ENDOGENEITY OF INDONESIAN MONEY SUPPLY

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Abstract

There has been a long debate about the endogeneity of money supply. The main objective of this article is to identify whether money supply in Indonesia is an exogenous or an endogenous variable. Using a Vector Autoregressive model and monthly data 1997(5)-2010(6), the estimation result shows that money supply in Indonesia is an endogenous variable. The movement of broad money supply does influence the movement of base money and Consumer Price Index. Consequently, the central bank does not have control power on money supply. The bank is only able to maintain the stability and control the movement of broad money supply.

Keywords: Endogenous variable, money supply, vector autoregression
JEL classification numbers: E51, E52, E58

Abstrak

Perdebatan tentang sifat endogen dari penawaran uang atau jumlah beredar telah lama terjadi. Tujuan utama dari artikel ini adalah untuk mengidentifikasi apakah jumlah uang beredar di Indonesia adalah variabel eksogen atau variabel endogen. Menggunakan model *Vector Autoregresif* dan data bulanan 1997(5)-2010(6), hasil estimasi menunjukkan bahwa uang beredar di Indonesia memilik sifat sebagai variabel endogen. Pergerakan uang beredar dalam arti luas tidak mempengaruhi pergerakan uang inti dan indeks harga konsumen. Akibatnya, bank sentral tidak memiliki kekuatan kontrol pada suplai uang. Bank hanya mampu mempertahankan stabilitas dan kontrol gerakan uang beredar.

Keywords: Variabel endogen, penawaran uang, vector autoregression
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INTRODUCTION

Money is one important element in an economy. In a narrow definition, money is a medium of exchange used for transactions of goods and services. In modern economics, money is defined as something that is available and is generally accepted as a means of payment for the purchase of goods and services and other valuable property as well as for debt payments (McDonough and Caderone, 2006).

In accordance to law of demand and supply, money also has its law of demand and supply. Money supply is the amount of money available in an economy. A monetary policy is meant for regulating this money supply. To control the supply of money is the responsibility of the government through the central bank.

One of the interesting issues in the supply of money is the debate about whether the money supply is exogenous or endogenous. So far money supply (Ms) is generally considered as exogenous when the central bank has the power and full control of money supply. On the other hand, another opinion states that money supply is endogenous. Money supply is no longer given, but there are other variables that influence the money supply. Thus, the money

circulation cannot be fully regulated by monetary policy.

If the money supply is proved as exogenous, then the central bank as an institution that has full authority to control money supply policy is very important in setting monetary policy especially in terms of regulate the circulation of money. Conversely, if the money upply is endogenous, then the central bank no longer had authority in setting monetary policy to control the money supply. This paper aims to prove whether the money supply is endogenous or exogenous in Indonesia, Malaysia, Hong Kong, and the America.

According to Mankiw (2006) the mainstreams argue that the money supply is determined exogenously by the central bank. In other words the money supply is determined by base money that is injected by central bank. How the base money determines the money supply can be evaluated in the credit multiplier equation. Monetarists prove that the credit multiplier is stable so that changes in the amount of base money will change the money supply. This is the rationality of why the money supply is determined by the Central Bank.

On the other hands, most of the reserve is the bank deposits or other claims that are created by the banking system and other financial intermediaries so that base money is endogenous (Lavoie, 1984). Then in the system of credit money the money supply is determined by the demand for credit by businesses for investment. So if the demand for credit is as function of other economic variables then the money supply is endogenous. Further, Lavoie states that the money supply is endogenously determined by the level of output. Therefore, the Post Keynesian uses reverse equation of credit multiplier. It means that base money is as function of the money supply.

Palley (2002) in "Endogenous Money: What It Is and Why It Matters" describes that the endogenous money has been prevalent in economic theories. Contribution of Post Keynesian is the identification of the relationship between bank lending and money supply. The money supply endogenously determined has several important implications. Firstly, if it is found any correlation between the sluggish real economic activity and the contributing of money supply, then this could be absolutely no evidence that the monetary policy is as the cause. Second, the policies to control the money supply through money supply targeting by central banks will likely fail. Third, the fluctuation of the endogenous money supply leads to business cycle and contributes to economic instability.

Haghighat (2011) investigates the endogenous and exogenous of money supply. Specifically, he investigates whether money supply being determined by banking behaviour, or by the behaviour of central bank of Iran. That money is endogenously determined is a proposition of post-Keynesian (PK) economists suggesting that money supply is determined by the behaviour of commercial banks as banks adjust money creation in response to credit demands by the public. This theory challenges the monetarist view of exogenous money supply, where the central bank is said to control money supply. Using the unit root and Johansen cointegration tests to test for stationarity of the variables and whether the variables are cointegrated, and followed by vector error-correction models (VECM) and Granger causality tests to test whether there is one-way or bidirectional causality in the long run and in the short run, he tests whether money is endogenous or exogenous, and if money is endogenous, which of the three views of Post Keynesian theory is supported in this study. More on endogeneous and exogenous money supply can be read in Teigan (1964), Tang (2007), Shanmugam et al. (2003), Spiliotis (1992), and Vera (2001), among others.

Keen (2006) in “The Circuit Theory of Endogenous Money” states that the circuit theory of money in general accepts the

position of the chartalist or the state theory of money with one big difference, namely its model at the outset excludes government sector and gives no explicit role to the central bank (Graziani 2003). Thus the circuitists oppose the chartalist argument that it is impossible to separate the theory of money from the theory of state (Wray 2000). In this sense money to the circuitist is completely endogenous, since money comes into being in the complete absence of any monetary authority.

According to the Circuitist, money is, first and for most, a unit of account transferable in all commodity and service exchanges as final payment. Thus the presence of a taxing government is not necessary for a monetary system to function well. However Graziani (2003) argues that the absence of a tax collecting government requires the fulfilment of the following three conditions for the system to exist; (a) money can only be in the form of a token and cannot be a commodity; (b) the use of money constitutes an immediate and final payment and not just a pledge or commitment to make a payment in the future; and (c) the use of money must be so regulated as to give no privilege of seigniorage to any agent.

Therefore the Circuitist views that all sales in a monetary economy involve three parties: a seller, a buyer, and a bank which transfers the requisite number of units of account from the buyer's account to the seller's. It is clear from this view that the production and enforcement of a unit of account does not need a tax-levying state. This Circuitist pure credit economy is undoubtedly the closest to the essential nature of money, although the Chartalist money is the universal norm today and seems the only viable way to sustainably meet Graziani's third condition in the real world.

The fact that the Circuitists up to know failed to produce a coherent model of endogenous money could have given the impression that the Chartalist position was the correct one, in that a tax-levying state was indeed an essential component of a functional model of money. However Keen (2006) shows that a functional model of a monetary production economy can be built without either a government sector or a central bank, so long as transfers between private bank accounts are accepted as making final settlement of debts between buyers and sellers. Although contradicting the accepted Circuitist dogma his conclusions support its general insights and underlying intuition and importantly are consistent with common sense, namely firms can make monetary profits as well as service debt.

Although Minsky's Financial Instability Hypothesis that in the real world there is clearly a tendency for firms to accumulate excessive debt is currently omitted the model has been so designed that Minsky's insights are possible to be incorporated when other factors treated implicitly in the model are added: production, mark up pricing, capital asset production and pricing, expectations formation. The model is also extendable by incorporating a government and central bank that generate fiat money, in addition to the credit money created by the banks and firms, thereby compatible with Chartalism, despite seeing the state generation of money as secondary to credit money.

METHODS

This study uses quantitative data sourced from International Financial Statistic of IMF. Specifically, the data used and the periods used are as in Table 1.

To achieve the research objectives, this study uses Vector Auto Regression model (VAR). VAR model is closely related to stationary data and co-integration between the variables. In addition, this model assumes that all economic variables are inter-dependent between one variable and another. The first step in the formation of VAR model is stationary test. If the data

is stationary at level, then the VAR model used is the unrestricted VAR. Whether there is any restriction of the VAR depends on the existence of co-integration. If the data is stationary at level, then the co-integration test is not necessary. Conversely, if the data is not stationary at level but it is stationary in differentiation, then the co-integration test should be conducted to see whether the data has a long term relationship or not. If the data is not co-integrated but it is stationary on differentiation then the appropriate VAR model is VAR in difference. Meanwhile, if the data has a long term relationship then the Vector Error Correction Model (VECM) is the right model. VECM model is a restricted VAR model since the co-integration shows long-term relationships of the data (Primiceri, 2005).

Table 1: Data Summary

No	Variable	Symbol	Indonesia
1	Growth of *M*0	*GM*0	1997:05-2010:06
2	Growth of *M*1	*GM*1	1997:05-2010:06
3	Growth of *M*2	*GM*2	1997:05-2010:06
4	Growth of *CPI*	*GIHK*	1997:05-2010:06
5	Growth of *IPI*	*GIPI*	1997:05-2010:06

Notes: *M*0 is base money, *M*1 is narrow money supply, *M*2 is broad money suppy, *CPI* is consumer price index.
Source: International Financial Statistic, IMF.

To detect relationship amongst variables, it regress the VAR equations as follows:

$$G(M0)_{1t} = \alpha_{01} + \sum_{i=1}^{p} a_{il} G(M0)_{t-1} + \sum_{i=1}^{p} b_{il} G(M1)_{t-1} + \sum_{i=1}^{p} c_{il} G(M2)_{t-1} + \sum_{i=1}^{p} d_{il} G(IHK)_{t-1} + \sum_{i=1}^{p} \gamma_{il} G(M2)_{t-1} + e_{lt} \quad (1)$$

Following the VAR estimation is impulse response analysis, variance decomposition and causality test.

The coefficient in the VAR model difficult to interpret individually so that the experts econometric using impulse response analysis. Impulse response is one of the important analyses in the VAR model. Impulse response analysis is to track the response of endogenous variables in the VAR system is a result of the shock or changes in disturbance variables. With the impulse response method can be seen whether the money supply is exogenous or endogenous nature (Wikanti, 2010). The money supply is exogenous if the *GM*1 and *GM*2 response to *GM*0 is positive. It is also exogenous if the *GM*2 response to *GIPI* is positive, and *GM*0 response to *GM*1 and *GM*2 is negative. In addition if the *GIPI* response to *GM*2 is negative, this is also indication of exogenous variable.

Instead, the money supply is endogenous if the response of *GM*0 to *GM*1 and *GM*2 is positive. If the *GIHK* and *GIPI* response to *GM*0 is positive, then it is endogenous variable. In addition, the negative response of *GM*1 and *GM*2 to the *GM*0 as well as the negative response *GM*0 to the *GIHK* and *GIPI* also indicate that the money supply is endogenous.

Decomposition variance illustrates the importance of each variable in the VAR system of shock (shock). Variance decomposit is useful to predict the percentage contribution of variants of each variable due to changes in certain variables in the VAR system.

Final analysis in the VAR model is to find a causal link or causality tests between the endogenous variables in the VAR system. Granger causality test can be used to determine a causal relationship in the data. Presence or absence of causality can be seen from the value of For views of probability.

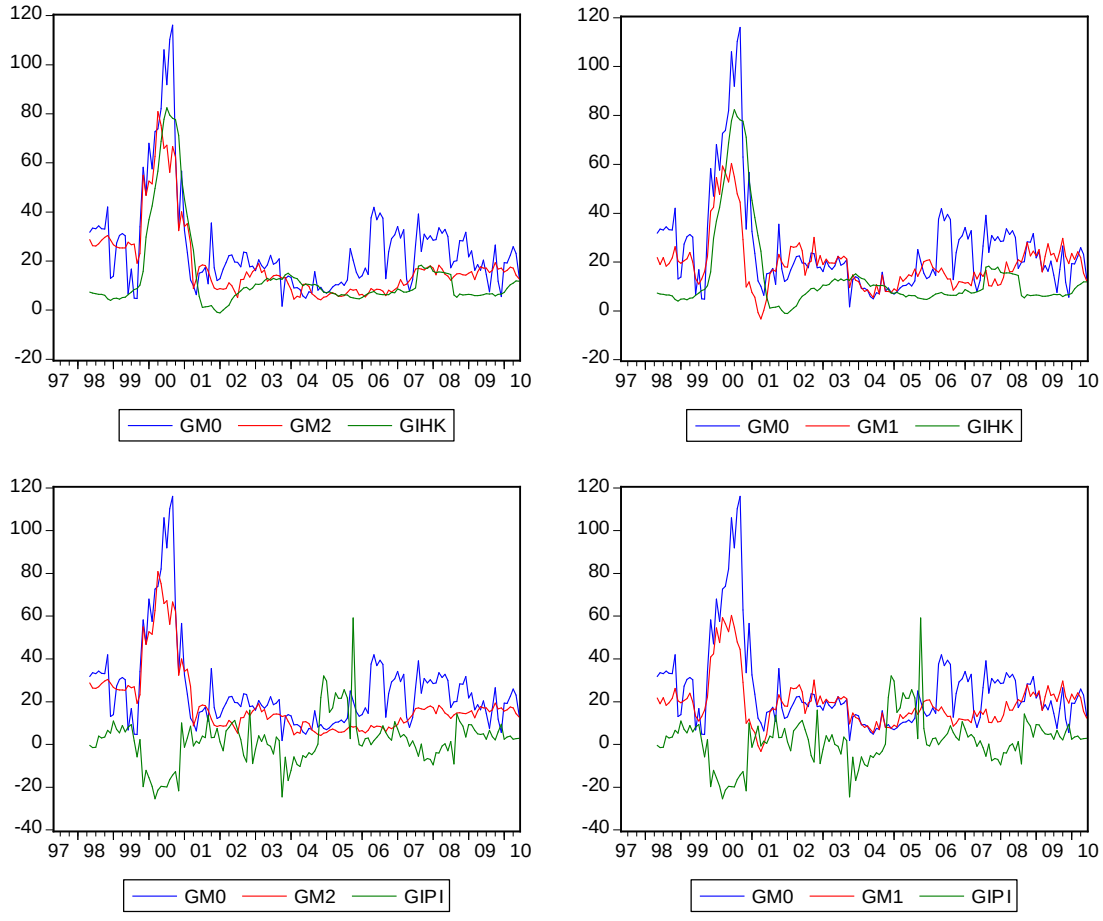
RESULTS DISCUSSION

Figure 1 shows that each variable has interdependence to each others. Refer to the movement direction of *GM*0 and *GM*2 it

explain that these two variables have the same effect. Nevertheless, this graphic analysis cannot able to explain the interrelationships among variables in detail.

Before running the VAR estimation, the stationary test should be performed. The results show that all data has been stationary at level so it can be estimated with a Vector Auto Regression (VAR). Because the variables are stationary but there is no indication of co-integration, then the VAR in level will be used for estimation. The results of the estimated VAR in levels show that a partial test (t-test) yield different values of t-statistic of *GM*0 against *GM*1, *GM*2, *GIPI* and *GIHK* at different lags. Detail of the t-statistic is presented in Table 2. Meanwhile the F test results all variables are jointly significant in influencing the other variables.

Impulse responses are used to see the effect of shock on the present and future value of the endogenous variables. Impulse response can also track the shock effect for several subsequent periods. The result of the impulse response show that *GM*1, *GM*2, *GIPI* and *GIHK* respond negatively to a *GM*0 shock. In other words *GM*0 shock causes a decrease in *GM*1, *GM*2, *GIHK*, and *GIPI*. Conversely, there is a positive response of *GM*0, *GM*1, *GIHK*, and *GIPI* against *GM*2 shock (Figure 2). Therefore, this result suggests that the money supply in Indonesia is indicated as endogenous rather than exogenous variable.



Source: Data calculation.

Figure 1: Graph of Indonesia *GM*0, *GM*1, *GM*2, *GIHK* and *GIPI*

Table 2: Result of Partial*t* Test

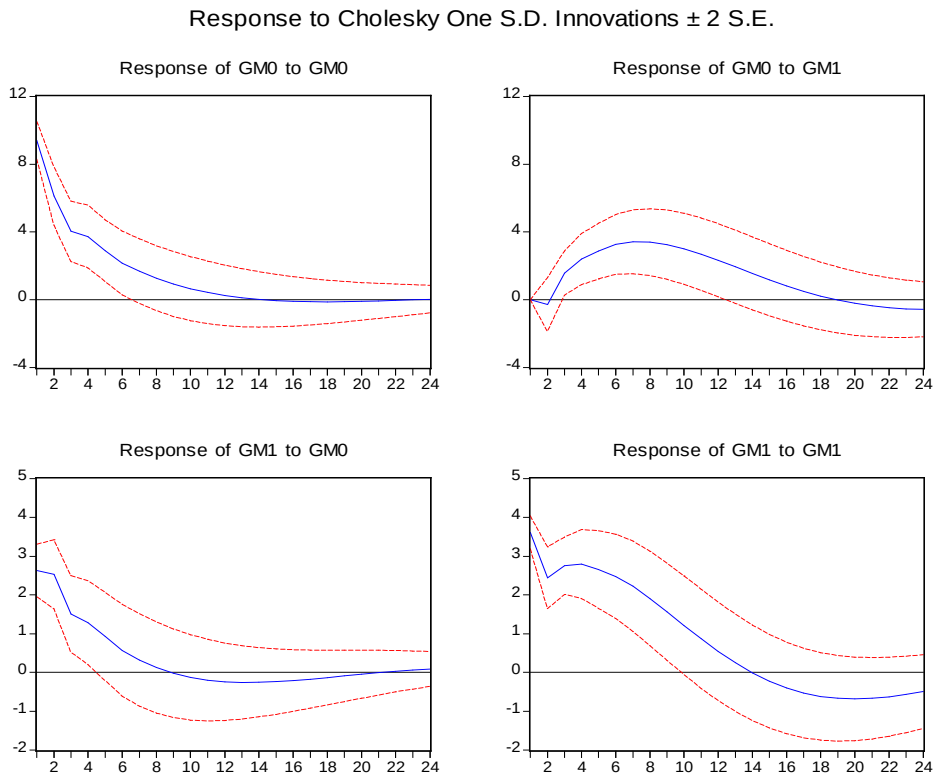
	*GM*0	*GM*1	*GM*2	*GIHK*	*GIPI*
*GM*0(-1)	[5.19337]	[0.87226]	[1.71588]	[2.71237]	[0.97817]
*GM*0(-2)	[-1.82434]	[-3.25113]	[-3.33993]	[-3.28873]	[-0.17040]
*GM*0(-3)	[0.67219]	[0.40146]	[0.21638]	[-2.63920]	[-0.81873]
*GM*0(-4)	[0.68389]	[0.39895]	[0.95513]	[-0.67892]	[-0.79172]
*GM*0(-5)	[-0.69079]	[-0.61052]	[-1.17695]	[2.72953]	[0.41034]
*GM*0(-6)	[2.22572]	[1.42389]	[1.82260]	[0.12966]	[0.84729]
*GM*1(-1)	[-0.01427]	[5.37664]	[-0.21941]	[-1.74213]	[-0.75458]
*GM*1(-2)	[1.41313]	[2.25408]	[2.52632]	[1.89281]	[1.06296]
*GM*1(-3)	[-0.73619]	[-1.14307]	[-1.81519]	[2.44389]	[0.38456]
*GM*1(-4)	[-0.68469]	[0.20656]	[0.21720]	[-0.65532]	[0.12701]
*GM*1(-5)	[-0.26908]	[-0.59639]	[-2.08777]	[-3.69939]	[-0.09277]
*GM*1(-6)	[0.05265]	[-0.37677]	[0.55949]	[1.29653]	[-0.98287]
*GM*2(-1)	[0.18825]	[1.02862]	[6.90660]	[7.64560]	[-1.07726]
*GM*2(-2)	[0.93790]	[1.58862]	[0.11673]	[-1.24442]	[1.28999]
*GM*2(-3)	[-2.01281]	[-1.18429]	[2.06244]	[-2.08443]	[0.35698]
*GM*2(-4)	[1.26410]	[0.27686]	[-1.29236]	[-0.59337]	[-1.61585]
*GM*2(-5)	[1.88637]	[1.05693]	[4.30731]	[-1.88511]	[-0.16876]
*GM*2(-6)	[-2.11053]	[-1.47253]	[-3.23149]	[1.60668]	[0.60517]
GIHK(-1)	[0.90458]	[0.02091]	[0.33989]	[12.2917]	[-2.26273]
GIHK(-2)	[1.08750]	[-0.40274]	[-1.42002]	[-1.58975]	[1.30861]
GIHK(-3)	[-0.71558]	[1.60961]	[2.42350]	[0.79956]	[0.41685]
GIHK(-4)	[-1.31177]	[-1.38695]	[-0.69157]	[0.93782]	[0.33287]
GIHK(-5)	[0.09980]	[-0.46030]	[-0.51615]	[-2.22892]	[-0.28268]
GIHK(-6)	[0.80645]	[1.01743]	[-0.36501]	[0.49406]	[-0.34329]
GIPI(-1)	[0.61636]	[-0.13637]	[-0.26133]	[-0.57338]	[2.10918]
GIPI(-2)	[-1.12919]	[-0.95363]	[-1.15111]	[0.53479]	[2.77487]
GIPI(-3)	[-0.03668]	[1.02526]	[0.56366]	[0.66530]	[2.20465]
GIPI(-4)	[-0.57555]	[-0.24353]	[-0.10486]	[-1.28048]	[0.52247]
GIPI(-5)	[-0.32585]	[0.76932]	[0.43394]	[0.15110]	[-0.55493]
GIPI(-6)	[1.93627]	[-0.05567]	[0.56395]	[-0.09205]	[-0.34059]

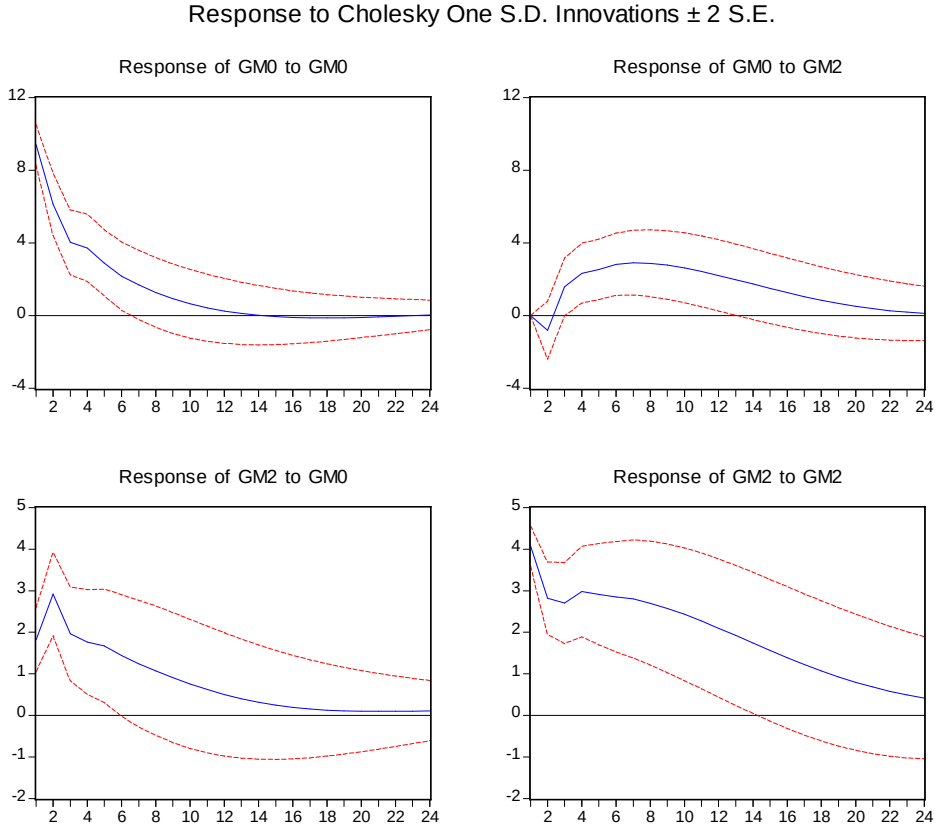
Source: Data estimation.

After performing the impulse response analysis, this article estimates the variance decomposition (Table 3). The variance decomposition of *GM*0 explains that in the first period of shock of *GM*1, *GM*2, *GM*3, and *GIPI GIHK* do not affect *GM*0. In the second period, the variance of *GM*0 explained by the variable itself is as much as 53.42%, while the rest is explained by *GM*1 as much as 21, 39%, by *GM*2 as much as 16.62%, by *GIHK* as much as 3.28%, and by *GIPI* as much as 5, 29%. In this period it can be seen the changes as response from the other variables.

On the variance decomposition of *GM*1, its variance described by the variable itself is as much as 65.38%, and by *GM*0 much as 34.62%. Meanwhile, *GM2*, *GIPI* and *GIHK* do not affect the *GM*1 variance. In the second period the variance began to response the change of the other variables.

The variance decomposition of *GM*2 suggest that in the first period the shock of *GM*2 explained by the *GM2* itself is as much as 72.56%, explained by *GM*0 as much as 14.36%. On the other hands the *GIHK* and *GIPI* do not cause any loss of *GM*2. While in the second period, *GM*2 variance is explained by the variable itself as much as 49.91 percent, by *GM*0 much as 14.37%, by *GM*1 as much as 27.13%. In the second period influence of *GM*2 to itself start to decline.


Response to Cholesky One S.D. Innovations ± 2 S.E.
Response of GM0 to GM0
Response of GM0 to GM1
Response of GM1 to GM0
Response of GM1 to GM1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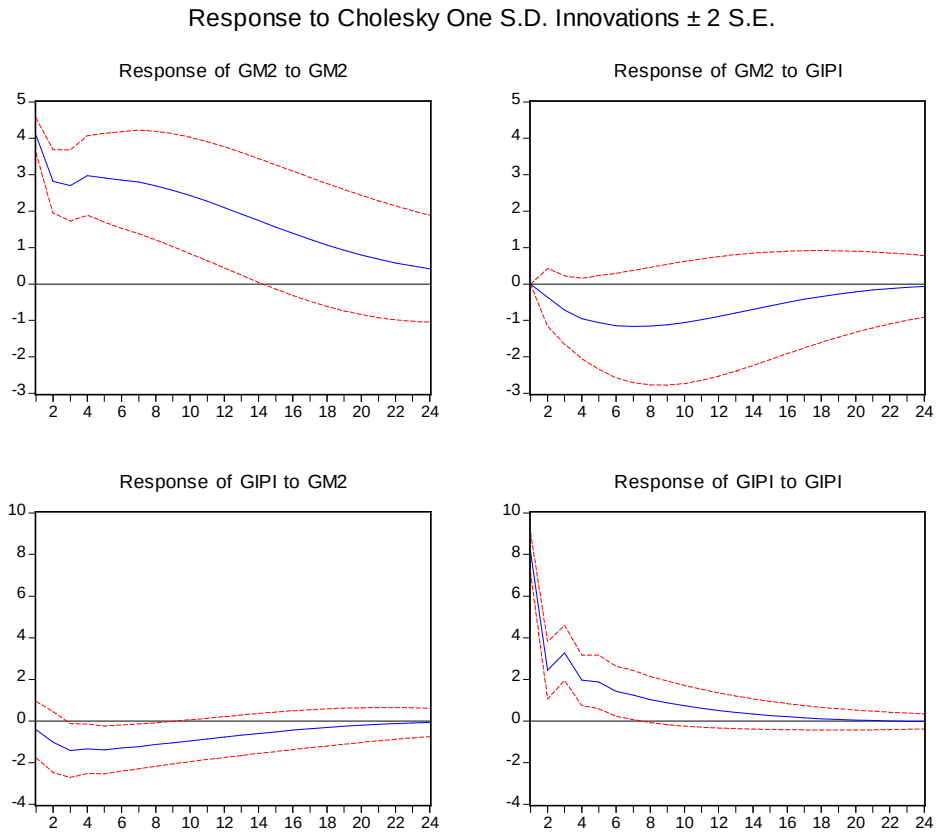
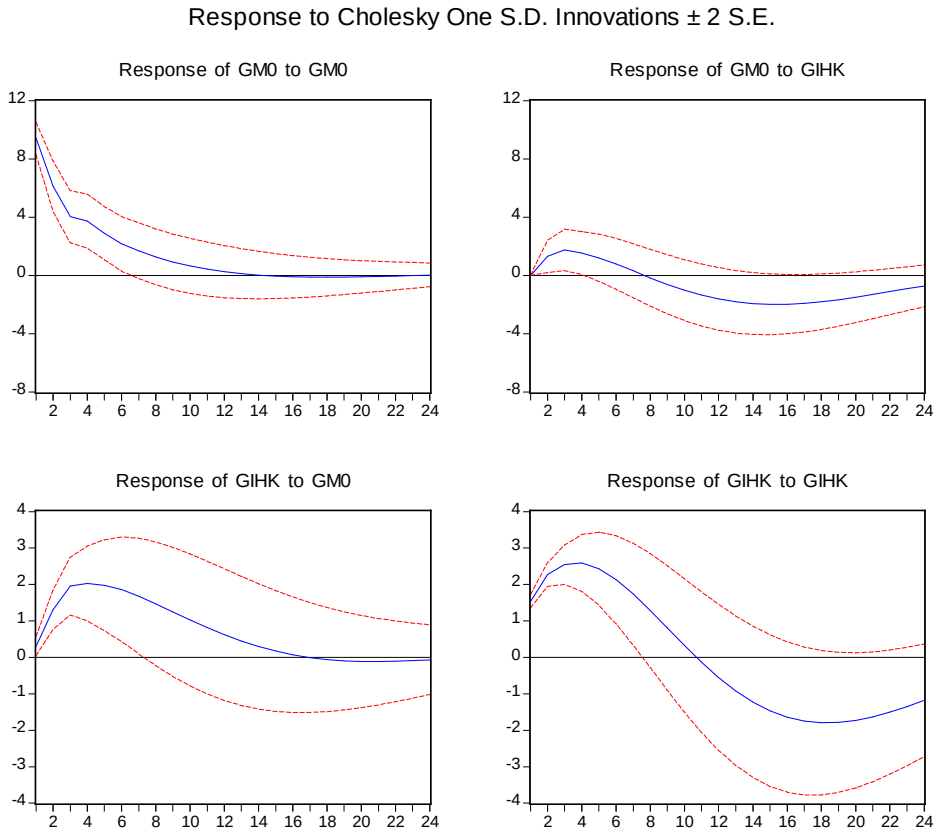
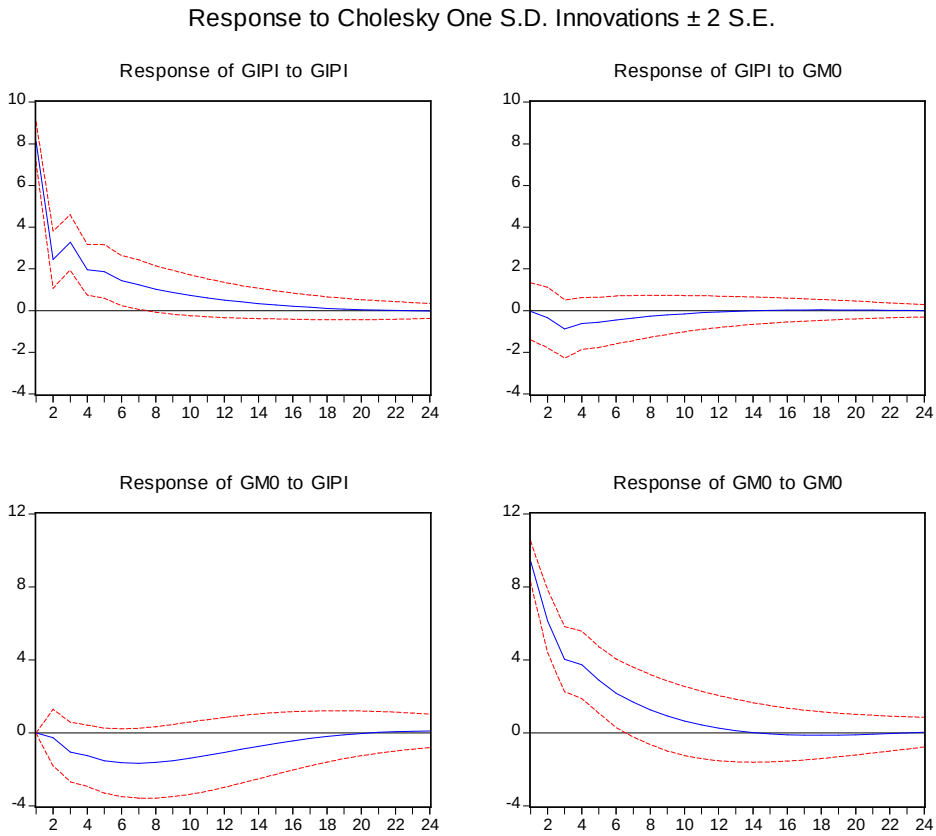

Response to Cholesky One S.D. Innovations ± 2 S.E.
Response of GM2 to GM2
Response of GM2 to GIPI
Response of GIPI to GM2
Response of GIPI to GIPI


Response to Cholesky One S.D. Innovations ± 2 S.E.
Response of GM0 to GM0
Response of GM0 to GIHK
Response of GIHK to GM0
Response of GIHK to GIHK



Source: Data calculation.

Figure 2: Impulse Responses

The first period variance of *GIHK* described by the variable itself is as much as 91.81%, explained by *GM*0 much as 3.69%, described by many as 4.48% *GM*1. Meanwhile, *GM*2 and *GIPI* do not cause any loss of *GIHK*. While in the second period, the variance of *GIHK* explained by the variable itself is as much as 20.11 percent which is much lower than the first period. On the table of variance decomposition of *GIPI*, in the first period the *GIPI* variance described by himself is as much as 97.52%, by *GM*0 as much as 0.001%. In the second period, *GIPI* variance described by the variable itself as much as 74.77% which decrease than in the first period. The causality test is final step in using VAR analysis in which this research uses Granger causality test. This test is to determine the two-way relationship or causality between variables. The result of causality tests are shown in Table 4.

Granger causality test concluded that *GM*1, *GM*2, and *GIHK* have Granger Causality *GIHK* to *GM*0 (Tabel 4). Meanwhile *GIPI* do not have Granger Causality to *GM*0 as well as *GM*2 has no Granger Causality against *GM*1. *GIHK* and *GIPI* have Granger Causality to *GM*1. *GIHK* and *GIPI* have no Granger Causality against *GM*2, and *GIPI* do not have Granger Causality to *GIHK*.

Using 4 lags, Granger causality tests indicates that at four lags *GM*I, *GM*2, *GIHK* and *GIPI* have Granger Causality to *GM*0. Meanwhile *GM*2 and *GIHK* have no Granger Causality to *GM*1, whereas *GIPI* has Granger Causality to *GM*1. *GIHK* and *GIPI* have Granger Causality with *GM*2, while *GIPI* have no Granger Causality to *GIHK* (Table 5).

Table 3: Variance Decomposition

Variance Decomposition of *GM*0						
Period	S.E	GM0	GM1	GM2	*GIHK*	*GIPI*
1	9.408418	100.0000	0.000000	0.000000	0.000000	0.000000
2	18.09977	53.41810	21.38997	16.61642	3.283271	5.292231
3	20.22757	42.85208	22.31708	19.18570	10.25959	5.385557
Variance Decomposition of *GM*1						
Period	S.E	*GM*0	*GM*1	*GM*2	*GIHK*	*GIPI*
1	4.471306	34.61690	65.38310	0.000000	0.000000	0.000000
2	10.23646	17.72789	57.39666	13.85365	8.632525	2.389275
3	11.29467	14.86355	49.41524	12.86494	20.66556	2.190707
Variance Decomposition of *GM*2						
Period	S.E	*GM*0	*GM*1	GM2	*GIHK*	*GIPI*
1	4.787277	14.36995	13.06099	72.56906	0.000000	0.000000
2	13.05210	16.27431	27.13582	49.91529	1.369213	5.305355
3	15.23632	12.40379	26.15027	47.31143	8.565483	5.569032
Variance Decomposition of *GIHK*						
Period	S.E	*GM*0	*GM*1	*GM*2	*GIHK*	*GIPI*
1	1.605209	3.696321	4.488455	5.56E-07	91.81522	0.000000
2	13.47388	13.57633	34.54277	26.22546	20.11687	5.538574
3	17.13277	8.874568	36.97827	28.72607	19.23976	6.181333
Variance Decomposition of *GIPI*						
Period	S.E	*GM*0	*GM*1	*GM*2	*GIHK*	*GIPI*
1	8.207794	0.001654	1.324141	0.249938	0.897303	97.52696
2	11.31419	1.603962	7.708574	10.37666	5.532564	74.77824
3	11.67302	1.520574	8.906162	11.88909	6.629641	71.05454

Source: Data estimation.

Table 4: Two Lags Granger Causality Test

Null Hypothesis:	Obs	*F*-Statistic	Probability
*GM*1 does not Granger Cause *GM*0	144	8.71686	0.00027
*GM*0 does not Granger Cause *GM*1		8.32257	0.00039
*GM*2 does not Granger Cause *GM*0	144	8.78640	0.00026
*GM*0 does not Granger Cause *GM*2		10.8993	4.0E-05
GIHK does not Granger Cause *GM*0	144	12.6104	9.3E-06
*GM*0 does not Granger Cause *GIHK*		15.7930	6.6E-07
GIPI does not Granger Cause *GM*0	144	3.58767	0.03025
*GM*0 does not Granger Cause *GIPI*		1.48847	0.22929
*GM*2 does not Granger Cause *GM*1	144	0.32377	0.72396
*GM*1 does not Granger Cause *GM*2		5.96473	0.00327
GIHK does not Granger Cause *GM*1	144	5.18459	0.00674
*GM*1 does not Granger Cause *GIHK*		16.0016	5.6E-07
GIPI does not Granger Cause *GM*1	144	0.02295	0.97731
*GM*1 does not Granger Cause *GIPI*		2.78781	0.06500
GIHK does not Granger Cause *GM*2	144	1.97431	0.14273
*GM*2 does not Granger Cause *GIHK*		57.5755	6.1E-19
GIPI does not Granger Cause *GM*2	144	1.05935	0.34946
*GM*2 does not Granger Cause *GIPI*		3.49052	0.03318
GIPI does not Granger Cause *GIHK*	144	1.71547	0.18367
GIHK does not Granger Cause *GIPI*		5.02498	0.00782

Source: Data estimation.

Table 5: Four Lags Granger Causality Test

Null Hypothesis:	Obs	*F*-Statistic	Probability
*GM*1 does not Granger Cause *GM*0	142	4.67692	0.00146
*GM*0 does not Granger Cause *GM*1		3.63675	0.00760
*GM*2 does not Granger Cause *GM*0	142	5.20620	0.00063
*GM*0 does not Granger Cause *GM*2		5.44073	0.00043
GIHK does not Granger Cause *GM*0	142	7.29466	2.4E-05
*GM*0 does not Granger Cause *GIHK*		8.93344	2.0E-06
GIPI does not Granger Cause *GM*0	142	1.97134	0.10249
*GM*0 does not Granger Cause *GIPI*		0.49884	0.73661
*GM*2 does not Granger Cause *GM*1	142	1.04845	0.38480
*GM*1 does not Granger Cause *GM*2		4.03767	0.00402
GIHK does not Granger Cause *GM*1	142	2.22153	0.07001
*GM*1 does not Granger Cause *GIHK*		8.07109	7.4E-06
GIPI does not Granger Cause *GM*1	142	0.66028	0.62067
*GM*1 does not Granger Cause *GIPI*		1.41313	0.23304
GIHK does not Granger Cause *GM*2	142	5.59836	0.00034
*GM*2 does not Granger Cause *GIHK*		34.3632	1.1E-19
GIPI does not Granger Cause *GM*2	142	0.99528	0.41254
*GM*2 does not Granger Cause *GIPI*		1.35144	0.25431
GIPI does not Granger Cause *GIHK*	142	0.82366	0.51230
GIHK does not Granger Cause *GIPI*		2.33697	0.05862

Source: Data estimation.

Table 6: Six Lags Granger Causality Test

Null Hypothesis:	Obs	*F*-Statistic	Probability
*GM*1 does not Granger Cause *GM*0	140	3.79490	0.00164
*GM*0 does not Granger Cause *GM*1		2.43018	0.02944
*GM*2 does not Granger Cause *GM*0	140	9.46503	1.4E-08
*GM*0 does not Granger Cause *GM*2		4.71876	0.00023
GIHK does not Granger Cause *GM*0	140	7.81601	3.6E-07
*GM*0 does not Granger Cause *GIHK*		6.30179	8.0E-06
GIPI does not Granger Cause *GM*0	140	1.86692	0.09146
*GM*0 does not Granger Cause *GIPI*		0.56633	0.75646
*GM*2 does not Granger Cause *GM*1	140	2.71521	0.01629
*GM*1 does not Granger Cause *GM*2		4.13386	0.00079
GIHK does not Granger Cause *GM*1	140	2.17588	0.04948
*GM*1 does not Granger Cause *GIHK*		8.11119	2.0E-07
GIPI does not Granger Cause *GM*1	140	0.77449	0.59137
*GM*1 does not Granger Cause *GIPI*		0.96568	0.45128
GIHK does not Granger Cause *GM*2	140	2.05104	0.06358
*GM*2 does not Granger Cause *GIHK*		24.1779	6.0E-19
GIPI does not Granger Cause *GM*2	140	1.04201	0.40135
*GM*2 does not Granger Cause *GIPI*		1.68138	0.13073
GIPI does not Granger Cause *GIHK*	140	0.77436	0.59147
GIHK does not Granger Cause *GIPI*		1.44580	0.20229

Source: Data estimation.

From the Table 6, it can be concluded that *GM*1, *GM*2, *GIHK*, and *GIPI* have the Granger Causality to *GM*0. *GM*2, *GM*1 and *GIPI* have Granger Causality to *GM*1. *GIHK* has no Granger Causality to *GM*2, while *GIPI* has Granger Causality to *GM*2. In addition the *GIPI* has Granger Causality to *GIHK*.

CONCLUSION

This study aimed to analyze whether the money supply in Indonesia was an exogenous or endogenous variable. VAR estimation results indicated that the money supply was endogenous variable. This was indicated by the movement of *M*2 that affected the movement of *M*0 and *CPI*.

It implied that the central bank cannot control the money supply. Thus, the central bank just maintained stability and control the movement of *M*2. In contrast when the money supply was exogenous, then the central bank had the control power to the money supply. So by setting economic policies, the central bank could control the movement of *M*0.

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