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Analysis of The Impact of Macroeconomic Shocks on Residential Property Price Index In Jabodebek-Banten

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Abstract: Increased demand has driven the property business to grow and expand more rapidly. This has a positive impact on the national economy because it can increase the rate of economic growth through the level of investment. Behind its rapid development, the property business is extremely vulnerable to economic shock.. With Vector Error Corection Model (VECM) method, this study aims to see what macroeconomic variables influence the Residential property prices index as well as the magnitude of their contribution and how residential property price index respond to macroeconomic shocks. Macroeconomic variables used in this study such as economic growth, inflation, interest rates, money supply, and exchange rates. The results of this study show interest rates and economic growth does not significantly affect residential property price index on Jabodebek-Banten. The responses generated from the Impulse Response Function is different in each category. Meanwhile from the Forecast Error Variance Decomposition shows that the Money Supply, Exchange Rate, and Inflation has a big contribution on the shocks that occur in residential property price index in Jabodebek-Banten in various categories.

Keywords: VECM, Macroeconomics, Residential Property Price Index, Jabodebek-Banten.

INTRODUCTION

The rapid growth of the world population is currently in line with the swift flow of inward investment in the property business, this development makes the property sector as one indication of economic progress of a country [1]. The property sector is closely tied to market demand, high demand and the rise of speculative behavior by investors create property prices to soar rapidly. If this is not given special attention, the possibility of bubble property will occur. As is known, the bubble property is a condition when the price of properties increases drastically and becomes unreasonable which then causes most people cannot afford to buy. This high price of property causes a decreasing demand, so the property becomes worthless. In the end, this phenomenon will cause a recession in the economy of a country [2].

Nowadays, property is shifting from residential needs to a wider direction by involving long-term investments. People not only buy property as a place to live, but they buy it to get the benefits provided by the property. Investment is one of the economic activities in terms of developing property. Therefore, investment is an active form of sharia economy. In the complete economics dictionary, investment is defined as the exchange of money with other forms of wealth, such as financial instruments or immovable property, which is expected to be held for a certain period of time in order to generate income [3].

HYPOTHESIS

Inflation

Inflation is a condition of general price increase of goods that does not occur simultaneously, but the increase occurs continuously for a certain period [4]. A one-time increase in the price of a good is not inflation, unless it leads to an increase in the price of other goods. The proxy of inflation used in this study is the Consumer Price Index which shows the price of goods and services consumed by people.

Sari, Ewing, and Aydin [5] found that inflation had a positive effect on the housing market in Turkey. Apergis [6] concluded that inflation had a positive effect on house prices in Greece. The same is also evidenced by Panagiotidis

and Printzis [7] who found a positive influence between inflation and the house price index in Greece. Therefore, the hypothesis taken based on these research is:

H1: Inflation positively affects residential property price index.

Economic Growth

According to Sukirno [8], economic growth is a change in the level of economic activity from year to year. So, in order to know it, there must be a comparison of national income from year to year, known as the growth rate. In this study, the proxy used from economic growth is Gross Domestic Product (GDP). According to Case and Fair [9], GDP is the total market value of output of a country. GDP is the final market value of all goods and services produced within a certain time period by factors of production in a country.

Meidani, Zabihi, and Ashena [10] showed that economic growth positively affected residential property prices in Iran. Sari, Ewing, and Aydin [5] found that economic growth had a positive effect on the housing market in Turkey. Gabriel [11] concluded that economic growth had a positive influence in leasing volumes in Germany and Sweden. Therefore, the hypothesis taken based on these research is:

H2: Economic growth positively affects residential property price index

Base Interest Rate

The interest rate is a price to be paid by the debtor to the creditor. Like market prices, the interest rate is determined by the demand and supply of loanable funds [12]. The interest rate proxy in this study is BI Rate. The BI Rate is a one-month tenor rate announced by Bank Indonesia periodically for a specified period of time that serves as a signal of monetary policy and operational objectives [13]. However, this research also uses BI 7 days repo rate according to the policy of Bank Indonesia in August to December 2016 [24].

Bjornland and Jacobsenn [14] found that interest rates negatively affected property prices in America. Demary [15] found a negative influence between interest rates and house prices in Denmark and the Netherlands. Gabriel [11] concluded that interest rates had a negative effect with lease volume in the USA, France, Germany, Italy, and Canada.

H3: Interest rates negatively affect residential property price index.

Money Supply

The money supply is defined as the total of all publicly owned currency and demand deposits owned by individuals in commercial banks. In a broader term, the money supply includes other assets that are easily converted into cash, such as long-term deposits. To ensure that the target inflation rate is achieved, a central bank of a country can determine interest rates or money supply. The government controls the money supply using the policy instruments of government such as open market operations, namely the sale and purchase of government bonds [4]. Control over this money supply is called monetary policy.

The findings of Fengyun [16] showed that the money supply had a positive effect on residential property prices in China. Liang and Cao [17] concluded that the money supply had a positive effect on property prices in China. Freese and Berlemann [18] concluded that there was a positive effect between the money supply and the real estate market in Switzerland.

H4: The money supply has a positive effect on the residential property price index.

Exchange Rate

The exchange rate is the value of a currency used as a current or future payment between the currencies of each country. The rupiah (IDR) exchange rate is the amount of rupiah (IDR) required to obtain a unit of foreign currency. The exchange rate between countries is the price level that has been agreed by each country to be traded.

Wulandari [2] found that the exchange rate of the rupiah (IDR) to the US dollar (USD) had a positive effect on property prices in Indonesia. Miller, Sklarz, and Ordway [19] concluded a positive effect between the USD exchange rate against the yen and the average selling price of the Waialae-Kahala property in Honolulu. Liu and Zhang [20] found a positive effect between real estate prices in China and the nominal appreciation of the RMB exchange rate.

H5: The IDR/USD exchange rate has a positive effect on the residential property price index.

METHOD

The subject of this research is residential property price index in Jabodebek-Banten, consisting of price index of small (up to 36 M^2), medium (>36 M^2 up to 70 M^2), large(>70 M^2), and all type with time period from 2007 to 2016. This research uses macroeconomic variables, such as inflation, economic growth, the exchange rate of rupiah against dollar, money supply (M2) and BI rate as a proxy of interest rate. Macroeconomic data is obtained from various official websites, such as Bank Indonesia, Statistics Indonesia (BPS), and *International Financial Statistics* through *International Monetary Fund*.

The method used in this research is Vector Error Correction Model (VECM). VECM based on the views of Achsani *et al*. [21], the first requirement of VAR analysis is that the data is stationary or does not contain a unit root. In fact, time series data is generally not stationary at the level, and new stationary on the first difference that causes the loss of long-term information. To anticipate the loss of long-term information, it can use the VECM model if there is at least one cointegrated equation. The VECM estimation is used to obtain short and long-run relationships with IRF (Impulse Response Function) and FEVD (Forecast Error Variance Decomposition).

RESULTS

The time series data used is quarterly data with the time period from the first quarter (2007) to the fourth quarter (2016). All data is transformed in logarithmic form, except BI Rate data, economic growth and inflation.

Result of Stationarity Test

Testing of this data is done from *level* to the level of *1st Difference*. The result of stationary test shows that almost all macroeconomic variables are not stationary at the level except inflation. The result of stationary test on the residential property price index data shows that all types of residential property is not stationary at the *level*. However, non-stationary data at the level, be it macroeconomic variable or residential property price index data, has stationary in *first difference*.

Table-1: Stationarity Test of Macroeconomic Variables

Stationarity Test in *First Difference*				
Variable	ADF Score	McKinnon 5%	Prob	Status
Inf	-4.166	-2.954	0.0026	Stasionary
Ln_ER	-4.338	-2.941	0.0014	Stasionary
Rate	-3.002	-2.941	0.0437	Stasionary
Ln_MS	-5.598	-2.941	0.0000	Stasionary
Growth	-5.908	-2.941	0.0000	Stasionary

Description: * Significant at the real level of 5%

Table-2: Stationarity Test of Price Index

Stationarity Test in *First Difference*				
Price Index	ADF Score	McKinnon 5%	Prob	Status
Ln_ST	-4.241	-2.941	0.0019	Stasionary
Ln_MT	-3.934	-2.941	0.0043	Stasionary
Ln_LT	-5.215	-2.941	0.0001	Stasionary
Ln_All	-3.793	-2.941	0.0063	Stasionary

Description: * Significant at the real level of 5%

RESULT OF STABILITY TEST

VAR stability can be seen from the inverse roots value of its polynomial AR characteristics. This can be seen from the modulus value in its AR Roots table, if all AR values are below one, then the system is stable. A VAR system is considered stable if all its roots have a modulus smaller than one (modulus value is <1). However, if the VAR model is not stable, then the result of IRF analysis is not valid.

Table-3: Stability Test

	Residential Property Price Index			
	Ln_ST	Ln_MT	Ln_LT	Ln_All
Lag	2	4	3	3
Modulus	0.7675	0.974298	0.874118	0.823594

In this study, all residential property price index variables are not stationary at the level. Therefore, the stability test is done at first difference. The result of the stability test shows that all residential property price index variables have roots of characteristic polynomial value less than one. Thus, the residential property price index variable has a stable VAR model.

RESULTS OF OPTIMUM LAG TEST

The Optimum Lag Test is very useful for eliminating autocorrelation problems in the VAR model. In this research, optimum lag testing is done at first difference. The determination of optimum lag test is done using two different criteria. Optimum lag testing is done at first difference. Optimum lag testing on residential property price index for small, medium, and all size types is done based on Akaike Information Criterion (AIC).

Table-4: Optimum Lag Test

	Residential Property Price Index			
Lag	Ln_ST	Ln_MT	Ln_LT	Ln_All
	AIC	AIC	HQ	AIC
0	-9.11540	-10.4826	-10.7866	-10.2472
1	-9.30642	-10.9796*	-10.8874*	-10.6385
2	-9.51843*	-10.8034	-10.3758	-10.8279*

The result of optimum lag test on this criterion indicates that the residential property price index of small and all size types are in second lag, while the middle type is in first lag. Then, the optimum lag testing on residential property price index of large type is done based on Hannan-Quinn Information Criterion (HQ) which shows that large type has optimum lag on first lag.

RESULT OF COINTEGRATION TEST

Cointegration test in this study using Johansen approach by comparing the trace statistic value with the critical value used in this research is 5%. Before performing a cointegration test, it first determines the deterministic assumptions used. In this study, the assumption used is asumi 3 (Intercept [no trend] in CE and Test VAR).

The result of cointegration test shows that there is one cointegration relation on residential property price index of small, middle and all size type. In the residential property price index, there are three cointegration relations. Thus, the research will proceed using the Vector Error Correction Model (VECM) model. The above results also show that between variables does not only have short-run relationship, but also has a long-run relationship.

Estimation of *Vector Error Correction Model* (VECM)

Because of the relationship of cointegration in the data level, then the choice of method used in this research is VECM (Vector Error Corection Model). A variable that is said to significantly affect other variables can be seen from the t-statistic value of the variable. If a variable has a t-statistic value greater than t-value of 1.96, then the variable has significant effect.

In the VECM, there are two main types of analysis, IRF, which aims to look at the current and future response trace of a research variable to the shocks of a particular variable, and FEVD that has the function of predicting the contribution of each variable to changes in other variables.

Table-5: Estimation of VECM in the Long Run

	Residential Property Price Index			
	Ln_ST	Ln_MT	Ln_LT	Ln_All
Inf	-0.098556	0.007001	-0.028135	-0.156559
	[-2.74865]*	[1.95017]	[-6.04099]*	[-2.89607]*
Ln_ER	3.547642	0.285221	0.285455	5.261829
	[3.44541]*	[2.44504]*	[1.87175]	[3.33219]*
Rate	-0.121791	0.003975	0.026621	-0.230397
	[-1.34022]	[0.37289]	[1.89793]	[-1.63741]
Ln_MS	-0.334466	0.377645	0.192826	-0.972107
	[-1.00381]	[9.47680]*	[3.68940]*	[-1.91365]
Growth	0.109988	-0.007654	0.009972	0.174384
	[1.13122]	[-0.66054]	[0.65418]	[1.18759]

Description: * Significant at the real level of 5%

In the short-run, only economic growth in first lag has a significant effect with positive relationship pattern on residential property price index. While other macroeconomic variables have no significant effect on residential property price index. In the long run, there are only three macroeconomic variables that have a significant effect on the residential property price index in Jabodebek-Banten. If the coefficient value is inserted into the VECM equation, then the equation would be as follows:

$$\Delta LNST_t = \alpha_0 - 0.098556\,\Delta INF_{t-1} + 3.547642\,\Delta LNER_{t-1} - 0.121791\,\Delta RATE_{t-1} - 0.334466\,\Delta LNMS_{t-1} + 0.109988\,\Delta GROWTH_{t-1} - \lambda(LNST + 0.002429\,INF + 0.016360\,LNER + 0.013149\,RATE + 0.263128\,LNMS - 0.004217\,GROWTH) + \varepsilon$$

$$\Delta LNMT_t = \alpha_0 + 0.007001\,\Delta INF_{t-1} + 0.285221\,\Delta LNER_{t-1} + 0.003975\,\Delta RATE_{t-1} + 0.377645\,\Delta LNMS_{t-1} - 0.007654\,\Delta GROWTH_{t-1} - \lambda(LNMT - 0.000156\,INF + 0.032674\,LNER + 0.001011\,RATE - 0.025712\,LNMS - 0.000889\,GROWTH) + \varepsilon$$

$$\Delta LNLT_t = \alpha_0 - 0.028135\,\Delta INF_{t-1} + 0.285455\,\Delta LNER_{t-1} + 0.026621\,\Delta RATE_{t-1} + 0.192826\,\Delta LNMS_{t-1} + 0.009972\,\Delta GROWTH_{t-1} - \lambda(LNLT - 0.000762\,INF - 0.002456\,LNER - 0.000706\,RATE + 0.122875\,LNMS + 0.008584\,GROWTH) + \varepsilon$$

$$\Delta LNALL_t = \alpha_0 - 0.156559\,\Delta INF_{t-1} + 5.261829\,\Delta LNER_{t-1} - 0.230397\,\Delta RATE_{t-1} - 0.972107\,\Delta LNMS_{t-1} + 0.174384\,\Delta GROWTH_{t-1} - \lambda(LNALL + 0.001986\,INF + 0.001306\,LNER + 0.004821\,RATE + 0.203778\,LNMS - 0.0036\,GROWTH) + \varepsilon$$

Table 5 above shows that inflation has a significant effect on the negative pattern in almost all residential property price index of various types, except in residential property price index of medium size. A one percent increase in inflation may decrease by 0.098 percent in residential property price index, 0.028 percent in residential property price index, and 0.156 percent of residential property price index of all sizes.

The exchange rate of rupiah against the dollar has a positive effect on various types of residential property price index. However, a positive and significant relationship is found only in small, medium, and all sizes. The one-percentage increase (depreciation) in the exchange rate of rupiah against the dollar increased by -3.547 percent of the small residential property price index, -0,285 percent of the medium residential property price index, and -5.261 percent of the residential property price index of all sizes.

In the long run, the base interest rate and economic growth do not significantly affect the residential property price index in any type. The money supply has significant effect with positive pattern in residential property price index for medium and large type. A one-percent increase in the money supply could raise by -0.377 percent of the residential property price index for the medium type, and -0.192 percent of the residential property price index for large type.

Impulse Response Function (IRF) Analysis

Impulse response function (IRF) is a method used to view the response of an endogenous variable to a particular shock. IRF can be used to examine the shock effect of one standard deviation from one innovation on the value of the current or future endogenous variable. In other words, IRF measures the impact of shocks from endogenous variables at a certain time. The impulse response function used in this research is to find out how the response from each residential property price index in Jabodebek-Banten toward the existence of macroeconomic variable shocks.

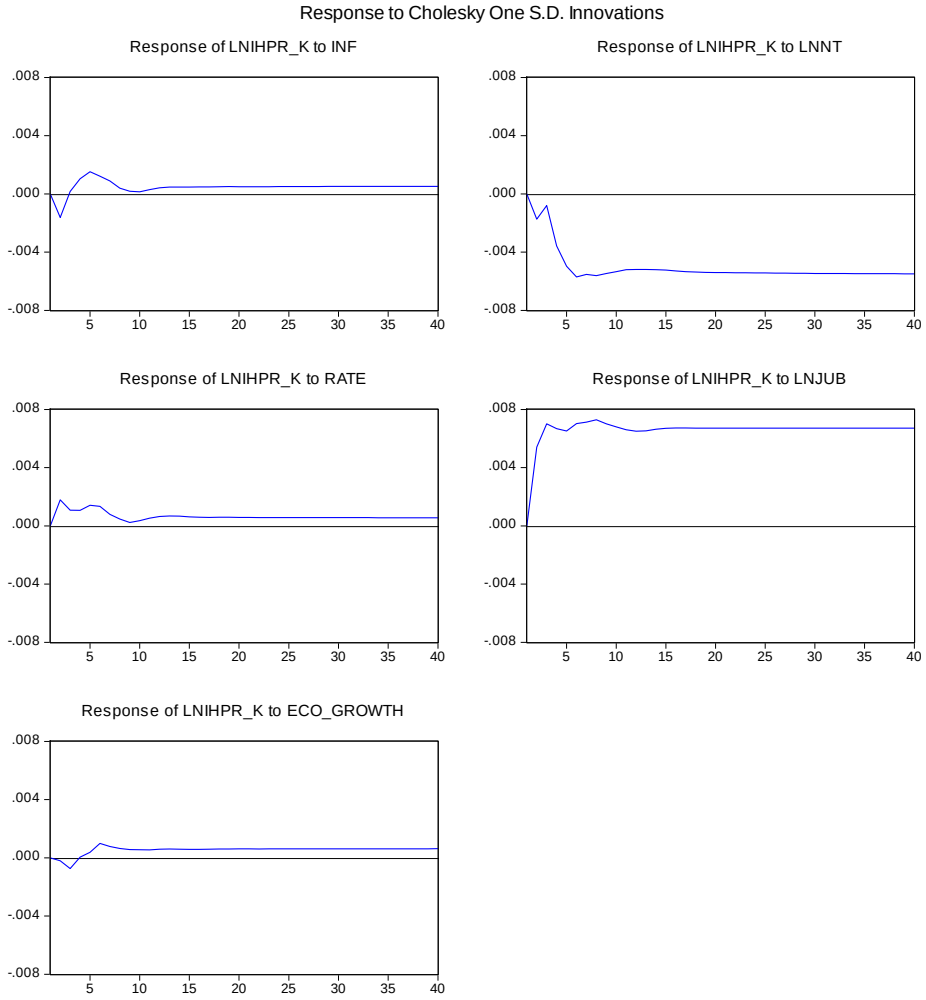

Fig-1: Response of Small Type on Macroeconomic Shocks

Figure 1 shows that the shock of one standard deviation on the base interest rate was responded positively and it caused the residential property price index to rise by 0.0018 percent in the second quarter. Although it experienced a decline in the third and fourth quarters which reached 0.0011, but it increased to 0.0014 in the fifth quarter. In the ninth quarter, there was a significant drop to 0.0002. After experiencing volatility from the ninth quarter, the base interest rate began to stabilize in the range of 0.0006 in the fifteenth to the last quarter of the research.

The shock of one standard deviation on the money supply was responded positively and it could raise the residential property price index by 0.0054 percent in the second quarter and increased to 0.0070 in the third quarter. Although it experienced a decline in the fifth quarter which reached 0.0065, but it increased to 0.0073 in eighth quarter. Then, there was a decline in the 12th quarter with a value of 0.0065. In the end, the money supply was stable in the range of 0.0067 in the fifteenth to the last quarter of the research. The shock of one standard deviation on economic growth was responded negatively and it could lower the residential property price index for small types by -0.0007 percent in the third quarter and an increase of 0.0010 in the sixth quarter. It then declined to reach 0.0006 in the eighth quarter and stabilized at that point until the last quarter of the research.

The shock of one standard deviation on inflation was responded negatively and it could lower the residential property price index for small type by -0.0016 and experienced a significant increase of 0.0015 in the fifth quarter. Despite a drastic decrease of 0.0001 in the tenth quarter, it increased to 0.0005 in the 13th quarter and stabilized at that

point until the last quarter of the research. The shock of one standard deviation at the exchange rate was responded negatively and it could lower the residential property price index for small type by -0.0017 percent in the second quarter and increased by -0.0008 in the third quarter. Then, it decreased to -0.0056 in the eighth quarter. After experiencing the volatility of the ninth quarter, the exchange rate began to stabilize in the range of -0.0054 in the 18th quarter until the last quarter of the research.

Figure 2 below shows that the shock of one standard deviation on inflation was responded negatively and it could lower the residential property price index for the medium type by -0.0013 in the third quarter and decreased continuously to -0.0060 in the 13th quarter and it began to stabilize at that point until the last quarter of the research. The shock of exchange rate was responded negatively and it could lower the residential property price index for the medium type by -0.0010 in the third quarter and decrease by -0.0034 continuously until the seventh quarter. The exchange rate began to stabilize in the range of -0.0033 value in the 10th quarter until the last quarter of the research.

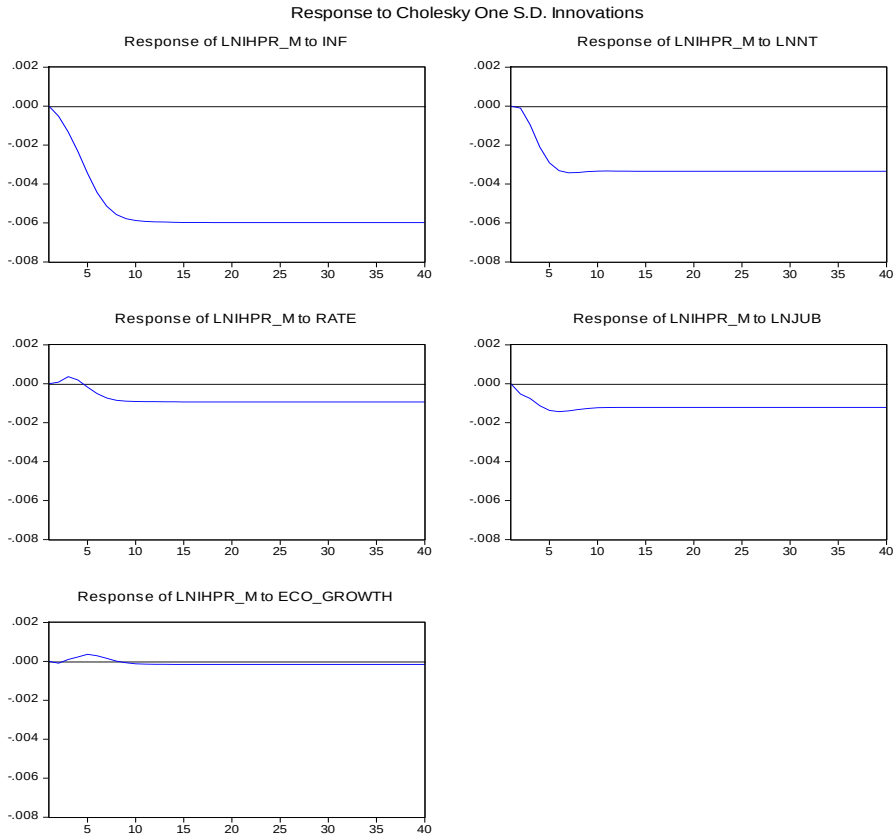

Fig-2: Response of Medium Type on Macroeconomic Shocks

The shock of money supply was responded negatively and it could lower the residential property price index for the medium type by -0.0008 in the third quarter and decrease continuously to -0.0014 until the sixth quarter. The money supply began to stabilize in the range of -0.0012 in the 10th quarter until the last quarter of the research.

The shock of one standard deviation on the base interest rate was positively responded and it could raise the residential property price index by 0.0004 in the third quarter. Then, there was a significant decrease of -0.0009 until the ninth quarter and it began to stabilize at that point until the last quarter of the research. Meanwhile, the shock of economic growth was responded positively and it could raise the residential property price index by 0.0004 in the fifth quarter. Then, there was a decline of -0.0002 until the 12th quarter and it began to stabilize at that point until the last quarter of the research.

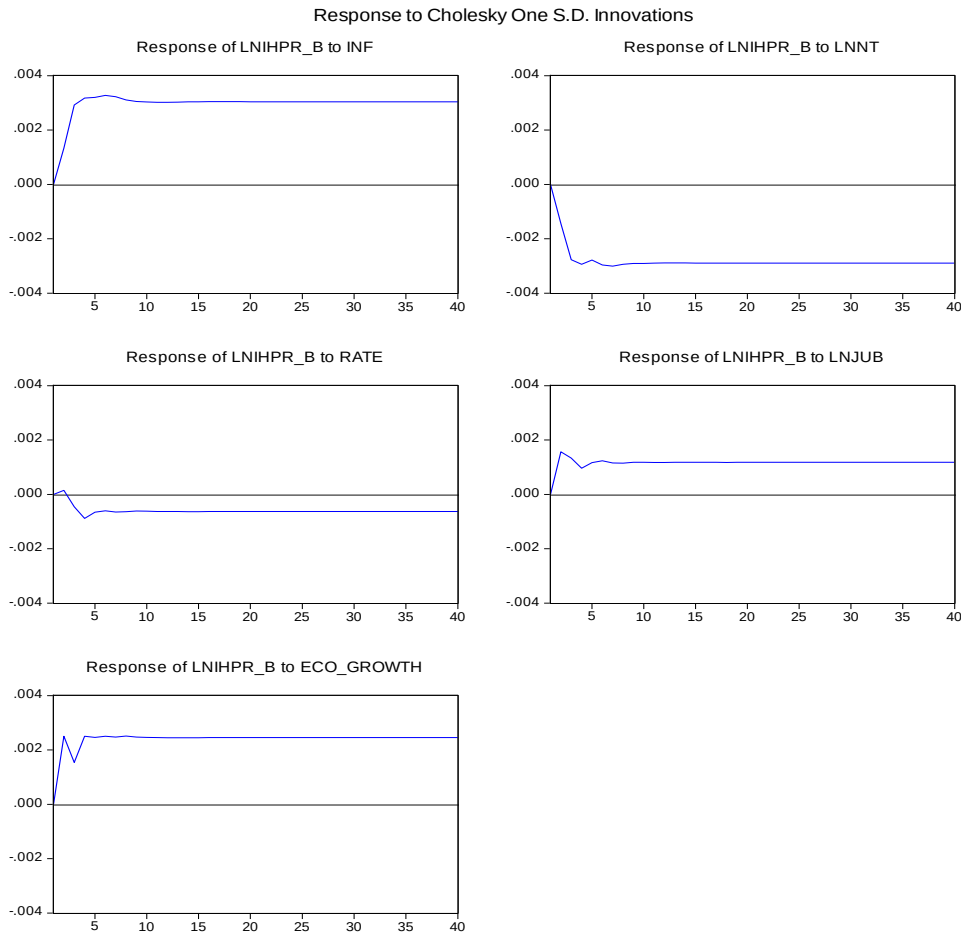

Fig-3: Response of Large Type on Macroeconomic Shocks

Figure 3 above shows that the shock of one standard deviation on the exchange rate was negatively responded and it could decrease the residential property price index for large type by -0.0029 in the fourth quarter. Then, there was a decrease by -0.0030 in the seventh quarter. After experiencing the volatility, the exchange rate began to stabilize in the range of -0.0029 from the eighth quarter until the last quarter of the research.

The shock of one standard deviation on inflation was positively responded and it could increase the residential property price index for large type by 0.0029 in the third quarter and it increased by 0.0033 in the sixth quarter. Then, there was a decline that reached 0.0030 in the 10^{th} quarter and it began to stabilize at that point until the last quarter of the research. A positive response also occurred in the shock of one standard deviation of money supply that could increase the residential property price index for large type by 0.0016 in the second quarter. Two quarter later, it declined by 0.0010. Then, the money supply began to stabilize in the fifth quarter with the value of 0.0012 until the last quarter of the research.

The shock of one standard deviation on economic growth was also responded positively and it could increase the residential property price index for large type by 0.0025 in the second quarter and decreased by -0.0015 in the third quarter. Then, it increased and returned to the initial value of 0.0025. It began to stabilize at that point until the last quarter of research. Meanwhile, the shock of one standard deviation on the base interest rate was positively responded and it could increase the residential property price index by 0.0001 in the second quarter and it decreased by -0.0009 in the fourth quarter. After experiencing volatility, the base interest rate began to stabilize in the eighth quarter with a value of -0.0006.

Figure 4 below shows that the shock of one standard deviation on economic growth was responded positively and it could raise the residential property price index for all sizes by 0.0007 in the second quarter and decreased by 0.0001 in the next quarter. Then, there is a continuous increase, as in the sixth quarter which reached 0.0010. After experiencing volatility, economic growth was stable with the value of 0.0012 in the 20^{th} quarter until the last quarter of the research.

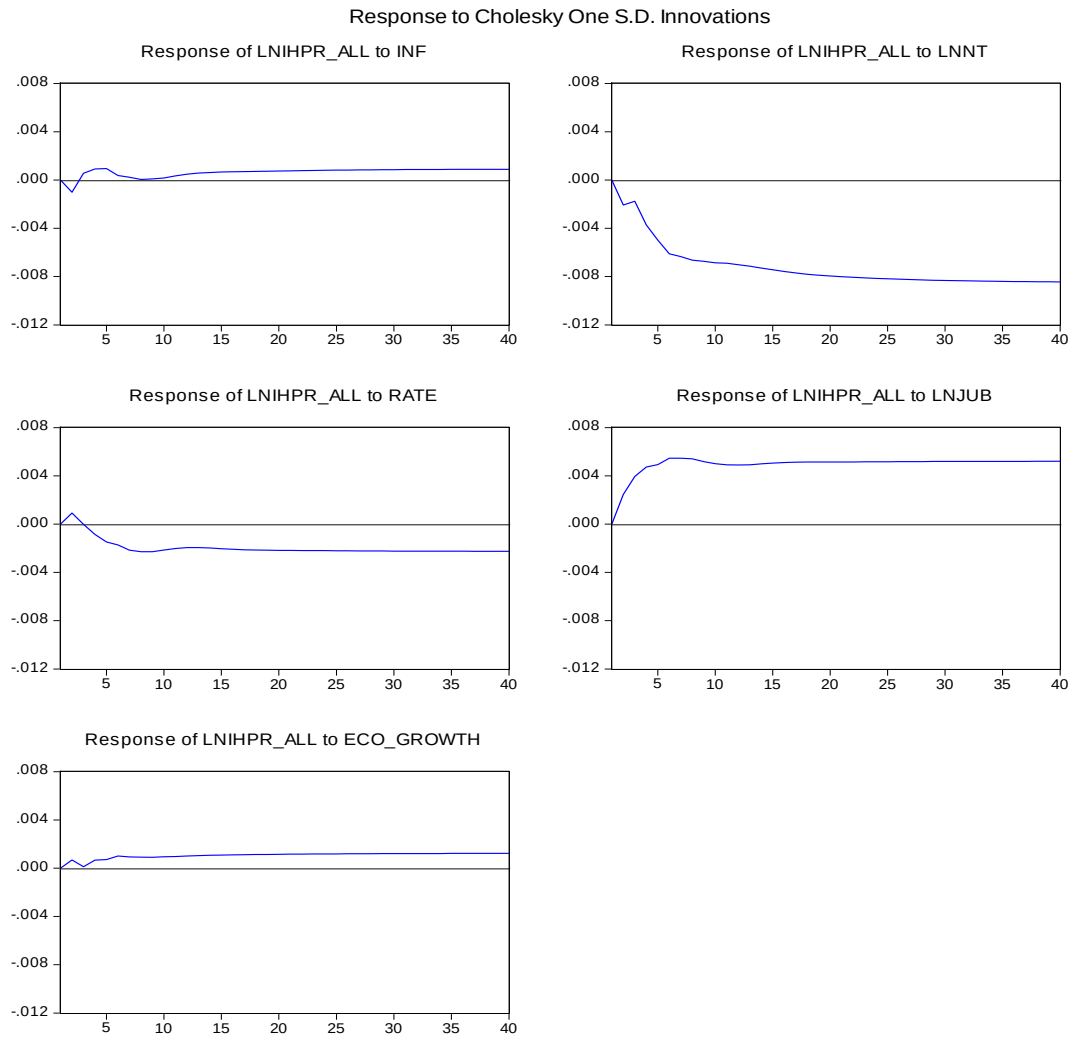

Fig-4: Response of All Type on Macroeconomic Shocks

The shock of one standard deviation on the money supply was responded positively and it could raise the residential property price index for all sizes by 0.0040 in the third quarter and it increased continuously by 0.0055 until the sixth quarter. After experiencing volatility, the money supply was stable with a value of 0.0052 in the 22nd quarter. In the meantime, the shock caused by the exchange rate was responded negatively and it could result in decline in the residential property price index for all sizes by -0.0021 in the second quarter and it continued to decline by -0.0063 in the seventh quarter. After a steady decline, the exchange rate began to stabilize in the 32nd quarter with a value of -0.0084.

The shock of one standard deviation on the base interest rate was responded positively and it could raise the residential property price index for all sizes by 0.0009 in the second quarter and it decreased continuously by -0.0023 in the eighth quarter. After experiencing volatility, the base interest rate was stabilized to -0.0022 from the 18th to the last quarter of the research. Meanwhile, the shock of one standard deviation on inflation was responded negatively and it resulted in a decline in residential property price index for all sizes by -0.0010 in the second quarter and an increase of 0.0009 in the fifth quarter. The inflation was finally stabilized in the 21st quarter with a value of 0.0008.

Forecast Error Variance Decomposition (FEVD) Analysis

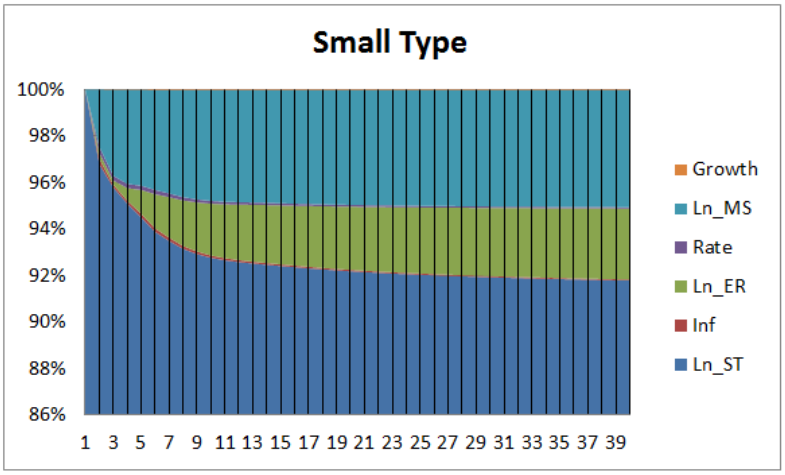

Fig-5: FEVD of Small Type

The final step of the method used in this research is the test of Forecast Error Variance Decomposition (FEVD) analysis. This analysis aims to estimate the variance percentage contribution of each variable to the change of a certain variable. This FEVD test can show the relative importance of variables due to the emergence of a shock.

Figure 5 shows that the shocks that occurred in the residential property price index for the small type in the first quarter were mostly affected by itself by 100%. In the second quarter, the money supply and the exchange rate took part in affecting the residential property price index for the small type, but only a little. In the fifth quarter, the effect of the money supply increased by 4.11%, followed by the influence of exchange rate which also increased by 1.02%. In the thirteenth quarter, the effect of residential property price index for small type began to decrease but still dominant at 92.46%.

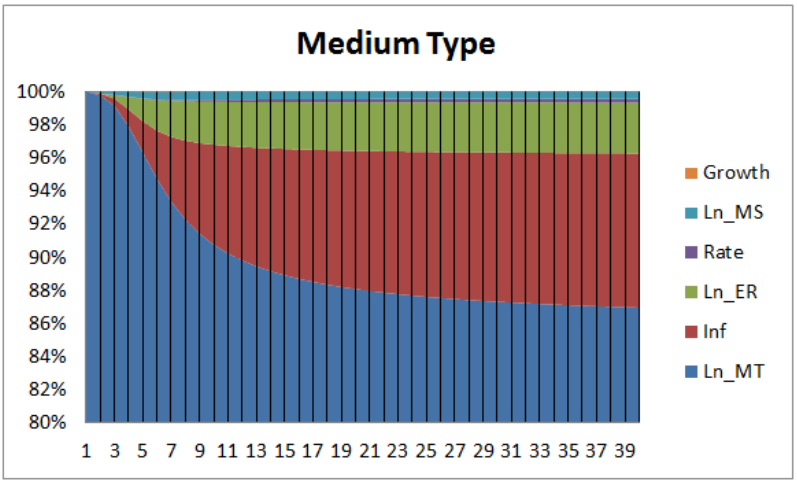

Fig-6: FEVD of Medium Type

Meanwhile, the effect of money supply increased to 4.81% and it was stable in the range of that number. In the same quarter, the effect of exchange rate also increased to 2.41%. The effects of other macroeconomic variables, such as inflation, interest rates and economic growth, are hardly noticeable. The result of forecast error variance decomposition (FEVD) shows that during the next forty quarters, the residential property price index for small types contributed the most in the residential property price index itself reaching 91.79% in the 40th quarter. Followed by a significant contribution from the money supply of 5.01% and the exchange rate of 3.04% in the 40th quarter.

Meanwhile, Figure 6 shows that the shocks occurring in the residential property price index for medium type in the first quarter are affected by itself by 100%. In the fifth quarter, there were other variables began to play a role, such as the inflation of 1.9% followed by the exchange rate of 1.35%. In the 14th quarter, the residential property price index for medium type started to decline on its own, but remained dominant at 89.17%. Meanwhile, the effect of inflation

increased to 7.4% and continued to show an upward trend. Still in the same quarter, the effect of exchange rate was up to 2.79%. The effects of other macroeconomic variables, such as economic growth, interest rates, and money supply only contributed below 1%.

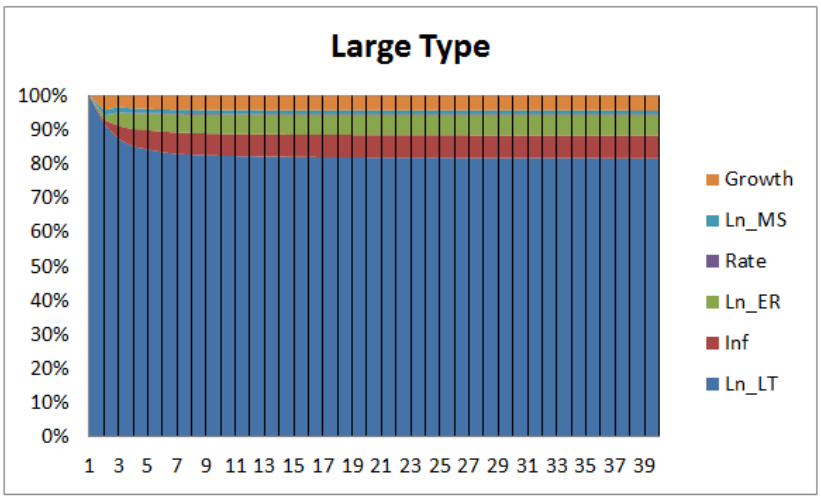

Fig-7: FEVD of Large Type

The result of forecast error variance decomposition (FEVD) shows that over the next forty quarters the residential property price index of the middle type contributed the most in the residential property price index itself, reaching 86.96% in the fortieth quarter. For forty quarters, the inflation variable has a significant contribution to the residential property price index for medium type of 9.31%, followed by contribution from the exchange rate of 3.06%. The role of other macroeconomic variables to the forty quarters was still below 1%.

Figure 7 shows that the shock that occurred in the residential property price index for large type in the first quarter was affected by itself by 100%. In the second quarter, there were other variables that began to affect the residential property price index for large type, such as economic growth with 4.13%, inflation with 1.65%, money supply with 1.61% and exchange rate with 1.36%, while the contribution of base interest rate was still below 1%.

In the seventh quarter, the residential property price index for large type began to decline on its own, but remained dominant at 82.96%. Meanwhile, the effect of inflation increased to 6.26% and showed a stable trend. It also experienced an increasing exchange rate of 5.32%, and an increase in economic growth to 4.03%. Different results were experienced by the money supply that contributed in the previous quarter amounted to 1.17, but decreased to 1.13% in the seventh quarter. Meanwhile, the contribution of the base interest rate on residential property price index for large type was still below 1%.

The result of forecast error variance decomposition (FEVD) shows that during the next forty quarters, the residential property price index for large type gave the largest contribution in residential property price index itself, reaching 81.67% in the 40^{th} quarter. For forty quarters also, the inflation variable had a significant contribution to residential property price index of 6.67%, followed by the contribution of the exchange rate of 5.99%, economic growth of 4.33%, and the money supply of 1.02%. Meanwhile, the contribution of the base interest rate until the 40^{th} quarter was still below 1%.

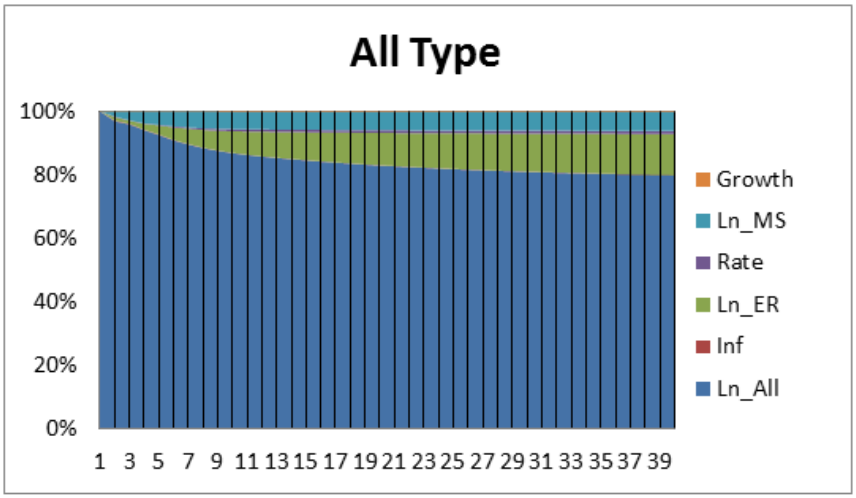

Fig-8: FEVD of All Type

Figure 8 shows that the shock that occurred in the residential property price index for all sizes in the first quarter were affected by themselves by 100%. In the fifth quarter, there were other variables that began to significantly affect the residential property price index for large type, such as the money supply of 4.81% and inflation of 2.81%. The effects of other macroeconomic variables, such as economic growth, base interest rates and inflation, only contributed below 1%. In the seventh quarter, the residential property price index for all sizes began to decline on its own, but remained dominant at 86.81%. Meanwhile, the contribution of exchange rate to the residential property price index for all sizes increased to 6.79%, followed by an increase in the contribution of money supply by 5.45%. The influence of other macroeconomic variables, such as economic growth, base interest rates and inflation, only contributed below 1%.

The result of forecast error variance decomposition (FEVD) shows that during the next forty quarters, the residential property price index for all sizes gave the largest contribution in residential property price index itself, reaching 79.78% in the 40th quarters. For forty quarters, exchange rate variables had a significant contribution to the residential property price index for all sizes of 12.92%, followed by the contributions of money supply of 5.89%. Meanwhile, the contribution of other macroeconomic variables, such as base interest rates, until the 40th quarter was still below 1%.

DISCUSSION

Discussion of VECM Estimation

In the short-run estimation of VECM, only economic growth in lag one has a significant effect on the pattern of positive relationships with respect to residential property price index for large type, while other macroeconomic variables do not significantly influence residential property price index in various types. Wulandari [2] found a significant and positive effect by economic growth on the Indonesian residential property price index.

What is interesting about this fact is that residential property price index for large type is the only one that is significantly affected by economic growth. Increased economic growth indirectly provides a good signal for investment, people who live in Jabodebek-Banten take advantage of this opportunity to buy or invest in residential property compared with other types. Economic growth reflects an increase in economic activity and will ultimately affect demand for the property sector. Increased demand for large-scale property can increase the price. While in the long-run estimation of VECM, the three macroeconomic variables that have a significant effect on residential property price index in Jabodebek-Banten are inflation, exchange rate, and money supply.

Inflation has a significant effect with negative pattern in almost all residential property price index in Jabodebek-Banten, except medium type. Follain [22] suggested that inflation negatively affected housing demand and investment. Sari, Ewing, and Aydin [5], Apergis [6], and Panagiotidis and Printzis [7] found that an increase in inflation might cause property prices to rise.

Before the increase in inflation, the property sector in Jabodebek-Banten is in an expansion phase where the demand for the property is very high. Developers must take steps by building new residential property to meet their needs as well as the opportunities for them to maximize profits. When there is an increase in inflation, this phase is over. Rising inflation will trigger the government to increase its base interest rate to curb higher inflation. An increase in the base interest rate will affect the lending rate.

Meanwhile, their purchasing power on residential property will decrease in line with the inflation and an increase in the base interest rate leads to higher lending rates. In this case, of course, the developers adjust to the current economic situation by temporarily suspending the ongoing development due to the expensive price of raw materials caused by inflation. In addition, developers tend to set standard prices or even below the usual profit standards they earn in order to keep selling supplies that have been made to meet the previous demand, in the theory of *real estate cycle*, this phenomenon is called *hyper supply*.

The interesting fact here is that inflation has no significant effect and tends to have a positive relationship in the middle type. This indicates that middle- and upper-class people in Jabodebek-Banten do not care about the rise of inflation. Their needs for shelter cannot be avoided, consequently the people who cannot afford to buy large type of residential property will divert their choice to buy the medium type.

The high demand from people living in Jabodebek-Banten on medium type of residential properties has forced developers to increase their product prices to cover the losses caused by expensive raw materials affected by inflation. In addition, this high demand becomes an opportunity for developers to make profits, because the other two types are experiencing the negative impact of inflation.

Meanwhile, in the long run, the exchange rate positively affects residential property price index in Jabodebek-Banten in all types, but only has significant effect on small, medium and all size. These results were also found in previous studies. Wulandari [2] found that the exchange rate of rupiah (IDR) against the US dollar (USD) had a positive effect on property prices in Indonesia. Miller, Sklarz and Ordway [19] concluded there was a positive effect between the exchange rate of USD against the Yen and the average selling price of the Waialae-Kahala property in Honolulu. Liu and Zhang [20] found a positive effect between real estate prices in China and the nominal appreciation of the exchange rate of RMB.

After the recession phase, it makes the banking industry seem to learn from experience. They see that the property sector is profitable for them, but on the other hand, the property sector can also harm them. On this basis, banks in Indonesia have a policy to limit the financing of property development. Therefore, the developers try to find alternative funds from investors, both foreign and domestic, either in the form of shares or bonds. However, the proportion of funding is still dominated by banks. Funds from banks and investors were then used to continue to the expansion phase. This phase will end when the rupiah weakens.

The high demand in the expansion phase forced the developers to build new residential properties. This makes the suppliers experience shortage of raw materials to meet the needs of the developers. Therefore, some components of the raw materials must be imported by the developer. The weakening of the rupiah makes imported raw materials slightly more expensive. Developers who do not want to lose will ultimately raise the price of their products to cover the expensive price of raw materials.

The depreciation of the rupiah against the dollar indicates an increase in the debts of developers that use the US Dollar currency, so developers will transfer the burden of increased bond interest by raising the price of their properties. Bonds are long-term debt, so it is not a big problem for developers. The debts do not have to be settled immediately. What if the rupiah continues to weaken? It is likely that developers will repay their bonds early by using the profits from the increase in the price of their properties.

The effect of exchange rate that is not significant with positive pattern is found in large type. This shows that the large type is not too affected by inflation. The weakening of the exchange rate seems to be a positive signal for foreign investors to invest in the property sector, especially on large residential properties. When the rupiah against the US dollar weakens, foreign investors can buy more rupiah currency. This benefits foreign investors when buying and investing property in Indonesia when the rupiah weakens. The number of requests makes the developer dominantly play a role in setting prices. Developers will set a high price to maximize their profits.

In the long run, the money supply has a significant effect on the positive pattern on residential property price index for medium and large type in Jabodebek-Banten. These results are also found in the previous studies. Liang and Cao [17] concluded that the Money Supply had a positive effect on property prices in China, reinforced by subsequent research by Fengyun [16] who found that the money supply had a positive effect on residential property prices in China. Freese and Berlemann [18] concluded that there was a positive effect between the money supply and the real estate market in Switzerland.

The increase in money supply reflects the expansion phase, where demand for properties is too high. The need for property ultimately forces developers to adjust it by building new properties. Due to high consumer demand for

properties, then it brings an imbalance between the number of properties available with the amount of money owned by individuals to buy the property. High demand for properties, and if it is not accompanied by the number of its offerings, can led to a surge in property prices.

The interesting thing about this result is that the significant effect of money supply is only felt by the medium and large type of residential property price index. Generally, only rich people who will buy and invest in both types. In other words, the money supply is dominated by this class. When they have too much money, they will buy and invest in medium and large type of residential properties.

Insignificant results were found on residential property price index of small and all size type. This indicates that the small type is usually bought by the lower-middle class, where they usually buy a house to be a place to live, not as an investment. All sizes also have an insignificant relationship with the money supply. Although both middle and large type have significant relationships, all sizes remain unrelated. This is because the sale activity of residential property is more active in small type.

On the other hand, economic growth and base interest rates do not have a significant relationship in various types. The insignificant relationship between economic growth and residential property price index in Jabodebek-Banten shows different results from previous research. Meidani, Zabihi and Ashena [10] stated that economic growth positively affected residential property prices in Iran. Sari, Ewing, and Aydin [5] found that economic growth had a positive effect on the housing market in Turkey. Gabriel [11] concluded that economic growth had a positive influence in leasing volume in Germany and Sweden. This shows that the rise and fall of residential property prices in Jabodebek-Banten caused by economic growth is not a consideration for people to buy or not to buy residential properties there.

The insignificant relationship between the base interest rates and residential property price index in Jabodebek-Banten shows different results with the previous studies here. Bjornland and Jacobsenn [14] found that interest rates negatively affected the price of property in America. Demary [15] found a negative effect between interest rates and house prices in Denmark and the Netherlands. Gabriel [11] concluded that interest rates had a negative effect with leasing volume in the USA, France, Germany, Italy, and Canada. Similar to economic growth, the base interest rate does not affect people in buying or not buying residential property in their area.

DISCUSSION OF IMPULSE RESPONSE FUNCTION (IRF)

The result of Impulse Response Function (IRF) indicates that the exchange rate was responded negatively in various types. This result differed from the previous studies. Wulandari [2] showed that exchange rates were positively responded in various types. The shock caused by the exchange rate began to stabilize in the 18^{th} quarter for small types, 10^{th} quarter for medium type, eighth quarter for large type, and 32^{nd} quarter for all sizes. The base interest rate was responded positively in various types. Ncube and Ndou [23] found that interest rates were responded positively by all type. The shock caused by the base interest rate began to stabilize in the ninth quarter for small type, 12^{th} quarter for medium type, eighth for the large type, and the 18^{th} for all sizes.

Meanwhile, inflation was responded negatively to almost all types, except large types. This was similar to the research by Demary [15]. The research showed that inflation was responded negatively by house prices in Germany, Japan, Britain, and America. The shock caused by inflation began to stabilize in the 13^{th} quarter for small and medium type, the 10^{th} quarter for the large type, and the 21^{st} quarter for all sizes. Unlike the money supply, this variable actually responded positively to almost all types, except the medium type. Similarly, Wulandari [2] showed that the money supply was responded positively to almost every type, except the large type. The shock caused by the money supply began to stabilize in the 15^{th} quarter for small types, 10^{th} quarter for medium type, fifth quarter for large type, and 22^{nd} quarter for all sizes.

The economic growth was responded negatively in small and medium type, and it was responded positively by large type and all sizes. A negative response in the short-run was also found in Demary [15] on the house prices in five European countries, along with America, Australia and Japan. Then, the shock caused by economic growth began to stabilize in the eighth quarter for the small type, the 12^{th} quarter for the medium type, the fourth quarter for the large type, and the 20^{th} quarter for all sizes.

Discussion of Forecast Error Variance Decomposition (FEVD)

The result of Forecast Error Variance Decomposition (FEVD) showed that the money supply had a dominant contribution to the residential property price index for small type, followed by the contribution of the exchange rate. The dominant contribution of money supply differed from the previous studies used in this study.

In the residential property price index for medium type, the dominant contribution was inflation, followed by the contribution of the exchange rate. Meanwhile, inflation also became the dominant contribution to residential property price index of large type, followed by the exchange rate. Similarly, Wulandari [2] concluded that there was a dominant role contribution from inflation to residential property indexes of small, medium and all sizes.

While in the residential property price index for all sizes, the large contribution was the exchange rate, followed by the money supply. The same results were shown by Ncube and Ndou [23]. This study showed that the exchange rate has a dominant contribution to the residential property price index for all sizes. To conclude, this research showed that:

Price Index	Test	Macroeconomic Variables				
		Inf	Ln_ER	Rate	Ln_MS	Growth
Ln_ST	VECM	Negative*	Positive*	Negative	Negative	Positive
	IRF	13th	18th	15th	15th	8th
	FEVD	0.04%	3.04%	0.05%	5.01%	0.04%
Ln_MT	VECM	Positive	Positive*	Positive	Positive*	Negative
	IRF	13th	10th	9th	10th	12th
	FEVD	9.31%	3.06%	0.22%	0.43%	0.01%
Ln_LT	VECM	Negative*	Positive	Positive	Positive*	Positive
	IRF	10th	8th	8th	5th	4th
	FEVD	6.67%	5.99%	0.28%	1.02%	4.33%
Ln_All	VECM	Negative*	Positive*	Negative	Negative	Positive
	IRF	21st	7th	18th	22nd	20th
	FEVD	0.12%	12.90%	0.99%	5.89%	0.27

Description: * Significant at the real level of 5%

CLOSING

CONCLUSION

This research used residential property price index in Jabodebek-Banten as the research subject. The price index examined was divided into four, namely small, medium, large and all sizes types. The existence of cointegrated variables made this research used the Vector Error Corection Model (VECM) method. Based on the results of the discussion in the previous chapter of this research, the conclusions are:

- The results of VECM estimation in the short-run indicated that economic growth only significantly affected residential property price index for large type with positive pattern. In long-run estimation of VECM, the economic growth and base interest rates did not have a significant effect in various types. The money supply had a significant effect with the negative pattern only on residential property price index for medium and large type. Inflation had a significant effect in residential property price index for small, large and all sizes type with positive pattern. Meanwhile, the exchange rate had significant effect with negative pattern in small, medium and all size type.
- From the results of Impulse Response Function (IRF), the exchange rate was responded negatively in various types. Contrary to the interest rate that was responded positively in various types. In the meantime, the inflation was responded negatively almost in all types, except the large type. Unlike the money supply, this variable was actually responded positively in almost all types, except the medium type. The economic growth was responded negatively in small and medium type, and it was responded positively by large type and all sizes.
- From the result of Forecast Error Variance Decomposition (FEVD), it showed that the money supply had a dominant contribution to the residential property price index of 5.03%, followed by the contribution of the exchange rate of 3.04%. In the residential property price index for medium type, the dominant contribution was inflation of 7.1%, followed by the contribution of the exchange rate of 2.79%. Meanwhile, the inflation also dominantly contributed to residential property price index of 6.67%, followed by the exchange rate of 5.59%. While in the residential property price index for all sizes, the large contribution was the exchange rate with 6.79%, followed by the money supply of 5.45%.

The property sector was indeed one of the most lucrative investment fields yet highly vulnerable to macroeconomic shocks. The overall results obtained above were still in the form of an approximate study. In the future, the results obtained may not in accordance with the results that have been written above.

RECOMMENDATIONS

The growth in the property sector in Indonesia is very rapid, evidenced by the proliferation of property development projects, such as housing, hotels, apartments, retail and others. Coupled with property marketing that has been widespread in various media, be it electronic or mass media. The rapid growth of property indirectly provides

opportunities for other industries, such as consultants, agencies, paint, wood, cement, iron, concrete, and so on. With wide business scope, the property sector ultimately affects economic growth and employment. Therefore, the property sector can be an important indicator for economic growth. Here are some recommendations that can be given from the results that have been obtained in this research:

- The managerial team of a company, which in this case is the property developers, needs to pay attention and prepare the necessary steps to anticipate the negative and significant effects provided by the exchange rate variables and money supply. In addition, the managerial is expected to be able to take advantage of the prospective opportunities given by the positive and significant effect of the inflation variable on residential property price index in Jabodebek-Banten. In addition, in building property projects, it must be adjusted to market absorption so that there is no excessive supply.
- Given that the property sector can be an important indicator of economic growth, the government which acts as a monetary policy regulator is expected to be cautious in maintaining the stability of the exchange rate of rupiah, the money supply, and minimizing the possibility of rising inflation. This is because there are three macroeconomic variables that have a large contribution to residential property price index in Jabodebek-Banten.
- Investors and the people as potential customers need to monitor and pay attention to macroeconomic trends to prevent losses when investing or buying residential property products, given that the property sector is particularly vulnerable to macroeconomic shocks. From the results of this research, it is better for them to not buy residential properties when the inflation increases. They can buy and invest when the condition of the exchange rate increases (depreciates) or when the money supply increases.

The overall results were still in the form of an approximate study. In the future, the results obtained may not in accordance with the results that have been written above. Therefore it is necessary to do further research on this issue in the future. Here are recommendations for further research:

- The lack of local research related to property and real estate prices in Indonesia can affect the quality of future research. Thus, research about property prices and real estate in Indonesia can be discussed more deeply.
- For further research, it is expected to not only use macroeconomic variables, it is better to add other variables, such as the average income of people in the area, corruption, fraud or other things.
- Conduct a comparative study between one region and another.
- The results of this research need to be reconfirmed using methods other than VECM, such as using the method of ARDL, multiple linear regressions, ARCH GARCH, or others. This needs to be done as a comparison to determine which model test is better and appropriate.

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