Should Central Banks of ASEAN Countries Respond to Movements in Asset Prices?

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Abstract
The purpose of this study was to analyze whether monetary policy can be used as an instrument to control asset prices using a VECM and Panel-VAR approach. The research was conducted by analyzing the impulse response of the monetary policy shock on residential property prices, stock prices, output and inflation, both in each country and as a groups of countries. Results of the study indicate that monetary policy still can't be directed to asset price stabilization. Changes in monetary policy to control asset prices will cause turmoil on output and inflation. Central bank intervention to anticipate the formation of asset price bubbles can be reached by regulation may indirectly affect to the asset price movements.
Keywords: asset prices bubble, monetary policy, panel VAR

1. Introduction

Financial history of the world shows that financial crises that have occurred often preceded by the occurrence of asset price bubbles. This phenomenon encountered in Dutch Tulip Mania crisis in the 17th century, South Sea Bubble in England, and Mississippi Bubble in France in the early 18th century as well as Great Depression in 1929 in the US (Allen, 2000).

Financial liberalization and a significant expansion of credit referred as the initial process of the formation of asset price bubbles that triggered the beginning for most of the world's financial crisis (Kaminsky and Reinhart, 1996; 1999). High credit expansion will be an impact on the rise in stock prices which is higher than at the normal period. In addition, the price of real estate and other assets will also increase significantly.

Southeast Asian economic condition towards the financial crisis of 1997-1998 also showed similarities with the crisis phenomena in various countries. In the period of 1991-1996, there was a significant increase in the rate of bank credit growth in almost all countries of Southeast Asia, particularly in countries that experienced a serious economic crisis, as happened in Indonesia, Thailand including Malaysia.

The increase in high bank credit growth has resulted in an increase in demand for financial assets, either stock or property. As a result, the prices of stock and property showed a rapid increase since the early 2000s, thus exceeding its fundamental value.

When there was an economic shock in 1997, the bubble burst and caused asset prices which experienced a sharp correction, then causing panic for investors and triggering an acute and systemic financial crisis. The stock price index in major Asian stocks, such as Korea, Singapore, Malaysia and Indonesia experienced a dramatic correction.

Property prices also experienced a downfall, as indicated by the decline in the index of property stock prices in Asian capital markets. Hong Kong and Singapore were examples of countries that experienced the sharpest fall of residential property prices which reached almost 50% from the previous period.

Similar symptoms also occured in the US and Europe before the financial crisis in 2008. At first, a rapid credit expansion in the previous period triggered the rising asset prices, especially residential property. When economic shock occurred, then a sharp correction in asset prices caused turbulence in the financial markets in those regions indicated by the fall in property prices. Housing prices in some countries of the Organization for Economic Co-operation and Development (OECD) experienced a sustained decline which reached its peak in 2008-2009, thus, it triggered the global financial tsunami and affected on the world economic contraction.

The occurrence of asset prices bubbles are also the contributions from central bank's policy. When US capital markets received capital inflows as a result of Asian financial crisis in 1997-98, the stock price on National Association of Securities Dealers Automated Quotations (NASDAQ or American stock exchange) from 1998 to 2000 was also booming (see McKibbin and Stoeckel, 1999; Polle, 1999; Merrouche and Erlend, 2010). Once the asset price bubble experienced a sharp correction (burst) in 2001, then to anticipate the threat of deflation, The Fed enacted easing monetary policy during 2001-2004. This monetary policy then triggered the booming in housing prices and the increase of credit growth and leveraged loans. The facts show that in the period of 2000-2006, the housing prices in some of the main regions in the US were recorded to increase twofold.

When the housing asset price was corrected, in which the housing index in real terms fell by 6.2% from the first quarter of 2008 to the same quarter of 2009, it became a strong indication that the asset price

bubble has burst and affected on the fall of asset prices and the decline of household welfare. The next result was a reduction in society's consumption and savings that led to the widespread financial crisis. Therefore, a significant rise in asset prices should be interpreted as an increased risk of sharp price correction in the future, so it could result in shocks to financial stability (Assenmacher, et.al., 2009).

That description will emphasize two important things. **First**, the capital inflows and easing monetary policy followed by the ease lending that will lead to asset price bubbles. **Second**, the collapse of asset prices (stock and property) has an important role to financial instability, both at the level of individual financial institutions and to the macro economy (Ahearne et al., 2005, Goodhart and Hofmann, 2007). Therefore, if the Central Bank wants to stabilize the economy in long term, then Central Bank should give full attention to the movements in asset prices (Bean, 2004, Ahearne et al. 2005). However, it does not necessarily mean that the asset price becomes the target of monetary policy (Stevens, 2004).

Although theoretically monetary policy could be used as an instrument to control asset prices, but in reality there are still serious debate on more than a last decade (Filardo, 2006). Generally, the debate could be summarized in two groups of view.

The first group less agrees with the active intervention of Central Bank towards the asset price. This group states that Central Bank's policy to address the asset price fluctuations face some limitations. It happens due to the increase in interest rates to overcome asset price bubbles can cause a large decrease in output which is unpredictable. Therefore, Central Bank should be very careful in performing the policy of asset price stabilization. Katrin and Gerlach (2008) state that the monetary policy to control asset prices can cause shocks to economic activity and the stabilization on certain asset prices will raise the disability of other asset prices.

Meanwhile, the second group supports the active role of Central Bank to stabilize the asset prices. This group believes that various empirical experiences that emerged lately, such as the subprime mortgage crisis and the fall in property prices in the US and in several other countries indicate that the asset price bubble has led to financial instability, so that seriously affected the global economy (Katrin and Gerlach, 2008, Ahearne et al., 2005, Goodhart and Hofmann, 2007). This fact should be the foundation that Central Bank should react proactively to asset price movements, due to excessive fluctuations which will affect aggregative demand and inflation (Borio and Lowe, 2002, Cecchetti et al., 2000).

Nevertheless, along with the debate, in fact, there is recognition and greater acceptance that Central Bank should consider seriously about the possibility of the booming of asset price and what should be done by Central Bank to be able to make policy adjustments optimally. It can be done well, if Central Bank is able to identify whether the occruing asset price movements is reasonable or not.

In relation to the above, there are a number of criteria which need to be noticed to ensure that the monetary policy pursued by Central Bank to control asset prices become effective (Bean, 2004, Bernanke, 2002, Kohn 2006). *First*, the changes in monetary policy through interest rate controls should give stable and predictable effect for asset prices. *Second*, the effect of monetary policy on asset prices are different, such as residential property prices and equity prices, it must be felt quickly. *Third*, the amount of change in interest rate required to reduce the volatility of asset prices is not too big, so it does not result in economic activity and inflation which deviates from the expected level.

From that description, it may implicitly be said that monetary policy can not necessarily be used to stabilize the asset prices. Therefore, further research is needed on this issue. Some things which need to be explored is about the relationship between asset price bubbles with macro-economic conditions, such as inflation and output. In addition, effect differences in the asset price bubbles on consumption and investment are also very interesting to do.

2. Theoretical Framework

Existing various financial crises today which affect on the occurrence of a sharp and widespread economic contraction is a challenge for monetary authorities and other economic policy makers. Economic and monetary authorities are required to formulate a policy, both monetary policy and other regulatory policies that could be used to prevent similar crises in the future (Mester, 2009). In the context of these problems, asset prices and credit growth are the most prominent issues which relate to the discussion about the causes of the crisis. In this case, there is an understanding among practitioners of Central Bank in around world; although the asset price does not need to be used as a target of monetary policy, but the movements of asset price should be wary and require a policy response (Stevens, 2004).

Asset prices, such as housing and stock prices, are conceptually different from the prices of goods and services. Asset prices are more forward looking and reflect the expectations of market participants about the value of these assets in the future. More popular views today state that asset price plays a very important role for macroeconomic fluctuations. Referring to *The Economist* (2004), the economic decline that occurred in the US and some European countries is partly due to the behavior of asset prices. Low interest rates causing households feel richer than previously and encourage them to increase consumption, thus, resulting in high economic growth.

However, when the asset prices decline sharply, it will result in a recession.

Theoretically, the movement of asset prices will have an impact on economy through its influence on consumption (real expenditure). In this case, there are 4 (four) channels how asset prices directly affect the consumption, namely; wealth channel, balance sheet channel, equity financial channel, and allocation channel (Chirinko, et.al., 2004).

The impact of rising asset prices on real economy is still ambiguous. This ambiguity is also found in the structural macroeconomic models, such EUROMOON built by De Nederlandsche Bank (2000). The simulation experiments show that business investment in fixed assets can be negatively affected by asset prices. Demand pull inflation will lead to a tightening of monetary policy through Taylor Rule. Consequently, after the stock and housing prices rise, the business investment will likely fall below the base line.

If the asset price is not in accordance with the fundamental values, and the asset price increase appears to be not sustained, then monetary policy should only be used to eliminate the impact of the correction and not be directed at the efforts to limit the size of these deviations. (Bernanke, 2002; Bernanke and Gertler, 2001; and Kohn, 2006 & 2008).

Checcetti (2005) states that the policy of Central Bank in response to asset prices could be explained by 3 (three) theoretical models, namely: (1) Bernanke and Gertler Model (2) Dupor Model, and (3) Gruen, Plum and Stone Model. In **Gruen, Plumb, and Stone** Model, it is explained that the activists could increase the interest rates to cope with the initial impact of the bubble, but then quickly decrease the interest rates to anticipate the outbreak of asset price bubbles. If the bubbles continue to rise, it means that the potential negative impacts due to bubbles eruption will also increase.

In its development, there was support from various parties to Central Bank using a more proactive approach (activist approach) by stating that monetary policy should be used to take extra actions to restrain the growing imbalance (Cecchetti, et al., 2000; Cecchetti et al. 2005; and Borio and Lowe, 2002). In this case, monetary policy should be directed to address the rising asset prices which are seen as rising unsustainably. In line with this understanding, some members of Monetary Policy Committee from Bank of England support the tendency to restrain the rise in high house prices at the moment (Ahearne, et al., 2005).

The difference between these two approaches is often illustrated as a policy reaction function. In accordance with the traditional view, the reaction function of Central Bank which relate to the policy of nominal interest rate is based on the forecasts of inflation deviation from the desired target and the magnitude of the output gap.

in which:

i = nominal interest rate
r^* = equilibrium real interest rate
π = inflation rate
y^* = ln (potential output), dan
y = ln (output)

In accordance with the view of activist groups, reaction function of Central Bank's policy should also incorporate the asset prices variable.

in which ; q = asset price, dan
q^* = asset price in accordance with fundamental

Arguments against activist approach are centered on two main points (Mester, 2009). **First**, it is difficult to identify a particular asset price bubble because Central Bank is not supported with adequate information. **Second**, monetary policy is not an effective tool to overcome the bubble even though if the price discrepancy or deviation can be detected. Therefore, there will be some questions arise later. First, whether the higher interest rate would be able to control excessive optimistic expectations and continuing price increases. Or, second, the high interest rates will also be able to control the rise of willingness to take the risk from business and household sectors (Kohn, 2008).

However, viewpoints difference in the debate between activist and conventional groups concerning the reaction function of Central Bank's policy has indeed become no longer appropriate (Kohn, 2009). It is based on the fact that financial instability will cause macroeconomic instability, and vice versa. Moreover, both parties agree that asset prices play an important role in the transmission mechanism of monetary policy which potentially will affect aggregative and inflation demand.

More cautious views, as stated by Cecchetti, et al. (2005), present to support for a more activist policy, and Central Bank does not have to respond the deviations which are smaller than asset prices.

Based on this point of view, a small difference between the two views is merely about a matter regarding level and nuance. It means that the policy reaction function cannot be viewed as a traditional function, but by explicitly recognizing the effect of asset price on inflation and output gap (along with other variables

affecting the destination variable):

In fact, two points raised by the supporters of traditional view are correct, because it is very difficult to measure further on whether the asset prices deviate from its fundamentals, and it is also difficult to assess the effect of monetary policy on the cause of such incompatibility. However, this does not automatically mean that monetary policy does not need to consider the asset prices more explicitly than before.

The existing crisis challenges the policy makers to pay further attention to asset prices because the lesson shows that arbitration does not always have to be in the form of an effort to treat imbalances. From a number of asset bubble examples that have occurred and can be observed over the years, some of them assert that it will be better to assume that there is an asset bubble than none (Cecchetti, 2005).

Gruen, Plumb, and Stone (2005) define that policy makers need to know about stochastic process which cause the bubble in order to formulate the appropriate policies to address them. However, this does not mean that no action is required to prevent it. They assert that the case of policy tightening to offset the expansionary effect of asset price bubbles will be stronger when; (a) the possibility of bubbles to burst is low, (b) the possibility of bursting is very sensitive to interest, (c) the happening cost increases as the bubble sizes, (d) the demise of bubble has a longer period than the rapid correction.

Therefore, it would be better and profitable for central bank to be more careful in monitoring asset prices and more open to the possibility of taking action to settle it. Considering the effects of dynamic asset price can affect the forecast of output and inflation.

The topic of asset price bubble is not something new in financial history of the world (Maniatis, 2009). The most famous first bubble in the history occurred in Netherlands, which is often called as "Tulip Bubble" in the early 17th century (November 1636-January 1637) (Garber, 1989; Thomson, 2006). The bubble was followed by the collapse of stock prices and the company that published it. After Tulip Mania, then, followed by a bubble of the Company of Indies of John Law and the South Sea Company in 1720, and various series of the next bubbles until there was a great stock exchange bubble in the USA in 1929 (Galbraith, 1975).

The theme of bubble has grown to become one of the major issues in the realm of financial economics today. One of the interesting aspects to be discussed regarding the financial bubble is; what is the financial bubble, if any, what kind of forms can be happened in the conditions of rational behavior of market participants, and what kind of testing can be done to detect it (Dimitriadi, 1994). In addition, the factors that cause such bubbles are also important to be discussed further.

Generally, the term of financial bubble can be defined as the movement of asset prices that occur so quickly that goes beyond its fundamental value, but then decline sharply and suddenly from the terms of price and transaction volume (Lind, 2008, Blancard and Watson, 1982, Hsieh et.al, 2009). Asset price bubble is usually triggered by psychological factors that encourage excessive optimism, the uncertainty and constraints in taking decisions, or the euphoria-pessimism cycles in the market (Kindleberger and Aliber, 2008; Hsieh et.al).

Some bubbles that have ever existed are identified to have naturally been created as part of economic cycle. However, some other bubbles exist because of the investor exuberance. This type of bubble usually occurs in securities, stock market, real estate, and other business sectors due to the certain changes from the behavior of the key players who run the business.

Meanwhile, other economists state that economic bubble is related to inflation. Therefore, the factors that cause inflation are the factors that cause the economic bubble as well. There is also chaotic theory that emphasizes more on the bubble formation. This theory keeps the concept that the bubble occurs because of the particular critical condition that happens in the market which comes from the communication between the economic players.

Some other economists also state that the bubble is an imbalance in the way people understand opportunities because they try to go after the asset prices instead of purchasing with the intrinsic value of the assets as the basis (this condition is often called as speculator mentality).

Besides the debate concerning the cause of economic bubble, by adopting the framework of *INUS-Condition (Insufficient but Necessary part of the Unnecessary but Sufficient complex)* on the model that was previously developed by Mackie (1974), Lind (2008) tries to show a general framework that hopefully can explain in a more comprehensive way about several necessary conditions that cause the bubble. Those conditions are: (1) macro-economic policy and macro-economic situation, (2) structural changes in the economy, (3) capital and credit market, (4) beliefs, expectations, and the plans of the market participants, (5) individual incentives.

From the policy perspectives, the most important aspect from the bubble theory is the prediction ability. On the other word, the power of this theory is how this theory can be used to show the possibility that the dramatic increase in price will be followed by dramatic decrease in price as well.

The development of *behavioural finance* (Shiller, 2001; 2002) shows that efficient market cannot just happen. Thus, there should be other interesting empirical rules which can be used as the basics to create bubble indicator and, if possible, can be used to predict if the market is in the first stage of the bubble formation.

The report written by *China Academy of Social Science* (Xiaoling, 2007) tries to compile several indicators to detect the existence of bubble in the housing sector (Table 2.2). Even though this indicator is close to hypothesis and not something that is final, but at least this can be used as the initial reference in identifying the symptoms of the forming of asset prices bubble.

Table 2.2
Bubble Indicator, Housing Price Index

Index Type	Little Bubble	Serious Bubble
Selling price	Ratio of house prices to the income is < 1.6	Ratio of house prices to the income is < 1.6
Race of price increase	Ratio of the increase of house prices / the average increase of income is > 1	The increase of house prices > 30%
Range of the price increase	All the types of property asset increase in national-scale	All the types of property asset increase in national-scale
Rental cost	Ratio of rent level index / CPI index <1	Rent level index <1
The psychological condition of the investor	Close to optimistic	Very optimistic

Source: Adopted from Xiaoling, 2007, p. 27

Kindleberger (2000) identifies the formation process of the asset bubbles based on the occurrence of asset bubbles from 1720 until 1999, namely: (1) Displacement of established expectations, (2) Credit expansion, (3) New economy, (4) Swindles, (5) Overtrading, revulsion, and discredit, (6)Financial panic and crisis management, and (6) Aftermath.

3. Data
The observation data in this research covered the period of 2002-2010. The observation began in 2002 with the reasons that; first, many countries, including Indonesia, started to deregulate the banking and finance sector in the 1980s which resulted in the era after that year being considered as the representative of the modern economic era / financial liberalization. Second, most of the developing countries, including Indonesia, have just started paying serious attention to the development of property asset prices since 2000s, which is shown by doing the survey of property prices periodically.

The data of stock price in each country used the data of *Composite Price Index (CPI)* which is obtained from *International Financial Statistic (IFS)* in form of quarterly data measured in the end periods. The price of Residential Property for each country that became the object of this research came from Property Price Statistics published by BIS (Bank of International Settlements) in the form of quarterly data. CPIs data that showed the inflation level of each ASEAN countries that became the object of this research referred to the CPI (Consumer Price Index) data which came from *IFS (International Financial Statistics)*. The real GDP data that described the level of real output of each country which became the object of this research came from IFS (International Financial Statistics).

Meanwhile, the data of policy interest rate that described the monetary policy in each country were set on proxy by using the benchmark interest rate set by each central bank (Central Bank Policy Rate) based on the data from IFS (International Financial Statistics).

Analysis of the impact of monetary policy on asset prices, inflation, and the output growth were conducted using the econometric analysis. According to Goodhart and Hofmann (2008), the basic model of Vector Auto regressive (VAR) can be used to examine the relation between monetary policy and asset prices. However, to make sure that the VAR model is the appropriate approach to answer the research questions in the individual country analysis, there should be some stages of co-integration test procedures. If there is a co-integration vector in the test, then Vector Error Correction (VEC) approach will be applied. Furthermore, this study is conducted in three stages as explained below:

4. The Impact of Monetary Policy on Asset Prices, Inflation, and Output
The monetary policy transmission mechanism can be done by testing the response of monetary policy shocks to various variables by estimating Impulse Response Fuction (IRF). In accordance to this, although the best monetary policy is characterized by the systematic reaction from central bank to the variable growth in VAR/VECM indicated by estimation coefficient, but this research emphasizes more on how the asset prices react to the interest rate changes by keeping other constant variables. Meanwhile, to identify the shocks, Coleski Forecast Error Variance Decomposition (FEVD) is used with the standard ordo variable in the

literature of monetary transmission (Christiano et.al., 1999).

To see the impact of monetary policy shocks on asset prices, inflation, and output, there should be estimation on the model proposed in each country, namely: Indonesia, Thailand, Malaysia, Australia, UK, and USA. Since Johansen test result shows that all of the proposed VAR models contain con-integration vector, the estimation will be conducted using VEC (Vector Error Correction) approach. However, in accordance with the purpose of the research which focuses more on the impact between variables (in this case are the impact of monetary policy on asset prices, inflation, and output), then the analysis will be focused on the estimation result of Impulse Response Function (IRF) and Forecast Error Variance Decomposition (FEVD).

The result of the analysis of each country is summarized in matrix tabular from as shown in Table 4.1.

Table 4.1
An Overview of Impulse Response and Variance Decomposition
The effect of interest rate policy shocks on asset prices, output, and inflation

Country	Response to *shock*	The most responsive variable	Explanatory variables of the changes in the policy of interest rate
Indonesia	first period	output	inflation
Malaysia	first period	output	asset prices
Thailand	first period	output	asset prices

Source: STATA data

Based on table 4.1 above, monetary policy cannot just be used to stabilize the asset prices, because it can cause macroeconomic instability in form of turbulence in output or inflation.

Nevertheless, for developed countries especially Australia, UK, and USA where financial markets have developed in such a way, the opportunity for the monetary financial to be used to affect the asset prices appears to be more possible, considering the response of asset prices or the contribution of asset prices in explaining that the variation of policy interest rate is bigger than the variation in developing countries (Indonesia, Thailand, and Malaysia). In Australia and UK, the opportunity of monetary policy to stabilize the asset prices is relatively big. This indicates that there is a possibility of the differences between the impact of effectiveness and transmission mechanism of monetary policy. Therefore, further testing is needed to know the impact of the difference in the development of financial markets on the impact of monetary policy on the asset prices by using panel data.

5. VAR Panel Analysis: The Impact of Monetary Policy on Output, Inflation, and Asset Prices

The use of panel data method has several advantages (Wibisono, 2005). First, panel data can explicitly calculate the individual heterogeneity by allowing the individual specific variables. Later on, the ability to control the individual heterogeneity will enable the data panel to test and build a more complex behavior model. Second, panel data are based on the cross-section observation in time series, thus, panel data method is suitable for the study of dynamic adjustment. Third, the high number of the observation has implications on the more informative and more varied data, the decreasing of co-linearity between variables, and the increase of degree of freedom, so that more efficient estimation result can be obtained. Fourth, panel data can be used to study the models of complex behavior. Fifth, panel data can minimalize the bias that might be caused by the aggregation of individual data. Based on the literatures used in this research (Wibisono, 2005; Aulia, 2004; dan Gujarati, 2003), those advantages mentioned above have the implications that classical assumption testing is not needed in panel data models.

There are two steps in this research about panel data analysis which uses VAR approach; First, using the panel data for the six countries at the same time. This step aims to analyze the impact of monetary policy on asset prices in general. Second, VAR panel analysis will be applied in two groups of countries, which means each group consists of three countries. The first group consists of the countries which have bank-based financial structure, while the other group consists of the countries which have market-based financial structure. The second step aims to analyze if there is an impact of financial structure on the impact of monetary policy on asset prices.

Meanwhile, IRF analysis using the panel data of the three countries indicates that monetary policy shown by the policy rate in those countries is able to be responded by other variables although with different intensities. Inflation variables show good response to the monetary policy shocks, in which in the early period after the interest rate changes happen, inflation tends to decrease continuously and it moves stably after some periods. The increase of policy interest rate in this case will affect the increase of market interest rate which will cut the aggregate demands and implicate on the decrease of general prices level. As stated in the analysis for the groups of countries in general, it can be concluded from this point of view that in the countries with bank-based financial structure, monetary policy is quite effective in achieving its objective, which is to stabilize the price.

Output variables seem to give different responses compared to what are shown in the groups of countries in general. In this case, the monetary policy shocks in the early period causes the increase in output instead, although there is a decrease in the end. This phenomenon may occur because of the expectation formation which is not in line with the monetary policy in short term. In this case, monetary policy faces announcement effect, in which the direction of the policy can be interpreted differently by the public. The increase of policy interest rate can be seen as the signal of inability of central bank in controlling targeted inflation, thus, the public expects that the prices will increase more in the future. Therefore, the public chooses to increase their consumptions now to prevent the risk of a price increase in the future. However, after the panic subsides and the prices increase for real, the public will give normal response in form of the decrease of consumptive activities so that the output decreases as well.

The stock prices are indeed pretty responsive to the changes in monetary policy. In the first period, the stock prices will decrease rapidly, although it increases again after the second period. This indicates that the investors in capital market are more sensitive to the monetary policy shocks and support the prediction that the activities in capital market are dominated by investors who tend to get the benefit from short selling. Therefore, when there is an increase in interest rate that might potentially reduce the value of the stock market, the investors anticipate it by selling their stocks. This type of investor behavior will result in the decrease of stock prices.

The changes in monetary policy are also responded by property prices. In the early period after the increase in policy interest rate, there is a decrease in property prices and it tends to fluctuate and only shows its stability on the fourth period. This is understandable because the changes in interest rate will be responded by the decrease in inflation in the first period and will increase in the fifth period and become stable after the sixth period. This is understandable because the increase of policy interest rate impacts on the increase of market interest rate. The implication is that mortgage rates will also increase which affect the demand of the properties. If the consumers are able to adjust, then the demand on the property assets will be normal again, thus, the property assets will increase again.

Meanwhile, according to the variance decomposition analysis, it shows that the variables which relatively affect the interest rate are stock prices, output, and property prices. This is because the variations in the policy interest rate are not only explained by the variable itself (83.15%), but also other variables, namely stock prices (8.89%), output (4.5%), and property assets (3.2%). On the other hand, inflation variable only gives small contribution in explaining the variation in the interest rate, which is 0.2%.

According to the description above, although the response shown by asset prices to the monetary policy shocks is relatively visible and asset prices have a pretty good contribution in explaining the changes in interest rate, but the impact of monetary policy on asset prices in the countries with bank-based financial structure is fluctuant, unstable, and predictable. Therefore, monetary policy done by central bank will not be effective if it is used to control asset prices (Bean, 2004; Bernanke, 2002; Kohn, 2006).

The result of this research gives the policy implication that the authority of monetary policy should beware of the movement of asset prices, not only because it will affect the achievement of inflation target but also because the turbulence that attacks the price assets will cause the financial and monetary instability. The harmonization of monetary policy becomes a very important issue because the interest rate policy of the central bank is not only concerned with the achievement of inflation and output targets but also needs to consider the implications on the stability of asset prices.

Second, when the direct intervention through the monetary policy has not been considered possible, then central bank can use certain regulations that indirectly affect the dynamics of asset prices, for example, by tightening the requirements for housing loan transactions through the increase of LTV Ratio.

There were several limitations in this research. The data used for this research was relatively limited, both from the number of countries observed and the observation period. Residential asset price was one of the data that was relatively hard to get, both in the context of the availability of data series and the suitable time interval for this research.

In relation with the indicator or the size of the financial structure, this research only used one of the indicators that should be calculated, which was the ratio of market capitalization to the GDP compared to the total bank credit to GDP. The limited quantitative data that could describe the financial structure of a country was one big obstacle for this research.

The limited research data might affect the validity of the result and conclusion of this research. Therefore, the next research should use more observation data to obtain more accurate result, both in the number of observed countries and research period in order to get better data variations using the available financial structure indicators.

Besides using the limited data for financial structure, the classification of financial structure of a country into bank-based or market-based is only based on a simple method which is using the median number from the indicator of the ratio of market capitalization to GDP compared to the total bank credit to GDP from the six observed countries. Therefore, this classification is relative. In addition, the indicators used have not

considered the other relevant aspects, such as law characterization and other rules or regulations that can affect the characteristic of the financial structure of a country.

Therefore, the next research should use better and more established methodology, particularly in relation with the classification of financial structure by using better indicator, so that it can minimize the bias in the research.

6. Conclusion

Based on the individual VEC analysis for each country, it can be concluded that there has not been any strong evidence yet which states that monetary policy can be used or directed to affect and stabilize the asset prices. Monetary policy strategy is still relevantly maintained to achieve the main goals, which are to control the inflation and affect the output. However, considering the fact that the effect of asset prices on the macro-monetary stability is getting bigger, it is better for the future monetary policy to start considering the movement of stock prices and property variables.

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