow against the collateral value of their home trend to increase housing demand and house prices. Hornstein (2009) argue that the cost of owner-occupied housing will go down because the reason of financial innovations and it lead to increase the housing demand and in the end, cause the increased of house prices. The price of U.S. houses has increased significantly and most of the price rise up in the current houses' prices as against to the price of new houses. However, one of the possibilities is to combine the recent externality-based theory of city structures. The aggregate economy forecast the land and housing price gradients, local land policy affects the house prices (Quigley & Rosenthal, 2005). Huerta and Ibarra (2009) indicate that housing finance has undergone major structural changes due to macroeconomic stability and financial innovations. Financial innovations improve the accessibility of mortgage credit. Apart from this, financial innovation seems to change the sensitivity of the economy as a whole to the impact of the housing sector through 4 channels: changes in market interest rates, changes in expected house prices, consumer spending of changes in house prices, and shocks to credit supply (Elmendorf, 2008). There are several keys term of financial innovations that effects on the stability of housing markets. Its includes mortgage itself, the development of specialized housing finance institutions such as savings and loans, the various government entities, securitized mortgages, and covered bonds (Allen, Barth & Yago, 2014). The theory said that the financial innovations had effects on the housing price in both positive and negative effects.

2.2 Review of Empirical Studies

2.2.1 GDP and Housing Price

Real estate market and real estate prices were closely linked with general economic cycles (Quigley, 1999). According to Grum and Govekar (2016), they found that the correlation between residential real estate prices and GDP was statistically significant. Based on the research development of prices of real estate and GDP done by Kepili and Masron (2011), they studied the association between real estate prices, growth of foreign investments and GDP in Malaysia and South Korea. They mentioned that in view of the higher growth of foreign investments has resulted in a parallel higher boost of GDP and prices of real estate in South Korea. Based on the study Kawaguci (2009) carried out, the GDP growth measures on the expected rate of appreciation of housing prices. When the expectation of the Japanese increased, the housing prices would increase since the demand of houses was increased as well.

Ping-Ma (2010) used empirical analysis to conduct a research of influence of movement of real estate prices on the economy of China or GDP. He proved that an increase of investment into real estate significantly influenced the increase of GDP. There was also the similar other result shown that the housing market and housing price demonstrating a very significant positive correlation with GDP rate in Asia, especially in China and Korea (Zhu, 2006). Besides, Valadez (2010) studied the relationship between the property prices, index of the property prices and GDP in U.S.A. He identified a statistically significant association between the property and GDP prices index, however, he did not find the reason for this association. (Ayuso, Perez & Saurina 2002) The household disposable income was a factor to influence the relationship between housing price and GDP. Since the household income was measured by the

GDP, hence the income would be a fundamental factor to affect the housing prices as well as the housing market (McCarthy & Peach, 2004).

On the other side, some scholars discovered there are a negative influence between housing price and GDP rate. In the view of (Zandi, Supramaniam, Aslam & Lai, 2015) indicated that GDP rate had negative impact in the housing price. They found that globalization was moving towards the strong effect of housing prices. Another scholars Garrision (2015) using 50 global sets of housing market correction study on housing market correction drag on GDP. He said that for every 10% fall in the housing price the GDP falls by around 4% from its pre-peak path. Shimizu, Nishimura and Watanabe (2010) claimed real estate prices fluctuations have a substantial impact on economic activity. In Japan, the sharp rise of real estate prices during the 1980s and a sharp decline in the 1990s had led to a stagnation of the economic.

2.2.2 Inflation and Housing Price

There are discordant views on the actual impact of inflation on housing market which supported by several numbers of studies that examined the relationship between inflation and housing price. Piazzesi and Schneider (2006) pointed out inflation had impact on the price of real assets. In Zhu study, he demonstrated the strong and long-lasting impact among the inflation and house prices (Zhu, 2004). Most of the things including daily necessities even the buildings materials would rise during inflation and affect the house prices. Cho (2006) pointed out a significant relationship between Korea inflation and housing price where the rise of house price was composed of two parts included the rise of inflation itself and the rise in the relative price of a house over general prices. Then in Kuang and Liu (2015), who did investigate housing price in 35

major cities in China found that the relationship between inflation and housing price is significantly positive. The similar result also found by Zhang, Li, Hui and Li (2016). Zou and Chau (2015) also pointed out that inflation positively and slightly impacts housing prices in long run. The researchers also found that changes in inflation are positively and impressively impact the housing prices in the short run. Besides that, Andrews (2010) indicates the inflation occur lead to rising housing price. An increase in the price-dividend ration on house due to the higher expected in inflation (Piazzesi & Schneider, 2009). According to Panagiotidis and Printzis (2015), the housing price rose in Greece due to the deregulation of bank sector and the inflation decline.

Furthermore, the study examined the changes in the GDP, inflations rate, costs of construction, population, interest rate and real property gains tax was lead an upward trend in Malaysian housing price (Ong, 2013). The results shown only the GDP, population and real property gains tax were found to be significantly positive correlated with the housing price but not the inflations rate (Ong, 2013) which also supported by Rogers (2001) examined there were a negative relationship in inflation rate on a price level in Europe during 1999. Madsen (2012) also claimed that the negative relationship of inflation on housing prices.

However, according to the study of (Zandi et al., 2015) found the inflation indicated no correlation towards housing price in Malaysia (Penang) due to the result which inflation rate has very high F-value. Some researchers also investigated there is an insignificant effect of inflation on housing prices (Tze, 2013; Tan, 2011). The changes on inflation would not have any effect towards housing price.

2.2.3 Population and Housing Price

According to the Ishikawa (2011) research, he revealed land prices had undergone structural change and continued to growth at an unusually fast rate, even faster than economic growth of 50 years after the war. This change is caused by the rapid pace of the Japanese population in the city, rising housing demand, then caused the housing prices increased. Mulder (2006) stated that population and housing are interrelated. The change in population has led to changes in housing demand. The growth in population would particularly growth in the number of households and lead to a growth in housing demand. According to Shimizu and Watanabe (2010), Japan's 35-to-45-year-old housing ownership rate has had a positive and significant impact on housing prices. This group of people created new housing demand which indicating the high housing demand led to the high housing prices.

According to Shimizu and Watanabe (2010) shown, the home ownership rates in Japan tend to rise significantly from age 35 through 45, and that the population in this age group created new housing demand which indicating the high housing demand led to the high ownership rates and causing the housing prices to increase. (Kobayashi, 2015) stated that in 1980s and 2000s, there were two period of population bonus created by baby boomers and baby boomers juniors, which overlapped with the housing boom. The baby boomers had created the greatest housing demand since the war and the baby boomers juniors had created a significant housing demand when the housing prices turned upward in 2000s. Both of them had created a substantial housing demand, thus the housing prices has been boost up.

From the study of other researcher Gallin (2003) conducted, he tested out population had no effect on the housing prices, which mean there was an insignificant relationship shown. In addition, stated that population aging and housing prices development had a negative correlation which indicated the level of land price was lower in the area where the average age of population was older. The similar study

conducted by (Essafi & Simon, 2015) has demonstrated the real estate price in French is negatively affected by the old aged dependency ratio. The lower property prices was because of the old aged population liquidating their asset for the post-retirement financial needs, thus caused supply exceed on the market. Based on research did by (Saita et al., 2016), they pointed out the contribution of demographic changes was negative in all regions but the scenario was more obvious in rural area. The significant population outflow to the urban areas was the main factor causing the acceleration of decline in real estate prices in rural area.

2.3 Gap of the Study

According to the literature review that had been done, there are many studies discussed about the housing bubbles affect housing market in Japan and more studies are in United State and China. Nevertheless, only a small number of studies discussed the relationship between housing price and the macroeconomic determinants. Perhaps the housing bubbles can be used to explain the previously housing market yet it is not suitable to describe the latest housing market in Japan. Hence, to have a clear understanding of the latest housing market in Japan, this study will fills up the gap by focusing on the macroeconomic aspects to figure out the latest housing market reflects. Furthermore, this study will be using the time series analysis to find out the long run and short run relationships between macroeconomic factors and housing prices in Japan, to observe the performance of macroeconomic factors towards the housing prices in Japan.

2.4 Theoretical Framework

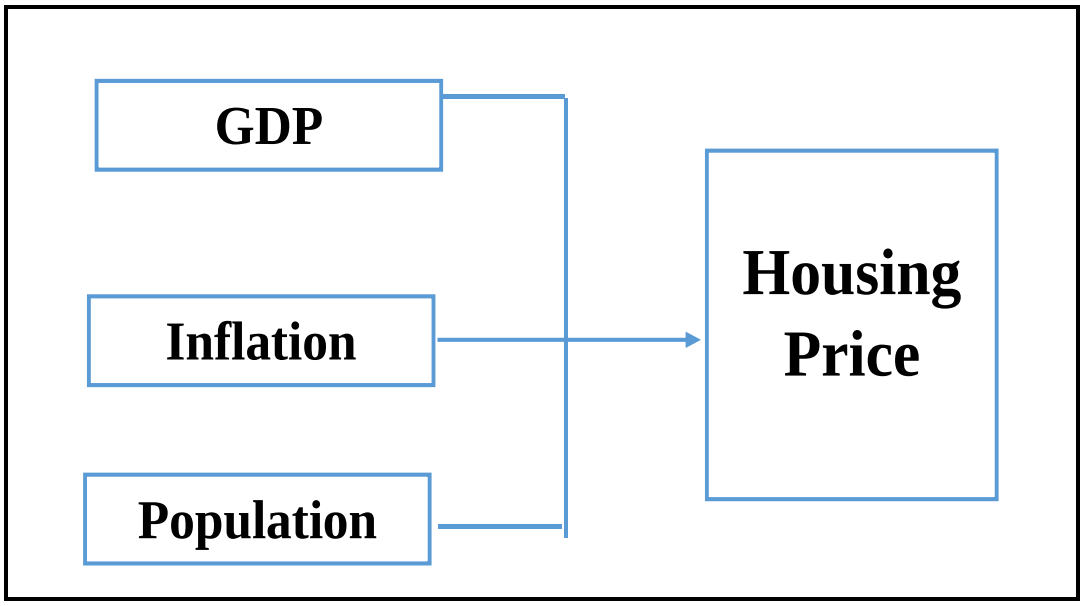

Figure 2.1: Theoretical Framework

Based on the discussion in literature on GDP, inflation and population, this study expanded its theoretical framework from nexus of macroeconomic and the housing prices, user cost-rent equivalence theory, housing cycle theory, global savings glut hypothesis and fundamental theory of housing prices.

For the nexus of macroeconomic and the housing prices theory, user cost-rent equivalence theory, housing cycle theory, global savings glut hypothesis and fundamental theory of housing prices. These theories showed that macroeconomic variables were the main factors affecting the housing price. The nexus of macroeconomic and the housing prices theory stated that the macroeconomic variables such as, GDP, inflation and unemployment will affect the housing prices. Besides, as for the user cost-rent equivalence theory, rising housing prices are categorized in three groups, the first group stated that limited supply of lands played a vital role in affecting housing prices, the second group investigated the demand for housing increase over time, researchers stated that population, age and income would affect housing prices,

the third group stated that interest rate and income affecting the house prices. The housing cycle theory stated that the trend of housing market move in cyclical way in nature. Firstly, owing to housing demand causes the housing shortage, this will lead to the housing price and rent rise which encourage. As the number of investor increases, the supply of houses will increase respectively; this causes the prices and rents of housing to decrease. As the prices and rents decrease, the investors stop their investment in the unprofitable housing construction. Hence, the housing supply will be in stagnant situation. Lastly, this will eventually lead to final shortage of housing and increase in demand. This cycle will keep on repeated with a higher level of vacancy rate at the stages of surplus supply. Researchers stated that the macroeconomic factors and the demographic factors bring significant impact on housing cycle. Moreover, for the global savings glut hypothesis, the researchers state that the saving will have positive impact on the housing prices. They have denote that rises in saving in developing countries can provide safe and high quality financial asset that their own countries cannot offer. The global savings glut occurs is due to the increase in saving in developing countries cannot offer. Furthermore, the fundamental theory of house prices is the financial innovations made the households to borrow against the collateral value of their home trend to increase housing demand and house prices. The financial innovations improve the accessibility of mortgage credit. Besides, there are 4 channels that the change of sensitivity of the economy as a whole to the impact of the housing sectors which are changes in market interest rates, changes in expected house prices, consumer spending of changes in house prices, and shocks to credit supply. This theory stated that the financial innovations will bring positive and negative effect on the housing price.

There is positive relationship between GDP and housing prices. GDP is one of the key factors that affect the housing prices among the macroeconomic factors. There is connection between housing prices, growth of foreign investments and GDP. This could be proved by the GDP and prices of housing in South Korea was higher due to the higher growth of foreign investments. In addition, the GDP and unemployment are

statistically significant with the prices of housing rental in European countries. In the contrary, there is also negative influence between housing price and GDP rate. GDP rate brings negative impact in the housing price. Every 10% fall of housing price will lead to the GDP falling by around 4%. Thus, GDP movement will affect the housing prices movement.

Population is positively related to the housing prices. As the land prices grows at an abnormal rapid rate due to the increase of population which also increase in the housing demand. Therefore, the housing prices will increase. This implies that the population and housing prices are interrelated. Other than that, the increase in income and population will also push up the housing prices. In Australia, the rising of population causes the housing affordability to decline because of the housing prices increase. Furthermore, the significant population outflow from rural area to urban areas caused the acceleration of decline in housing prices in rural area. This shows that the population is positively related to the housing prices.

There is a positive relationship between inflation rate and housing prices. Inflation is one of the vital factor that will affect the housing price and there is strong and long lasting link between inflation and housing prices. As the inflation rate increase, the raw materials used to build a house will increase. Hence, the housing prices will also increase. In Korea, there is significant relationship between Korea inflation and housing prices where the rise of house price is composed into two parts which is the rise of inflation itself and the rise of a relative price of a house over general prices. Besides, significant positive relationship can also be found in 35 major cities in China between inflation and housing price.

In short, the macroeconomic variables, GDP, inflation and population have direct relationship towards the housing prices.

2.5 Hypothesis Development

H_1: GDP will have a positive relationship with the housing price.

H_2: Inflation rates will have a positive relationship with housing price.

H_3: Population will have a positive relationship with the housing price.

CHAPTER 3: RESEARCH METHODOLOGY

3.0 Introduction

In this chapter, econometric methods are used to determine the relationship between housing price and the numerous macroeconomic variables in Japan. The secondary data collected from various reliable sources such as World Bank and Economic Co-operation and Development (OECD) is used for analysis in this study based on the time series analysis for the year 1967 to 2015. This study applies unit root tests which is Augmented Dickey-Fuller (ADF) test to examine the stationary of the data.

In addition, Granger (1981) introduced co-integration concept to illustrate that the long run equilibrium relationship between housing prices with the independent variables. Autoregressive Distributed Lag (ARDL) model is applied to examine the long run and short run relationship between housing price and various macroeconomic variables. Besides, the Granger Causality test is executed to find out whether there is any causal relationship between the dependent and independent variables.

Lastly, the diagnostic checking is the purpose to make sure the regression does not have any error and all the independent variables are significant with housing price with the Autoregressive Conditional Heteroscedasticity (ARCH) test, Breush-Godfrey Serial Correlation LM test, Jarque-Bera (JB) test, and also the Ramsey RESET test. In addition, Cumulative sum of recursive residuals (CUSUM) and cumulative sum of recursive residuals of squares (CUSUMSQ) are used to detect the changes and stability of ARDL parameters.

3.1 Data Description

This study has collected the secondary data from the country of Japan for this study. The secondary data was collected based on the time series analysis from various sources for the year 1967 to 2015. The table 3.1 below shows the summary of the variables.

Table 3.1: Summary of Variables, Unit measurement of Data and Source of Data

Variables	Unit Measurement	Sources
Housing prices	Index Number =100	Economic Co-operation and Development (OECD)
Economic Growth (GDP)	Annual percentage (%)	World Bank
Inflation (CPI)	Consumer Price (annual %)	World Bank
Population	Annual growth rate (%)	World Bank

Adapted from: World Bank Indicator

3.1.1 Dependent Variables and Measurement

3.1.1.1 Housing Prices

Housing Prices from the country of Japan has been used as dependent variable in this study and expressed in index number. The variables are gathered from the Economic Co-operation and Development (OECD).

3.1.2 Independent Variables and Measurements

3.1.2.1 Economic Growth (GDP)

Economic growth has been used as the independent variable for this study. It is measured by the annual percentage growth rate of GDP in the market prices. GDP is the amount of gross value added by all of the resident manufacturer in the economy and add up the taxes of the goods and deduct the subsidies which is not contain in the value of the goods.

3.1.2.2 Inflation (CPI)

Inflation is measured as consumer price index which reflects the annual percentage change in the prices of goods and services which is collected from the World Bank data. Inflation is the change of percentage or long term rises in the value of goods and services based on the year on year basis.

3.1.2.3 Population

The population variable extracted from the World Bank data and expressed by the annual percentage of population growth rate. Population is defined on the reality population which counted all of the residents regardless the status of legal or nationality.

3.2 Econometric Model

The functional form of housing price model is construed as below:

Housing Price = F (Gross Domestic Product, Inflation, Population) (Eq.3.1)

$$HPI_t = \beta_0 + \beta_1 GDP_t + \beta_2 INF_t + \beta_3 POP_t + \mu_t \quad \text{(Eq. 3.2)}$$

3.3 Econometric Techniques

In this chapter, the methodology applied in this study contains of various tests to determine the relationship between housing price and the macroeconomic variables in Japan. Applying of Unit Root Test is to ensure the time series data have achieved stationary in the mean. Moreover, the ARDL test need to be used to examine the long run relationship between housing price and macroeconomic variables in Japan. Lastly, the Granger Causality test will be conducted to test the causal relationship between the dependent variable and independent variables.

3.3.1 Unit Root Test

Unit root test is used to test whether a time series variable is non-stationary and possesses a unit root. A stationary time series represents the mean and variances are constant over time and the auto-covariance depends only on the time lag. Conversely, non-stationary time series represents there is a varying of mean (Gujarati, 2004).

Generally, the main approach applied in unit root test is Augmented Dickey-Fuller (ADF) test. The ADF is unit root test for stationary in all the variables to avoid spurious regression and misleading result. The reason of using ADF instead of Dickey-Fuller test is because of the ADF can handle a larger and more complex model. In the hypothesis of the test, the null hypothesis for this test is that there is a unit root whereas the alternative hypothesis is different depending to which equation is used, but is basically stationary or trend-stationary.

The testing procedure for the ADF test.

$$\Delta y_t = \alpha + \beta t + \gamma y_{t-1} + \delta_1 \Delta y_{t-1} + \cdots + \delta_{p-1} \Delta y_{t-p+1} + \varepsilon_t$$

(Eq. 3.3)

where,

- t is the time index,
- α is an intercept constant called a drift,
- β is the coefficient on a time trend,
- γ is the coefficient presenting process root, i.e. the focus of testing,
- p is the lag order of the first-differences autoregressive process,
- $\varepsilon_t$is an independent identically distributes residual term.

The focus of the test is whether the coefficient γ equals to 0, which mean the model has a unit root. Thus, the null hypothesis of $\gamma = 0$ (random walk process) is test against the alternative hypothesis $\gamma < 0$ of stationarity. To estimate the significance of the coefficients, the t-statistic is computed and compared with the relevant critical value. If the t-statistic is less than critical value then the null hypothesis is rejected.

3.3.2 Co-integration Regression Model

The co-integration test concept refers that variables used should integrate of the same order and linear combination of non-stationary variables (Gujarati & Porter, 2008). It shows the long run relationship between the integrated series. In this study, this test examines whether the non-stationary variables are co-integrated or not co-integrated. The aim of using this test is to avoid spurious regression and thereby estimate the long run equilibrium solution.

3.3.2.1 ARDL Approach

Autoregressive Distributed Lag (ARDL) is proposed by Pesaran and Shin (1995). This approach is use for a long run relationship and to co-integration or bound procedure, irrespective of whether the underlying variables are I(0), I(I) or combination of both. The application of ADRL approach to co-integration will give realistic and efficient estimates. Besides, the ADRL approach helps to identify the co-integrating vectors. Which is each of the underlying variables stands as a single long run relationship equation. If one co-integrating vector is identified, the ARDL model of the co-integrating vector is reparametrized into ECM. Other than that, given the

endogenous variable, this co-integrating model helps to identify whether the underlying variables are co-integrated or not. As discussed by Johansen & Juselius (1990), the general model are discussed as below:

$$\Phi(L,p)y_t = \sum \beta i\,(L,q_i)\, x_{it} + \delta w_t + u_t \qquad \text{(Eq. 3.4)}$$

where

$$\Phi(L,p) = 1 - \Phi_1 L - \Phi_2 L^2 - \ldots - \Phi_p L^p \qquad \text{(Eq. 3.5)}$$

$$\beta(L,q) = 1 - \beta_1 L - \beta_2 L^2 - \ldots - \beta_q L^q, \quad \text{for } i=1,2,3\ldots\ldots k,\ u_t \sim iid(0;\delta^2) \qquad \text{(Eq. 3.6)}$$

L is a lag operator such that $L^0\ y_t = X_t$, $L^1\ y_t = y_{t-1}$, and w_t is a s x1 vector of deterministic variables such as the intercept term, time trends, seasonal dummies, or exogenous variables with the fixed lags. P=0,1,2…,m, q=0,1,2….,m, i=1,2….,k: namely a total of $(m+1)^{k+1}$ different ARDL models. The maximum lag order, m, is chosen by the user. Sample period, t = m+1, m+2….,n.

By selecting the optimal lags length that need to used, the smallest result of the Akaike Info Criterion (AIC) and Schwarz Criterion are chosen to prevent autocorrelation occur between error term. The result will be present by using E-View 9.5.

Here, to examine the integration for whole model, equation of Unrestricted Error Correction Model (UECM) is interpreted as follow:

$$\Delta HPIt = \alpha 0 + \alpha \text{GDP}\ \text{GDP}t-1 + \alpha \text{INF}\ \text{INF}t-1 + \alpha \text{POP}\ \text{POP}t-1$$

$$\sum\ \Delta\ \text{GDP}t-1 + \sum \alpha q\ \Delta\ \text{INF}t + \sum \alpha s\ \ \Delta\ \text{POP}t + \mu \qquad \text{(Eq. 3.7)}$$

Next, after examining the relationship, ARDL's Residual Unit Root Test is used to investigate existence of unit root for residual.

3.3.3 Granger Causality Test

In year 1969, Granger causality test was proposed by Granger in year 1969 and modified in 1972 by Sims. The correlation between one variable causes movement in another variable is the purpose of the test conducted. By conducting the test, the researcher can identify whether there is any causality among the variables. The one thing that makes this test different from the others econometric tests is it assumes all variables are endogenous and exogenous.

This is to examine the causal relationship between housing prices and other variables such as GDP, inflation and population in Japan during year 1967 to 2015. This is the following regression equation:

$$\Delta \mathrm{INF}t = \gamma 1 + \sum \alpha 1i\ \Delta \mathrm{INF}t{-}i + \sum \rho 1j\ \Delta GDPt{-}j + \sum \omega 1j\ \Delta \mathrm{POP}t{-}j + \mu 1t \quad \text{(Eq. 3.8)}$$

$$\Delta GDPt = \gamma 2 + \sum \rho 2j\ \Delta GDPt{-}j + \sum \alpha 2i\ \Delta \mathrm{INF}t{-}i + \sum \omega 2j\ \Delta \mathrm{POP}t{-}j + \mu 2t \quad \text{(Eq. 3.9)}$$

$$\Delta \mathrm{POP}t = \gamma 4 + \sum \varphi 4j\ \Delta \mathrm{POP}t{-}j + \sum \rho 4j\ \Delta GD\mathrm{P}t{-}j + \sum \alpha 4i\ \Delta \mathrm{INF}t{-}i + \mu 4\mathrm{t} \quad \text{(Eq. 3.10)}$$

Besides, to show the hypothesis testing for this test, F-test used, which is as follow:

Test statistic: $F = (RSS_{UR} - RS_{SR})/m/RSS_{UR}/ (n-k)$

Based on the formula given above, $RSSUR$ represent R^2 from unrestricted model; RSSR indicates R^2 from restricted; n is the number of observation; k refer to the number of explanatory variables in the unrestricted regression.

Hypothesis Statement:

Ho: β1=β2=β3=β4=0

H1: At least one of the βt is ≠0, where t =1, 2, 3, 4

Decision Rule: If F-statistic higher than the critical value at 1%, 5% or 10% level of significant, Ho will be reject. Otherwise, do not reject Ho. After that, we can conclude that there is relationship between X and Y or not.

3.4 Diagnostic Checking

Diagnostic checking has become the standard tool for identification of modal before forecasting the data. If econometric problems such as heteroscedasticity, serial correlation, model mis-specification or non-normality of error term exist in the model,

the results will become biased, inconsistent and inefficient Hence, diagnostic checking is important to ensure there is no econometric problem in the modal.

3.4.1 Autoregressive Conditional Heteroscedasticity (ARCH) Test

Heteroscedasticity is the variance of error terms is not constant and vary depends on the value of independent variables. In order to detect heteroscedasticity problem in the modal in a time series modal, ARCH test is the most suitable test to examine heteroscedasticity. Heteroscedasticity does not destroy the unbiasedness and consistency properties of OLS estimators. But the model become inefficient as it no longer minimum variance and the t- and f- statistics in the model is also not reliable, indicating the model is no longer BLUE which are best, linear, unbiased, and efficient. The null hypothesis is set to no existence of heteroscedasticity problem whereas alternative hypothesis is set to have existence of heteroscedasticity problem in the model. If p-value of χ^2 is lower than the significance level (α) at 1%, 5% or 10%, then reject null hypothesis. Otherwise, do not reject null hypothesis. In addition, select the minimum Akaike Information Criterion (AIC) and SIC of ten lagged residuals if tend to find optimal lag length. E-View 9.5 will be used to perform the ARCH test.

3.4.2 Breusch-Godfrey Serial Correlation LM Test

Serial correlation occurred when the error terms correlate between one another. Serial correlation is likely to be occurred in time series data. The pros of applying Breusch-Godfrey Serial Correlation LM test instead of Durbin-Watson and Durbin's h

test is due to the test can detect higher orders of autocorrelation and the lagged dependent variable. Serial correlation problem will cause the model become inefficient as it no longer minimum variance and the t- and f- statistics in the model is also not reliable, indicating the model is no longer BLUE which are best, linear, unbiased, and efficient. The null hypothesis of LM test is set to without autocorrelation problem whereas alternative hypothesis is set to have autocorrelation problem in the model. If p-value of χ^2 is less than the significance level (α) at 1%, 5% or 10%, then reject null hypothesis. Otherwise, do not reject null hypothesis. Besides, the minimum AIC and SIC of ten lagged residuals will be selected if to find out the best lag length. E-View 9.5 will be used to perform the Breusch-Godfrey Serial Correlation LM.

3.4.3 Ramsey RESET Test

There are several types of model specification error problem which are omitting relevant independent variable that play a significant role in determination of dependent variable, include irrelevant variable, unnecessary or non-influential independent variable as well as wrong functional form of respondent and manipulation variables. For wrong functional form of variables, the estimated parameter value is in the non-linear so the estimated value is incorrect estimator. Ramsey RESET test can be used to identify wrong functional form of dependent and independent variables. The null hypothesis of Ramsey RESET test is set as the model specification is correctly formed whereas alternative hypothesis is set as the model specification is wrongly formed. If p-value of F-statistic is lower than the significance level (α) at 1%, 5% or 10%, then reject null hypothesis. Otherwise, do not reject null hypothesis. E-View 9.5 will be used to perform the Ramsey RESET.

3.4.4 Jarque-Bera (JB) Test

The normality of error terms in a model is essential because the parameter of the model will become normally distributed once the error terms are normally distributed, and thus the hypothesis testing is valid. Furthermore, the estimator will have consistency when the error term is normally distributed, which the expected value of β will become more concentrated to the actual value β value, thus having a more accurate output. Jarque-Bera (JB) test is applied to detect the normality of error term. The null hypothesis of JB test is set as the normally distributed of error term whereas alternative hypothesis is set as the not normally distributed of error term. If p-value of χ^2 is lower than the significance level (α) at 1%, 5% or 10%, then reject the null hypothesis. Otherwise, do not reject null hypothesis. E-View 9.5 will be used to perform the JB.

3.4.5 CUSUM and CUSUMSQ Test

The researchers, Brown, Durbin and Evans (1975) introduced Cumulative sum of recursive residuals (CUSUM) and Cumulative sum of recursive residuals of squares (CUSUMSQ) are tests for parameter constancy in the connection of a linear regression which in another word, the recursive estimation of testing the stability of the coefficients. In order to indicate the stability of parameters, the result of CUSUM and CUSUMSQ must be within a straight line of 5% significant level. E-View 9.5 will be used to perform the CUSUM and CUSUMSQ tests.

CHAPTER 4: DATA ANALYSIS

4.0 Introduction

In Chapter 4, the macroeconomic effect on housing price which are economic growth (GDP), inflation and population in Japan during long run and short run relationship are presented. This chapter is to focus on analyzing and interpreting the estimated results which conducting empirical result based on the methodology discussed in Chapter 3. Firstly, diagnostic checking will be conducted in order to check the efficiency in model. Next, the level of stationary in time series variables is determined by using Unit Root test, Augmented Dickey-Fuller (ADF). Subsequently, CUSUM and CUSUMSQ stability test is to study the structural stability. Then, The Autoregressive Distributed Lag (ARDL) bound test for Co-integration test is to investigate long run relationship in the time series variables. Last but not least, granger causality test is to illustrate the causality between independent variables and dependent variable in short run.

4.1 Unit Root Test

Table 4.1 illustrates the result of the Augmented Dickey-Fuller unit root test for the dependent variables, housing price, and the three macroeconomic factors which is GDP, inflation rate and population rate of Japan. The results indicate that the variables are stationary either at level form or at first difference with the selection of intercept. For variables that achieved stationary at level form, they follow the integrated order of I(0) whereby variables that achieved stationary at first difference level form follow the

integrated order of I(1). The inflation rate and population rate variables are stationary at first difference level form when only the intercept is included. As for the GDP variable, it is found that the variable is stationary at level form.

Table 4.1 Results of The Augmented Dickey-Fuller Unit Root Test for The Dependent and Independent Variables

Variables	ADF	
	Level Form	First Difference
	Intercept	Intercept
HP	-2.472559 (0.1285)	-3.367993**
GDP	-4.404989 (0.0009)	-8.275452***
INF	-1.144172 (0.6895)	-3.158395**
POP	-2.566628 (0.1069)	-12.86569***

Note: *, ** and *** denoted that the reject the null hypothesis at 10%, 5% and 1% significant level respectively.

4.2 Diagnostic Checking

Table 4.2 Result of diagnostic checking

Diagnostic checking	t-statistic/ F-statistic	P-value	Conclusion
Serial correlation LM test	1.679523	0.0968	There is no autocorrelation.
ARCH test	6.450833	0.0053***	There is heteroscedasticity.
Jarque-Bera test	0.112038	0.945521	The error terms is normally distributed.
Ramsey reset test	0.286528	0.4255	There is no model specification bias.

Note: *, ** and *** denoted that the reject the null hypothesis at 10%, 5% and 1% significant level respectively.

Autocorrelation

H0: There is no autocorrelation problem in the model.

H1: There is an autocorrelation problem in the model.

We performed the Breusch-Godfrey Serial Correlation LM test to detect whether the model had autocorrelation problem or not. The result generated through E-View showed that the p-value= 0.0968 is greater than significant level at 5%. Hence, we do not reject the null hypothesis and there is sufficient evidence to conclude that there is no autocorrelation in the model.

Heteroscedaticity

H0: There is no heteroscedasticity problem in the model.

H1: There is a heteroscedasticity problem in the model.

The ARCH test had also been conducted to detect existence of heteroscedasticity problem in the modal. The result indicated that there is a heteroscedasticity problem in the model since the p-value= 0.0053 is less than significant level at 5%. Thus, we do not reject the null hypothesis and there is not sufficient evidence to conclude that there is no heteroscedasticity problem. Since there is heteroscedasticity problem, the white's heteroscedasticity test is conducted and the heteroscedasticity is solved.

Jargue-Bera test

$H0$: The error terms is normally distributed

$H1$: The error terms is not normally distributed

Besides, we carried out the normality test to detect whether the error term in the model is normally distributed or not. From the result, it indicated that the probability is 0.945521 is more than the significant level at 5%. Thus, we do not reject the null hypothesis and there is sufficient evidence to conclude that the error term is normally distributed.

Ramsey reset test

$H0$: There is no model specification bias.

$H1$: There is model specification bias.

We executed the Ramsey Reset test to test whether the model is correctly specified or not. The result demonstrated that the probability is 0.4255 more than the significant level at 5%. Hence, the null hypothesis is not rejected and we have sufficient evidence to conclude that there is no model specification bias.

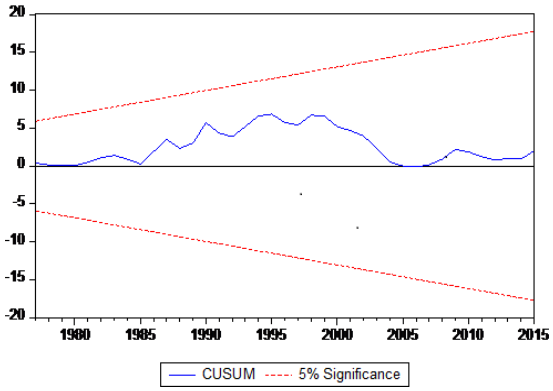

Figure 4.1: CUSUM Test

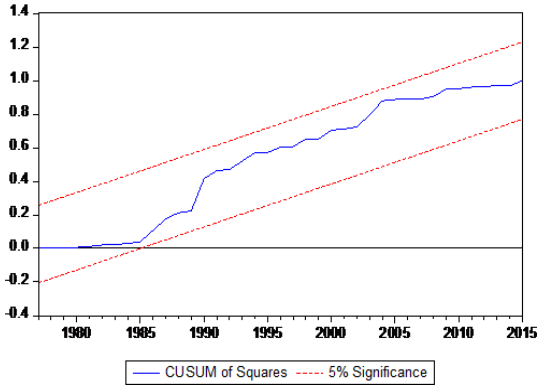

Figure 4.2: CUSUM Square Test

The result in Figure 4.1 and 4.2 showed Cumulative Sum (CUSUM) test and Cumulative Sum Square (CUSUMSQ) test respectively. According to Figure 4.1 and 4.2, the dot of CUSUM and CUSUMSQ was fall among the range of the red straight line at 5% significant level. Thus, it represents that the parameters were stable as the year progress.

4.3 Bound Test for Co-integration

Long run relationship in the time series variables can be examined through Autoregressive Distributed Lag (ARDL) bound test for Co-integration test. In this approach, long run relationship are said to be established if F-statistics is greater than the lower critical value bound. No conclusion can be made if F-statistics falls within the upper critical value bound and lower critical value bound. At 10% significant level as proposed by Pesaran and Shin (1995), the lower critical value following I-(1) is 3.2% and upper critical value following I-(0) is 2.37. While at the 5% significant level, the lower critical value following I-(1) is 3.67% and upper critical value following I-(0) is 2.79%. At the 2.5% significant level, the lower critical value following I-(1) is 4.08% and upper critical value following I-(0) is 3.15%. Lastly, at the 1% significant level, the lower critical value following I-(1) is 4.66% and upper critical value following I-(0) is 3.65%.

Table 4.3 Result of Bound Test for Co-integration (Housing Price)

	Optimal Lag Length	F-statistics	Conclusion
(HP/GDP,INF,POP)	(3,1,0,2)	5.647401***	Co-integration

Note: *, ** and *** denoted that the reject the null hypothesis at 10%, 5% and 1% significant level respectively.

4.4 Long Run Effect of Macroeconomic Variables on Housing Prices

Table 4.4 Estimated long run coefficients using the ARDL approach

Variable	Coefficient	Standard error	t-statistic (Prob)	Prob.
GDP	17.209809	5.798794	2.967826	0.0057***
INF	-8.716664	3.049872	-2.858043	0.0076***
POP	11.302198	28.462953	0.397085	0.6940

Note: *, ** and *** denoted that the reject the null hypothesis at 10%, 5% and 1% significant level respectively.

Table 4.5 Estimated short run coefficient using the ARDL approach

Variables	Coefficient	Standard Error	t-statistic	Prob.
D(GDP)	0.968725	0.184861	5.240290	0.0000***
D(INF)	-0.126531	0.245862	-0.514643	0.6105
D(POP)	-9.533079	3.137309	-3.038617	0.0048***
CointEq(-1)	-0.095173	0.016856	-5.646281	0.0000***

Note: *, ** and *** denoted that the reject the null hypothesis at 10%, 5% and 1% significant level respectively.

4.4.1 The Impact of Gross Domestic Production on Housing Price

Does GDP effect HP in the long run?

Table 4.4 indicates the relationship between housing prices and GDP in Japan. The result shows that there is a significant relationship between housing prices and GDP at 5% significant level in the long run. The coefficient of GDP is significant which p-value=0.0057 less than the significant level of 1%, 5% and 10%. On average, every 1% increase in GDP, the housing price will increase 17.209809 indexes. Hence, it represents that housing price and GDP has a positive relationship in the long run.

The positive interaction of housing price and GDP had been studied by Hoxha and Salaj (2014). The long run housing prices are determined by the essential economic determinants of housing demand and supply as well as the market size (Kawaguci, 2009). Besides, the urban housing market's supply elasticity also has a relation to the size of expectation. The GDP growth measures the expected appreciation rate towards the housing prices (Kawaguci, 2009). Thus, when the expectation of Japanese increases, the housing price will increase. It will lead to an increase in the demand of houses as well. The motivation in building a new house will also lead to a rises in the flow of housing prices (Kurita, 2010). Furthermore, the housing prices indicator is calculated by the GDP and expected growth rate of GDP (Nakamura & Saita, 2007). The rate of housing price grows rapidly when Japan experienced an uncommonly high economic growth. Hence, the government has implementing the Plan for Remodeling the Japanese Archipelago in order to balance the price between residential and GDP growth (Nakamura & Saita, 2007). Besides, the diversification of the economic activities in the town and the rises of supply could reduce the housing prices.

Moreover, the ministry of land aggregates the annual growth rate of each housing price check point with equal weights. Thus, the high value of housing price and the low value of housing price were in the same weights. However, in the past, the high value price region experienced a huge fluctuation. The ministry of land value will underestimate the impact of fluctuated in housing prices if they use the same weight to estimate. Hence, when the housing prices fluctuate with the macroeconomic such as GDP, it is more accurate to use different weight to measure the housing price (Nakamura & Saita, 2007).

The relationship between housing price and GDP is also reflected through the household disposable income (Ayuso, Perez & Saurina 2004). The household income also measured by the gross domestic product per capita (GDP). The income will lead the households to the fundamental factor which affecting the housing prices as well as the housing market (McCarthy & Peach 2004). When the income increase, household will tend to increase their consumption of houses and the demand of houses will increase as well. Thus, higher housing prices will occur. On the other hand, the housing construction expert has an importance to the economy due to its linkage with other economic sector (Jackman, 2010). The increasing of housing construction is regularly related to the employment and wage for the labors in the housing sector. It also involve in the sector provided goods and services of houses (Jackman, 2010). Hence, when the number of housing construction rise, followed by rising of prices and wages of the goods and service, the economic growth will rise as well and lead to a rise in the housing price.

Does GDP affect HP in the short run?

Result from table 4.5 above illustrates the relationship between economic growth (GDP) and housing price in Japan in short run. The coefficient of CointEq(-1) obtained is -0.095173 (<1.00) and the p-value is 0.00000 (<0.01) have demonstrate the

co-integration and statistically significant relationship between GDP and housing price in Japan. The coefficient of GDP is significant with p-value=0.0000 at significant level of 5% and 10% respectively means that for every 1% increase in GDP, the housing price increase by 0.968725 index on average. Thus, this indicates a positive relationship between the GDP and housing price in Japan in short run.

The finding of positive correlation between the GDP and housing price are supported by Piazzesi and Schneider (2009). The establishment of positive correlation is mainly due to external factors such as the European financial crisis and the yen's appreciation (Judanren, 2012). According to Noguchi (1994), the extraordinary land price inflation during 1980s in Osaka and Tokyo area had caused the GDP and housing price to increase. This is due to the scenario when there is inflation on the land price, the housing price will rise as well. Increasing of housing price had lowered the household purchasing power of wage income Japan and lead to an economic stagnation after its property and stock market burst. Moreover, houses were becoming far more expensive due to an increase in the relation of purchase price to income (The Economist, 2005).This is because when nation income rises, purchasing power increase and people tend to buy more houses. When the demand of houses increases, the housing prices tend to increase as well. Furthermore, Chau and Zou (2000) report that the private housing investment is influential in determining short run economic output and cause price's increase. The study suggests that the growth of housing investment in China predicts a growth in GDP in the short run. The development of economic growth lead to increasing of house's price. Thus, housing investment affected China's short-term national economic growth, whereas the impact on non-housing investment is not obvious. As housing investment is one of the key indicators of short-term economic growth or recovery, the collapse of housing investment may lead to large fluctuations in economic growth, which may damage the stability of the national economy (Liu, Park, & Zheng, 2002).

Even though there are previous studies to support the positive association between GDP and housing price, another group of studies such as Ley and Judith (2010)

showed that GDP rate has negative influence on housing price. Judanren (2012) also support the finding of negative relationship by concluding that the increasing of elderly person caused slowing down of economic growth as the increasing social welfare costs associated with the aging of the population are increasing against the national finances. However, it is ironic that older people alleviate state finances by buying and holding government bonds. Holding more government bond mean more demand of Yen in the market, thus Yen appreciated. More people have higher money to finance house as economic growth improved, causing dropping of housing price. Next, the occurrence of "Japan's Lost Decade" from 1991 through 2001 has caused deflation of price. The weak domestic economy had contributed to Japan's government to man the fiscal problem (Kambayashi, 2009). After the collapse of these bubbles, the unemployment rate of Japan had stabilized. Workers started to get job in this new situation. Nevertheless, their income become lower and the money to finance the house also lesser due to low security with the employers. It means it has become impossible for an average worker to purchase a house in Tokyo, based solely on wage income. Hence, weak economic growth also gives impact to declining of housing price

4.4.2 The Impact of Inflation on Housing Price

Does INF affect HP in the long run?

According to the result in table 4.4 shows that there is a significant relationship between inflation and GDP at 5% significant level in the long run. The p-value=0.0076 which is lesser than the significant level of 1%, 5% and 10% indicates that the coefficient of inflation is significant. This illustrates that every 1% increase in inflation, the housing price will decrease by 8.716664 index. Therefore, this shows that there is negative relationship between inflation and housing price in Japan.

According to Guo, Wang and Ma (2015), the rising of housing prices restrains the inflation whereas the inflation will not raise the housing prices. In the short term, the rising of inflation speeds up the rise of the housing prices but it changes later by retraining the rise of the housing price. This is because the rising housing prices affected by inflation through the interest rate effect, property hedging effect, and cost effect. Nevertheless, investors would diversify their capital to other hedging products when the prices rose to some extent. Hence, this will restrain the rise of the housing prices. Besides, there is long-lasting and strong link between inflation and nominal interest rates on one hand and housing price on the other hand. This link shows that long terms of increasing in inflation will lead to serious deceleration of housing price growth (Zhu, 2004).

In addition, there is negative effect between housing demand and investments while after change of inflation either increases or decrease; the housing price will also remain upward trends. Besides, the housing price rose in Greece during 1997-2012 due to the deregulation of bank sector and the inflation decline (Panagiotisdic & Printzis, 2015).This shows that there was negative relationship between inflation and housing price. Furthermore, the higher inflation signified that higher funding costs needed to purchase house resulting the demand for housing become lesser. Hence, the housing prices will decrease respectively. Moreover, according to Demary (2009), interest rates and inflation were strongly linked between each other. The housing price will fall when the interest rates risen by central bank which will increase the inflationary pressures. Furthermore, according to Piazzesi and Schneider (2012), households are the main cause in affecting the negative relationship between inflation and housing prices. Particularly, young households more likely to adjust their inflation forecast comparing to the older households. Therefore, when households forecast that inflation would increase, followed by falling of demand for house and the housing price will decrease accordingly following the negative relationship between inflation and housing prices.

From Adams and Fuss (2008) studied, inflation occur cause the real housing price to decline rather than when reduction of nominal price. After all, the behavior of the housing prices will be influenced since expectations of house owners facilitated the formation of housing bubbles during economic booms. Moreover, impacts of the inflation of the cost of mortgage financing suggest that high inflation can bring negative impact to house prices. High inflation and high nominal interest rates charge more on the repayment of the mortgage principal and the real value of the repayment increase, thus the demand for housing decrease. The declining of demand for housing implying that the housing prices will decrease. This signifies that there is negative relationship between inflation and housing prices (Debelle, 2004).

Does INF affect HP in the short run?

Result from table 4.5 above illustrate the relationship between inflation and housing price in Japan in short run. The coefficient of CointEq(-1) obtained is -0.095173 (<1.00) and the p-value is 0.00000 (<0.01) have demonstrate the co-integration and statistically significant relationship between inflation and housing price in Japan. The coefficient of inflation is insignificant with p-value=0.6105 at significant level of 5% and 10% respectively means that for every 1% increase in inflation, the housing price will not be effected. Thus, this indicates there is insignificant between the inflation and housing price in Japan in short run.

The finding of insignificant effect of inflation on housing price are consistent with several studies (Tze, 2013; Tan, 2011). Tze (2013) examined the macroeconomic factors (GDP, unemployment rate and inflation rate) correlated with housing prices in Malaysia. He found that the inflation variable not to have significant relationship towards the housing price. According to Tan (2011), he used hedonic pricing model to

examine the macroeconomic factors correlating with housing prices and found that the output of the findings shown that inflation rate has moderate negative r-value. Its means that inflation was insignificant on housing price. The researcher concluded that financial indicators such as total loans to house or economic indicators such as employment rate only effect to the housing price (Tan, 2011). According to the study of Zandi et al. (2015), they found the inflation indicates no correlation towards housing price in Malaysia (Penang) because inflation rate had very high F-value.

4.4.3 The Impact of Population on Housing Price

Does POP affect HP in the long run?

Table 4.4 illustrates that the relationship between population and housing prices in Japan. The result shows that the relationship between population and housing price is insignificant at 5% significant level in the long run. The coefficient of population where the p-value=0.6940 is larger than 1%, 5% and 10% shows that the coefficient of population is insignificant. This signifies that every 1% increase in population, the housing price will not be affected. Hence indicates that population and housing prices have no relationship between each other.

According to Ong (2013), the population does not affect housing price in UK. The government in UK will provide housing benefits to those people with lower earning income. This signifies that the increase or decrease of population will not affect the housing prices. Other than that, Li (2014) emphasized that population has no significant relationship towards the housing prices. This is due to the housing prices are price elastic, population will only affect the housing prices in the short run.

Moreover, the researcher stated that population will not affect the real housing price in since the negative effects in the market could be offset by the shift in real per capita income (Fortin & Leclerc, 2000). Furthermore, Mankiw and Weil (1989) highlighted that there is no significant correlation towards housing demands. Hence, there is no relationship towards housing prices.

On the other hand, by using Japanese data to examine the relationship between population and housing prices, the population does not affect the housing prices as the supply will increase to the changes in demand, therefore it will be counterbalanced (Li, 2014). Besides that, Rahman (2008) states that population will affect the housing prices in the long run. The population is correlated to the housing prices, by increasing population, the housing demand will increase as well, and hence the housing price will increase. In the contrary, our studies show that the relationship between population and housing price are insignificant, this is because our studies is only about the population and housing prices in Japan, but the journal that we study include all demographic factors such as marital status, ageing, sex, education level, occupation, birth rate and many more. Therefore, there is the different result comparing with our studies.

Does POP impact HP in the short run?

Result from table 4.5 above clarify the relationship between population (POP) and housing prices in Japan in short run. The coefficient of CointEq(-1) obtained is -0.095173 (<1.00) and the p-value is 0.0048 (<0.01) have demonstrate the co-integration and statistically significant relationship between POP and housing price in Japan. The coefficient of POP is significant with p-value=0.0048 at significant level of 1%, 5%, and 10% respectively means that for every 1% increase in population, the housing price

decrease by 9.533079 index on average. Thus, this shows a negative relationship between the POP and housing price in Japan in short run.

In the earlier study (Saita, et. al, 2016) revealed there is a negative relationship between housing prices and population in Japan. As the Tokyo land price reached its peaked in 1988, while the old dependency ratio had declined from the 1980 to 1990. Similar tendency observing in Osaka, the land prices and dependency ratio move roughly the same direction as in Tokyo. The reason for demographic changes is consistently negative in Tokyo and Osaka due to the housing bubbles caused high housing prices in Tokyo and Osaka, thus it is resulting the population outflowed to suburbs. In contrast, the housing prices show a lower trend in Japan is because of the average age of population is older. Thus, as the age of population increase, it will cause the housing prices get cheaper due to the demand of housing decrease (Saita, et. al, 2016).

Same situation occurred in French, Essafi and Simon (2015) pointed out the old age dependency ratio are significantly and negatively influenced the real estate prices. The researchers divided the population in French into two groups which are active population and non-active population. The active population means the working population where the non- active population is the sum of the population under age of 20 and population over 60 years of age. Essafiand Simon (2015) They found that the active population has positive relationship with the real estate prices whereas the non-active population has negative relationship with the real estate prices due to the population under 20 are not directly related to the real estate market (only 1.6% of them are homeowners) and people over 60 years of age may liquidate assets to ensure that they have additional income after retirement to meet their needs. This liquidate action will lead to an increase of dwelling supply onto the market. However, the smaller working age population (buyers or demanders) and a higher retirement population (sellers or suppliers) would bring tremendous downward pressure on the housing prices (Essafi & Simon, 2015).

Besides that, supposed the population aged between 30 and 39 has a positive impact on the housing prices in French as a demander. Yet, (Essafi & Simon, 2015) found there was a significant and negative relationship between population aged 30-39 and housing prices. They explained this situation is especially for the population and the young adult are increasingly worse. Over the past decade, the vulnerability of the young adult has been enlarged. The fragile behavior causing them to delay the house purchase project and stay longer in the rental. Hence, the demand of housing reduced and the supply of housing relatively increased.

4.5 Granger Causality Test

Granger causality test is a statistical hypothesis test for determining whether there is directional causality between dependent variable and independent variable. This study conducts Pairwise Granger Causality test between dependent and independent variables. The Table 4.6 shows that housing prices index is significant granger caused the inflation at 5% significant level but not to the gross domestic product and population. In the meantime, gross domestic product, inflation, and population are significant granger caused housing prices index at 1% and 5% significant level. Furthermore, inflation does granger caused population at 1% significant level.

Table 4.6 Pairwise Granger Causality Test

	HP	GDP	INF	POP
HP	------	0.8352	0.0101**	0.5916
GDP	0.0188**	------	0.2680	0.2665
INF	0.0005***	0.4098	------	0.0047
POP	0.0000***	0.4301	0.3643	------

Note: *, ** and *** denoted that the reject the null hypothesis at 10%, 5% and 1% significant level respectively

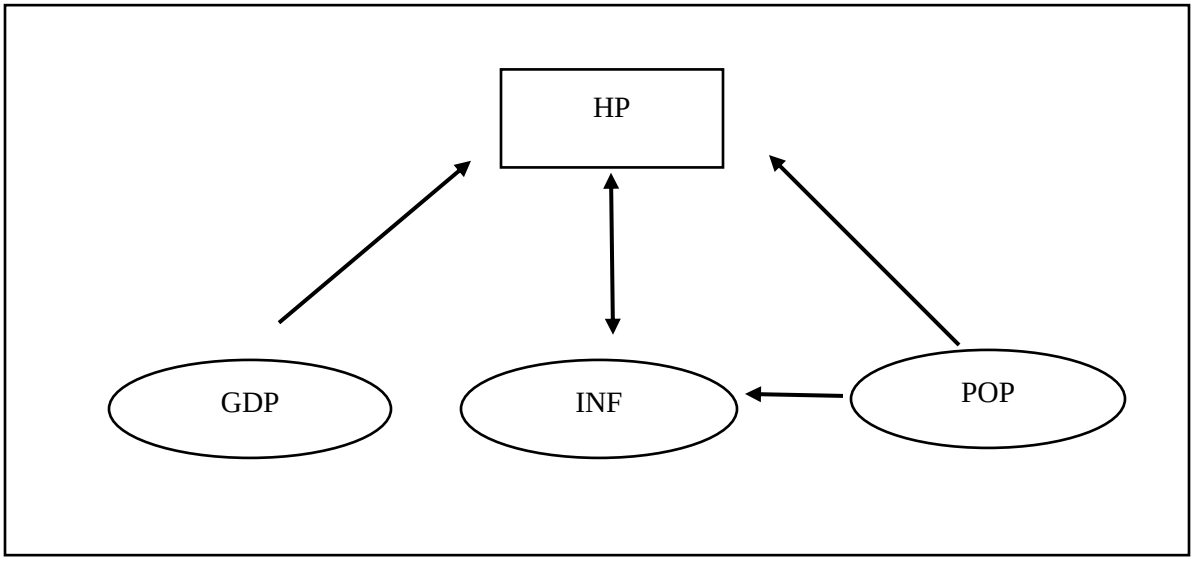

Figure 4.3: Granger Causality between the variables

Note: ⟶ Unidirectional causality effect

⟷ Bidirectional causality effect

4.5.1 Gross Domestic Product

H_0: There is no granger causality from HP to GDP

H_1: There is granger causality from HP to GDP

From the Table 4.6 and Figure 4.3 show, GDP has a unidirectional causal relationship with HP, where GDP granger causes HP at 5% significant level with a p-value of 0.0188 which is smaller than 0.05. Thus, reject the null hypothesis. This means that the changes of the gross domestic product in the past can be used to foresee the occurrence of event of housing prices. This finding is consistent with the nexus of macroeconomic and housing prices theory discussed in Chapter 2, the actual housing prices are well interpret by the economic factors such as GDP, inflation, and unemployment. However, there is no inverse causal effect from HP to GDP. This shows that the changes of the housing prices in the past cannot be used to foresee the occurrence of event of gross domestic product.

4.5.2 Inflation

H_0: There is no granger causality from HP to INF

H_1: There is granger causality from HP to INF

From the Table 4.6 and Figure 4.3 show, there is a bidirectional causal relationship can be seen between HP and INF, where HP granger causes INF at 5% significant level with a p-value of 0.0101 and reverse causality from INF to HP at 1% significant level with a p-value of 0.0005 which are smaller than 0.01 and 0.05. Thus,

reject the null hypothesis. This indicates that the changes of housing prices in the past can be used to foresee the occurrence of event of inflation or the changes of inflation in the past can be used to foresee the occurrence of event of housing prices. This finding is consistent with the theory of nexus of macroeconomic and housing prices. The housing prices can be well predicting by the economic fundamentals such as inflation. The increase of inflation has the impact on the construction and housing payment. Hence, lead to the lower demand of housing.

4.5.3 Population

H_0: There is no granger causality from HP to POP

H_1: There is granger causality from HP to POP

From the Table 4.6 and Figure 4.3 show, there is a unidirectional causal relationship can be seen between HP and POP, where POP granger causes HP at 1% significant level with a p-value of 0.0000 which is smaller than 0.01. Thus, reject the null hypothesis. This indicates that the changes of the population in the past can be used to foresee the occurrence of event of housing prices. This finding does not consistent with the user cost-rent equivalence theory discussed in Chapter 2. The theory stated that the housing prices are driven by the demographic changes such as population. The increase of population will lead the demand of housing increase. Thus, the theory is consistent with the finding shows on population does granger caused the housing prices.

CHAPTER 5: DISCUSSION, CONCLUSION AND IMPLICATIONS

5.0 Introduction

This section presents the summary of some major findings in this study. Some policy implication is discussed to improve the housing price through different macroeconomic variables such as GDP, inflation and population. Besides, this section end by discussing the limitations of the study and recommendations for future study.

5.1 Summary

In today economic, the housing prices are important for citizens because the higher housing price will increase the burden of citizens and lower down their purchasing power. The housing price had expressed the situation of the macroeconomic in Japan. In this research, it focused on investigating the relationship between the housing price and macroeconomic determinants in Japan.

Besides that, the macroeconomic determinants had involved economic growth (GDP), population and inflation to assemble the real housing prices in Japan. To proceed with this study, a series of test had been conducted such as ARDL and the outcome had present in chapter 4. In the bound test, it is obviously indicated that there is co-integrated between the dependent variables and manipulated variables. A part

from that, the granger causality test had showed that the three variables which is GDP, inflation and population are significant granger caused the housing prices. Besides, the inflation also had granger caused the housing prices index at 1% significant level. In addition, the economic growth (GDP) and inflation had significantly affected the housing prices in the long run whereas the population and GDP had a significant relationship with Japan's housing price in the short run.

Furthermore, the inflation and population had a negative relationship with housing price in Japan while the GDP is the only determinants had positive relationship towards the housing prices. For instances, when GDP rises, the housing price will increase as well, ceteris paribus. For the situation of negative relationship, when the inflation increases, the housing price will decrease, ceteris paribus. Due to urbanization process and high population, housing price will drop as more demand in purchasing house. Supply of housing will increase as well due to increase of demand in housing and hence high competition in the housing market will cause the housing prices go down.

Based on the test and result this research had conducted, this research found that the dynamic of housing prices had been influenced by the three macroeconomic determinants which are GDP, inflation and population.

5.2 Policy Implication

Throughout the study, the result shows that the demand of houses in Japan has a slow increased trend and it has an impact on the price of the property. To efficiently

enhancing the performance of property market in Japan, there are a few policy implications being suggested.

To improve the economy growth in Japan, the government should involve in the open market actively. The government encourages more FDI inflows by further liberalizing trade, lowering barriers to investment and ownership. This action can enhancing the productivity through technology spillovers and improves competitiveness. Thus, it can attract more investment on the local property market. Besides, liberalize controls on immigration to allow more foreign students and high-skilled workers in Japan will improve the performance and developing global supply chains. By way of liberalization, the foreigners in Japan can help to boost the demand of the houses in Japan.

Reduction of property tax is a way to improving the performance housing market in Japan. The property tax is a reason causes of the high vacancy rate in Japan. Due to Japanese citizen need to pay the property tax, they will decided to sell off their property to cut off or prevent to pay the property tax if that property is not in used anymore (Kobayashi, 2016). However, with a lower property tax rate, they will be more willing to hold property even the property is not occupied. Hence, the demand of the houses will be increased.

In addition, Japan is now facing a drastically changes of the demographic as well as the aging society. The retirement-age population are usually have less physical competence than the working-age population. Thus, the action of assistance for the elderly should be taken. According to the (Kobayashi, 2016), Law on Securement of Stable Supply of Elderly Persons' Housing has provides a rental homes with elderly care services. The rental housing units for people aged 60 or older include staff to keep an eye on residents and conduct other welfare duties. These types of facilities are operated mainly by companies and medical corporations. Hence, they are entitled to

receive a subsidy for the construction cost, accelerated depreciation for income tax, and reduction of property tax.

5.3 Limitation

Similar with previous researches, the there are some limitations and difficulties found throughout process of study. First and foremost, we are unable to investigate the entire factors determinant to housing price hence this study uses three macroeconomic variables which are inflation, population and gross domestic production (GDP) as research variables and investigate their relationship with the housing prices. However, other variables such as unemployment, real mortgage rate and foreign direct investment or other macroeconomic factors are not taken into consideration in this research. Beside macroeconomic factors, there are also geographic features such as oceans, lakes, mountains, and wetlands can also induce a relative scarcity of developable land. Housing price in metro areas should have more expensive housing than housing price in rural areas. The model shows that land restrictions should reduce housing supply elasticity (Saiz, 2010). In addition, non-economic fundamentals, including monetary policy, credit policy, land policy, safe housing policy and tax policy and other control policies may also affect the housing prices as they believe that real estate price fluctuations is the main reason for price fluctuations (Goodhart & Hofmann, 2008).

Moreover, external factors such as the European financial crisis and the yen's appreciation during 1990s which happened during our research period (Judanren, 2012) has caused housing price to decline. Previous literatures only analyzes the impact of the recent global financial crisis on Japan and the actions taken by the Bank of Japan but did not explain the lessons learned in Japan during the 1990s financial crisis. Therefore, these studies do not allow decision makers to determine the appropriate response to the financial crisis (Vollmer & Bebenroth, 2012). Thus, our study does not

analyze the indirect impact of the European financial crisis on house prices. In fact, the financial crisis has caused a negative impact on the housing market in many countries including Japan.

In addition, the research conducted in Japan may not be generated to other ASIAN countries. The reason for this situation is due to the economic characteristic, culture background, and the regulation in a country. A research outcome may be able to undertake activities in their home country but would not be permitted in foreign country due to the legal or ethical constraints (Skene, 2007).

5.4 Recommendation for future research

First of all, macroeconomic variables such as unemployment, real mortgage rate and geographical factors that have relationship with the housing prices should be consider using in the future studies. Unemployment will affect the housing prices as countries that have high unemployment rate will reduce the demand of houses and hence will affect the housing prices. Moreover, during the economy boom, most of the banks were like to borrow mortgage loans to people who are interested in buying houses and the amount borrowed can be in large amounts. Therefore, the people purchasing power increase causing the demand for houses increase which boost the housing prices.

Furthermore, geographical factors are also one of a potential determinant that will affect housing prices. Due to most of the housing markets are highly geographical, housing prices are more expensive in metro areas comparing to rural areas. Non-economic fundamentals are also encouraged to study such as monetary policies, credit

policies, land policies, security housing policies and tax policies in order to more understand the housing prices movement.

In addition, future researchers should also pay attention on global financial crisis that will also bring negative impact on the housing prices in countries worldwide and learn from the crisis. This information might be useful to investors. Besides, the cause and effect of housing price due to the global financial crisis in the past, present and future should be focused by the researchers.

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APPENDICES

Appendix 1: Autoregressive Distributed Lag (ARDL) Unit Root Results

Level Form: Intercept

Housing Prices

Null Hypothesis: HP has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.472559	0.1285
Test critical values:	1% level	-3.577723	
	5% level	-2.925169	
	10% level	-2.600658	

*MacKinnon (1996) one-sided p-values.

Gross Domestic Product

Null Hypothesis: GDP has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.404989	0.0009
Test critical values:	1% level	-3.574446	
	5% level	-2.923780	
	10% level	-2.599925	

*MacKinnon (1996) one-sided p-values.

Inflation

Null Hypothesis: INF has a unit root
Exogenous: Constant
Lag Length: 5 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.144172	0.6895
Test critical values:	1% level	-3.592462	
	5% level	-2.931404	
	10% level	-2.603944	

*MacKinnon (1996) one-sided p-values.

Population

Null Hypothesis: POP has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.566628	0.1069
Test critical values:	1% level	-3.574446	
	5% level	-2.923780	
	10% level	-2.599925	

*MacKinnon (1996) one-sided p-values.

First Different: Intercept

Housing Prices

Null Hypothesis: D(HP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.367993	0.0173
Test critical values:	1% level	-3.577723	
	5% level	-2.925169	
	10% level	-2.600658	

*MacKinnon (1996) one-sided p-values.

Gross Domestic Product

Null Hypothesis: D(GDP) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.275452	0.0000
Test critical values:	1% level	-3.581152	
	5% level	-2.926622	
	10% level	-2.601424	

*MacKinnon (1996) one-sided p-values.

Inflation

Null Hypothesis: D(INF) has a unit root
Exogenous: Constant
Lag Length: 5 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.158395	0.0298
Test critical values:	1% level	-3.596616	
	5% level	-2.933158	
	10% level	-2.604867	

*MacKinnon (1996) one-sided p-values.

Population

Null Hypothesis: D(POP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-12.86569	0.0000
Test critical values:	1% level	-3.577723	
	5% level	-2.925169	
	10% level	-2.600658	

*MacKinnon (1996) one-sided p-values.

Appendix 2: Diagnostic Checking Results

ARCH Heteroskedasticity Test

Heteroskedasticity Test: ARCH

F-statistic	6.450833	Prob. F(2,40)	0.0037
Obs*R-squared	10.48685	Prob. Chi-Square(2)	0.0053

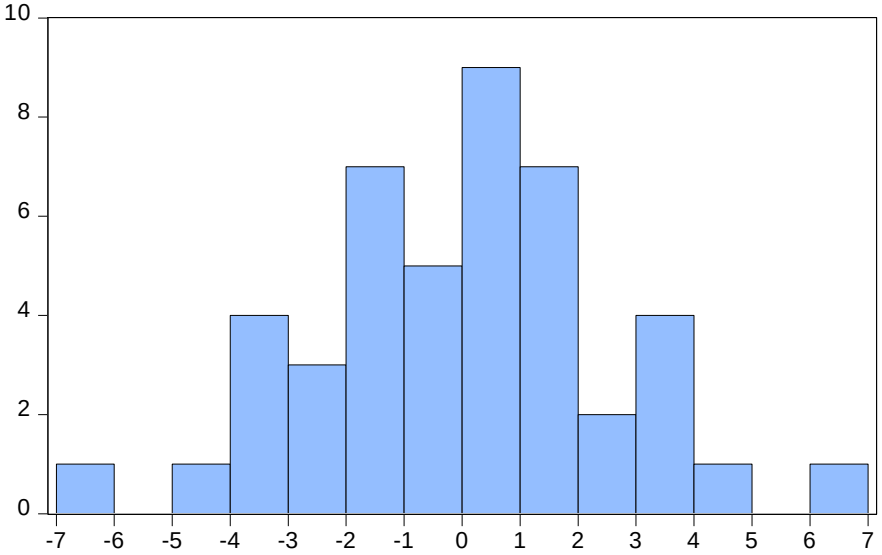
Serial Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.679523	Prob. F(2,29)	0.2041
Obs*R-squared	4.671247	Prob. Chi-Square(2)	0.0968

Test Equation:

Jarque-Bera Normality Test



Series: Residuals
Sample 1971 2015
Observations 45

Mean	-4.55e-14
Median	0.082747
Maximum	6.736481
Minimum	-6.669535
Std. Dev.	2.600128
Skewness	-0.018396
Kurtosis	3.241661
Jarque-Bera	0.112038
Probability	0.945521

Ramsey RESET Test

Ramsey RESET Test
Equation: UNTITLED
Specification: HP HP(-1) HP(-2) HP(-3) HP(-4) GDP GDP(-1) GDP(-2) INF INF(-1) POP POP(-1) POP(-2) POP(-3) C
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	0.808001	30	0.4255
F-statistic	0.652865	(1, 30)	0.4255

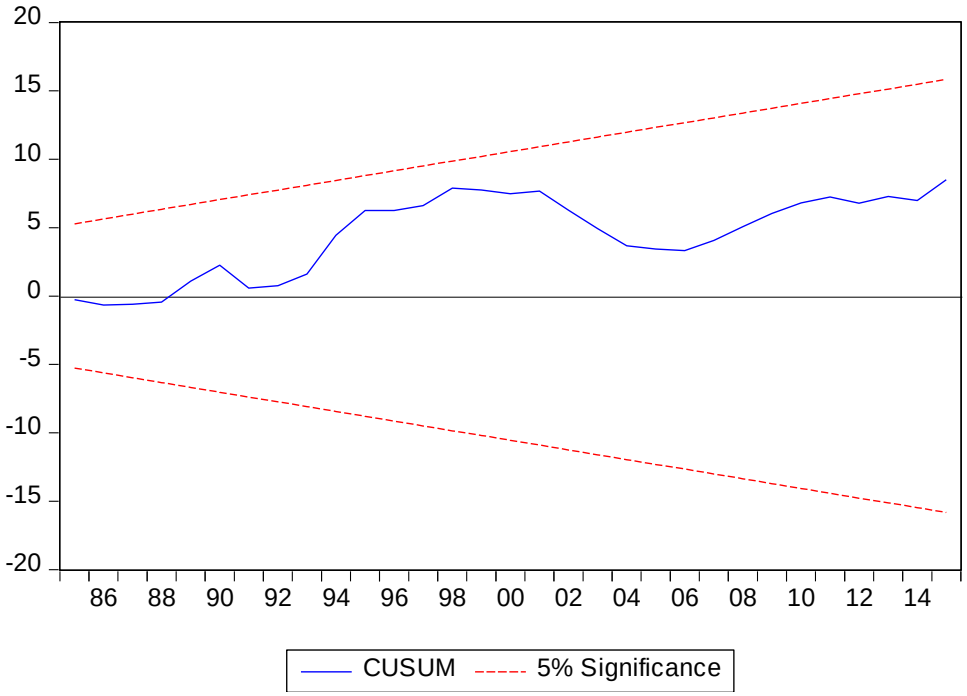
F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	6.335699	1	6.335699
Restricted SSR	297.4693	31	9.595784
Unrestricted SSR	291.1336	30	9.704454

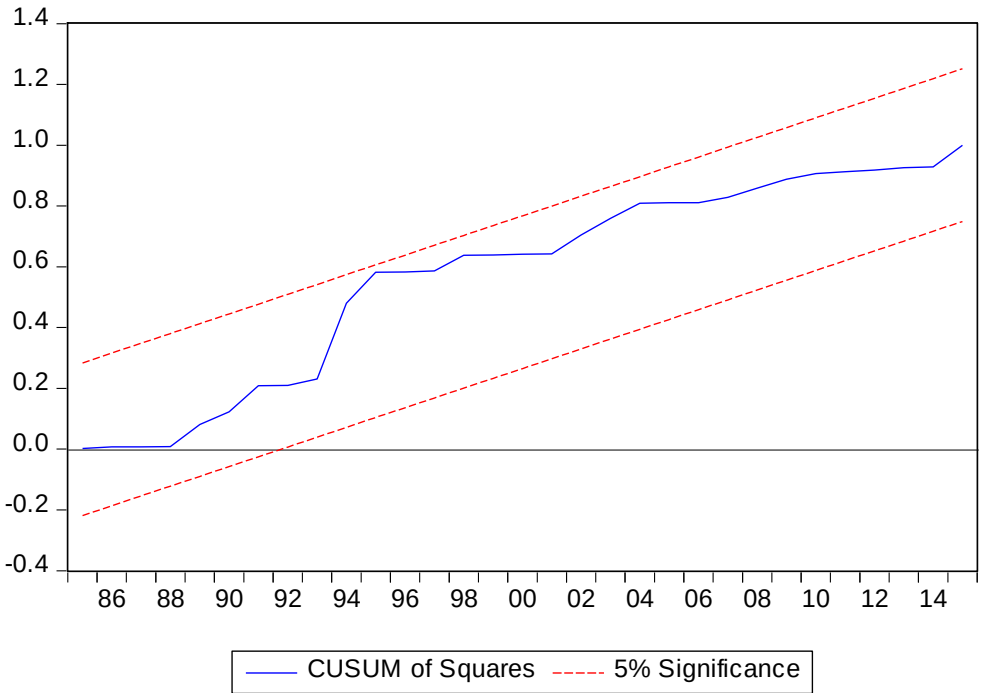
Unrestricted Test Equation:

Appendix 3: CUSUM and CUSUM Square Test

CUSUM Test



CUSUM Square Test



Appendix 4: Bound Test for Co-integration Result

ARDL Bounds Test
Date: 06/21/17 Time: 11:57
Sample: 1971 2015
Included observations: 45
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	5.647401	3

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.37	3.2
5%	2.79	3.67
2.5%	3.15	4.08
1%	3.65	4.66

Appendix 5: ARDL Long Run and Short Run Estimation

ARDL Cointegrating And Long Run Form
Dependent Variable: HP
Selected Model: ARDL(4, 2, 1, 3)
Date: 06/21/17 Time: 11:59
Sample: 1967 2015
Included observations: 45

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(HP(-1))	0.832820	0.144189	5.775896	0.0000
D(HP(-2))	-0.556357	0.169682	-3.278816	0.0026
D(HP(-3))	0.336610	0.112618	2.988953	0.0054
D(GDP)	0.968725	0.184861	5.240290	0.0000
D(GDP(-1))	-0.920679	0.254606	-3.616091	0.0010
D(INF)	-0.126531	0.245862	-0.514643	0.6105
D(POP)	-9.533079	3.137309	-3.038617	0.0048
D(POP(-1))	1.924053	2.883896	0.667171	0.5096
D(POP(-2))	-3.318931	1.917067	-1.731255	0.0933
CointEq(-1)	-0.095173	0.016856	-5.646281	0.0000

Cointeq = HP - (17.2098*GDP -8.7167*INF + 11.3022*POP + 91.8358)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP	17.209809	5.798794	2.967826	0.0057
INF	-8.716664	3.049872	-2.858043	0.0076
POP	11.302198	28.462953	0.397085	0.6940
C	91.835826	11.945667	7.687794	0.0000

Appendix 6: Granger Causality Test Estimation

VEC Granger Causality/Block Exogeneity Wald Tests
Date: 06/21/17 Time: 12:09
Sample: 1967 2015
Included observations: 44

Dependent variable: D(HP)

Excluded	Chi-sq	df	Prob.
D(GDP)	11.80751	4	0.0188
D(INF)	20.16039	4	0.0005
D(POP)	30.49319	4	0.0000
All	64.00494	12	0.0000

Dependent variable: D(GDP)

Excluded	Chi-sq	df	Prob.
D(HP)	1.451476	4	0.8352
D(INF)	3.972366	4	0.4098
D(POP)	3.825685	4	0.4301
All	10.79686	12	0.5464

Dependent variable: D(INF)

Excluded	Chi-sq	df	Prob.
D(HP)	13.25102	4	0.0101
D(GDP)	5.194119	4	0.2680
D(POP)	4.320836	4	0.3643
All	33.06584	12	0.0009

Dependent variable: D(POP)

Excluded	Chi-sq	df	Prob.
D(HP)	2.801282	4	0.5916
D(GDP)	5.209103	4	0.2665
D(INF)	15.00813	4	0.0047
All	42.86983	12	0.0000