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Monetary Policy and Demographics: Empirical Evidence for Housing Prices in Indonesia

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Abstract: The housing market in Indonesia has different characteristics for each region. These differences underlie changes in house prices, factors that affect house prices include Loan to Value (LTV), mortgage rate, income, and population. The data was obtained from relevant agencies of Bank Indonesia and the Statistics Indonesia, using data from 2012-2021, which is a combination of time-series data and a cross-section of 18 cities in Indonesia. The research method used is a regression panel. The results of the study of income levels, population, and Loan to Ratio (LTV) are significant to house prices, except for mortgage rates which not be effective in depressing housing price during the observation period.

Keywords: Housing Prices; Loan to Value; Population; Mortgage Rate; Panel Regression.

Introduction

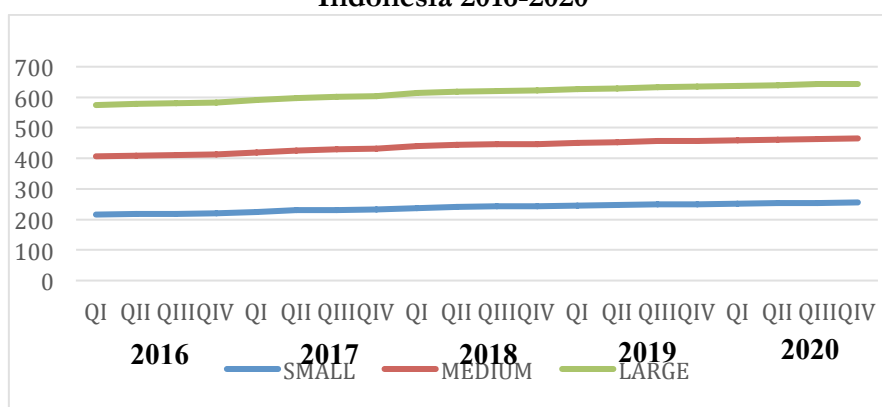
The decision to buy a house is closely related to the socio-economic conditions of consumers. Economic aspects such as income level and credit status are the most important issues in making a decision to buy a house (Liu & Li, 2018). The house is not just a place to live and live for the community but can reflect socioeconomic conditions. Hartono et al (2020) state that demand for house are available to everyone, including people with low abilities, need to know more about how to make home occupancy decisions. However, the options available for low-income people to own a house are quite limited so that the house can represent social and economic status which ultimately determines the environmental perception of each individual.

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People's decisions on housing demand are also influenced by living standards. Aspects of the quality of the available infrastructure can influence households in determining housing demand. Not only physical infrastructure such as roads, transportation and electricity, but digital infrastructure such as internet availability is an important consideration and people's living standards that may not be fully achievable by their current income levels (Watt, 2020).

The housing market in Indonesia tends to have different characteristics in several areas. The development of the housing market in Indonesia is indicated by the movement of housing prices as measured by the Residential Property Price Index (IHPR). The results of the Residential Property Price Survey conducted by Bank Indonesia, among others, provide information on residential property sales, residential property price indexes, and sources of developer financing to build houses (Bank Indonesia, 2021).

Figure 1. Development of Residential Property Price Index (IHPR) Indonesia 2016-2020



Source: Bank Indonesia, 2021

Based on the Residential Property Price Survey reported by Bank Indonesia, the Residential Property Price Index (IHPR) data consists of various types of buildings and a combination of 18 cities. The building types are classified into small, medium, and large. Currently, IHPR data covers the regions of Bandung, Bandar Lampung, Banjarmasin, Denpasar, Palembang, Semarang, Yogyakarta, Padang, Medan, Makassar, Manado, Surabaya, Pontianak, Batam, Balikpapan, Jabodetabek, Pekanbaru and Samarinda. The combined IHPR statistics for 18 cities for each type of building show that housing price growth tends to increase every year but with different percentages. The question arises whether economic indicators and monetary policy can affect housing prices in Indonesia.

One way that can be taken to buy a house is to seek a loan through banking or credit. From the real estate company side, they need credit from banks to develop housing projects, from the household side, they need housing mortgage loans to buy houses. It shows the demand and price of houses in relation to the interest rate (Zhu et al., 2018). Therefore, it is necessary to develop a policy framework to address financial system instability, namely macroprudential policy. Loan to Value (LTV) ratio policy aimed at mitigating systemic risks that may arise from housing loan growth (Siravati, 2018). Facing credit risk in the housing market, the government has implemented macroprudential policies related to housing and apartment loans through the LTV policy (Nugroho et al,

2018). Excessive growth in housing loans can lead to an increase in property asset prices that do not reflect the actual price (bubble), which causes property prices to fall and causes the overall economy to decline until an economic recession occurs. LTV regulations are enacted to dampen the cycle of housing prices, preventing bubble issues (Lim & Nugraheni, 2017).

In addition to the loan to value (LTV) ratio, housing prices are also influenced by demographic issues, this is related to the demand for housing in the community which is a primary need. Research conducted by Coskun et al (2017) argues that changes in demographic structure affect the number of demand for houses. Housing prices show an increasing trend in recent years. The demand for housing faces a challenging situation in obtaining decent housing due to the high rate of population growth (Liang et al, 2016). Demographic aspects cannot be separated from the determinants of housing prices. Mankiw & Weil (1989) analyze whether there is a relationship between demographics and the housing market. The increase in demand for new houses in the next 20 years is due to an increase in the number of newborns (baby zoom). It can be concluded that the number of births and population has a strong influence on the demand and housing prices. It is interesting to prove whether demographic factors have a major influence on housing prices.

From the various factors that have been described above, there are many things that affect house prices and demand. Indonesia's geographical conditions which consist of various islands and provinces that cause different characteristics from one region to another, the application of loan to value (LTV) and mortgage rates as well as differences in income levels and population levels, cause changes in house prices in Indonesia.

This study aimed to examine the novelty and contribution of the impact of each variable on the housing prices of distinct sizes across 18 cities in Indonesia. The data used is the house price index which is explained more specifically based on the type of houses, namely the type of small, medium, and large houses. Prior research on housing prices has only analyzed the overall housing price index without differentiation based on the size of the houses. Then, the LTV ratio limit used is also based on the size of the type of house, where small house size is reflected in the LTV ratio limit for houses less than 21 m², medium houses in the LTV ratio limit for houses > 21m²-70m², large houses on the LTV ratio limit for a house measuring >70 m². The specific contribution to this research is to show socioeconomic aspects, in this case, demographic issues, as measured by population, which have an effect on housing prices.

Literature Review

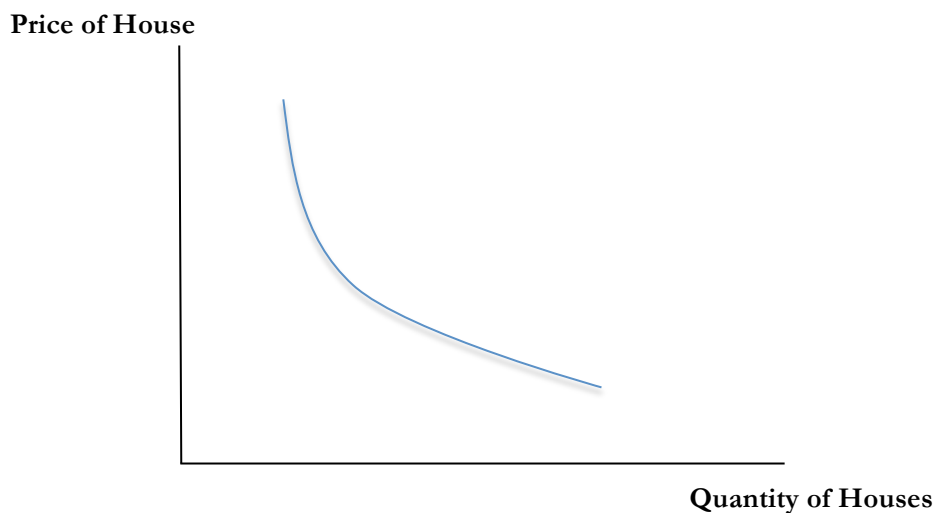
Housing Demand Theory

The market demand for housing is shown in figure 2. The various choices and decisions made by households regarding the demand for housing can be described by a demand curve. Cooper & John (2012) explains that the demand for housing at each price can be described by the market demand curve. The quantity demanded can increase if house prices decrease. More individuals and households decide that they can afford to buy a house at a lower price. However, in certain cases, households with very high income levels may buy more than one house. The demand curve shows the price level and it is assumed

that the values of other factors are fixed. However, if there are changes in other factors such as income levels, prices of goods and services, they can shift the demand curve, so that the quantity demanded will change. In addition, shifts in the market demand curve for housing, can be caused by concerns about the health of the economy in the future, rising mortgage rates, changes in people's tastes so that buying a house is no longer seen as a status symbol.

The condition of suitability between the house purchased and the house sold is shown by the equilibrium between demand and supply. Housing price movements can be predicted using a supply and demand framework.

Figure 2. The Market Demand for Houses



Source: Cooper & John (2012)

The various factors that can affect changes in house prices have been explained using a supply and demand framework. Cox & Pavletich (2016) & Lee (2016) assert that housing affordability is related to income. When a household spends more than this amount, they are classified as “core housing needs”. In the short term, affordability issues result from supply-demand, but in the long term, affordability issues are associated with a widening gap between reasonably increasing household incomes and rapidly increasing housing costs. Based on these conditions, the level of income as one of the main factors to measure the affordability of a household in buying a house, recorded a significant correlation between the buyer's salary and the choice of home. In addition, mortgage loans provided by banks are assessed based on the eligibility and ability of the buyer from their level of income. And not to be ignored, the high demand for housing is also influenced by population growth and urbanization rates.

Housing Market and Determinants Factor

Policy makers regarding the housing market consider the financial crisis by adopting macroprudential policies. Monetary authorities seek to promote the sustainability and resilience of the housing market by using policy instruments. Stable house price levels are one of the main focuses of the monetary authorities (Chu, 2018).

Lyon (2018) examines housing price ratios in Ireland during the housing boom and bust of 2000–2012 where credit conditions were the main long-term determinant. Macroprudential policies are relied on by central banks in every country to maintain financial stability (Bruno et al, 2017). Macroprudential policies have the objective of increasing the resilience of the financial system and limiting the accumulation of financial imbalances. The way to meet this goal is to increase buffers within financial institutions and moderate asset prices and the credit cycle. Evaluation of the effectiveness of the loan-to-value ratio (LTV) limitation can be seen how much influence it has in moderating house price inflation (Armstrong et al, 2019).

A higher LTV ratio may result in an increase in the credit ratio. House assets obtained by borrowers are used as collateral for loans so that LTV is used as an indicator of credit risk assessment (Bian et al, 2018). The LTV ratio limit applied as a measure to control housing loans and ultimately affects house prices. The LTV ratio regulates the maximum proportion of house value that can be disbursed as credit (availability), an increase in the LTV ratio indicates relaxation because more loan funds are obtained. Thus, the implementation of this policy is expected to affect housing demand and prices (Lim & Nugraheni, 2017). Kuttner & Shim (2016) used panel data from 57 countries to evaluate the effectiveness of various macroprudential, housing, and tax policies on imbalances in the housing market. The tightening of LTV restrictions has a statistically significant effect on housing prices.

Pontines (2020) compares the effects of monetary policy and the shock ratio of LTV in Korea. This study finds that monetary policy shocks and the LTV ratio have effects over the period in which the constraints apply to different credit sizes, i.e., real bank credit, real total credit and real household credit, as well as on real output credit, real consumption and real investment. . This finding suggests that for the period covered by this study, the LTV limit achieves the goal of financial stability in Korea in terms of limiting credit appreciation and house prices under the inflation targeting regime. Richter et al (2019) used panel data in developed and developing economies to specifically investigate the impact of numerical changes in the maximum LTV ratio on real output, inflation, credit and housing price growth from 1990Q1 to 2012Q2.

Aliefendioglu & Tanrivermis (2021) examines the factors that affect the House Price Index during the Covid-19 pandemic period. The Covid-19 shock provides a long-term and short-term asymmetric relationship on the House Price Index (HPI) in Turkey and the results in Kazakhstan. Igan & Loungani (2012) examine housing price dynamics and emphasize that it can be influenced by demographic and income factors, while changes in the level of balance are largely determined by changes in the condition of the amount of credit. Mohan et al. (2019) examining the data that shows macroeconomic indicators have a significant effect on housing prices.

The empirical analysis of the housing market in Greece uses monthly data for the period 1997 to 2013. The research focuses on the following variables: House Price Index, Consumer Price Index, Industrial Production Index, Retail trade volume, loan interest rates, mortgage annual growth rate, the money supply growth rate M1 and the Unemployment rate (Panagiotidis & Printzis, 2016).

The level of house prices affects the local housing market so that changes in house prices reflect the economic conditions of a region and the global economy as well as the national business cycle. Some empirical evidence shows that a large number of economic variables affect the variation in housing prices over time (Mohan et al, 2019). It must be emphasized that GDP is an important indicator that reflects the level of economic development and has a close relationship with housing prices (Wang & Jiang, 2016).

The people's purchasing power for housing demand cannot be separated from the loan facilities provided by the banking sector. An important part of a bank's loan portfolio is mortgage loans. The causal relationship between bank loans and housing prices is very important not only for financial institutions but also for government agencies responsible for making fiscal and monetary policies (Hui & Ng, 2016). There is the influence of the mortgage market on the duration of the housing boom, bust, and normal times. The impact of housing finance characteristics and institutional differences in mortgage markets on different long-phases of the housing market cycle (Agnello et al, 2020).

Empirical evidence shows that GDP, income, and the housing market are related and need to be examined further. Oikarinen (2012) stated that income level is an important index that reflects demand capacity. When income increases, the demand for the commodity will increase and hence cause an income effect. The level of income has a close relationship with house prices. An increase in income levels can increase the ability to pay buyers and therefore increase the demand for real estate products and housing prices.

Methods

The object of this research is the influence of monetary policy and demography on housing prices in Indonesia. This research is limited to covering 18 cities in Indonesia in 2012 – 2021. During the observation period, IHPR (housing prices) data published by Bank Indonesia consisted of 18 cities covering the areas of Bandung, Bandar Lampung, Banjarmasin, Denpasar, Palembang, Semarang, Yogyakarta, Padang, Medan, Makassar, Manado, Surabaya, Pontianak, Batam, Balikpapan, Jabodetabek, Pekanbaru and Samarinda. The data of all variables are obtained from the publications of Bank Indonesia and the Statistics Indonesia. This research uses the panel regression analysis technique (pooling regression), which is a combination of time-series data and a cross-section of 18 cities in Indonesia.

Housing prices in this study are measured using housing price index that obtained from a survey by Bank Indonesia covering small (SHP), medium (MHP), and large housing prices (LHP). Loan to Value ratio (LTV) is measured by the ratio between the value of credit/financing provided by conventional commercial banks to the value of collateral, in the form of property at the time of granting credit/financing based on the results of the latest assessment. Mortgage rate (MR) is measured by a credit facility provided by banks to individual customers who are going to buy a house. Income level (INC) is measured by the applicable minimum wage in each city that is the focus of the research. Population (POP) is measured by data on the amount of people living in an area.

The housing price function consists of each different type of house for 18 cities in Indonesia, so it can be written in the panel regression equation as follows:

$$SHP_{it} = \alpha + \beta_1 LTV_{it} + \beta_2 MR_{it} + \beta_3 INC_{it} + \beta_4 POP_{it} + e \quad (1)$$

$$MHP_{it} = \alpha + \beta_1 LTV_{it} + \beta_2 MR_{it} + \beta_3 INC_{it} + \beta_4 POP_{it} + e \quad (2)$$

$$LHP_{it} = \alpha + \beta_1 LTV_{it} + \beta_2 MR_{it} + \beta_3 INC_{it} + \beta_4 POP_{it} + e \quad (3)$$

The estimation model above is estimated using three approaches, namely the common effect model (CEM), fixed effect model (FEM), and random effect model (REM) approach (Widarjono, 2018). Of the three estimation approaches, the best one will be chosen and will be used in this study. The selection of the best estimation approach is carried out through model selection tests, namely: (a) Chow test; (b) Hausman test (Alvitiani et al., 2019). Then, an assumption test was carried out which consisted of a multicollinearity test and a heteroscedasticity test to find out whether the regression model really showed significant and representative relationships.

Ghozali (2018) states that with a significance level of 90%, the existence of multicollinearity between independent variables can be detected using a correlation matrix with the following conditions. The multicollinearity test aims to test whether in the regression model there is a high or perfect correlation between the independent variables. If the value of the correlation matrix between the two independent variables is greater than 0,90 then there is multicollinearity. If the value of the correlation matrix between the two independent variables is smaller 0,90 then there is no multicollinearity.

The heteroscedasticity test aims to test whether in the regression model there is an inequality of variance from the residuals of one observation to another. With a significance level of 5%, the presence of heteroscedasticity can be identified with the following criteria: if the probability value of the independent variable is greater than 0.05, then there is no heteroscedasticity.

Findings

Table 1 presents descriptive statistics for this research variable. The table reports the number of observations used in this research was 668. The average amount of small housing prices is 234,006 in 18 cities, which is the highest city at 481,71. The average amount of medium housing prices is 251,05 which is the highest city at 420,56 and the lowest city at 99,74. The average amount of large housing prices is 176,34 which is the highest city at 316,58 and the lowest city at 100.

Table 1. Descriptive Statistics

	Variable	Obs	Mean	Std.Dev	Min	Max
Small Housing Prices	SHP	668	234.0066	77.28408	100.0000	481.7100
	LTV	668	76.33234	8.749746	70.00000	90.00000
	MR	668	9.532695	1.123344	7.380000	12.25000
	INC	668	2299341.	781992.0	892660.0	4416186
	POP	668	3109836	6691762	415706.3	31419059
Medium Housing Prices	MHP	668	215.0507	67.16296	99.74000	420.5600
	LTV	668	84.14671	7.240112	70.00000	90.00000
	MR	668	9.532695	1.123344	7.380000	12.25000
	INC	668	2299341.	781992.0	892660.0	4416186
	POP	668	3109836.	6691762	415706.3	31419059
Large Housing Prices	LHP	668	176.3435	43.31544	100.0000	316.5800
	LTV	668	78.23353	7.584167	70.00000	100.0000

Housing	MR	668	9.532695	1.123344	7.380000	12.25000
Prices	INC	668	2299341.	781992.0	892660.0	4416186.
	POP	668	3109836.	6691762.	415706.3	31419059

Source: Panel Regression Analysis (processed)

This study uses panel data regression, based on different types of houses and 18 cities in Indonesia. After the Chow Test and Hausman Test were carried out, the best estimation results in this study used the fixed effect model. The results obtained are that several variables are significant in the three types of houses, except for the mortgage rate, population which is significant in large housing price. Table 2 of the panel data estimation results show that LTV and income level are significant for the three types of houses.

Based on the above equation, it is known that the constant value of small housing prices and medium housing prices has a positive sign, meaning that if LTV, mortgage rate, population, and income level are held constant, small housing prices will increase by 155,77 percent, medium housing prices will increase. by 76,19, large housing prices will decrease by 741,83.

Table 2. Estimation Results

Variables	Small Housing Prices		Medium Housing Prices		Large Housing Prices	
	Coefficient	Probability	Coefficient	Probability	Coefficient	Probability
C	155.7745	0.0000	76.1957	0.0000	-741.8346	0.0000
LTV	-0.9498	0.0000	0.8991	0.0000	-0.2535	0.0070
MR	0.6369	0.3897	-0.6114	0.3401	-0.0037	0.9926
INC	0.00006	0.0000	0.00003	0.0000	55.0198	0.0000
POP	-0,0000	0.9320	-0.000001	0.5726	9.5424	0.0039
R-Square	0.9392		0.9372		0.9436	
F-Stats	475.5642		459.2779		514.8434	
Prob (F-Stats)	0.0000		0.0000		0.0000	
ChowTest	0.0000		0.0000		0.0000	
Hausman Test	0.0001		0.0000		0.0039	

Source: Panel Regression Analysis (processed)

The model is examined under the condition that it fulfills the assumptions used so that it can be seen whether the regression model can correctly show a significant and representative relationship. The purpose of the assumption test is to assess the validity and unbiased estimator parameters used. The assumption test used in this study is the multicollinearity test and the heteroscedasticity test.

Table 3. Multicollinearity Test

		LTV	MR	INC	POP
Small	LTV	1	-0.203316	0.640135	0.010145
Housing	MR	-0.203316	1	-0.331728	-0.00518
Prices	INC	0.640135	-0.331728	1	0.273718
	POP	0.010145	-0.00518	0.273718	1
Medium	LTV	1	-0.320504	0.657964	0.009603
Housing	MR	-0.320504	1	-0.331728	-0.005181
Prices	INC	0.657964	-0.331728	1	0.273718
	POP	0.009603	-0.005181	0.273718	1
Large	LTV	1	-0.388706	0.673544	0.055905
Housing	MR	-0.388706	1	-0.353156	-0.026252
Prices	INC	0.673544	-0.353156	1	0.198150
	POP	0.055905	-0.026252	0.198150	1

Source: Panel Regression Analysis (processed)

The results of the multicollinearity test show that there is no high correlation value between the independent variables which does not exceed 0.90, so it can be concluded that there is no multicollinearity between the independent variables.

Table 4. Heteroscedasticity Test

		t-Statistic	Prob.		
Small Housing	LTV	1.589933	0.1123		
	Prices	MR	1.791579	0.0737	
		INC	0.259442	0.7954	
		POP	-0.486559	0.6267	
Medium	LTV	-8.255297	0.2418		
	Housing	MR	2.119683	0.0944	
		Prices	INC	4.647071	0.1384
		POP	-1.157895	0.2473	
Large Housing	LTV	-0.938155	0.3485		
	Prices	MR	0.318957	0.2510	
		INC	0.080408	0.9359	
		POP	-0.713849	0.4756	

Source: Panel Regression Analysis (processed)

Regression models that are considered good are residuals from one observation to another that are constant or homoscedasticity or there is no heteroscedasticity. Based on the information in the table, there was no heteroscedasticity in this study.

Discussion

Based on the results of fixed effect model that has been carried out, it is known that the LTV has a significant positive effect on housing prices in type of medium housing prices. However, the LTV limit policy can restrain the rate of increase in house prices for small and large housing prices. The LTV ratio policy that is applied is related to credit growth which will affect the demand for houses which in turn will affect the increase in housing prices. In Armstrong et al (2019), house prices are one of the most important instruments to evaluate the effect of LTV restrictions on asset price moderation. The increase in house

prices can be caused by the effect of easing the LTV policy. Fauzia (2019) stated that variations in the LTV ratio according to the conditions of each house price growth in each type will show LTV as an indicator of housing demand.

The income level has a significant positive effect on housing prices in each different type of house. These results are in accordance with the hypothesis that when the level of income increases, it affects the demand for houses so that housing prices will increase. Empirical analysis shows a positive relationship between personal income and house prices in line with Kishor & Marfatia (2016). There is a positive relationship between income and housing demand. The higher the income, the higher the demand for housing. Effective policy designs can be developed based on the income elasticity of consistent housing demand. Many developing countries are trying to take steps to improve the operating efficiency of the housing market (Obaid, 2020).

The regression results show that the population variable has a significant effect on housing prices in large type of house. But, the coefficient value of the population variable has a negative effect on small housing prices and medium housing prices. These results are not in accordance with the hypothesis that when the population increases it will affect the demand for housing so that housing prices will increase. This means that a high population in some areas is associated with an increase in house prices for small and medium-sized housing types, until a certain population density point is reached, a high population is seen as an inconvenience and a growth in housing prices for small and medium types tends to decrease. So that this condition will cause a decrease in the demand for houses, especially houses with small and medium-sized types. The dynamics of the environment and the developed socioeconomic are important aspects of the housing market concept. Nevin et al (2004) argue that there is a shrinking housing market caused by the type of property and the sustainability capability of the neighborhood behavior. (Meen, 2002) asserts that it is not only seen from the population but the structure of the population will determine the quantity of housing demanded. The effect of the population on large housing prices is in line with the theory of housing demand, the results show that the population increases it will affect the demand for housing and finally housing prices will increase.

Conclusion

In this study, the authors focus on the factors that influence housing prices with various factors ranging from economic factors and social factors in various regions in Indonesia and different types of houses. The conclusion is the three types of houses have their respective factors that affect housing prices in each area. In the type of small housing and medium housing prices, the two variables in this study have a significant influence on housing price but the mortgage rate and population has no effect on the housing price. The type of large housing prices show that LTV, income level and population has a significant effect on housing price. The mortgage rates not be effective in depressing housing price during the observation period. The government should evaluate policies related to the housing market to restrain the rate of growth in house prices. The limitation in this study is that it still uses population data and has not specifically included population structure data based on age, gender and marital status which is thought to affect the demand for houses and house prices.

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