

Impact of Inflation, Interest Rate, And Use of Electronic Money on The Amount of Money Circulating in Indonesia During the Period 2015–2022

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ABSTRACT

The study aims to determine the impact of inflation, interest rates, and the use of electronic money on the amount of money circulating in Indonesia in the period 2015-2022 both partially and simultaneously. This research uses quantitative research methods. The research model used in the study is the Ordinary Least Square (OLS) model or double linear regression. Data used in this study is data time series in Indonesia from the year 2015-2022 obtained from the official website of the Bank of Indonesia and the Central Statistical Authority which comprises 96 samples. The results of this study show that inflation has a significant and related negative influence on the amount of money circulating in Indonesia during the period 2015-2022. This is demonstrated by a double linear regression analysis with a coefficient of -269859.5. The t-count value of -7.918753 is smaller than the t-table value of 1.66159. The significance value comparison obtained is 0.0000, which is smaller than 0.05. The same is true of the interest rate has significant and relevant negative impact on the quantity of money in circulation in Indonesia between 2015 and 2022. This is demonstrated by double linear regression analysis, with a coefficient value of -172870.6. The t-count value is -3.979156; this value is smaller than the t-table of 1.66159. The significance ratio obtained is 0.0001, which is smaller than 0.05. While the use of electronic money has a significant and positive impact on the amount of money circulating in Indonesia in the period 2015-2022. This is demonstrated by double linear regression analysis, with a coefficient value of 0.028128. The t-count value of 21.69518, this value is greater than the t-table of 1.66159. The relative value of significance obtained is 0.0000, smaller than 0.05. From the results of this research, it is also known that the value of Adjusted R-Squared is 0.926799, this means that 92.6% of the money supply in Indonesia for the 2015-2022 period is influenced by inflation, interest rates and the use of electronic money. The remaining 7.4% is explained by other variables not explained in this study.

Keywords: Inflation, Interest Rates, Use of Electronic Money, Amount of Money in Circulation.

INTRODUCTION

This research provides an understanding of how inflation, interest rates, and the transformation towards the use of electronic money have a real impact on the dynamics of the amount of money circulating in Indonesia. Inflation, as a phenomenon of price rises in general, can affect consumer behavior, investment, and monetary policy. Meanwhile, interest rates, as monetary-policy instruments, play a crucial role in regulating financial returns and determining people's decisions to save or invest. In a modern context, the use of electronic money has become an increasingly relevant aspect, especially with the development of financial technology. The successful implementation of e-money can also reflect changes in society's transaction patterns, affect liquidity, and overall shape the economic structure.

By combining these three variables, the study seeks to provide a comprehensive picture of the factors that shape the amount of money circulating over this relevant period of time. The period 2015–2022 covers a significant timeframe in Indonesian economic dynamics. During this period, Indonesia faces a variety of dynamics, including commodity price turmoil, changing fiscal and monetary policies, and the impact of technology on payment systems. In addition, the study also covers the implementation phases of various national economic policies, including efforts to mitigate the significant impact of the COVID-19 pandemic. Therefore, the period is considered relevant to analyze how inflation, interest rates, and the use of electronic money contribute to the amount of money in circulation, in line with the changes and economic challenges that occurred during the period. By encompassing a broad time context, the study is expected to provide a more holistic insight into the factors that influence the amount of money circulating in Indonesia.

The amount of cash in circulation is the total amount of money officially given by the central bank in the form of cartel money, giral money, and quasi money (savings, currencies, and so on), not just money that is circulating and is in the hands of the public. Simply put, the amount of money in circulation is the total amount of cash available in an economy at a given time, usually during a budget year (Solikin & Suseno, 2017). In its development, the amount of money circulating in Indonesia does not exclude the possibility of increasing or decreasing. The amount of money in circulation is crucial to influencing the level of production and price stability in the economy (Dwihapsari et al., 2021). Through the transmission mechanisms in monetary policy, the influence on the amount of money in circulation can be regulated to remain stable.

In money demand theory, elements such as inflation, interest rates, and the evolution of the use of electronic money play a crucial role in shaping the pattern of money demand by society. The rate of inflation affects the preference of people for the form of money as a means of storing value. The higher the inflation rate, the greater the tendency for people to look for alternative investments or more stable value storage (Amanah et al., 2020). Research conducted by (Al Hafizh, 2022) found that inflation had a significant influence and was positively linked to the amount of money in circulation. However, unlike (Sihombing et al., 2022) findings, inflation is negatively linked and has a significant influence on the amount of money in circulation.

Furthermore, interest rates play an important role in the dynamics of money demand. According to the opportunity cost theory, high interest rates can encourage people to shift their funds to financial instruments that provide greater returns, while lower interest rates may drive a tendency to hold cash as a more flexible form of liquidity (Arwin et al., 2019). The results of (Sudirman et al., 2014) research stated that interest rates can affect the amount of money circulating in society. According to (Harahap & Hafizh, 2020) research, interest rates have a significant negative influence on the amount of money in circulation; in other words, a change in the percentage of interest rates or a significant change in interest rates affects the rate of money.

The evolution of the use of electronic money as a result of technological advances gives a new dimension to the theory of demand for money. The shift in the pattern of public transactions towards non-cash payments reflects adaptation to the facilities offered by electronic money, such as ease, speed, and efficiency. This creates a variation in public preferences for the form of money, which over time can significantly affect the overall dynamics of money demand. According to a study conducted by (Costa & Grauwe, 2021), using electronic money can reduce the need for cash, which in turn can affect the amount of money in circulation. However, based on the field data obtained, the use of electronic money has not completely reduced the amount of money circulating in society. The large number of people who use electronic money payment tools in Indonesia have not been able to fully reduce the use of cartel money in society.

Based on the explanation, the research gap, and the gap between the phenomena and the theory above, this study is expected to answer the formula of the problem in this study, namely: (1) Does inflation have a significant influence on the amount of money circulating in Indonesia in the period 2015–2022? (2) Does the interest rate have a major influence on the quantity of money in circulation in Indonesia during the period 2015–2022? (3) Does the use of electronic money significantly influence the volume of money circulating in Indonesia from 2015 to 2022?

METHOD

In accordance with the background of the problems that have been mentioned earlier, then this research belongs to the type of quantitative research. The data used in this study is secondary data in the form of time series data with monthly intervals. The data in this study comes from sources published through the official website of Bank Indonesia at www.bi.go.id and the Badan Pusat Statistik (BPS) at the www.bps.go.id. In collecting the data and information obtained in this research, the researchers use documentation methods. This data collection is taken from the official web of BPS, BI, articles, books, journals, and other references related to the research submitted. This data collection is obtained from the library and downloaded data from the internet.

Among the samples in the study are inflation in Indonesia, interest rates, the value of electronic money transactions and the amount of money circulated in Indonesia between January 2015 and December 2022, which is 96 samples. The analysis method used in this

study is the double linear regression analysis with the OLS (Ordinary Least Square) method assisted by the Eviews 12 program. In the analysis of double regression noted as follows:

$$Y = a - \beta_1 X_1 - \beta_2 X_2 - \beta_3 X_3 + e$$

$$JUB = a - \beta_1 IF - \beta_2 SB - \beta_3 EM + e$$

Which:

Y : Money Supply (JUB)
a : Constant
 $\beta_1 \beta_2 \beta_3$: Multiple Regression Coefficient
X1 : Inflation (IF)
X2 : Reference Interest Rate (SB)
X3 : E-money (EM)
e : Error Term

RESULTS AND DISCUSSION

Before conducting data analysis, it is vital for researchers to ensure that the quality of the data meets the necessary standards for accurate analysis. One crucial initial step in this process is performing classical assumption testing. This testing aims to confirm that the data utilized in regression analysis adheres to several fundamental assumptions required for reliable and valid analytical outcomes.

Table 1. Normality Test Results

<i>Series</i>	<i>Jarque-Bera</i>	<i>Probability</i>	<i>Description</i>
Residuals	0.938839	0.625365	Normal Distribution

The normality test results showed Jarque-Bera values of 0.938839 with a p value of 0.625365 > 0.05, so the data is normally distributed which means the testing of classical assumptions in the regression model has met the normality assumption.

Table 2. Multicollinearity Test Results

<i>Variance</i>	<i>Variable</i>	<i>Centered VIF</i>	<i>Description</i>
Inflation Vactor	Inflation	2.577263	Multicollinearity does not occur
	Interest rate	3.071933	Multicollinearity does not occur

Use of electronic money	1.604483	Multicollinearity does not occur
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From the above data indicates that each variable has its VIF value < 10 . Based on the classical assumption that a good linear regression is free of multicollinearity, the above model has thus been free of multi-linearity.

Table 3. Heteroscedasticity Test Results

<i>Glejser Heteroskedasticity</i>	<i>Probability Chi- Square</i>	<i>Description</i>
	0.7438	There's no problem with heteroscedasticity.

The value of the prob. F count of 0.7527 is greater than the alpha level of 0.05 (5%) which indicates that the model is free from the problem of heteroscedastic.

Tabel 4. Autocorrelation Test Results

<i>Durbin- Watson Test</i>	<i>Durbin Watson stat</i>	<i>Description</i>
	2.647259	No autocorrelation problem.

Based on table 4.8, the autocorrelation test results can be determined using the Durbin-Watson test. The value of D-W is 2.647. This value will be compared to the value of d-W by using a level significance of 5%, the number of observations or samples (N)=96 and the independent number of variables 4 (k)=4 whereas the value (dU)=1.7326. Since the DW value of 2.647 is greater than the upper limit of (DU) 1.7326 and less than $4-1.7326$ (4-dU), where $(1.7326 < 2.647 < 4-1.7326)$, it can be concluded that this number level does not occur automatically.

Tabel 5. Regression Test Results

<i>Ordinary Least Square (OLS)</i>	<i>Variable</i>	<i>Coefficient</i>	<i>Probability</i>
	C	7168104.	0.0000
	Inflation	-269859.5	0.0000
	Interest rate	-172870.6	0.0001

Use of electronic money	0.028128	0.0000
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Based on the results of data processing using EViews 12 above it can be concluded that the double linear regression equation of inflation, interest rates, and the use of electronic money against the amount of money in Indonesia is as follows:

$$\text{JUB} = 7168104 - \text{Inflation} - \text{Interest rate} - \text{Use of electronic money} + \text{Error Term}$$

$$Y = 7168104 - 269859.5 X_1 - 172870.6 X_2 + 0.028128 X_3 + e$$

Based on the regression equation above, a regression model can be interpreted as follows:

- A constant value of 7168104 means that the variable value of the amount of money in circulation (Y) is 7168.104 assuming that if the free variables, namely inflation, interest rates and e-money have a fixed value or equal to zero then the volume of money is increased by 716 8.104 in rupiah units.
- The regression coefficient for the inflation variable (X1) is -269859.5, which means that if inflation increases by 1% it will reduce the money supply by 269859.5 billion rupiah assuming other variables are constant, and vice versa.
- The regression coefficient for the interest rate variable (X2) is -172870.6, which means that if the interest rate rises by 1% it will reduce the money supply by 172870.6 billion rupiah assuming other variables are constant, and vice versa.
- The regression coefficient for the variable use of electronic money (X3) is 0.028128, which means that every increase in the use of electronic money by 1% will increase the money supply by 0.028128 billion rupiah assuming other variables are constant, and vice versa.

Hypothesis testing

Statistical t-test (partial)

Table 6. Results of Partial Significance Test (Uji t)

<i>Ordinary Least Square (OLS)</i>	<i>Variable</i>	<i>t-Statistic</i>	<i>Probability</i>	<i>Description</i>
	Inflation	-7.918753	0.0000	Significant and negative influence
	Interest rate	-3.979156	0.0001	Significant and negative influence

Use of electronic money	21.69518	0.0000	Significant and positive influence
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Based on the above table, the degree of freedom (dk) is $96 - 3 - 1 = 92$ with the alpha confidence of 0.05. So, we get a t-table of 1.66159. Here are the t test results for each independent variable:

- The inflation variable (X1) has a t-count value of -7.918753. This value is smaller than the t-table (1.66159) and the sig. t (0.0000) is less than 0.05. So, testing the research hypothesis for H_a was accepted and H_0 rejected. The negative sign means that the movement of inflation rate growth will be opposed to the growth of the amount of money circulating in Indonesia. This explains that partially inflation has a significant and negative influence on the amount of money in circulation.
- The Interest Rate variable (X2) has a t-count value of -3.979156. This value is smaller than the t-table (1.66159) and the sig. t (0.0001) is less than 0.05. So, testing the research hypothesis for H_a was accepted and H_0 rejected. The negative sign means that the movement of the growth of the Bank of Indonesia's reference interest rate will be opposed to the growth in the amount of money circulating in Indonesia. It explains that partially the Flower Tribes have a significant and negative influence on the amount of money in circulation.
- The e-money usage variable has a t-count value of 21.69518. This value is larger than the t-table (1.66159) and the sig. t (0.0000) is smaller than 0.05. So, the hypothesis test for H_a was accepted and H_0 rejected. It explains that partially the use of electronic money has a significant and positive influence on the amount of money in circulation.

F-statistical test (Simulant)

Tabel 7. Simultaneous Significance Test Results (Uji F)

Ordinary Least Square	F-Statistic	Prob (F- Statistic)	Description
	401.9331	0.000000	H1 accepted and H0 rejected, independent variables jointly influencing dependent variables

Based on the results of the above calculations, it is known that the F-count value is 401.9331 with the statistical Prob F-value is 0.000000. The F-table value of the total sample of 96 samples with the significance level of 0.05 and the value of k which is the total independent and dependent variable is 4, so obtained df_1 (degree freedom) = $k - 1 = 4 - 1$

= 3 and $df_2 = n - k = 96 - 4 = 92$ is 2.70. From such data obtain the result of the F -count of 401.9331 > F-table of 2.70 and the probability value of $0.000000 < 0.05$, then H_0 is rejected and H_a is accepted. Thus, it can be concluded that inflation (X1), interest rate (X2), and the use of electronic money (X3) simultaneously (together) have a significant influence on the amount of money circulating (Y) in Indonesia in the period 2015-2022.

Determination Coefficient Test (R²)

Table 8. Determination Coefficient Test Results (Adj R-Square)

Ordinary Least Square	Adjusted R- Squared	Description
	0.926799	Independent variables can explain a dependent variable of 92.6%.

The results of the regression above resulted in an Adjusted R-Squared value of 0.926799 or 92.6%. This suggests that the independent variables in this study, namely Inflation (X1), Interest Rate (X2), and the use of electronic money (X3), explain the magnitude of the influence on the amount of money in circulation in 2015-2022 of 92.6% while the remaining 7.4% are explained by other variables that are not included in the study.

Results of data on regression analysis show that the significance value of inflation is 0.0000, smaller than the 0.05 alpha rate. This means that inflation variables have a significant influence on the amount of money circulating in Indonesia during the period 2015-2022. The double regression coefficient of inflation obtained from the results of the analysis is -269859.5. If there is a negative sign on the outcome of the regression factor indicates that every inflation increase of 1%, it will decrease the intensity of the amount of money circulating in Indonesia by 269859.5 billion rupees.

Quantity theory states that there is a positive relationship between inflation and the amount of money in circulation (Hasyim, 2017). Inflation changes are influenced by changes in the amount of money in circulation. On the contrary, an increase in prices causes demand for money to rise, which has an impact on the increase in the quantity of money. As a result, a decrease in inflation has an effect on the rapid decline in the volume of money that is circulating. The theory differs from this study, on the inflation variable has a negative and significant influence on the quantities of money circulating in Indonesia. As inflation goes down, the amount of money in circulation does not go down, but increases.

One of the causes is the impact of the Covid-19 pandemic that has hit the world since the end of 2019, which has reduced people's purchasing power and economic activity, thereby reducing demand and supply of goods and services, as well as increasing production costs. This caused inflation in Indonesia to rise, especially core inflation and volatile inflation. The next reason is the monetary policy implemented by BI as a monetary

authority in Indonesia. During the period 2015-2022, BI has reduced BI7DRR by 11 times, from 7.5% at the end of 2015 to 3.5% at the End of 2020. This decrease in BI7 DRR is in response to the weakening global and domestic economic conditions as a result of the impact of the Covid-19 pandemic.

Inflation has an influence on the amount of money circulating in Indonesia. However, the relationship between inflation and the quantity of money in circulation cannot always be explained exclusively by the theory of money quantity (Alawiyah et al., 2019). Although the theory emphasizes a close link between increased amount of money in circulation and inflation rates, in fact, inflation dynamics involve a number of complex factors. Factors such as aggregate supply and demand, production costs, currency exchange rates, external conditions, and fiscal and monetary policies play a role in shaping an economy's inflation rate.

The results of this study are relevant to the results of a study conducted by (Sihombing et al., 2022) which suggested that inflation is linked negatively and has a significant influence on the amount of money in circulation. In money quantity theory, if there were no change in the factors that influenced the speed of money circulation or transactions, then the relationship in the exchange equation was only between the amount of money supply and the rate of price. From the results of the analysis of the data, the answer can be obtained from the formula of the research problem that inflation has a significant influence on the amount of money circulating in Indonesia in the period 2015-2022.

Results of data on regression analysis show that the significance value of the interest rate is 0,0001, smaller compared to the 0.05 alpha rate. This explains that interest rate variables have a significant influence on the amount of money circulating in Indonesia during the period 2015-2022. The double regression coefficient of the interest rate obtained from the results of the analysis is -172870.6. The negative sign on the regression factor indicates that each rate of interest increases 1%, then will reduce the amount of money circulating in Indonesia by 172870.6 billion rupees.

The theory put forward by John Maynard Keynes, or may be called Keynesian theory, says that the relationship between interest rates and the amount of money in circulation is negative (Upadiyanti et al., 2018). It means, if interest rates go up, then the amount of money in circulation will go down, and vice versa. This is because interest rates affect aggregate demand, that is, the total demand for goods and services in an economy. If related to this research, this theory is in line with the results of research that has been carried out, namely that when interest rates increase, the amount of money circulating in society will decrease.

Interest rates influence the money supply. The relationship between the money supply and interest rates is negative (Upadiyanti et al., 2018). That is, if the amount of money goes up, then the rate of interest will go down, and vice versa. This is because the quantity of money going on affects the demand and the supply of money in the market. If the quantities of money go on more than the needs of the people, the value of the money will fall, so that

the rates of interest also go down. Conversely, if the money supply is less than what society needs, the value of money will rise, so that interest rates also rise.

The results of this research are in line with the theory and research results of (Harahap & Hafizh, 2020) which stated that interest rates have a significant negative influence on the money supply, in other words changes in the percentage of interest rates or changes in interest rates significantly affect the level of money in circulation. Money Supply. Where an increase in interest rates will encourage people to prefer saving their money in banks rather than investing it in the real sector. So, an increase in interest rates will reduce the amount of money circulating in society. From the results of the analysis, the answer can be obtained from the formulation of the research problem that interest rates influence the amount of money circulating in Indonesia in the period 2015-2022.

Results of data on regression analysis show that the significance value of the use of electronic money is 0.0000, smaller than the alpha rate of 0.05. This means that the variable of e-money usage has a significant influence on the amount of money circulating in Indonesia. The double regression coefficient of the use of electronic money obtained from the results of the analysis is 0.028128. The positive sign on the regression factor indicates that each use of e-money increases by 1%, then will increase the amount of money circulating in Indonesia by 0.028118 billion rupees.

The currency theory proposed by the Bank of Indonesia is M1 and M2. Currency circulation M2 covers money circulating in society (M1) plus giral money and quasi money. As the economy progresses, the portion of the use of the tiger money, which includes the paper money and the metal money, will become less and less, and will be replaced by the giral money. From the theory it can be said that the circulation of the dwarf money will be less and more if the non-cash transactions become more and more (Fatmawati & Indah Yuliana, 2020). If the results of this research are associated with the theory, then it would be reversed. From the analysis of the data on this study obtained that the electronic money transactions currently taking place in Indonesia could not replace the role of cartel money as a means of payment. This is evidenced by the increase in transactions using electronic money, so currency has also increased.

Many Indonesian citizens are still unable to fully switch to electronic payments. The use of electronics as a means of payment is still dominated by young people and adolescents who generally have Android devices and can install electronic payment applications. Most people, especially the elderly, still use cash as their means of payment. Moreover, when in a sudden situation, cash can be used quickly and without having to rely on Android signals, etc.

The results of this study are relevant to the results of research conducted by (Ulmi & Devi, 2022), which showed that electronic money in the short term does not significantly affect the amount of money in circulation. However, in the long-term electronic money has a positive influence on the volume of money. The increasing use of electronic money by society has an impact on the circulation of cartel money in Indonesia. The increasing use of electronic money transactions is also accompanied by an increase in the circulation of

currency in Indonesia. Based on the results of the data analysis carried out obtained answers from the formulation of the research problem that the use of electronic money has a significant influence on the amount of money circulating in Indonesia period 2015-2022.

CONCLUSION

Based on the results of the research and discussions that have been carried out, it can be concluded that the three variables, namely inflation, interest rates, and the use of electronic money, simultaneously affect the amount of money in circulation due to the interrelationship and interaction of these factors in the economic dynamics. Overall, the interaction between these factors creates conditions in which changes in one variable can stimulate changes in another variable, which ultimately affects the quantity of money circulating at the same time. Therefore, managing the amount of money in circulation needs to pay attention to the joint role and impact of the three variables in the context of complex economic dynamics.

The findings are in line with the principles of money demand theory, which states that several factors, including price levels, income rates, and interest rates, can influence the amount of money circulating in the economy. The amount of money in circulation is also affected by technological developments, in particular the use of electronic money as a means of transaction.

The conclusion that can be drawn is that the three variables, namely inflation, interest rates, and the use of electronic money, are interrelated in affecting the amount of money in circulation. Changes in one variable can stimulate responses and changes in the other variable. Managing the amount of money in circulation needs to consider the complex dynamics of the interaction between inflation factors, interest rates, and technological developments. Monetary policy must respond to changes in these factors. As a monetary authority, the Bank of Indonesia must monitor and evaluate changes in these three variables to determine appropriate policies to maintain price stability and the overall economy.

As the holder of monetary authority, the Bank of Indonesia has authority in controlling the amount of money circulating in Indonesia should be more careful in determining the reference interest rate. Because Bank Indonesia has a policy of reducing or increasing interest rates. Interest rate policy must be more targeted towards encouraging maximum absorption of M2 to maintain the amount of money circulating in society to remain stable.

Considering that the use of electronic money has a positive and significant impact on the amount of money in circulation, it is recommended that governments and regulators be more active in encouraging the adoption of innovative financial technologies. More intensive educational campaign efforts and providing incentives for the public to adopt the use of electronic money need to be strengthened, in order to accelerate the transition to a more efficient and modern digital economy.

For future researchers, it is expected that this research can be used as a reference then it is also expected that further researchers will add other free variables specialized in the

field of Shariah economics such as mudharabah and musyarakah. Both variables have the potential to influence the interests of the public to save in the context of the shariah economy, so that the money held by the community will be collected in the bank.

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