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Identification of Real Estate Bubbles in Indonesia

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Background: Significant increases in demand for real estate affects it's market price. Rapid growth of real estate prices caused some economists to analyse the possibility of real estate price bubbles in the market.
Purpose: The purpose of this research was to identify the existence of real estate price bubbles in Indonesia in 2003-2013. This research was also to analyse factors determining Indonesian real estate prices.
Method: This research used the time series econometric method of Vector Error Correction Model (VECM) with 2003-2013 of time series data. A quantitative approach was used to test hypotheses using measured data and would generate a generalisable conclusion. The quantitative approach was done in the form of a statistical approach and a time series econometric approach. The type of statistical approach used was the regression analysis model to examine the relationship between the tested variables.
Result: The data showed that Indonesia real estate prices in 2003-2013 had a bubble although this bubble did not endanger the economy because it was still below an international safe threshold. Factors determining real estate prices were Gross Domestic Product, lending rates, and speculation-influenced real estate price growth.
Conclusion: There were real estate speculative bubbles in Indonesia in 2003-2013 but the speculation level in the housing market did not exceed the international threshold, while the speculation-influenced house price growth had the greatest effect on house price fluctuations.

Key words: *Real estate, price bubbles, speculation, Vector Error Correction Model.*

Introduction

The housing sector is highly influential in the economy of a country. Housing price movement can affect many other economic sectors such as construction, banking, and the capital market. In 1990, the Japanese housing price bubble burst, causing 11 years of recession because the ones that plummeted were not only the real estate market but also the capital market (Flackler, 2005). Real estate bubbles occurred not only in developed countries but also in developing

countries such as India and China. The Indian property market experienced a boom during the administration of UPA (United Progressive Alliance). Next, China experienced an asset price bubble which slowed down the growth of China economy in 2012 (Colombo, 2012). Symptoms of a price bubble had been evident since 2005 when government monetary policies were loose and local customs/culture existed. Increasing demand for housing was due to low interest rates and liquidity rates.

Considering several property bubbles that have occurred, it can be concluded that the housing market has a very important role in the economy. Distortions that occur in this market can have an effect on overall economic activities (Goodhart and Hofmann, 2008). House price calculation is influenced by different factors in each country, one of which is geographical location (Dreger and Kholodilin, 2013). Therefore, a tool is required to detect the symptoms of future economic crises, especially the price bubble.

An early warning system that serves as a detector of economic vulnerability is one method that can be used to identify a price bubble to anticipate future crises (Adiningsih, 2001). However, research on early warning systems for a real estate speculative bubble is very limited. This is because the bubbles are hard to pinpoint with certainty except retrospectively, when prices have suddenly dropped as the bubble is bursting. In addition, econometric methodologies to identify bubbles in a period have yet to be developed (Daoud and Antolin-Diaz, 2014).

To date, there is still much debate about how to identify the occurrence of a speculative real estate price bubble and there is no single standard method of how to measure it. The existing econometric method has not been effective or satisfactory, because of differences in the test results; one study found a bubble, while other studies with the same data found no bubbles (Gürkaynak, Sack and Swanson, 2005). Knowing a potential speculative housing price bubble in Indonesia will help policy makers in formulating preventive measures to avoid a crisis like the United States financial crisis, or to minimise future losses (Njo, I. Made and Irwanto, 2019). The purpose of this research was to identify the potential of a real estate speculative bubble in Indonesia in 2003-2013, and to identify the factors influencing real estate prices in Indonesia in the years 2003-2013.

Lierature Review

Theoretical Framework

Housing Bubbles

Bubbles can be identified from property prices increasing very quickly to a certain point (*boom period*) then drastically going down (*burst period*) (Garber, 2000). A reason why house prices have a big role in the economy is their importance for the wealth of a household and their role

in debt settlement (a house is the loan collateral) (Dreger and Kholodilin, 2013). A housing price bubble occurs less frequently, but it lasts twice as long and leads to twice as much of output losses (International Monetary Fund, 2003). Recent research shows that, compared to financial markets, the period of the housing market boom is longer than its burst period (Ikromov and Yavas, 2012).

The Austrian School argues that a price bubble occurs due to changes in both real and psychological factors contributed by the manipulation of monetary policy. This view is commonly called *The ABC Theory* or *Austrian Business Cycle Theory*. According to the ABC theory, if the Fed does not pursue a loose monetary policy, events such as the dotcom technology bubbles and subprime mortgage bubbles will not develop (Thornton, 2006). But if the Fed implements a loose monetary policy, then bubbles can occur in any aspect of the economy.

According to Krainer in the article *House Price and Fundamental Value*, housing prices are influenced by the power of supply and demand. When bubbles occur, many economists attribute the increase in house prices to variables that potentially shift the supply and demand curves, such as interest rates and people's income. Price dynamics are usually explained in terms of interactions between multiple variables and constraints in distributing supply into the market (McCarthy and Peach, 2004). A bubble forms when housing prices rise sharply above their fundamental values. On the other hand, bubbles are hard to detect because fundamental values are not easily observable (no one knows how much profit will be generated in the future and what interest rate will be set for housing).

$$P_t^* = E_t\left[\sum_{i=0} \frac{\alpha Y_{t+1}}{(S_{t+1})\prod_j^i (1+\rho+r_{t+j})}\right]$$

P_t^* = fundamental value of the house

S_{t+1}= number of houses supply next year (t + 1)

Y_{t+1}= people income next year (t + 1)

γ_{t+j}= mortgage rate

ρ= value of home maintenance service and cost

From the above model, the fundamental value of a house is determined by present and future aggregate income, population and mortgage rates by past, present and future construction activities (Hott and Monnin, 2008).

Speculation Theory

Speculation is an unusual business action relating to making profit from price fluctuations. This action is closely related to entering a business involving unusual risks in order to gain the opportunity of reaping a considerable profit. Speculation is different from investment activities. In investment, an investor invests some money after performing calculation of risks and profit in the future. When one speculates, he ignores future risks because he has confidence, instinct, or a hunch for profit (Alnassar and Chin, 2017). The profit generated from speculation is bigger, but the risk is also higher (*high risk high return*).

Wealth effect in general is a change in the aggregate demand caused by changes in the value of assets such as stocks, bonds, gold and property (Lolić, Sorić and Čižmešija, 2017; Upadhyaya, Dhakal and Mixon, 2017). The increasing value of these assets in the market causes the asset owners to feel richer, although there is no real money increase. In the case of subprime mortgages in America (2008), the housing wealth effect made homeowners feel richer based on their home prices on paper and then decided to buy more houses or to finance their consumption through home ownership loans. This effect causes a change in the amount and distribution of public consumption due to changes in consumers' wealth. There are two conditions of this effect: the society is indeed getting richer or the society merely feels richer. There will be an increase in demand for some goods, especially inferior ones.

The existence of a rational speculative bubble indicates a market flaw because a house price bubble causes a swell in the lending value of the society, weakening the balance sheet and financial stability. The price bubble also causes instability of the financial system and macroeconomic conditions. In this case, the government must intervene to avoid distortions and potential financial crises in the future.

Previous Research

Previous research on price bubbles, especially the housing price bubble, was the reference for this research. Some studies agree that the occurrence of price bubbles cannot be separated from speculative activities in the housing market. The analysis presented by these researchers varies but with one conclusion; namely that the existence of a price bubble can be bad for the economy, if the boom is not anticipated.

Thornton states that the housing price bubble appropriately illustrates the failure of the government. The *Easy Money* policy applied in the United States led to the formation of a housing price bubble that when it burst it would cause a financial crisis. Thornton analyses the American economy using the ABC Theory, *The Austrians Business Cycle Theory*, where real factors and psychological factors are the reasons for price bubble formation (Thornton, 2006).

Hott and Jokipii conduct research on the relationship between housing price bubbles and interest rates. The low interest policy of 14 OECD governments for a long time encouraged the public to speculate in the housing market, causing house prices to rise and forming price bubbles in several countries at about the same time. Research using the Taylor Rule method indicates a strong relationship between low interest rates and housing price bubbles. The impact is stronger when interest rates are low for too long a period of time (Hott and Jokipii, 2012).

Dreger and Kholodilin designed an early warning system to predict speculative house price bubbles. They took samples from 12 OECD countries during the period of 1969-2009 and then constructed the chronology of housing price bubbles using a combination of fundamental approaches and filter approaches. An early warning system could use three methods: A signalling approach, a logit model and a probit model. The calculation results show that the logit and probit models provide more accurate calculations in predicting speculative bubbles in the housing market. The results of logit and probit calculations are also sufficiently accurate to forecast the formation of future housing price bubbles (Dreger and Kholodilin, 2013).

Ning and Hoon analyse the effects of speculation on real estate price bubbles in Beijing and Shanghai to assess whether the price bubble would harm the economy in the future. Ning and Hoon also use the multiple regression method, as in Lai, Xu and Jia's (2009) study to measure the level of speculation in both cities (Lai, Xu and Jia, 2009; Ning and Hoon, 2012).

Hypothesis and Analysis Model

Hypothesis

1. Real estate speculative bubbles in Indonesia in 2012-2013.
2. Several economic variables influencing real estate prices in Indonesia in 2003-2013.

The analysis model used in this study was the regression model of house prices with variables that were relevant to each other. This model referred to the research by Ning and Hoon to measure real estate market speculation bubbles (Ning and Hoon, 2012).

$$P_t = \alpha_0 + \alpha_1 Y_t + \alpha_2 I_t + \alpha_3 [(\frac{g_{t-1}}{1+i_t})]_t + \mu_t$$

Where

$\alpha_0 + \alpha_1 Y_t + \alpha_2 I_t$= Fundamental values of houses

$\alpha_3 \left[\left(\frac{g_{t-1}}{1+i_t}\right)\right]_t + \mu_t$= Increase in the proportion of house prices by speculation

P_t= House price in period t

Y_t= People income

I_t= Loan interest rates

The rate of home price speculation is $\theta = -\alpha_3/\alpha_2$. The greater the value of θ, the higher the level of speculation occurring in the housing market and the greater the likelihood of a price bubble being formed. International standard stipulates that the safe value limit of θ is 0.4. In other words, if θ surpasses 0.4, the level of speculation in the housing price bubble is too high and could trigger the burst of the already formed home price bubble.

Thinking Framework

Policies made by the monetary authority determine the direction of future national economic growth. Many things can be done to stimulate economic growth, one of which is a loose monetary policy. The loose monetary policy is intended to increase public consumption and to encourage investment in strategic economic areas, such as the housing industry. Therefore, low interest rates are set so that more people can apply for mortgage loans, as a source of funding. Low interest rates also attract both local and foreign investors to enter the housing market.

High demand for houses will be followed by an increase in their prices. In this situation, there will be parties who want to generate big profits in a short time by doing speculative activities. Continued price increases will also lead to expectations in the public that house prices will continue to rise and will not fall. The greater the expectation, the greater the likelihood of speculation in the housing market.

House prices are influenced by three variables namely interest rates, Gross Domestic Product (GDP), and house price growth. There are two methods to measure the level of speculation in a housing price bubble: the index method and the modelling method. The index method finds whether or not there is a house price bubble by analysing different indexes. This method is easy and can directly illustrate the issues being raised. The modelling method uses the measurement and evaluation of the system with a model created based on existing theories. This study uses the modelling method to measure the level of speculation in price bubbles formed in the housing market.

In this modelling method, the level of housing market speculation is calculated using a simple regression of the model created under the above assumptions. The variables included in the model were the Gross Domestic Product (GDP), interest rates and growth of house prices that were influenced by speculation during 2003-2013.

Material and Method

A quantitative approach was used to test hypotheses using measured data and would generate a generalisable conclusion. The quantitative approach was done in the form of a statistical approach and a time series econometric approach. The type of statistical approach used was the regression analysis model to examine the relationship between the variables tested (Kurtner, Nachtheim and Neter, 2004). In terms of econometrics, this study used the *Vector Error Correction Model* (VECM) method to estimate the parameters in the model. The VECM method was aimed at seeing the relationship between variables, either independent or dependent, in the short and long terms, and to calculate the price speculation bubble level that existed in the market.

Some economic variables are involved in the measurement of house price bubbles. These variables represent the situation occurring in the housing market. The independent variables of this regression model were Gross Domestic Product, representing people's purchasing power, interest rates, and house price growth influenced by speculation in every quarter during 2003-2013 in Indonesia. The dependent variable was house prices during 2003-2013 in Indonesia. The above variables were selected based on some previous research on housing price bubbles and subprime mortgages.

Based on its type, the data used in this research was time series within three months (*quarter*). The distance of three months was chosen because speculation activities take place quickly in the short term. The sample taken was the State of Indonesia, with quarterly data from January 2003 to December 2013. Most of the data was taken from the official website of Bank Indonesia, bi.go.id, namely, Residential Property Price Index and Residential Price Growth Index. Lending rates data was obtained from the OECD website, OECD.stat, while the Gross Domestic Product data was obtained from the Central Bureau of Statistics (BPS).

The data analysis in this study used the *Vector Error Correction Model* (VECM) method to estimate the parameters in the model to measure the level of speculation in the housing market price bubbles. In the process of estimation and calculation, researchers were assisted by a computer software, EViews 8. Steps used in VECM analysis included: Unit Root Test, Optimum Lag Determination, Cointegration Test, VECM Estimation, and Impulse Response and Variance Decomposition functions.

The Vector Error Correction Model has dynamic behaviour. The dynamic behaviour of the VECM model can be seen through the response of each variable towards the shocks of that variable and towards other variables. The VECM was used to calculate short-term relationships between variables through standard coefficients and to estimate long-term relationships by using residual lags from cointegrated regressions.

Result

Analysis of the Property Price Speculation Bubble Model

This research used the Vector Error Correction Model (VECM) method with an econometric tool of EViews 8. The first stage was root unit test at the level stage. The variables of House Price and Public Income were not stationary at the level stage because the value of ADF test statistic was smaller than its test critical values, namely 1%, 5%, and 10%. Meanwhile, the variable of *lending rates* was stationary at the level stage as indicated by the value of the ADF test statistic greater than the test critical value at 5% level and *p*-value smaller than the critical value (0.0210 <0.05), thus H0 was rejected: the lending rate variable did not have unit root at the level stage. The variable of House Price Growth was also stationary at the level stage with an ADF test statistic value greater than its critical test value at all levels and *p*-value smaller than 0.05 (0.0028 <0.05), thus H0 was rejected, meaning that the variable of House Price Growth did not have unit root at the level stage. Because the stationarity tests based on the ADF test showed that some variables were not stationary at level, hence *differencing* the data was conducted to get stationary data, that is, by subtracting the data with data of the previous period, so that first difference data was obtained.

The second stage was the optimal lag length determination. Determining optimal lag length was done on several criteria, namely: *Final Prediction Error* (FPE), *Aike Information Criterion* (AIC), *Schwarz Criterion* (SC), and *Hannan-Quinn* (HQ). Some of the criteria for determining the optimal lag length are indicated by an asterisk (*).

Table 1: Optimal Lag Determination

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-620.2841	NA	9.42e+08	32.01457	32.18519	32.07579
1	-412.8621	360.6589	51648.84	22.19806	23.05116	22.50414
2	-378.8774	52.28414	21122.97	21.27576	22.81136*	21.82672
3	-364.4162	19.28165	24565.26	21.35467	23.57276	22.15050
4	-336.4996	31.49561	15399.93	20.74357	23.64414	21.78427
5	-297.9499	35.58432*	6272.097*	19.58718*	23.17023	20.87274*

Notes: EVews 8 estimation results

This optimal lag determination procedure is the same as when we determine the optimal lag on the VAR method. However, there is a difference in the number of lags in the VECM. When the optimal lag on VAR is p, then the lag on VECM is p-1. Based on the optimal lag determination, the optimal Lag on VAR was 5 (the most star signs). Then the optimal lag on VECM was 4.

The third stage was cointegration test. Cointegration test in the VECM method is very important because it aims to know whether some variables have the same movement in the long run. This is what makes it different from the VAR method. Based on the cointegration test results, the Trace Statistic value was greater than the 10% critical value, thus the data was cointegrated. This shows that there was a long-term relationship between House Prices, Public Income, Lending Rates and House Price Growth. The cointegration of data indicates that it is appropriate to use the VECM method.

The fourth stage of the VECM method was the VECM estimation. This estimate would show the relationships among the variables both in the short term and in the long term. The dependent variable in the VECM method was House Price. The following is the long-term equation of VECM estimates:

$$P_t = -49.19725 - 7.72E - 0.5Y_t - 162.7455I_t - 22.20734[\left(\frac{g_{t-1}}{1+i_t}\right)]$$

The international standard stipulates that the safe threshold value for the speculation level is 0.4. In other words, if the speculation level exceeds 0.4, then it can be concluded that the housing market speculation level is very high and can trigger the burst of the housing price bubble. Conversely, if the speculation level in Indonesia is less than 0.4, then the speculation activities in Indonesia are safe and have yet to harm the housing market.

The housing market speculation level in Indonesia was:
θ1=-θ3/θ2= 22.20734/-162.7455=-0.136

From the data processing, the level of speculation in Indonesia was -0.136. The value is smaller than the international threshold -0.136 <0.04 , thus it can be concluded that the speculation level in Indonesia was still within the safe limit and did not harm the housing market.

The fifth stage was testing the data used in this study, namely the classical assumption test. The purpose of the classical assumption test was to ensure that the estimate obtained was BLUE (*Best Linear Unbiased Estimator*). Stages of the classical assumption test included multicollinearity, heteroscedasticity, and autocorrelation tests. Based on the multicollinearity test, there was no perfect multicollinearity as proven by the public income variable (Yt) which had a correlation coefficient value greater than 0.8, so no repair was needed. The result of data processing on the heteroscedasticity test showed that the H0 was accepted because the chi-square probability value was greater than the critical value (0.2540> 0.05) then there were no ARCH effects. Subsequently, an autocorrelation test was performed. Detection of autocorrelation in time series data can be done by using the Buesch-Godfrey method, better known as the LM-Test. This study proved the Buesch-Godfrey/LM-Test as follows:

Table 2: Results of Woolridge Test

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.869253	Prob. F(4,16)	0.5036
Obs*R-squared	6.962234	Prob. Chi-Square(4)	0.1379
H0= autocorrelation does not exist			
H1= correlation exists			

Notes: Estimates by EViews 8

The discussion of impulse response in this study was focused on the responses of the four independent variables, namely public income (YT), lending rates (IT), and growth of house prices (GT) towards the shock of the dependent variable: house prices (PT). All the three independent variables showed quick responses when the value of the impulse response of PT increased; on the contrary, when PT decreased, IT and GT variables did not directly respond with a decrease.

Variance Decomposition provides information on the proportion of the movement of the shock of a variable to that of other variables in the present and coming periods.

Table 3: Contribution of Public Income (YT), Lending Rates (IT) and Speculation-Influenced House Price Growth Rate (GT) on House Price (PT)

Response of PT Period	SE	PT	YT	IT	GT
1	0.883241	100.0000	0.000000	0.000000	0.000000
2	1.861838	59.44917	8.381235	3.024423	29.14518
3	2.896695	42.58002	18.02361	8.370207	31.02617
4	4.113875	34.16921	19.11973	11.73264	34.97841
5	5.259266	25.28123	23.16270	14.16282	37.39325
6	5.958050	21.38677	25.78103	15.22858	37.60363
7	6.434436	19.05251	25.72484	15.86929	39.35336
8	6.684523	17.95615	25.33720	16.75592	39.95073
9	6.804647	17.81717	24.83367	17.00282	40.34634
10	6.927103	18.38360	24.03769	16.93647	40.64224

At the beginning of the period, all independent variables (YT, IT and GT) did not have any effect on PT. In the second period, the variables YT and IT began to affect PT despite its very small contribution. A great influence was visible in GT with a 29%. influence. The influence of GT continued to increase, even rapidly, during the rest of the period. Meanwhile, the variables YT and IT exerted smaller influence on PT than GT, with 24% and 17% respectively in the 10th period.

From the Vector Error Correlation Model (VECM) estimate, F-statistics value of 5.133855 was obtained. This F-statistics value was greater than the F arithmetic value of 2.87 so that H_0 was rejected. Thus, all independent variables (public income, lending rates, and speculation-influenced housing price growth) simultaneously influenced the dependent variable (housing prices) in Indonesia.

Based on the regression results, determination coefficient of 0.822079 was obtained. This means that variation in the independent variables (public income, lending rates, speculation-influenced house prices) accounted for the dependent variable (housing price) as much as 82.2%, while the remainder was due to variables outside the model.

Discussion

A price bubble is a situation where prices are rising sharply due to price increase expectations in the future but not supported by the economic fundamentals, and so that it later turns out that house prices drop. Bubbles can be identified through an increase in property (e.g. housing) prices which is very fast at first (the boom period) then drastically falls (the burst period). Price bubbles are difficult to detect because the fundamental values in a country's economy are not easy to observe (no one knows how much profit will be generated in the future and what the interest rate will be for housing). In addition, price increases can also be caused by the business cycle.

A business cycle is a fluctuation of economic growth around the trend that includes depression, recovery, boom and recession. Just like price bubbles, economic cycles have a peak period and a slump or valley period. At peak times, economic performance is at its best and then at one point the economy will decline into a valley where a decline or even recession occurs due to market distortion (Ikhsan, 2007; Handriana, 2016; Wasiaturrahma and Ajija, 2017).

Data analysis results with the variables of GDP, lending rates and the speculation-influenced house price growth to measure the level of housing market speculation in Indonesia showed that there were housing market price bubbles in Indonesia during 2003-2013 but the speculation degree was still within the safe limit. This safety was due to government intervention when the price bubble began to form in the Indonesian housing market.

Bank Indonesia also gave a warning in a report entitled *Indonesia Economic Quarterly* issued on March 18, 2013. Furthermore, the World Bank stated that the Indonesian property market might have a bubble considering the sharp increase in property loans and property prices throughout 2012. The warning was responded to by the government by, among others, enforcing the policy of *Loan to Value* (LTV) in line with Bank Indonesia Circular Letter No.15 / 40 / DKMP on Risk Management Implementation for Banks Giving Loans or Financing Property Ownership, Property-Backed Loans and Financing and Loans or Financing for

Vehicle Ownership, in order to control house purchases by investors who buy properties in bulk (more than 2 units) and to reduce the possible systemic effects of the boom-bust cycle of the house price bubble.

Bank Indonesia set a 30% down payment for a first home purchase, a 40% increase for a second mortgage and a 50% down payment for the third mortgage. The purpose of the policy was for price control. The slow growth of house prices in Indonesia was also the result of the slow domestic economic growth which was partly caused by rising inflation and the currency rupiah which continued to appreciate against the dollar. The Property Price Index did grow by 7.88% in Q-4 of 2014 but it was lower by 12.11% than the CPI in the same period the year before (Real Sector Statistics Division of Statistic Department, 2014).

Some property consultancy agencies such as *Knight Frank* and *Jones Lang LaSalle* argued that the slowdown in the domestic economy would not have much effect on the growth of house prices in Indonesia. The house price growth would slow down throughout 2014 but with the growing number of population and the increasing size of upper middle class in society, demand for housing would continue to increase in the future.

Conclusion

Based on the results and discussion above, it can be concluded that there were real estate speculative bubbles in Indonesia in 2003-2013 but the speculation level in the housing market did not exceed the international threshold. Then, several factors affecting house prices, which indicate price bubbles, included public income, lending rates and the speculation-influenced housing price growth. Among the three variables, the speculation-influenced house price growth had the greatest effect on house price fluctuations.

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