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Analysis of money supply in Indonesia: vector autoregression model approach

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ABSTRACT

Endogenous money is a major component of the Post Keynesian economy. This refers to the theory that the existence of money in an economy is driven by real economic upheaval. In this study examines the effect of macroeconomic variables on the amount of money in circulation in Indonesia during the period of global economic recession in 2008 and 2016. The analytical tool used the Vector Autoregression (VAR) in the period of January 2006 - July 2016. From the results of the study, that the variable of Money Supply Amount, BI Rate, Exchange Rates, Government Revenues and Inflation have a long-term cointegration relationship. VAR estimation results in the short-term show that M2 and BI Rate have a positive effect on M2 movement, Government Revenues and Inflation have a negative effect on M2.

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Analisis uang beredar di Indonesia: pendekatan model vector autoregression. Uang endogen adalah komponen utama ekonomi Post Keynesian. Ini mengacu pada teori bahwa keberadaan uang dalam suatu ekonomi didorong oleh pergolakan ekonomi riil. Pada penelitian ini mengkaji pengaruh variabel-variabel makroekonomi terhadap jumlah uang beredar di Indonesia pada periode resesi perekonomian global tahun 2008 dan 2016. Alat analisis yang digunakan adalah Vector Autoregression (VAR) pada periode Januari 2006 - Juli 2016. Dari hasil penelitian, bahwa variabel Jumlah Uang Beredar, BI Rate, Nilai Tukar, Pendapatan Pemerintah dan Inflasi memiliki hubungan kointegrasi dalam jangka panjang. Hasil estimasi VAR pada jangka pendek menunjukkan bahwa M2 dan BI Rate berpengaruh positif kepada pergerakan M2, Pendapatan Pemerintah dan Inflasi berpengaruh negatif terhadap M2.

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1. Introduction

Macroeconomic stability is a fundamental factor to guarantee sustainable economic growth. In the context of maintaining macroeconomic stability, steps need to be taken to strengthen the domestic economy therefore it has resilience to the various economic upheavals emerged, both from within or global factors. In maintaining the resilience of the Indonesian economy, it must be supported by fiscal and monetary policies in an effort to mitigate the impact of the global economy and create conducive macroeconomic conditions. Monetary policy is an illustration of the policies used to overcome economic problems with the main objective of maintaining the stability of the rupiah. This monetary policy is also a weapon to regulate the course of the economy and in particular to control the macro economy therefore it can run as desired, with a number of monetary policy instruments have been determined by policy makers.

Money plays an important role in the conventional theory of the mechanism of monetary policy transmission (Ariff, Chung, & Shamsher, 2012). Endogenous money is a major component of the Post Keynesian economy. This refers to the theory that the existence of money in an economy is driven by real economic requirements - which are combined with market forces and central banks in building money supply (Pollin, 1991). There are two types of monetary policy, namely expansionary monetary policy carried out to encourage economic activity, including by increasing the amount of money in circulation. And contractive monetary policy is carried out to slow down economic activity by reducing the amount of money in circulation (Nanga, 2005).

Along with the slowdown in the global economy, greatly affects to the slowing economic growth in Indonesia. The slowdown in the global economy in the last decade occurred in 2008 related to the *subprime mortage* crisis in America which caused a slowdown in the global economy and also affected Indonesia's economic growth (Sugema, 2012 and Nezky, 2013). In subsequent the global slowdown in 2013 caused by the projected slowdown in growth in European countries and other developed countries has been affected the export demand of other developed countries. The economic growth of China and India in 2013 also experienced a weakening, respectively from 8.5 percent to 8.0 percent and from 6.5 percent to 5.7 percent. This affected declining demand of Indonesia export in 2013, which declined by 3.9 percent and in 2012 it decreased by 6.6 percent from the previous year (Ministry of Trade, 2014). And the high value of inflation in 2013-2014 reached 8.38 percent and 8.36 percent was the highest inflation rate after 2009 although in 2015 it was quite improved with an average inflation rate of 3.35 percent (BI 2015, LPEM UI 2016).

Table 1. Data on World Economic Growth during the Period of Global Economic Slowdown since 2013 (In Percent)

Name of Country	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Brazil	3,96	6,07	5,09	-0,13	7,53	3,91	1,92	3,02	0,10	-3,85
China	12,69	14,19	9,62	9,23	10,63	9,48	7,75	7,68	7,27	6,90
Asia Pasifik	5,71	6,71	3,58	1,32	7,27	4,52	4,72	4,51	4,00	3,89
Franch	2,37	2,36	0,20	-2,94	1,97	2,08	0,18	0,58	0,26	1,16
Indonesia	5,50	6,35	6,01	4,63	6,22	6,17	6,03	5,56	5,02	4,79
Malaysia	5,58	6,30	4,83	-1,51	7,43	5,29	5,47	4,71	5,99	4,95
Turkey	6,89	4,67	0,66	-4,83	9,16	8,77	2,13	4,19	3,02	3,98
USA	2,67	1,78	-0,29	-2,78	2,53	1,60	2,22	1,49	2,43	2,43

Source: World Bank (for several years)

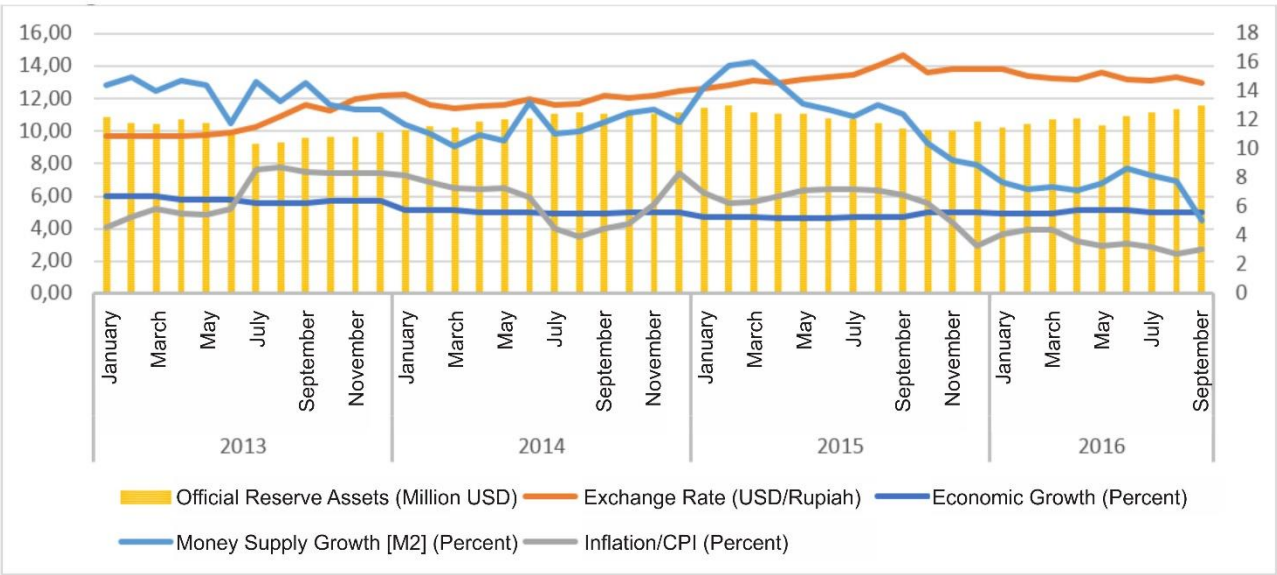

Figure 1. Data of Economic Growth, Inflation Rate, Exchange Rate, Amount of Money Supply and Official Reserve Assets in Indonesia 2013-2016
Source: Indonesia Bank, BPS, The Ministry of Trading (processed by the Author)

For the ratio of growth in the money supply (M2) in Indonesia experienced a downward trend since the beginning of 2015 (Figure 1). M2 growth in September only reached 5.1 percent *yoy* and this was the lowest growth in 2015. This was due to slowing bank credit growth, the existence of government financial operations (pemprus) policies and the impact *of tax amnesty* implementation (Bank Indonesia, 2016). This was also followed by a decrease in the inflation rate in Q2 in 2016. As for the value of Official Reserve Assets at Bank Indonesia, it did not experience a significant change even though the rupiah exchange rate increased due to the impact of falling exports and a slowdown in the global economy.

In this study will examine the relationship of interest rates, exchange rates, income, inflation and the money supply in Indonesia. The analysis tool uses the cointegration and VAR test models. This is expected to present the actual value of the relationship between the available variables therefore able to identify the factors influence the Amount of Money Supply.

2. Literature Review

Theory of Demand for Money

The theory of money quantity began with an explanation of the *equation of exchange* developed by Irving Fisher in 1911, namely:

$$M\,V_t = P\,T \qquad (1)$$

Where M is the money supply, Vt is *velocity* or velocity in a certain period, P is the price level and T is the number of transactions in the economy in a certain period. From this equation the number of transactions has a large role, but statistically it is difficult to calculate. It is assumed that the amount of T can be calculated with Gross Domestic Product (GDP) in real terms. Therefore, the standard form of *quantity theory* is:

$$M\,V = P\,Y \text{ or } P = M\,V / Y \qquad (2)$$

Where V in the standard form of *quantity theory* is the rapidity of velocity explains the velocity of money used for transactions (*velocity of money*). The amount of money is multiplied by the velocity of money which is equal to the national income multiplied by the price level. According to Fisher the factors that influence the velocity of money are the characteristics of institutions and technological

development. Both factors according to Fisher develop slowly therefore the velocity of money can be said to be constant (Bofinger 2001, Miskhin, 2008). If V is considered constant, then the factors that influence money demand are the level of income and price.

Linkage Amount of Money in Circulation

In Keynes's theory, the demand for money has a negative relationship with interest rates. (Nopirin, 1992). A higher interest rate causes lower money demand. The theory of liquidity preference: Keynes's theory that interest rates has an influence to the perspective of liquidity holders.

Interest rates can be assumed as exogenous variables (Lavoie, 1996; Smithin, 1994; Wray, 1995). The nominal interest rate is exogenous because it is already regulated by the central bank and the exogenous interest rate is determined in accordance with internal policies and macroeconomic objectives (Lavoie, 1992; Moore, 1988). Research related to the interest rates on the money supply has been carried out by Sriram (2002), Angraini (2012), Ben-Salha and Jaidi (2014), and Saputra (2016).

The impact of changes in the effective nominal exchange rate on money demand is considered an empirical problem. Appreciation of the effective nominal exchange rate of the domestic currency influences money demand positively or negatively (Hosain, 2010). Nourzad and Macgibany & Nourzad (1995) stated that if there is an imbalance in the demand for foreign money, it will cause an imbalance in the demand for the money supply. This is also consistent with the opinion of Mundell (1963) and McKinnon (1982). Research related to the exchange rate on the money supply has been carried out by Nourzad and Macgibany (1995), Tang (2003) and Ben-Salha and Jaidi (2014).

a. Economic Activity through Government Revenues

   Economic activity can be demonstrated through the amount of government revenue, government revenue is a system of regulating and controlling fiscal policy. This means that the greater government revenue indicates the higher economic activity of a country.

b. Inflation

   According to Setiadi (2012), the relationship between money demand can be seen from the money demand equation. The public wants to hold money for the purpose of the transaction of goods and services. If the prices of goods and services increase, the tendency is for people to prefer holding money. When inflation occurs means that the amount of money in circulation in society is abundant, causing the value of the currency to fall. The relationship between inflation and money demand is positive if inflation raises then the money supply or demand for money will also increase. Vice versa if inflation falls, the amount of money circulating in society also falls. Research related to the value of inflation on the money supply has been carried out by Sriram (2002), Ben-Salha and Jaidi (2014), and Saputra (2016).

Sriram (2002) observes the relationship and stability of money demand in Malaysia by assuming that each variable is an endogenous variable, namely M2, interest rates, inflation and credit interest rates using the *error correction models* (ECM) method with the analysis year from August 1973-December 1995. This research is to estimate the level of money demand in the long-term. In this study that in the long-term, each variable has a relationship with one another, whereas in the short-term the stability of money demand is more influenced by external factors.

Ben-Salha and Jaidi (2014) examine the factors of real income namely the Consumption Price Index (CPI), investment, export value and the interest rate on the demand for the amount of money in the country of Tunisia. In this study using the method of applying *autoregressive distributed lag* (ARDL) with the period 1979-2011. In the *error correction model* shows that money demand is only influenced by the interest rate and expenditure on investment goods in the short-term, while in the

long-term CPI and interest rates is the main determinant of money demand, this is in accordance with the research of Sriram (2002) and Saputra (2016). Meanwhile, if using *fully-modified ordinary least square* (FMOLS) that the level of *gross domestic growth* (GDP) significantly influences the amount of money demand, this is in the same opinion with Angraini's research (2012).

Nhor and Adamec (2016) examined the demand and stability of money in Ghana using the ECM method to determine the factors that influence the aggregate of real money in 1990 to 2014. The variables used are the level of GDP and Interest Rates. The results show that, GDP affects the level of money demand in the long-term, while the interest rate affects it in the short-term. Hossain (2010) examined the behavior of money demand widely in Bangladesh using annual data during the period of 1973-2008, the variables used were GDP, domestic interest rates, foreign interest rates and exchange rates. The empirical results showed that the function of money demand by the open economy remained stable in Bangladesh since the early 2000s. Empirical results also show a causal relationship between growth in the money supply and inflation. Other studies related to GDP on the money supply also conducted by Macgibany and Nourzad (1995), Angraini (2012) and Ben-Salha and Jaidi (2014).

Ariff et al. (2012) examines Friedman's proposition in liquidity theory by using 3 research models namely stock prices, liquidity and money supply. The money supply is influenced by GDP, reserve money, inflation and the Treasury bill rate. Results of estimation show that all variables have a significant influence according to the theory built, GDP, reserve money, stock prices have a positive effect while treasury bill rates and inflation have a negative effect. Chung & Ariff (2016) examined the effect of this liquidity on non-bank share prices in four major Asian economies. Using quarterly data from 1966-2012, using a single equation and cointegration test on the dynamic OLS method, the results show that changes in the money supply lead to liquidity effects are positive as Friedman's theory.

Asongu, Folarin, and Biekpe (2019) examined the stability of money demand in the proposed West African Monetary Union (WAMU). This study uses annual data for the period 1981 to 2015 from thirteen of the fifteen countries which form the Economic Community of West African States (ECOWAS) with the ECM method. The variable approach used is money supply, GDP, inflation, exchange rates and foreign interest rates. Nayan, Kadir, Abdullah, and Ahmad (2013) examined the application of endogenous money theory using the variable money supply, gdp, banking credit and inflation using a panel dataset from 177 countries from 1970-2011 and dynamic panel data analysis. The results show that the money supply is endogenous as proposed by Post Keynesian theory.

3. Research Method

Research Variables and Empirical Models

The money supply can be expressed as endogenous variables after the Keynesian economic thought. Where the money supply is influenced by macroeconomic factors, where the market balance and monetary policy adopted by the central bank have a role in maintaining the stability of the money supply (Pollin, 1991). And the exogenous variables chosen are interest rates, exchange rates, economic activity and inflation. Explanations regarding variables can be seen in Table 2.

Sources of data used were obtained from data published by Bank Indonesia. The research observations used monthly *time series* data from January 2006 to July 2016 with a total sample of 127 observations. The reason for choosing the analysis year was the global economic turmoil in 2008 caused by the subprime mortage crisis in America which had a pervasive impact on the economy in Indonesia (Sugema, 2012) and in 2013 due to the devaluation of the yuan currency which resulted in

a decline in the demand of Chinese import, therefore also affects the economic slowdown in Indonesia (Indonesian Bank, 2015).

Table 2. Descriptive Variable

Variabel	Definisi Variabel	Source
Amount of Money Supply	Amount of Money Supply stated in M2	Bank Indonesia
Interest Rate	BI Rate	Bank Indonesia
Economic Activity	Central Government Revenue	Bank Indonesia
Exchange Rate	Average selling and buying value of rupiah against USD (Data is taken at the end of the month calculation)	Bank Indonesia
Inflation	Annually Inflation Value (yoy)	Bank Indonesia

From the explanation above, the econometric model will be presented is:

$$m = f\ (r, y, e, inf) \quad (3)$$

Where the amount of money supply (m) is derived from equation (2), which depends on interest rates (*r*), exchange rates (*e*) and inflation (*inf*). This refers to the similarities in the research of Tang (2004), Ben-Salha and Jaidi (2014), Ariff and Chung (2016).

Research Method

This study uses the econometric approach of *vector autoregression* (VAR), the VAR approach is very commonly used to analyze the impact of monetary policy on economic variables (Prastowo 2007). VAR model is system equations where more than one variable treated as endogenous and variable values regressed towards the dependent variable remain in the system. In the stochastic process in VAR p order can be written by:

$$y_t = Ai\ y_{t-1} + ... + A_p y_{t-p} + \mu_t \quad (4)$$

and for the bifariat model: $y_t = Ai\ y_{t-1} + ... + A_p y_{t-p} + Bi\ x_{t-1} + ... + B_p x_{t-q} + \mu_t$

where *yt*, *t* = 1, ..., T, is the vector K x 1 of the time series, A is the parametric matrix K x K. *xt* is the vector M x 1 of the exogenous variable and B is the K x M coefficient matrix estimated. µt represents the term random term. In the VAR method if applied to the function of the money supply in equation (4), it can be derived with the following equation:

$$Ln\ Ms_t = \alpha + \sum_{j-1}^{p} Ln\ r_{t-j} + \sum_{k-1}^{p} Ln\ y_{t-k} + + \sum_{l-1}^{p} Ln\ e_{t-l} + + \sum_{m-1}^{p} Ln\ inf_{t-m} + \mu_t \quad (5)$$

Where:

Ms : is amount of money supply (IDR)

r : interest rate (%)

e : Exchange Rate (USD/IDR)

y : Government Revenue (IDR in Billion)

inf : Inflation (Inflation Level)

Unit root and co-integration test

In the timeseries model it is necessary to form stationary data, prior to establishing the model for analysis, it is necessary to apply a stationary test. Standard methods for checking stationary sequences are the unit root test is ADF (*Augmented Dickey Fuller*), Phillips-Perron (PP), KPSS (Kwiatkowski Phillips Schmidt Shin) from unit root tests to prove stationary tests and co-integration for long-term balance.

4. Result and Discussion

In Table 3 is an explanation related to descriptive statistics on research data. When viewed from the Skewness value, all variables have values > 0 except for the variable of Ln M2 and Ln Revenue and there is no significant difference or move away from 0, meaning that the average data slope tends to be skewed to the left and tends to be normally distributed. When viewed from the value of Kutrosis, the observation data tend to have homogeneous properties because the average data has a value of > 0 and the variable of Revenue, BIRATE and Inflation have a value of kurtosis> 3.

Table 3. Data Description

	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Probability
M2	2703887.0	2471206.0	4737451.0	1194939.0	1087751.0	0.322225	1.790821	9.934735	0.006961
LnM2	14.72547	14.72022	15.37101	13.99361	0.420299	-0.115851	1.749524	8.558613	0.013852
EXCHANGE	10328.43	9430.00	14650.00	8496.00	1655.49	0.948035	2.481647	20.445780	0.000036
LnEXCHANGE	9.23086	9.15165	9.59220	9.04735	0.151212	0.823751	2.211841	17.650120	0.000147
INF	6.775433	6.260000	17.920000	2.410000	3.274647	1.479066	4.981985	67.092050	0.000000
LnINF	1.81498	1.83418	2.88592	0.87963	0.435314	0.338321	2.927687	2.450425	0.293695
BIRATE	7.616142	7.500000	12.750000	5.750000	1.700197	1.523725	5.121386	72.957390	0.000000
LnBI_RATE	2.00895	2.01490	2.54553	1.74920	0.200561	0.996457	3.731085	23.845270	0.000007
REVENUE	94374.16	87738.40	284446.60	26248.90	40987.90	1.388935	6.617661	110.088000	0.000000
LnREVENUE	11.36714	11.38211	12.55830	10.17538	0.425693	-0.19097	3.259443	1.128122	0.568894

In the description of research data, M2 time series data tends to have a growth trend of each observation data with an average growth of 1.11%, the highest growth in 11/2007 in the amount of 5.78% and the lowest in 12/2007 of 3.22%. For other data tends to have a volatile trend, the exchange rate data has increased in 2008 then returned to the point below 10,000 in the 4th quarter of 2019, then increased again in> 10,000 semester 11 of 2013, the highest value reached at IDR 14,650 / USD at 09/2015 and the lowest value at 07/2011 which was IDR 8,496 / USD.

BI Rate shows data that tend to be flat in several observation periods, because the BI Rate is determined by the authority of Bank Indonesia as an instrument of monetary policy. The highest BI Rate is at the value of 12.75% in January - April 2006 and the lowest is 5.75 in February 2012 to May 2013. The Government Revenue data has a seasonal pattern, which tends to have high values every December each year, the highest value of Revenue is on 12/2015 at IDR 284,446,61218 billion rupiah and the lowest in 02/2006 at IDR 26248.9 billion rupiahs. The inflation value tends to have a pattern that is almost the same as the IDR exchange rate, the inflation value tends to rise in the period 05/2008 namely > 10% then decreased 01/2009 and increase again on 07/2013 to > 8% on 07/2013 and fell on 01/2014, the highest value reached at 17.92% in 02/2006 and the lowest value was at 11/2009 amounting to 2.41%.

Stationary Test & Cointegration

The results of the Augmented Dickey-Fuller (ADF), Phillips-Perron (PP) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) stationer tests can be seen in Table 4. The results of the unit root test stated that with the ADF method, only the BI Rate and Inflation variables stationary with a significance level of 10% and 5% respectively, and in the PP method only BI Rate, Government Revenue and Inflation rates are significant at 1% and 5%, respectively. And in the KPSS method the LM-test value of each variable has been stationary at the significance level of 1%. At the First Difference level, with the PP method all variables are stationary, in the ADF method only the M2 variable is not stationary, and the KPSS method, the LM Test value is only the M2 variable and the BI Rate has been stationary.

Table 4. Unit Root Test

Variables	Lavel			First Difference		
	ADF	PP	KPSS	ADF	PP	KPSS
LnM2	-1.881691	-1.943745	1.373516***	-2.395379	-15.29306***	0.304001***
LnBI RATE	-2.883284*	-2.633863*	0.692814***	-4.927342***	-4.951479***	0.268867**
LnEXCHANGE	-0.510506	-0.705594	0.839504***	-8.689966***	-9.617250***	0.137688
LnREVENUE	-2.015670	-6.800331***	1.258786***	-9.531373***	-47.20010***	0.208721
LnINFLASI	-3.157313**	-2.653891*	0.387313***	-7.932981***	-7.950599***	0.079310
M2	1.253732	3.466098	1.358279***	-1.978150	-14.2905***	0.721055***
BI RATE	-3.426598**	-3.147201**	0.715433**	-4.454067***	-4.499464***	0.343070***
EXCHANGE	-0.512989	-0.663031	0.847555***	-9.963164***	-9.940902***	0.142487
REVENUE	-1.272637	-8.730721***	1.402775***	-10.05408***	-58.72207***	0.204232
INFLASI	-3.812049**	-3.170362**	0.497177**	-8.802307***	-8.848538***	0.140906

** donate significance lavel 10%, ** donate significance lavel 5%, *** donate significance lavel 1%*

The Johansen Cointegration Test was applied in this study because the maximum likelihood of the framework involved known to have superior statistical properties with the Engle and Granger approach based on residual levels. The results of the Johansen Cointegration Test show that the null hypothesis of alternative cointegration that there is cointegration by rejecting the significance level at 5 percent, and it is concluded that there is a long-term cointegration vector on more than 1 variable (see Tables 5 and 6). The degree of cointegration can be seen if the statistical value > critical value is at a significant probability level. In the correlation test, the table of correlation matrix shows that all variables have correlations below 80% (Table 7).

Table 5. Johansen Cointegration Test Result in the veriable of Natural Logarithm

No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
Unrestricted cointegration rank test (trace)				
None *	0.524947	141.7992	69.81889	0.0000
At most 1 *	0.178463	48.75791	47.85613	0.0410
At most 2	0.086864	24.18561	29.79707	0.1927
At most 3	0.072601	12.82684	15.49471	0.1213
At most 4	0.026875	3.405383	3.841466	0.0650
Unrestricted cointegration rank test (maximum eigenvalue)				
None *	0.296061	42.82976	33.87687	0.0033
At most 1	0.184175	24.83379	27.58434	0.1081
At most 2	0.117831	15.29539	21.13162	0.2687
At most 3	0.056773	7.130668	14.26460	0.4738
At most 4	0.020393	2.513720	3.841466	0.1129

Note: Tests indicate 1 & 2 cointegration eqn(s) at 0.05 level

Table 6. Johansen Cointegration Test Result

No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
Unrestricted cointegration rank test (trace)				
None *	0.3409	114.9919	69.8189	0.0000
At most 1 *	0.2388	64.1312	47.8561	0.0007
At most 2 *	0.1631	30.8365	29.7971	0.0378
At most 3	0.0660	9.1149	15.4947	0.3549
At most 4	0.0064	0.7839	3.8415	0.3760
Unrestricted cointegration rank test (maximum eigenvalue)				
None *	0.3409	50.8607	33.8769	0.0002
At most 1 *	0.2388	33.2947	27.5843	0.0083
At most 2 *	0.1631	21.7216	21.1316	0.0413
At most 3	0.0660	8.3310	14.2646	0.3461
At most 4	0.0064	0.7839	3.8415	0.3760

Note: Tests indicate 1 or 3 cointegration eqn(s) at 0.05 leve

Table 7. Table of Correlation Matrix

	LnM2	LnBI_RATE	LnEXCHANGE	LnREVENUE	LnINF
LnM2	1.00000	-0.61900	0.71577	0.73056	-0.41815
LnBI_RATE	-0.61900	1.00000	-0.03637	-0.52345	0.76022
LnEXCHANGE	0.71577	-0.03637	1.00000	0.42591	-0.05542
LnREVENUE	0.73056	-0.52345	0.42591	1.00000	-0.32913
LnINF	-0.41815	0.76022	-0.05542	-0.32913	1.00000
	M2	BIRATE	EXCHANGE	REVENUE	INF
M2	1.00000	-0.51577	0.79504	0.62658	-0.41300
BIRATE	-0.51577	1.00000	-0.08617	-0.41183	0.83947
EXCHANGE	0.79504	-0.08617	1.00000	0.41079	-0.10399
REVENUE	0.62658	-0.41183	0.41079	1.00000	-0.30788
INF	-0.41300	0.83947	-0.10399	-0.30788	1.00000

Table 8. Output of Estimation Model VAR

	LnM2	LnBI_RATE	LnEXCHANGE	LnREVENUE	LnINF
LnM2(-1)	0.717947	0.004372	0.078572	0.101352	-1.180561
	(0.11867)	(0.13808)	(0.22498)	(2.26065)	(1.04719)
	[6.04981]	[0.03166]	[0.34924]	[0.04483]	[-1.12736]
LnM2(-2)	0.296120	-0.000415	-0.04461	0.755304	1.157364
	(0.11716)	(0.13632)	(0.22212)	(2.23185)	(1.03385)
	[2.52747]	[-0.00304]	[-0.20084]	[0.33842]	[1.11947]
LnBI_RATE(-1)	0.001273	1.506518	0.284602	2.867108	1.723863
	(0.07028)	(0.08177)	(0.13323)	(1.33873)	-0.62013
	[0.01812]	[18.4235]	[2.13615]	[2.14166]	[2.77984]
LnBI_RATE(-2)	0.007368	-0.541288	-0.21315	-3.05626	-1.45920
	(0.06817)	(0.07932)	(0.12924)	(1.29861)	(0.60155)
	[0.10808]	[-6.82404]	[-1.64928]	[-2.35349]	[-2.42575]
LnEXCHANGE(-1)	0.152708	-0.028018	0.974589	1.697209	0.517251
	(0.05098)	(0.05932)	(0.09666)	(0.97123)	(0.44989)
	[2.99519]	[-0.47229]	[10.0830]	[1.74749]	[1.14971]
LnEXCHANGE(-2)	-0.190082	0.020161	-0.074271	-2.079728	-0.667802

	(0.05043)	(0.05868)	(0.09561)	(0.96071)	(0.44502)
	[-3.76907]	[0.34356]	[-0.77681]	[-2.16479]	[-1.50060]
LnREVENUE(-1)	-0.004019	0.004926	0.009414	-0.022946	0.097192
	(0.00594)	(0.00691)	(0.01126)	(0.11317)	(0.05242)
	[-0.67654]	[0.71270]	[0.83588]	[-0.20276]	[1.85403]
LnREVENUE(-2)	-0.006912	-0.007013	0.009409	-0.210083	-0.032221
	(0.00490)	(0.00570)	(0.00929)	(0.09337)	(0.04325)
	[-1.41023]	[-1.22978]	[1.01261]	[-2.25009]	[-0.74501]
LnINF(-1)	-0.009815	0.036867	-0.004029	-0.312232	1.135548
	(0.01007)	(0.01172)	(0.01909)	(0.19182)	(0.08885)
	[-0.97475]	[3.14660]	[-0.21105]	[-1.62777]	[12.7800]
LnINF(-2)	0.008172	-0.027382	0.003352	0.337834	-0.326354
	(0.01006)	(0.01171)	(0.01908)	(0.19168)	(0.08879)
	[0.81220]	[-2.33876]	[0.17570]	[1.76253]	[-3.67563]
C	0.261259	0.088377	0.067097	5.295467	0.815977
	(0.08644)	(0.10058)	(0.16387)	(1.64661)	(0.76275)
	[3.02249]	[0.87870]	[0.40945]	[3.21599]	[1.06979]
R-squared	0.998868	0.992764	0.969917	0.572177	0.913841
Adj, R-squared	0.998769	0.992129	0.967279	0.534649	0.906283
Akaike AIC	-5.545777	-5.242793	-4.266477	0.348304	-1.190787
Schwarz SC	-5.296885	-4.993901	-4.017585	0.597196	-0.941895

Note: Standard errors in ( ) & t-statistics in [ ]

In the Table 7 is the estimated output of the VAR model, in equation 6 is a form of VAR modeling on the M2 variable, from the VAR estimation results that M2 was positively influenced by M2 and BI_RATE in the previous period and negatively affected by REVENUE and INFLATION. As for EXHANGE, it affects positively in the short-term and vice versa in the long- term. More specifically for the value of A coefficient elastic can be seen in equation (6).

$$\begin{aligned}\text{LnM2} = {} & 0.71794*\text{M2}(-1) + 0.296120*\text{LnM2}(-2) + 0.00127*\text{LnBI\_RATE}(-1) + \\ & 0.00736*\text{LnBI\_RATE}(-2) + 0.15270*\text{LnEXCHANGE}(-1) - 0.19008*\text{LnEXCHANGE}(-2) - \\ & 0.00401*\text{LnREVENUE}(-1) - 0.00691*\text{LnREVENUE}(-2) - 0.00981*\text{LnINF}(-1) + \\ & 0.00817*\text{LnINF}(-2) + 0.261258964075 \qquad (6)\end{aligned}$$

From the results of *Impulse Response Functions* (IRF) is a method to indicate the response of endogenous variables to certain variable shocks in the future. In the results of the IRF estimation states that M2 in the short term does not respond to BI_RATE shocks, but in the long term has a negative response to the value less than 1%, on the EXCHANGE variable, M2 responds positively in each period to EXCHANGE shocks and is stable below 1%. The REVENUA variable affects M2 in the short term by 2% and tends to be stable in the long term. In variable shocks, stable inflation is not too responsive to M2 even though on average it tends to respond negatively with very little value.

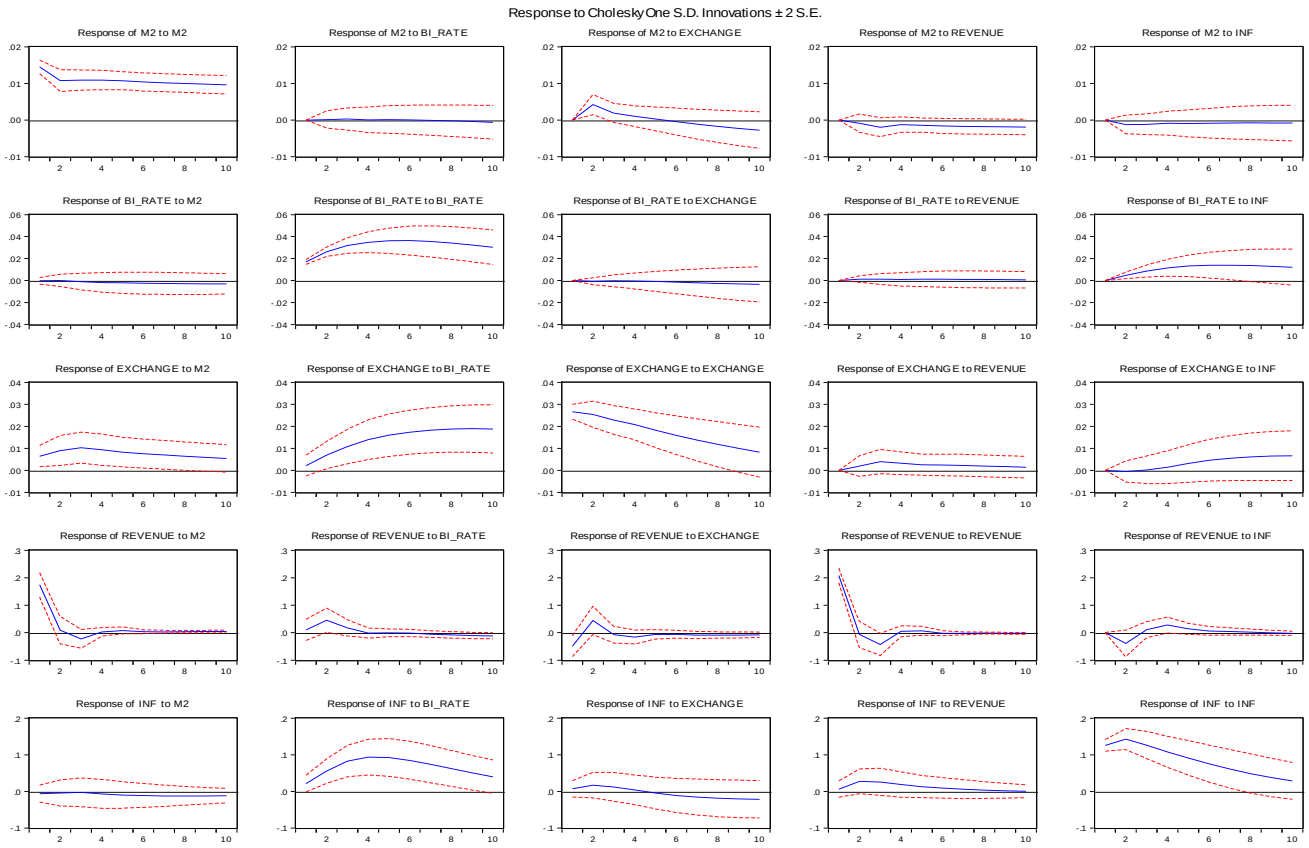

Figure 2. Impulse Response Functions

5. Conclusions

From the results of the study, that the variable Amount of Money Supply, BI Rate, Exchange Rates, Government Revenues and Inflation have a cointegration relationship in the long term and in the stationary test that each variable has been stationary at the first difference. VAR estimation results in the short-term show that M2 and BI Rate have a positive effect on M2 movement, Government Revenues and Inflation have a negative effect on M2. IRF results show different responses to each variable, but the shock to each variable tends to be stable because the average influence is still below 2%.

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