THE LINKAGE ANALYSIS OF INTEREST-FREEAND INTEREST-BEARING MONETARY AGGREGATES TO BUSINESS CYCLE AND INFLATION IN INDONESIA

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Abstract

The Money supply, which consists of M1 (interest-free monetary aggregates) and QM (interest-bearing monetary aggregates), is a monetary policy instrument often used by Central Bank of Indonesia to achieve the final target of output and price. The purpose of this study is to identify which component is the more effective to be a monetary policy instrument. We apply Vector Autoregressive (VAR) combined with Vector Error Correction Model (VECM) to analyze the responses of Indonesia's quarterly real GDP and price to the shock of M1 and QM.The result indicates that the shock of QM is relatively more able to explain the variance of real GDP and price compared to the shock of M1. This means, in the long-run QM is more related to real GDP and price, so QM is more effective to be a monetary instrument to overcome the business cycle and inflation in Indonesia.

Keywords: Interest-FreeMonetary Aggregates, Interest-Bearing Monetary Aggregates, Business Cycle, Inflation.

1. Introduction

Aside from the role as medium of payment in a daily transaction, money is often used by the central bank as an instrument to stabilise the economy. Through their open market operation, central bank controls the money to overcome the issues of output gap or employment gap. Money itself can be classified into three categories, such as: base money (M0), narrow money (M1) and broad money (M2). Among the three type of money, the authors are interested to use the term used by (Nasution and Nurzaman, 2006). In their study, they classified money into two terms, such as: interest-free money and interest-bearing money. The former term is used as a proxy of narrow money (M1) which is constructed by currency and demand deposit components, while the later term constitutes quasi money (QM) which consists by saving deposit and time deposit. They conducted a study to analyse the stability and the effectiveness of Islamic monetary instrument towards inflation of Indonesia. They used the M1 as interest-free money since currency and demand deposits are not contaminated by interest rate.

The use of broad money to overcome fluctuations in output and prices can't be separated from the two major components which construct broad money, namely M1 and QM. An increase or decrease in the money supply can be done by changing the number of M1 or (and) QM (simultaneously). As we know that an increase in QM is strongly associated with fractional reserve banking policy issued by the Central Banks. The question arises whether interest-free or interest-bearing money has better stability. The instability of the instrument will have an impact to the

fluctuation of output. Therefore, it is necessary to study which components have relatively high stability so that monetary policy can run effectively.

Money supply in Indonesia experiences a high growth rate from year to year. Figure 1 illustrates that the increase of M1 (interest-free) and QM (interest-bearing) money supply has increased in every period. The increase in QM is relatively larger than the increase in M1 where by from 2005, the increase looks exponential. The increase of QM reached the highest level of 29.8 percent in the second quarter of 1998. This significant increase was due to high interest rates applied by Bank Indonesia to withdraw money in circulation to curb high inflation after the 1997 economic crisis.
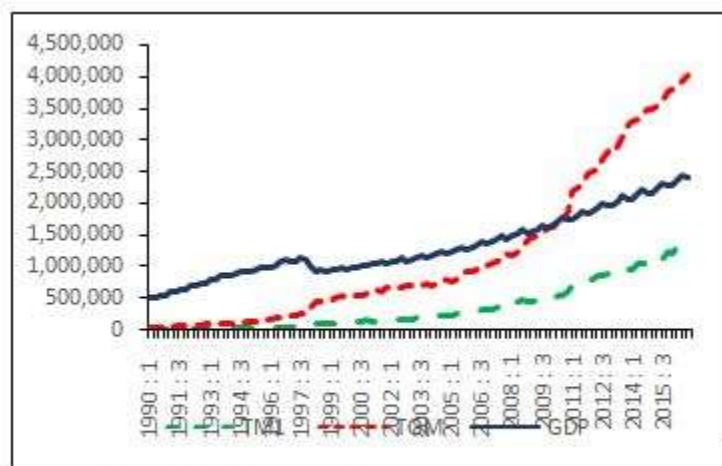
Source: SEKI, Bank Indonesia (2018)

Figure 1: Money Supply and Real GDP Over 1990:1 – 2016:4 (in Billions IDR)

Studies on economic fluctuations in Indonesia have been widely practiced by several scholars even though their studies do not specialize in Indonesian business cycle. Most research in the field of business cycles focuses on developed countries. Research on the business cycle in developing countries, such as in Indonesia and other ASEAN countries, are less desirable due to the lack of economic data. In addition, developing countries are relatively more susceptible to economic crisis making it difficult to identify the main sources of the business cycle.(Le, 2015)

(Leitner, 2005)conducted a study about the characteristic of business cycle in The Philippines using 1981-2003 time-series data. The result revealed that investment was the most volatile variable while private consumption is the least. All variables observed have strong and positive correlations with GDP. Strong negative price-output correlation and weak positive inflation-output correlation identify supply shocks as the triggering factor for observed business cycles. Finally, all macroeconomic variables presented low persistence. (Le, 2015)investigated the structural shocks on macroeconomic fluctuation in Vietnam by adopting S-VAR model with long-run restriction for small open-economy with flexibility of price. The result confirmed that output variance in Vietnam is mainly caused by the domestic supply shock. Price movement in Vietnam is mainly determined by domestic shocks. Therefore, domestic policy plays a crucial role to control the price so that in the long run Vietnam will maintain their stable inflation rate.

Empirical studies on Indonesian business cycle aimed at testing the shocks affecting the economic fluctuations of Indonesia which are still very limited. In terms of the relationship between money and Indonesian business cycle, there are several studies using various econometric models. (Siregar and Ward, 2002)aimed to see the response of macroeconomic variables to the shock of monetary policy and exchange rates. The results show that monetary policy shock affects output not through real money balance, but through the impact of domestic interest rate on the exchange

rate. This means that shocks in real exchange rates play a greater role in controlling macroeconomic fluctuations, so that monetary policy will be more effective when combined with fiscal policy.

(Dwiyoso and Susilo, 2007)used an artificial neural network method to construct Indonesian composite leading indicators that are becoming more widely recognized in predicting business cycles. The authors used monthly economic and financial data during the period of 1970–2001. The result shows that the composite leading indicators constructed by artificial neural network method can predict all the turning points of business cycles in Indonesia. The performance of this method is comparable to the other prediction method such as regression. The study also finds that during 1970 to 2001, there have been occurred four cycles in Indonesia. Compared to Malaysia and The Philippines, Indonesia is relatively better in maintaining its expansion phase which is shown by the average duration of expansion phase per cycle higher than the two countries. However, Malaysia is performing better revival from a slump as shown by the average duration of the contraction phase is the lowest compared to Indonesia and the Philippines.

Limitations in the study of business cycles in Indonesia underlie the authors in conducting empirical studies of business cycles in Indonesia, specifically to examine (i) the relationship of interest-free and interest-bearing money to business cycle in Indonesia (ii) the impact of shocks on interest-free and interest-bearing money on business cycle in Indonesia, and (iii) appropriate monetary policy in maintaining economic stability in Indonesia. This paper will provide the basic characteristics of a business cycle in Indonesia for the last three decades. We may find the variables that give more impact to the economy which in turn may be used as a policy instrument. In this study, the authors focus on how interest-free money (TM1) and interest-bearing money (TQM) explain the business cycle in Indonesia. The cycle will be characterized in terms of volatility, co-movement, and business cycle indicators. Moreover, the authors also assess the relationship between output and those monetary instruments.

This paper is organized as follow; First section provides the methodology used to extract the business cycle component from the observed data. Second section presents the Indonesia's business cycle stylized facts during the periods of observation. Proceed to the third section which will discuss the basic characteristics of Indonesia's business cycle. The fourth part will exhibit the relationship between output in Indonesia and will be closed by the conclusion.

2. Methodology

(Burns and Mitchell, 1946)defined Business Cycle as: *"A type of fluctuation found in the aggregate economic activity of nations that organize their work mainly in business enterprise; a cycle consist of expansion occurring at about the same time in many economic activities, followed by similarly general recession, contractions, and revival which merge into the expansion phase of the next cycle ; this sequence of changes is recurrent but not periodic ; in duration business cycle vary from more than one year to ten or twelve years ; they are no divisible into shorter cycle of similar character with amplitudes approximating their own."*

The study of business cycle begins with the processes of separating the components of trend and cyclical components, so-called de-trending, of macroeconomic variables time series data. Cyclical components of macroeconomic variables is then analysed by looking the patterns and characteristics and finding their correlation towards real GDP. Statistical approach applied for estimating the trend and cyclical components in this study is Hodrick-Prescott filter (HPF) provided by EViews 8. For almost twenty years after the presentation, HPF is still the favourite empirical technique among researchers who attempt to separate cyclical behaviour from the long run path of economic series. After de-trending the series, basic characteristics can be inferred, such as volatility, co-movement and business cycle indicators.

In this study, the authors use yearly time series data taken from various sources including Central Bank of Indonesia (SEKI Bank Indonesia), Statistics Indonesia (Biro Pusat Statistik), Federal Reserve Economic Data and Global Economy from the period of 1990:1 – 2016:4. All data are transformed into natural logarithms except interest rate.

Table 1: Variables and Sources of the Data

No.	Variable	Sources
1.	Gross Domestic Product (2010=100)	SEKI Bank Indonesia
2.	Consumer Price Index (2012=100)	SEKI Bank Indonesia
3.	Nominal Exchange Rate (IDR/USD)	SEKI Bank Indonesia
4.	Bank Deposit Interest Rate	The Global Economy
5.	Total Narrow Money	SEKI Bank Indonesia
6.	Total Quasi Money	SEKI Bank Indonesia
7.	Gross Domestic Product USA (2009=100)	Federal Reserve Economic Data
8.	Consumer Price Index USA (2010=100)	Federal Reserve Economic Data
9.	Certificate of Deposit Rate USA	Federal Reserve Economic Data

Source: Authors' Own

3. Indonesia's Business Cycles Stylized Fact

The economic growth in Indonesia was accompanied by considerable changes in the sectoral composition of GDP. Figure 2 depicts the actual data of Indonesia's output during the periods of 1990:1 to 2016:4. It can be clearly seen that the economy of Indonesia shows a gradual increase even it experienced some economic downturn around the year 1998:1 and 1999:1. Detailed description of the Indonesia Business Cycle from the period 1990:1-2016:4 is also presented in Figure 2 and Table 2.
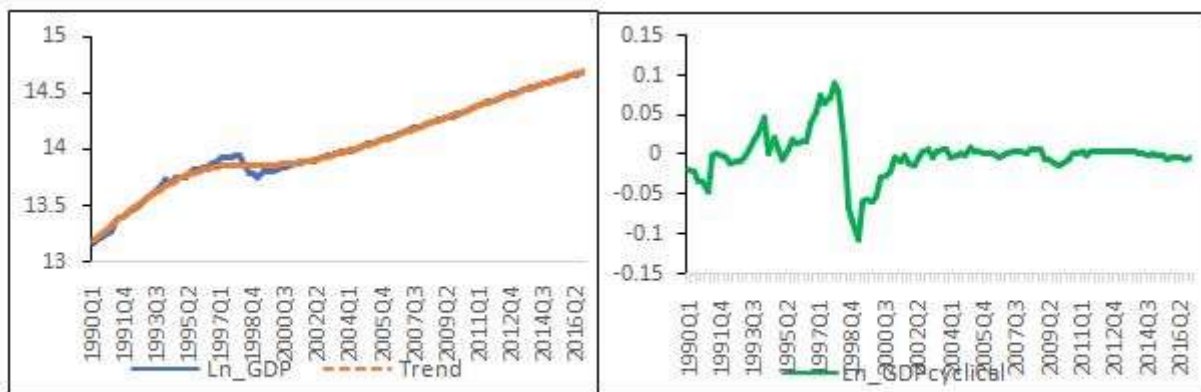

Figure 2: The Actual, Trend and Cycle of Indonesian GDP

The observed data comprise two different lengths and depths: One cycle covers the period 1994:1 to 1997:4 characterized by a profound recession in 1995, followed by the impressive peak in 1997. The other cycle occurred from 1997:4 to 2005:1 with the profound recession occurred in 1999:1. Recall from what had been occurred in South East Asia during the period of economic crisis. The speculation attack towards Thailand Baht spread into several neighbouring countries including the economy of Indonesia. After reaching its peak in 1997:4, for about five quarters, the economy of Indonesia experienced economic downturn before it started to recover in 1999:1.

Table 2. Trough and Peak Periods in Indonesia (Quarter)

Peak	Trough	Peak	Length
1994:1	1995:1	1997:4	15
1997:4	1999:1	2005:1	29

Source: Authors' Own

4. Indonesia's Business Cycles Characteristics Volatility

Volatility of one variable is measured by standard deviation. If the result is low standard deviation, it implies that the variable does not contribute much to the fluctuations. Table 3 reports standard deviations for each cyclical component such as, national output, consumer price index, narrow money, quasi money, interest rate and exchange rate. Among the variables observed on this study, interest rate becomes the most volatile variable while real GDP is the least volatile variable. All monetary instruments show higher volatility than GDP, with interest rate 100 times more volatile than GDP. It is followed by the exchange rate which volatile around eight times of GDP. Interestingly, the two components which have the highest volatility are the basic "weapons" that are always used to stimulate the economy. Interest-free money however, becomes the least volatile among the monetary instruments.

Table 3. Standard Deviation of Parameters

Cyclical Components	No. of Obs.	Standard of Deviation
DGDP (Gross Domestic Product)	42	0.027877
DCPI (Consumer Price Index)	42	0.057901
DTM1 (Interest-Free Money)	42	0.053466
DTQM (Interest-Bearing Money)	42	0.060742
DNIR (Nominal Interest Rate)	42	2.713324
DNER (Nominal Exchange Rate)	42	0.170592

Source: Authors' Own

5. Co-Movement

It indicates the cyclicality of key macroeconomic variables. This term is measured by the correlation coefficient where a positive value implies the correlation between variables is pro-cyclical. Negative sign indicates a counter-cyclical correlation, whilst near zero-coefficient indicates a-cyclicality. In this part, the cyclical of each component will be analysed using cross correlation method. Table 4 and Figure 3 present the result of cross correlation between monetary instruments and output. Surprisingly, most of the variables under investigation have strong and negative correlation (countercyclical) to output. This negative relationship implies that monetary policy tool turns out to be clearly countercyclical. In the other word, no active procyclical policy can be conducted by the Indonesian government to stabilize the economy

Table 4. Indonesia's Business Cycle Indicator & Co-Movement

Cyclical Components	Cross Correlation		Co-Movement
	Lag	Coefficient	
Leading Indicator			
Consumer Price Index	-1	0.87	Countercyclical
Narrow Money (M1)	-2	0.46	Countercyclical
Quasi Money (QM)	-1	0.72	Countercyclical
Nominal Exchange Rate	-2	0.80	Countercyclical
Consumer Price Index USA	-1	0.32	Procyclical
Co-incident Indicator			
Gross Domestic Product USA	0	0.19	Countercyclical
Lagging Indicator			
Interest Rate	+7	0.54	Countercyclical
Interest Rate USA	+8	0.12	Acyclical

Source: Authors' Own

6. Business Cycle Indicator

It indicates the cyclical pattern of a particular macroeconomic variable in terms of timing when it is compared with the reference business cycle variables (real GDP). In this case, we will eventually see whether a macroeconomic variable is said to be leading, lagging, or co-incident indicator. Table 4 also displays the cyclical timing parameter of monetary instrument towards the output in Indonesia. Among the five monetary instruments used in this study, there are four variables that can be categorized as a leading indicator for output namely consumer price index, narrow money, quasi money and nominal exchange rate. By considering to strong-negative correlation (countercyclical) between of those four instruments and output, it can be concluded that those four variables may be used to affect the fluctuation of output in Indonesia. The "-2" gives us information that the fluctuation of narrow money in *t-2* period leads changes in output at *t* period. In addition, different condition occurs when we discuss interest rate. This variable becomes the lagging indicator for output fluctuation. This finding explains to us that the fluctuation of interest rate in Indonesia is the result of output fluctuation.
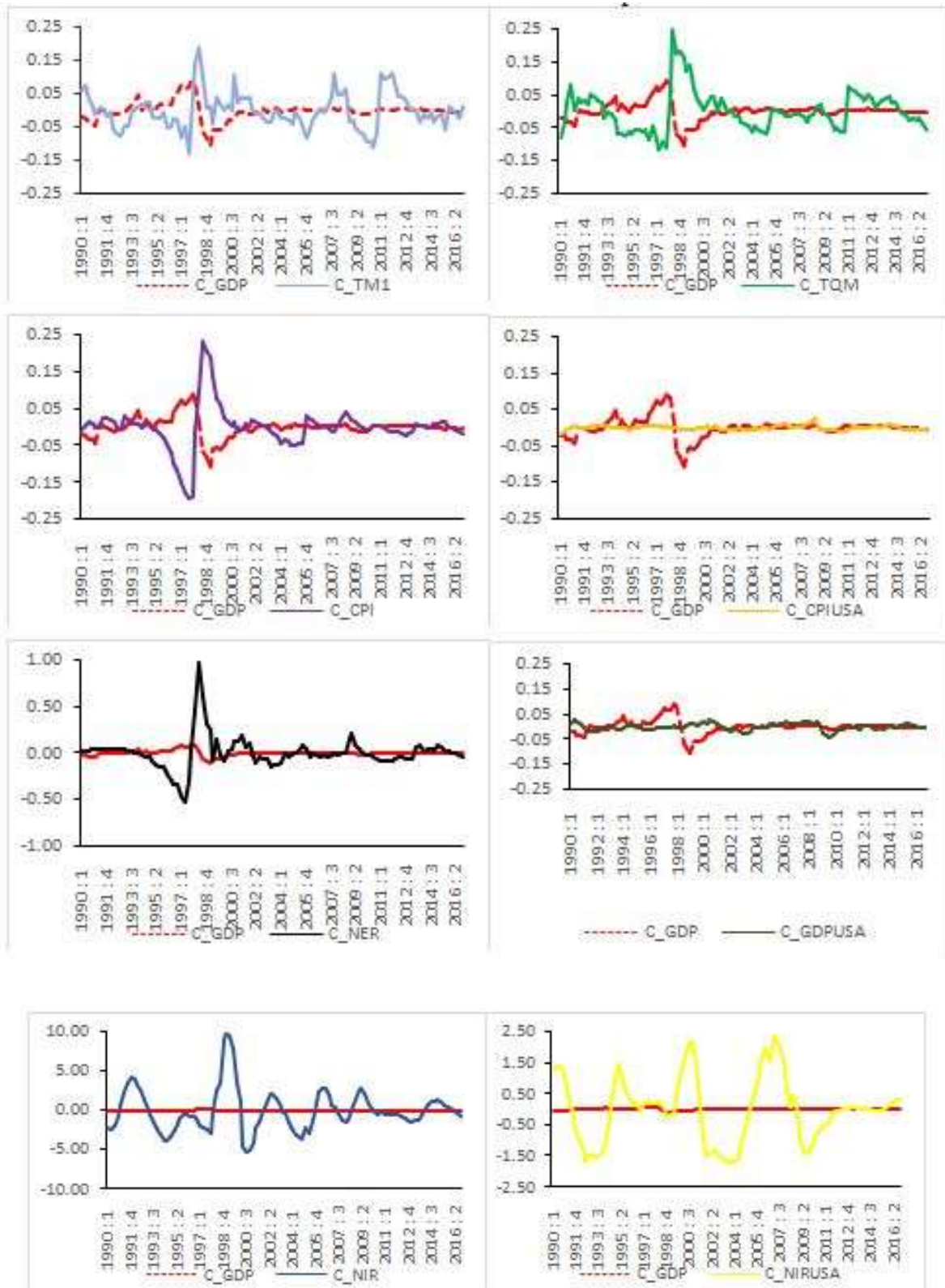
Figure 3: Cross Correlation Between Output and Money Supply

7. Relationship between Output and Monetary Instrument

Vector Error Correction Model

Table 5 summarises the estimated coefficient of VEC model (VECM). From the result, long-term relationship among the variables can be clearly analysed by comparing the value of t-statistic to the value of α (10 percent). Nevertheless, this following table solely present the long-term connection between monetary instruments to the aggregate output of Indonesia. This finding shows us that both interest-free and interest-bearing money significantly affect the changes of real output in Indonesia. The increase of one percent interest-free money will also increase the real output of Indonesia by 2.27 percent, whereby increasing in interest-bearing money by one percent will negatively stimulate the economy with account of 2.03 percent.

Table 5. VECM Estimated for Indonesia's Output

Variable	Estimated Coefficient	t-Statistic
NIR (-1)	0.0664	**-2.9623***
LnTM1 (-1)	2.2780	**-3.6031***
LnTQM (-1)	-2.0312	**3.4999***
C	12.5486	-
R Squared (Adj.)	0.3199	-

* Significant at 10% critical value
Source: Authors' Own

However, this study will not necessarily focus on the results presented by the VEC model. In looking at the relationship between monetary instruments, especially money with real GDP, the authors will focus on seeing how real GDP responds to the shocks of its dependent variable, especially interest-free money and interest-bearing money. In addition, the authors also look at how much the real GDP variance can be explained by the shocks of its dependent variables.

8. Forecast Error Variance Decomposition (FEVD)

(Brooks, 2002)states that variance decomposition gives the proportion of movement in the dependent variables associated with the shocks of the variables themselves, in addition to shocks from other variables. Simply, this method allows us to determine the shocks on which independent variables contribute the most to the variance of real GDP. It can be seen from Table 6 that variance of real GDP is dominantly explained by the shock on the variable itself until the period of 60. Other variables that can explain real GDP variance in sequence are CPI, exchange rate, interest-bearing money and interest-free money. Comparing two instruments of money that become the focus of this study, we can see that interest-free money affects the variance of real GDP lesser than any other variable in the model. It also indicates that the use of interest-free money can provide stability for the economy compared to its counterpart (interest-bearing money). Based on Table 6, it can also be seen that shocks in real GDP can be explained by interest-free money for only less than one percent up to 60 periods. In contrast, interest-bearing money accounts for the shock on real GDP for almost three percent over 60 periods.

Table 6. Variance Decomposition of Real GDP

Period	Explained by the Shock of					
	LN_GDP	LN_CPI	LN_NER	NIR	LN_TM1	LN_TQM
1	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	84.52967	10.63154	4.033998	0.403550	0.083215	0.318027
3	79.36516	11.89476	6.996201	0.918776	0.049150	0.775955
4	73.98161	14.46104	8.845362	1.393071	0.097680	1.221227
5	71.47061	15.42494	9.743929	1.750897	0.115485	1.494136
10	65.22507	18.63936	11.05159	2.801879	0.227423	2.054673
30	61.20028	20.95372	11.49644	3.656982	0.312288	2.380289
50	60.50259	21.35523	11.57112	3.807168	0.326772	2.437118
60	60.33433	21.45206	11.58913	3.843389	0.330266	2.450824

Source: Authors' Own

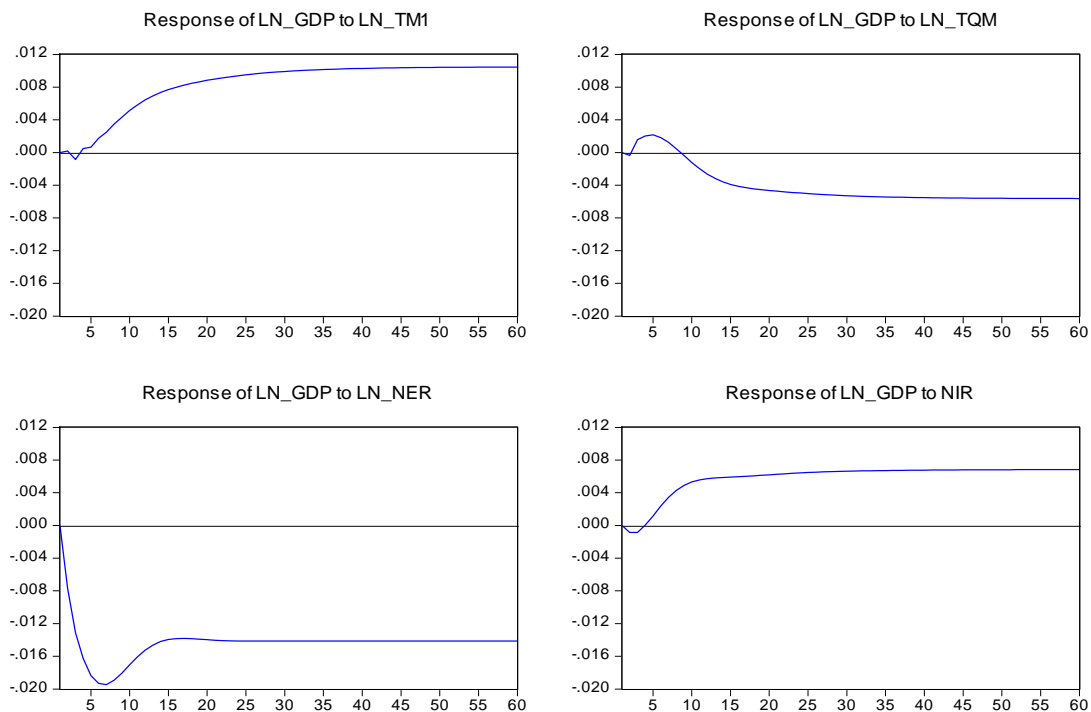## Impulse Response Function (IRF)

Figure 4: Response of Real GDP to One Stand Deviation Shock of Money

The best way to characterise the dynamic structure of a model is to analyse the response of the model to shock. In this study, we used IRF to illustrate the response of each endogen/ dependent variable over time to the variable itself and other variables. Real GDP response to shocks from interest-free money and interest-bearing money by one standard deviation is presented in Figure 4. One standard deviation shock of interest-free money will be responded negatively by real GDP at the beginning of the period. However, this response did not last for long since from period of 3 to 60, real GDP will respond in the positive direction resulting a persistent response at the period of 48 accounted from 0.8 to one percent. This indicates that real GDP takes a relatively prolonged period (48 quarters) to re-stabilize after the shocks.

Unlike interest-free money, the shock of interest-bearing money for one standard deviation is positively responded by real GDP for the first 8 period. However, starting from period 9 real GDP will be responding positively until it reaches the stability at the period of 39 with response rate of 0.5 percent. Interestingly, the response of real GDP when there is one standard deviation shock from exchange rate is showing negative direction before it reaches its persistent level at the period of 35 with a response rate of 1.4 percent. This could be a sign for the government that the severe depreciation in the exchange rate could worsen the economy and it takes a long time to achieve stable conditions.

Conclusion

The main aim of this study is to analyse the basic characteristics of Indonesian business cycle and the relationship between output and monetary instruments during the last three decades. For that purpose, the authors utilise Hodrick-Prescott filter, cross correlation and VAR/ VEC model to analyse annual time-series data collected from several sources. The authors find that during the observed periods, Indonesian economy has experienced at least two cycles. The longest and deepest cycles occurred between the periods of 1997:4–2005:1, whereby it needs 29 quarters to reach the peak condition. At that period, the economy of Indonesia experienced the trough phase where the total of output it could produce 10.58% below its potential.

In terms of volatility, interest rate and exchange rate are having the highest rate of volatility, while interest-free and interest-bearing money are relatively showing a low-level fluctuation during the period of study. In the case of Indonesia, it is found that interest-free money and interest-bearing money as well as exchange rates are becoming leading indicators for the fluctuation of output. Besides, all the variables mentioned earlier are having strong-negative correlation (countercyclical). This negative relationship implies that there is no procyclical monetary policy should be advised. Interest-free money affects the variance of real GDP lesser than any other variable in the model. It indicates that the use of interest-free money can provide stability for the economy compared to its counterpart (interest-bearing money). One standard deviation shock of interest-free money will be responded negatively by real GDP at the beginning. Nonetheless, in the long-run, real GDP will respond in the positive direction resulting a persistent response at the period of 48 with the rate of 0.8 percent on the average.

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