Controlling the money supply from macroeconomics perspective: Saving interest and exchange rate

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Abstract

The M2 money supply over the last five years has tended to increase by 10-12%, which is allegedly due to macro factors, namely, low savings interest and increasing exchange rate requirements, causing rising inflation rates. This research aims to determine the influence of savings interest and the exchange rate on the money supply in Indonesia for the 2004-2023 period. The analysis technique used in this research is linear regression with annual time series data of 20 observation units. This simultaneous model has never been studied by previous researchers. The results of this research analysis provide information that every change in savings interest negatively affects the M2 Money supply by 78.60% and a significant, positive effect between the Exchange Rate and Money in circulation by 78.40%. Meanwhile, simultaneous changes in savings interest and exchange rates have a significant effect on changes in money supply in Indonesia and the influence is substantial at 91.20%. Therefore, the conclusion of this research is, that partially and simultaneously the proposed model exhibits a significant influence between savings interest and the exchange rate on the amount of money circulating in Indonesia. Therefore, it is crucial to pay attention to the current macroeconomic conditions concerning these two factors, especially the stability of the exchange rate, to ensure that it does not increase the money supply and inflation which may reduce people's purchasing power in Indonesia.

Keywords: Savings interest; exchange rate; money supply; inflation

1. Introduction

The superpower country, the United States of America (USA), with its highest Gross Domestic Product (GDP) in 2023 (25.40 trillion USD) was not spared by the surging inflation in the last four years caused by the COVID-19 pandemic. This condition pushed The Fed to increase its interest rates which encouraged other countries to build up their USD reserves to fund their import of raw materials or due to investment speculation. This condition resulted in the increasing number of money in circulation and the potential for inflation.

The circulating money consists of demand deposits, electronic money, currency, money deposited in banks, and term deposits, which are under the supervision of the central bank and the government. Electronic money (e-money) is a shifting of securities in the M1 component (Jayanovita, 2022). It is an increasingly important component of money supply because the supervision includes the M2 component that combines the currency circulating in the community in the form of physical money, e-money, and the demand deposits in the form of bank deposits, checking account, and terms deposits in banks (Ramli and Djumena, 2024). A country with a high money supply will trigger an increase in prices that leads to inflation. Therefore, the control of the money supply is highly influenced by macroeconomic factors such as savings interest, including short-term and term deposit interests, and the stability of the exchange rate which is highly vulnerable toward speculative purchase of foreign exchange (especially USD).

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With its GDP that is lower than 1.50 trillion USD, Indonesia shows a sign that its economics are heavily affected by The Fed interest rate hike in 2022 which recorded the highest increase in the last 15 years with 4.5%. The highest recorded rate has contributed to the economic slowdown in the global economy, particularly in developing countries (Laoli, 2022). The high interest rate imposed on USD had a negative impact on the saving activities in Indonesia and increased people's tendency to build up USD reserves due to future investment opportunities. Bank Indonesia as the central bank took a careful step during the process by delaying the increase of savings interest, which resulted in people's reluctance to save their money. Some people even withdrew their savings and increased the circulated money from IDR 7,687.10 trillion in 2021 to IDR 8,525.50 trillion in 2022, marking a 10.9% increase.

IDR exchange rate towards USD also weakened in 2020-2023 due to the inflation in the USA, leading to increased demand for USD and people releasing their savings, which increases the money in circulation and triggers inflation (Media Indonesia, 2023). If left alone, this condition will increase the money supply (M2), increase import prices, and lower people's purchasing power in Indonesia (Goestjahjanti, 2018). The structure of Indonesia's industry's imports is dominated by raw materials purchasing and supporting materials (74.19%), followed by capital goods (14.46%), and consumption (11.32%), although the government claimed productive industrial growth prospects (Limanseto, 2021). Hence, if the increase in USD exchange rate cannot be controlled it will increase the production costs. This condition doubled with the increased oil price from import will lead to a cost-push inflation (Sugianto, 2023). that will hinder the government's efforts to achieve its productive industrial growth. Table 1 provides the growth of saving interest rate, IDR exchange rate, and money supply in Indonesia.

Table 1. Saving Interest Rate, Exchange Rate, and M2 Money Supply in Indonesia 2012-2023

Year	Saving Interest	Growth	Exchange Rate	Growth	Money Supply	Growth
2012	5.750		9,400.00		3,205.13	
2013	7.250	26.09	11,977.00	27.41	3,584.02	11.82
2014	6.750	-6.90	12,440.00	3.87	4,076.00	13.73
2015	6.250	-7.41	13,795.00	10.89	4,174.20	2.41
2016	5.250	-16.00	13,436.00	-2.60	5,303.30	27.05
2017	4.750	-9.52	13,548.00	0.83	5,350.00	0.88
2018	5.000	5.26	14,481.00	6.89	5,533.70	3.43
2019	4.250	-15.00	13,900.00	-4.01	6,136.00	10.88
2020	2.880	-32.24	14,037.00	0.99	6,900.00	12.45
2021	3.500	21.53	14,269.01	1.65	7,687.10	11.41
2022	3.680	5.14	15,731.00	10.25	8,525.50	10.91
2023	2.750	-25.27	15,416.00	-2.00	8,824.70	3.51

Source: Bank Indonesia, 2023

The average saving interest rate before COVID-19 was 5% which decreased after the pandemic to 3%, indicating that the economy is experiencing a deflation, as a result, people are not willing to save their money. Additionally, the IDR exchange rate towards USD continued to drop from IDR 14,000 to IDR 15,000 per USD after the pandemic. This combination resulted in the increased money supply to above 11% and the potential of inflation, to which the central bank, Bank Indonesia, only intervened in 2023.

Based on the background, the formulated problem is: what is the partial and simultaneous effect of macro economy factors such as saving interest rate and exchange rate on M2 money supply in Indonesia?. Therefore, this study has the following objective: to understand the contribution of saving interest rate and exchange rate on M2 money supply in Indonesia in 2004-2023, partially and simultaneously. This study is expected to support Bank Indonesia in supervising and controlling the money supply to prevent inflation by examining the effectiveness of saving interest rates and exchange rates. The result of this study is also expected to assist the government in achieving productive industry prospects.

2. Literature review

A review of the literature on the existing studies and books on macroeconomy can be conducted digitally in the current digital and computerized era (Rozan and Dewi, 2022). Money supply is the amount of money circulating in the market as a means of transaction. It is a combination of physical and electronic (e-money) money, demand deposits (M1), term deposits, and long-term deposits in banks. Therefore, the M2 money supply includes all cash held by people, checking deposits, and long-term deposits (Magdalena *et al.*, 2023). Based on this definition, controlling the money supply plays a significant role in general because it includes supervising people's cash and savings for investment activities within a certain time in a country (Manihuruk *et al.*, 2024).

Maintaining a stable money supply is crucial in maintaining national currency and pricing. Consequently, national monetary policy can be assessed through its money supply growth. As an example, the Republic of Uzbekistan is currently experiencing a high growth and volatile money supply, which hurts its national economy. This condition requires a new method to ensure a simple, continuous, and stable money supply (Bobakulov *et al.*, 2020).

Saving interest is a macroeconomy indicator to encourage people to save their money in banks. When people are not interested in saving their money in banks, they will be consumptive and spend their money, increasing the amount of money in circulation and causing inflation (demand-pull inflation) (Satria, 2021). A saving interest rate is a percentage of interest paid by banks to depositors for a certain period in a certain number. Saving interest is a benefit provided by banks for their depositors to save their money in the bank (Otoritas Jasa Keuangan, 2024).

According to Samuelson and Nordhaus (2004), the exchange rate is the unit price of a country's currency against another country's currency. Currency is traded in different markets to determine the value of the currency. In Indonesia, it is a common practice to report a firm's financial condition using the middle rate set by Bank Indonesia, which is the average between the selling and purchasing price of a currency (Otoritas Jasa Keuangan, 2024).

Previous studies stated that the positive effect of money supply on IDR currency is diminutive with a PLS regression result of 0.141(Fauji, 2016). Additionally, the study on the effect of term deposit interest rates found a significant effect on people's interest in investing in Depok City, Indonesia (Andriyani, 2013). Based on the previous studies, some gaps need to be explained as a form of scientific research originality. This study has not been examined simultaneously before, hence, providing new findings for research in this topic.

3. Method

The research method aims to describe to explain a condition objectively and openly using numerical data starting from data collection, interpretation, analysis, and reporting (Suharsimi, 2006). Positivist philosophy provides the background for quantitative research and population and sampling selections based on random concepts, with hypothesis analysis conducted using a non-qualitative method (Sugiyono, 2019).

The secondary data analysed in this study is the sequential data for the last 20 years from 2004 to 2023. The first independent variable (X1) is the saving interest rate and the second independent variable (X2) is the IDR exchange rate. The dependent variable (Y) in this study is the money supply in Indonesia. The data needed for the analysis was collected from Bank Indonesia and OJK including saving interest rate, exchange rate, and money supply. All data were recorded in these institutions' research and development reports. The research took around three months from March to May 2024.

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The data were analyzed using linear regression analysis as a popular analysis technique. The analysis was conducted using E-views 10 and SPSS-22 econometric programs. BLUE Test (best linear unbiased estimation) was conducted before the linear regression analysis to ensure accurate and reliable analysis for future research reference (Bauwens *et al.*, 2006). The classical assumption test conducted in this study is as follows Gujarati (2012):

(1) Normality test using One-Sample Kolmogorov-Smirnov Test. A probability result of > 0.05 indicates normally distributed data. (2) Heteroskedasticity test using Run test. A significance score of > 0.5 shows that the model is free from heteroskedasticity issues. (3) Autocorrelation test using Breusch

Godfrey (B-G Test). If the result of the test shows X2 count < X2 table, the data is free from autocorrelation issues. (4) The multicollinearity test is conducted by examining the R Square simultaneous if R Square simultaneous > partial correlation, the data does not contain a multicollinear component.

Table 2 Operational Definition of Variable

Variable	Definition	Data Source	Measurement
(X_1)	Saving Interest Rate The percentage of deposit interest paid by commercial banks to their depositors in one month (OJK, 2023)	Financial Service Authority (*Otoritas Jasa Keuangan*-OJK)	Ratio
$(X2)$	Exchange Rate is the IDR exchange rate against USD at the end of the year (BI, 2023)	Bank Indonesia	IDR/USD
(Y)	M2 Money Supply is the combination of the M1 money supply and quasi-money (BI, 2024).	Bank Indonesia	IDR, thousands of billion

The statistical analysis of relationships, determination, regression model, and hypotheses are conducted using Ordinary Least Square (OLS). This study assumes a linear regression model Pezzey (2015), with the following OLS model as written by Goestjahjanti *et al.* (2023). The research framework in the research paradigm shows the researcher's approach to understanding the issue which they apply as the foundation to answer the research's problems (Guba and Lincoln, 1994).
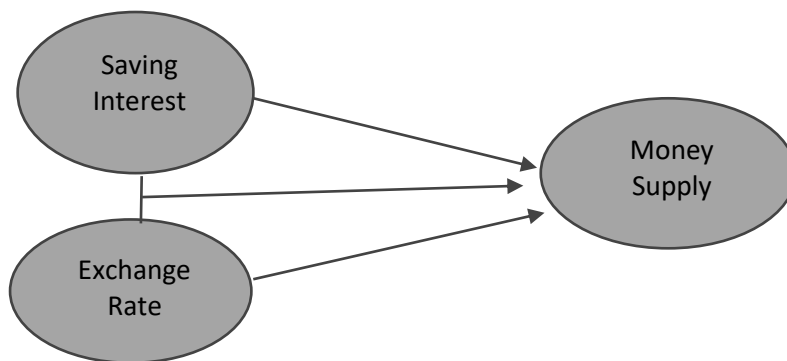
$$Y = b0 + b1X1 + b2X2 + \varepsilon \dots(1)$$

Figure 1. Research Framework

The research framework explains the causal relationships between the independent variables, (X1) and (X2), on the dependent variable (Y). The hypotheses proposed partial and simultaneous effects of saving interest (X1) and exchange rate (X2) on money supply (Y).

4. Results and discussion

The following step is transforming the data into a natural logarithm (Ln) for all research variables. SPSS and E-Views statistical programs are used in the analysis process, summarized as follows in Table 3. The saving interest rate has 20 sets of observation data with a minimum score of 1.011% in 2004 and a maximum score of 2.55% in 2023. The mean score of this variable is 1.76% with a standard deviation of 0.41%. The minimum score of IDR exchange rate is 9.10% with a maximum score of 9.66%. The means score of the variable is 9.37% with a standard deviation of 0.21%. Lastly, the dependent variable, money supply, has a minimum score of 13.85%, maximum score of 15.99%, means score of 15.06%, and standard deviation of 0.67%. These results show that saving interest rate and exchange rate generated 15.06% growth in money supply in the last 32 years (2004-2023), higher than the growth generated by saving interest rate (1.76%) and IDR exchange rate (9.37%) individually.

Table 3. Descriptive Statistics Analysis

	Saving Interest	Exchange Rate	Money Supply
Mean	1.759470	9.365767	15.05760
Median	1.812170	9.409708	15.15631
Maximum	2.545531	9.663389	15.99307
Minimum	1.011601	9.103979	13.84883
Std. Dev.	0.412099	0.207266	0.668841
Skewness	-0.077953	-0.06948	-0.29957
Kurtosis	2.493312	1.343249	1.904423
Jarque-Bera	0.234200	2.303445	1.299381
Probability	0.889496	0.316092	0.522207
Sum	35.18940	187.3153	301.1519
Sum Sq. Dev.	3.226692	0.816222	8.499607
Observations	20	20	20

The descriptive analysis shows that the independent variables simultaneously contribute to the process of controlling the money supply in Indonesia to monitor inflation. The linear regression analysis in this study has fulfilled the classical assumption tests:

➢ Normality test using Kolmogorov Smirnov resulting in Asymp. sig. (Two-tailed) 0.200 > P-value 0.05, indicating that the data is normally distributed.

➢ Multicollinearity using partial correlation generated R2 simultaneous = 0.955 > Partial Correlation -0.771 and 0.768, therefore, the model does not contain multicollinearity issues (Sulianto 2011: 89).

➢ Heteroskedasticity test using Run Test generated Sig. 0.152 for saving interest rate and Sig. 0.051 for the IDR exchange rate. Both are higher than the standard tolerance of 0.05, meaning that the data does not contain multicollinearity issues.

➢ The result of Breusch Godfrey (B-G Test) for autocorrelation shows X2 = (20 x 0.500) = 10.00 and X2 table n=20, df 2, alpha 0.05 = 28.869. Therefore, the X2 count of 10.00 is lower than the X2 table of 28.869, meaning that the model does not show a sign of autocorrelation.

The transformation of all research data into natural logarithm form (ln) aims to ensure accurate and precise analysis results (Berg *et al.*, 2012). Therefore, the statistical analysis generates a valid result:

Table 4. Correlation and coefficient of determination saving interests on money supply

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.887[a]	.786	.775	.31757

a. Predictors: (constant), saving interests

The relationship between saving interest rate and money supply with R= 0.887 shows a very strong relationship between the independent and dependent variables. The saving interest rate's contribution in determining the money supply is represented by R-Square= 0.786, showing a large effect of the saving interest rate (X1) on the money supply (Y). The saving interest rate explains 78.60% of changes in the money supply in Indonesia.

Table 5. Correlation and contribution of exchange rate on money supply

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.886[a]	.784	.772	.31925

a. Predictors: (constant), exchange rate

The relationship between IDR exchange rate (X2) and money supply (Y) is explained through R= 0.886, which indicates a very strong relationship. The R-Square = 0.784, shows that the IDR exchange rate explains 78.40% of the variability in money supply in Indonesia. Hence, the exchange rate has a large effect on the money supply. This finding shows a larger effect of the IDR exchange rate on money supply than the previous study (0.7840 > 0.141) (Fauji, 2016).

Table 6. Coefficient of determination and correlation

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.955ᵃ	.912	.902	.20926

a. Predictors: (constant), exchange rate, saving interest rate

The analysis using SPSS-22 generated R Square = 0.912, indicating that 91.20% of money supply conditions can be explained through saving interest and exchange rate. Hence the independent variables' contribution is large (Winarno, 2015). The result also shows a very strong relationship with R = 0.955, which is close to 1 as the maximum score.

Table 7. Hypothesis analysis

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	17.590	.319		55.123	.000
	Saving Interest Rate	-1.439	.177	-.887	-8.141	.000

a. Dependent variable: money supply

Partial model hypothesis analysis

Table 7 can be determined through statistical data of n = 20, k =2, Stand. Error = 0.05, t two-tailed t table (n-k-1) = 2.110, t count model 1= - 8.141, sig. 0.00 < 0.05. Therefore, it can be concluded that the alternative hypothesis (Ha) is supported, saving interest rate (X1) has a partial, negative, and significant effect on money supply (Y) in 2004-2023.

Table 8 Hypothesis analysis

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-11.706	3.310		-3.536	.002
	Exchange Rate	2.858	.353	.886	8.087	.000

a. Dependent Variable: Money Supply

For table 8, the t count model 2 = 8.087, sig. 0.00 < 0.05. Therefore, the alternative hypothesis (Ha) is supported. The exchange rate (X2) has a positive and significant effect on the money supply (Y).

Simultaneous hypothesis test

Table 6 with F count = 88.485, n = 20, df 2, Alpha= 0.05, and F $_{table}$ = 3.493, because F count 88.485 > F $_{table}$ 3.493 and the significance test shows 0.000 < 0.05, therefore, the model is simultaneously significant. The alternative hypothesis (Ha) is supported, saving interest rate (X1) and IDR exchange rate (X$_2$) simultaneously affected the money supply in Indonesia (Y) in 2004-2023.

The coefficient of determination shows the large size of the independent variables' simultaneous effect on the dependent variable. Thus, the independent variables can be employed to control the money supply growth in Indonesia to prevent inflation that may reduce people's purchasing power.

The multiple regression formula is **Y= 1.039 - 0.839 X$_1$ + 1.654 X$_2$**. Saving interest rate (X1) negatively affects the money supply (Y^). This formula can be interpreted that if X1, X2 = 0, then the Y^ will change according to the constant of 1.039 units. If the constant = 0, the money supply (Y^) is projected to grow into = 0 - 0.839*saving interest rate unit + 1.654*exchange rate unit, with the assumption that all conditions outside the model do not change.

Discussion

This study explains that the low savings interest rate causes people to be consumptive. Makes people reluctant to save or is considered less attractive, which will encourage consumption levels

(Kozlov, 2023). This condition will increase the inflation growth because people are reluctant to save their money. The amount of money in circulation and the inflation rate have a significant relationship (Amhimmid *et al.*, 2021). On the other side, the increasing exchange rate will encourage people to sell IDR, increasing the number of money in circulation. Thus, increasing prices and causing inflation. Nilai tukar dan tingkat inflasi memiliki hubungan langsung di antara keduanya (Monfared and Akın, 2017).

5. Conclusion

The negative and significant effect of saving interest rates on the money supply contributes to 78.60% of the changes in the money supply. The exchange rate has a positive and significant effect on the money supply with a 78.40% contribution. Simultaneously, the independent variables, saving interest rate and exchange rate, contribute strongly to the changes in money supply with 91.23%.

Bank Indonesia and OJK are expected to increase the saving interest rate to encourage savings instead of consumptive activities while avoiding the purchase of foreign currency on a large scale to control the money supply and slow down inflation. High inflation increases prices and lowers Indonesian people's purchasing power. The government is expected to be committed to creating a productive industry to open employment in the future.

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