THE INFLUENCE OF GDP, INTEREST RATE, WAGE, INFLATION AND EXCHANGE RATE ON RESIDENTIAL PROPERTY PRICE IN INDONESIA

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Abstract

Over the past years, Indonesia's economic growth has been recorded among the top developing countries. The economic growth is believed to contribute to the increase on residential property prices. The main objective of this study is to analyse the influence of determinants of residential property prices in Indonesia by examining the dynamic relationships of residential property prices reflected through the Residential Property Price Index (RPPI) with Gross Domestic Product (GDP), investment interest rates, wages, inflation and the exchange rate against the US dollar using secondary data over a period of thirteen-years between 2002Q1 and 2014Q4. By applying the Engle-Granger co-integration test and the error correction model, this research aims to see the relationship between the variables both in the short- and long-term. The results of the study indicated that macroeconomic factors that were significantly related to Indonesian residential property prices were GDP, wages, inflation, and exchange rates against the US dollar, while the investment interest rate was not included in these factors. Furthermore, based on the results of the regression analysis on research data, government policy in setting minimum wage standards has the greatest impact on residential property prices in the property sector in Indonesia. Thus, the results of this research are expected to provide the government with better viewpoints that will assist them in enacting better policies in the residential property sector.

Keyword: gross domestic product, wage, exchange rate, residential property price index

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INTRODUCTION

Indonesian property prices have continued to increase over the past decade as reflected in a Condensed Statements by Bank Indonesia concerning the increase in the Residential Property Price Index (RPPI). The continual increases in property prices have created fear among people that the 2008 property bubble in the United States as a result of excessive property loans will also occur in Indonesia. Thus, high economic growth and stable political conditions do not seem convincing enough for people to believe that there will be no crisis in the property sector in the upcoming years.

Indonesia is a country with the highest economic growth in Southeast Asia. Indonesia's population, according to the 2016 census by the Central Bureau of Statistics, is 260 million which places Indonesia as the fourth most populous country in the world. Among the islands where 34 Indonesian provinces are located, Java is the most populous island, even in the world, where more than half of the country's population lives. Jakarta, the Indonesian capital city, is also the most populous city in the country. The country shares land borders with the eastern part of Malaysia in the island of Borneo, the western part of New Guinea in the island of Papua, and the western part of Timor-Leste in the island of Timor. Major cities in Indonesia are Jakarta, Surabaya, Medan, Bandung, Semarang, Bogor, Depok, Tangerang, and Bekasi. Each city has a population of more than 1,500,000 people. Every year, population size continues to increase, resulting in increase in housing demand as well.

Conducting research on the increase in residential property price is really necessary. Continuous increase in residential property price will cause bigger portion of household expenditures to be focused on the purchase of the residential property which consequently reduces the portion for other needs. Furthermore, residential property is a primary need for human beings aside from food and clothing. Human beings will instinctively try to fulfil their primary needs before their secondary needs. Therefore, the residential property is deemed more important for human beings than commercial property or any other properties.

The government's policy, in fiscal and monetary field, is needed to ensure that the residential property price remains under control and is affordable for all levels of society. It is interesting to study which government policy is appropriate at the present time to control the residential property price. The government has the obligation to provide affordable residential property for all levels of society. Therefore, the government has to, without fail, control residential property price.

Researchers from various countries have studied the relation between residential property price and its determinants. According to Hong (2013), there is a dynamic relationship between economic growths, as reflected by the growth of Gross Domestic Product (GDP), with real estate demand. The increasing of GDP will increase people's purchasing power so it will also boost property demand.

Phyrr, Born and Webb (1990) studied the movements of price and demand on real estate. The results of these studies concluded that demand, supply and inflation strongly influence real estate price. The other results stated that the right time to buy and sell properties depends on the rate of return on the investment property. High inflation reduces the purchasing power of the general public including property investments.

Mahalik and Mallick (2011) analysed the dynamic relationship between residential property price with real incomes, stock price index, and real exchange rate, interest rate on non-food real and short-term real interest rate. The results of this research are that, in the long run, real incomes significantly affect residential property price with a positive direction; interest rate on non-food significantly affect residential property price with a negative direction. Variance Decomposition explains that the influence of shocks interest rate, on non-food, to the residential property price is the biggest outside itself, while the other variables are not significant.

Hofmann (2008) examined the relationship between bank lending, real interest rate and real GDP with real property price in 16 (sixteen) industrialized nations. The results of this study indicate that, in long-term, credit changes cannot affect credit demand. If property price shaped weighted average of the price of commercial and residential properties, the equation long term would show that bank lending to influence property price positively and significantly.

The existence of the phenomenon of the increase in residential property price in Indonesia is interesting to be studied. Previous researches have not specifically analysed the phenomenon. This study will analyse the determinants of residential property price in Indonesia. Variables that influence are GDP, interest rate, wage, inflation, and exchange rate to the US dollar. The relation between these factors is unlikely to be misleading. Therefore, the study uses error correction models (ECM) to analyse the influence of macroeconomic factors to residential property price. Results from this study are expected to give consideration to the government, as the policy maker in property sector, in controlling residential property price.

DATA DESCRIPTION
This study used secondary data for the period between 2002 Q1 and 2014 Q4. The quarterly data included RPPI, GDP, interest rate, wage and exchange rate to the US dollar. RPPI variables were taken from published reports of Bank Indonesia with the coverage survey of sixteen major cities in Indonesia consisting of Jakarta, Bogor, Tangerang, Depok, Bekasi and Banten provinces. RPPI in this paper was based on 2002=100. GDP was taken from the report publication of the Central Bureau of Statistics on a constant price basis 2000. The interest rate in this paper was based on the investment interest rate recorded by the Indonesian Institute of Sciences. Wages were the Real Wage Index (IUR) of industrial

workers under the foreman (supervisor) with IUR 2002 = 100, which was taken from the report published by the Central Bureau of Statistics. Inflation was the Consumer Price Index (CPI) at 2002 = 100 taken from the publication report of the Central Bureau of Statistics as well. While, the exchange rate data against the US dollar was taken from CEIC Data.
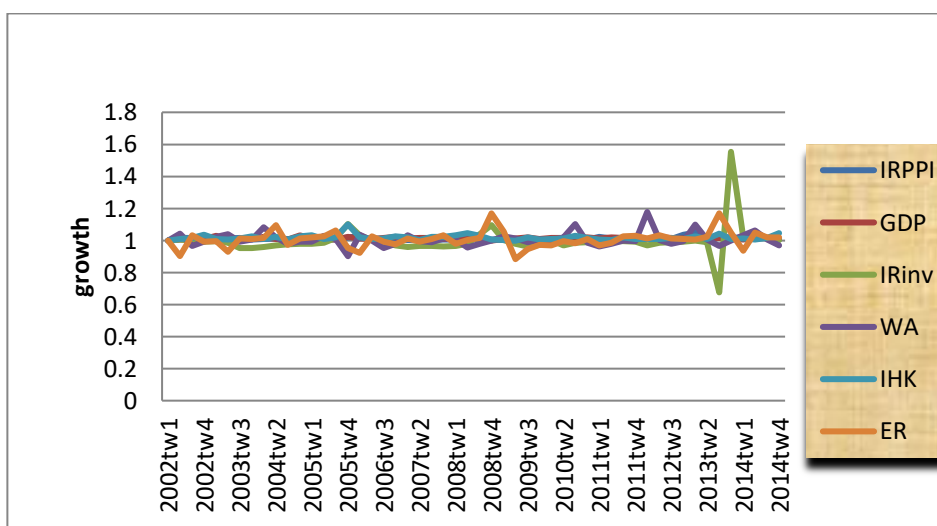

Figure 1: The graph of residential property price index with its determinant
Source: Bank of Indonesia

METHODOLOGY
The method used is error correction models (ECM) because the relationship of the variables has co-integrated. This is indicated by a linear combination of the series that is not stationary so there is a long-term equilibrium relationship between variables, while in the short term disequilibrium may occur. The differences on what to expect with what happened require an adjustment. Therefore we need a technique to correct the imparity towards the short-term to long-term balance by commencing adjustment. ECM was introduced by Sargan, further developed by Hendry and popularized by Engle - Granger. ECM is used to overcome the non-stationery time series data and spurious regression.

This method uses a unit root test, the level of integration test, and cointegration test. Unit root test procedures use Augmented Dickey Fuller (ADF) test, whereas the cointegration test uses the Engle-Granger procedure to see the long-term equation, while the short-term equation is estimated with error correction model (ECM).

This study developed a model that describes the influence of GDP, interest rate, wage, inflation, and exchange rate to the US dollar against

residential property price during the year period of 2002-2014. Mathematically the models used in this study are as follows:

$HP_t = f(GDP_t, IR_t, WA_t, I_t, ER_t)$
where:
HP_t = residential property price (index),
GDP_t = gross domestic product (Rp),
IR = interest rate (persentase)
WA_t = wage (index),
I = inflation (index), and
ER_t = exchange rate (Rp/US$),
t = quarter in-t, and

Based on the mathematical model above, an econometric model that aims to analyse the influence of independent variables on the dependent variable is formed. Dependent variable used in this paper was residential property price while the independent variables were GDP, interest rate, wage, inflation and exchange rate to the US dollar. Furthermore, based on the characteristics of time series data, the model is in the form of natural logarithm.

Imbalance correction coefficient is an absolute value that describes how long it is required to obtain the equilibrium value. If the value of the probability is smaller with the coefficient of 0.05 then the model is indicated to have a short-term relationship.

RESULTS AND DISCUSSION

Unit Root Test and Integration Test
As a condition of cointegration analysis, the first step carried was to test the unit root made for all the variables (LNHP, LNGDP, LNIR, LNWA, LNI, LNER) using Augmented Dickey - Fuller test (ADF). Stationary state occurs if the variable in question has an absolute value of Statistic Augmented Dickey Fuller (ADF - Test) that was greater than the critical value (McKinnon Critical Value) at the significance level of 1%, 5 %, and 10 %.

Based on unit root test results, it can be seen that non-fulfilment of assumptions are stationary at zero degrees or I [0]. Therefore, it is called stationary at first difference if the value of ADF count > Mackinnon Critical Value. The next test was the degree of integration. This test was a continuation of the unit root test. This test differentiates variables to a certain degree so that the variables are stationary at the same degree.

The result of the degree of integration test showed that variables pass the test of the degree of integration of I. However, the test results showed that the

variables are not stationary at the current level but stationary at 1st difference level with a level of significance of 1%, 5% and 10 %.

Engle-Granger Cointegration Test
Cointegration test is used to test whether there is a long-term relationship between residential property price to GDP, interest rate, wage, inflation, and exchange rate to the US dollar. If the variables that are not stationary become cointegrated then the linear combination between variables in the system will be stationary so that the equation will be stable long term. This study uses Engle-Granger cointegration test.

Cointegration test results based on Engle-Granger procedure that is unit root test against the residuals of the equation, we reject H_0 stating that the residuals are not stationary. It can be seen from the t-statistic Augmented Dickey Fuller (ADF) which is greater than the Mackinnon critical value of his good at significance level $\alpha = 5$ % and $\alpha = 10$ %. It means that in the long-term, equation cointegratied at significance level $\alpha = 5$ % and $\alpha = 10$ %.

Estimation and Analysis Long-Term and Short Term Equation
Based on test results obtained, it is positive that in the long-term, equation cointegrated. The model that explains the relationship between residential property price and its determinant variables is as follows:

$$LNHP_t = -3.3312 + 0.2431 * LNGDP_t + 0.04551 * LNIR_t + 0.3361 * LNWA_t + 0.2904 * LNI_t + 0.1229 * LNER_t$$

Where t-stat:
LNGDP   = 1,7561
LNIR   = 1,3876
LNWA   = 5,9817
LNI   = 2,8999
LNER   = 3,2848

LNGDP coefficient is positive. It means that in the long term, the relationship between GDP with residential property price is in the same direction. LNGDP coefficient value of 0.2431 indicates that a 1 percent increase LNGDP, ceteris paribus, in the long run, will raise residential property price up to 0.2431 percent. Absolute value (coefficient LNGDP < 1) indicates that in the long-term LNGDP is inelastic on residential property price. People's purchasing power is a factor determining the level of public demand including demand in the residential property sector. This has an impact on the increase in residential property price. According to Gallin (2003), the income level, in the long-term, has a positive effect on residential property price.
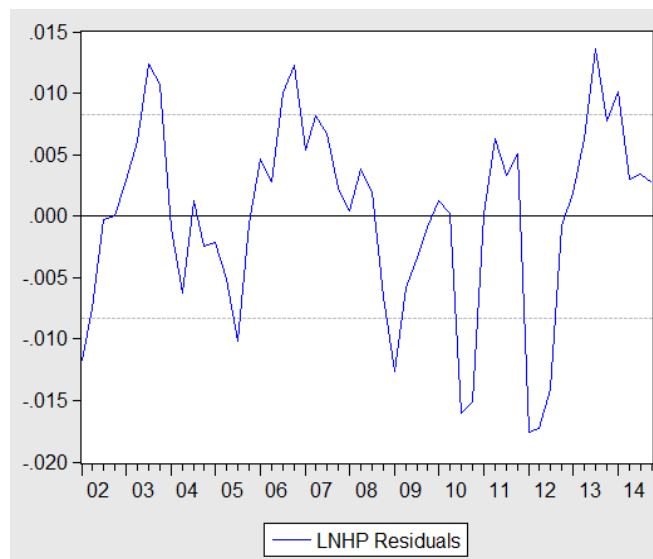
Figure 2: LNHP Residual Graph in the long-term

After knowing how the models of residential property price in the long term are, the next step we are making the short-term equation estimation. It was explained earlier that if variables mutually cointegrate, the dynamic model that is used to seek short-term balance is ECM.

Results of regression equations on residential property price in the short-term by using the approach of error correction model (ECM) is as follows:

$$D(LNHP) = 0.0045 - 0.0679*D(LNGDP) + 0.0051*D(LNIR) + 0.0491*D(LNWA) + 0.0868*D(LNI) + 0.0094*D(LNER) - 0.1279*RESID01(-1) ... (7)$$

Where t-stat:
LNGDP	= -0,3222
LNIR	= 0,3712
LNWA	= 1,4630
LNI	= 0,9968
LNER	= 0,3728

LNGDP coefficient is negative; the result is a negative short-term relationship between GDP with residential property price. LNGDP coefficient value of -0.0679 showed that an increase of 1 percent change in GDP, ceteris paribus, in the short term will lower the residential property price by 0.0679 percent. Absolute value of LNGDP coefficient showed that the relationship between GDP with residential property price in the short term is inelastic.

LNIR coefficient is positive; the result is a positive short-term relationship between interest rate with residential property price. LNIR coefficient value of 0.0051 indicates that an increase of 1 percent change in interest rate, ceteris paribus, in the short-term would raise residential property price 0.0051 percent. Absolute value of LNIR coefficient showed that the relationship between interest rate with residential property price in the short term is inelastic. The same meaning with LNWA, LNI and LNER.
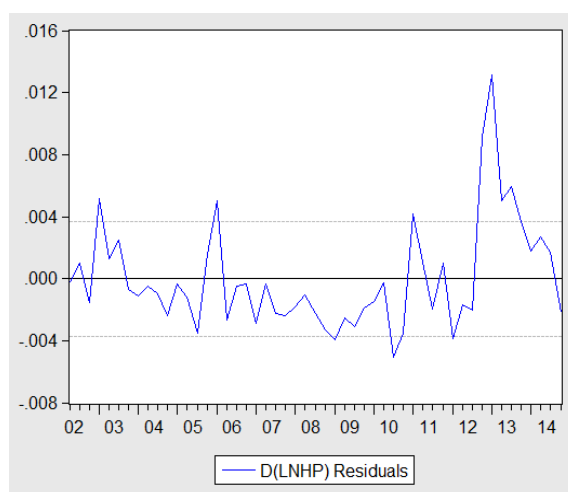

Figure 3: LNHP Residual Graph in the short-term

Variables Error Correction Term (ECT) shows the speed of adjustment which means how fast is it to correct the imbalance from the previous period to the current period. ECT value of $_{t-1}$-0.1279 means that the disequilibrium residential property price in the previous period is corrected 12.79 % in the current period. In other words, the speed of adjustment to correct an imbalance of residential property price model for short-term model towards equilibrium model of residential property price in the long term is 12.79 %. The negative sign on the ECT means that any deviation from the long-term balance will be corrected where the effect on residential property price will be going towards equilibrium point in the long run because the system is stable.

The estimation results show that in the short-term, determinant variable was not shown to have a significant effect on residential property price. According to Mahalik and Mallick (2011), GDP change was not able to influence residential property price because the investment in the property sector are long-term. Residential property price can be influenced by changes in GDP if the change is permanent. Permanent change on determinant variables is needed to have significant impact on residential property price. It takes quite a while to build residential property; on the other hand the house selling price has been

calculated and set previously. In other words when the construction of the housing is still undergoing, the price of materials and wage standard can rise unexpectedly and cause more expenses than what is already been calculated.

Evaluation Models

Results of model cointegration estimation indicate the value of R^2 0.9864 and the value is adjusted by 0.9849. The value of R^2 shows that variations in residential property price can be explained as much as 98.64 percent by the model; the rest is explained by variables outside the model.

The next is testing the significance of the effect of all explanatory variables to the dependent variable. Hypotheses test F are as follows:

H_o: $\beta_0 = \beta_1 = ... = \beta_k = 0$
H_0: $\beta_0 = \beta_1 = ... = \beta_k \neq 0$

The estimation results of the model of cointegration yielded a calculated F value of 668.0695 with probability 0.0000 while the value of F table is F (5%, 5.46) is 2.4173 which means that the value of Fcount>F table and probability of 0%<5% so that Ho refused. This means that the overall explanatory variables in the model have a significant effect on residential property price

This study tested the level of significance of independent variables on the dependent variables individually as well as the direction of influence. To determine the significance t-test is used t-test and compared with t-table value at 95% confidence level.

T-table value at a significance level is α: 5% = 2.0128; α: 1% = 1.6786; α: 10% = 2.6870. Thus in the long run, variables LNWA, LNI and LNER are significant at a significance level α = 1%; 5% and 10%; LNGDP variables are significant at a significance level α = 1%, LNIR variables do not have significant effects on residential property price. In the short term all independent variables do not significantly affect the price of the residential property.

The estimation results of equations of residential property price in short term is R^2 value 0.09364 or at 9.36%. This, due in the short term, is very possible variation of the dependent variables were influenced by noneconomic factors such as socio-political situation, security and government policy. The factor that causes the dependent variables do not respond to the change is the change of the independent variable which is not permanent.

ECM estimation results indicate that the F count equal to 0.7576 is smaller than F table (2.4173), so it can be concluded that, in the short run, jointly independent variables cannot explain the dependent variable.

Implication to Property Policy

The rapid increase in residential property prices may threaten the stability of the national economy. The increase can occur due to several factors such as GDP,

Interest rate, wage, inflation, and exchange rate to the US dollar. Therefore, to stabilize the residential property prices, the most important thing to have is full-control of the factors that affect the increase in residential property prices including the occurrence of speculative bubble in the long term.

The government and Bank Indonesia as policy makers in their respective field of fiscal and monetary policy must optimize all available instruments to control residential property price. The policies that must be issued are:

(a) Small residential property subsidy mechanism. The movement of residential property price is not in spite of the increase in GDP, from another point of view the increase in GDP is positive, which means increasing the prosperity of society. This becomes a problem when the increase in the purchasing power is lower than the rise in residential property price, so that for people, especially among the middle and lower class, it is difficult to buy a house. In this regard, the government needs to implement a subsidy mechanism for small-sized residential property so that people manage to afford housing according to their purchasing power. Furthermore, the government can issue a policy to provide the amenity facility of mortgages for low-income people.

(b) Reduction of interest rate for credit investment. The rate of credit interest for high-rated investment causes investors, in this case the developer in the property sectors, find difficulties in obtaining capitals to invest in housing construction. This resulted in the supply of housing on the property market has yet to fully meet the demand. Therefore, the government needs to control the investment credit interest rate so that it is affordable and enable the investors to meet its obligation to return their bank loan.

(c) Wage policy. The result of the study indicates that the regression of the positive wage factor carries a significant impact on residential property price; similar indication is also found with GDP factor. High wage causes the cost of residential property construction to increase so significantly that housing price also rises. In the other hand, high wage demanded by the labour unions will make the investment climate in property field unattractive to the investors. Investors will move out other countries looking for more profitable investment. Therefore, the government needs to issue the right policy that facilitate the both sides; the investors and the workers so that friendly investment and also the welfare of workers can be both achieved

(d) Inflation control. As long as it is kept at certain limit, Inflation is essential since it indicates that the economy is growing due to the price of goods / services that rises spurring economic productivity. But when inflation gets so high that the price of goods / services rises beyond people's purchasing power, it will be able to trigger economic crisis. Therefore, the government needs to control inflation through raising interest rate on deposits; providing economic stimulus / liquidity assistance to property developers; reducing government spending; reducing the circulation of money in the community

by selling government securities, and increasing the purchasing power of the society.

(e) Controlling exchange rate to the US dollar. In the era of globalization it cannot be denied that trade between countries is a common practice even with greater volume. Most residential construction materials are also obtained through imports. Therefore, the increase in the exchange rate to the US dollar causes the rising in residential property price. Bank Indonesia (BI) needs to take measures to control the exchange rate to the U.S dollar including the supervision of the fairness of foreign currency transactions, monitoring of the restrictions on rupiah transactions of non-residents, moral suasion, sterilization / intervention in foreign exchange and Open Market Operations (OMO) against excess on rupiah liquidity.

The study is limited only on the analysis of the data taken in the period of 13 years. A study covering data from longer time period may help to provide better results, and if we are to include other variables such as population, demand and supply of property, the results may be more accurate.

CONCLUSION

The results of the research on the influence of GDP, interest rate, wage, inflation, and exchange rate to the US dollar on residential property prices in Indonesia with study period data in the first quarter of 2002 until the fourth quarter of 2014 can be summarized as follows:

a) In the long term, the study results show that factors of GDP, wage, inflation, and exchange rate to US the dollar have significant impact to the residential property prices, while investment interest rate does not.

b) In the short term, determinant variables have no effect on residential property prices in Indonesia. It is possible that the permanent changes needed in the independent variable are required to determine the effect on the price of residential property.

c) The relation between the variables studied has important implications for policy-making in the property sector. The government as a fiscal authority as well as Bank Indonesia as the monetary authority can take steps to control residential property price through the instruments provided. Therefore, these policies include:

 i. The small residential property subsidy mechanism.
 ii. Reduction of interest rate for credit investment.
 iii. Policy in setting wage standards.
 iv. Inflation control.
 v. Exchange rate control.

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