

## The Effect of Digital Transactions, Interest Rates, and the COVID-19 Pandemic on the Money Supply in Indonesia (2018-2023)

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**Abstract:** This study analyzes the effect of digital transactions, interest rates, and the COVID-19 pandemic on the money supply (M2) in Indonesia from August 2018 to August 2023. Using monthly time series data from Bank Indonesia, BPS, and Katadata, the research employs multiple linear regression with the Ordinary Least Squares (OLS) method. The results show that digital transactions have a positive and significant effect on the money supply, indicating that the digitalization of financial systems accelerates the circulation of money in the economy. Meanwhile, the benchmark interest rate has no significant direct effect on M2, suggesting that its traditional role in monetary control may be diminishing in the digital era. The COVID-19 pandemic dummy variable shows a positive and significant impact on the money supply, reflecting the effects of fiscal and monetary stimulus policies during the crisis. Overall, the findings highlight that technological transformation and crisis conditions substantially influence liquidity dynamics, and that monetary policy must adapt to digital and structural economic changes.

**Keywords:** *Digital Transactions, Interest Rates, COVID-19 Pandemic, Money Supply, OLS Regression.*

## Introduction

Money supply is one of the important instruments in monetary policy because it plays a direct role in influencing inflation rates and short-term economic growth. Variations in the amount of money in circulation can also be influenced by various aspects, both policy and structural. Along with the rapid transformation of the digital economy, people's financial transaction activities have shifted significantly from the traditional system to the digital system. This can be seen from the increase in the value of digital banking transactions supported by technology-based financial institutions.

Changes in the way transactions are made are certain to affect the dynamics of the amount of money in circulation. On the one hand, digitalization makes it easier to circulate money through the banking system; On the other hand, it can also reduce dependence on physical money. Interest rates, as the main tool of Bank Indonesia's monetary policy, play a crucial role in regulating liquidity and maintaining economic stability. Changes in interest rates can affect an individual's motivation to save or consume, thus also having an impact on the circulation of money in the economic system. (Junaedi & Norman, 2021)

In addition, the COVID-19 pandemic that began in March 2020 had a major impact on people's economic activities and financial behavior. Mobility restrictions, accelerating digital transformation, and looser monetary policies during the pandemic are factors that have the potential to affect the volume of money in circulation. Thus, it is interesting to study the impact of digital transactions, interest rates, and the COVID-19 pandemic on the amount of money in circulation in Indonesia. (Putri & Nurjanah, 2024)

The importance of this research is to provide an empirical explanation to monetary authorities regarding the development of M2 in the digital age and in a global crisis situation. The results of this study are expected to be able to provide suggestions for monetary policy making that is responsive to structural changes and external conditions.

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## Literature Review and Hypothesis

### Money Supply (M2)

In monetary theory, the amount of money in circulation (M2) is the result of interactions between central bank policy, the banking intermediation process, and public demand for money. Through the money multiplier mechanism, the expansion of base money by the central bank is amplified by banks in accordance with liquidity demand. Mishkin (2019) explains that changes in M2 affect consumption, investment, and inflation, making it the main channel for monetary policy transmission.

The development of the modern financial system shows that M2 dynamics are not only determined by conventional monetary instruments. Utami (2023) emphasizes that financial innovation and digitalization change money demand behavior and the velocity of money circulation, so that structural factors play an increasingly important role in determining M2.

### Digital Transactions

Theoretically, digital transactions affect the amount of money in circulation through increased payment system efficiency and velocity of money. Digitalization reduces transaction costs and expands financial inclusion, so that more public funds enter the banking system and are reflected in M2 (Barajas et al., 2020).

In Indonesia, the growth of digital transactions accelerates the circulation of funds and increases bank deposits. Lubis et al. (2025) show that the intensity of digital transactions is positively correlated with liquidity expansion, while Putri and Nurjanah (2024) find that the use of e-money increases M2 through higher transaction frequency and broader financial access.

### Interest Rates

In Keynesian theory, interest rates are the opportunity cost of holding money. An increase in interest rates reduces the demand for money because people tend to save funds in interest-bearing assets, while a decrease in interest rates encourages credit and consumption, which increases M2. This relationship reflects the transmission mechanism of monetary policy through the interest rate channel.

However, the effectiveness of this channel can be weakened by structural changes. Retnowati et al. (2024) found a negative relationship between interest rates and M2 in Indonesia, but Mishkin (2019) asserts that digitalization and economic uncertainty can reduce the sensitivity of the money supply to interest rate changes.


### COVID-19 Pandemic (Dummy Variable)

The COVID-19 pandemic is an exogenous shock that triggers changes in economic behavior and monetary policy. Economic crisis theory explains that in periods of high uncertainty, the demand for money for precautionary motives increases, while the government and central bank expand liquidity. Junaedi and Norman (2021) show that fiscal stimulus and monetary easing during the pandemic drove an increase in M2. In addition, the crisis accelerated the adoption of digital transactions due to mobility restrictions. Barajas et al. (2020) explain that the acceleration of digitalization during the crisis strengthened the circulation of money in the financial system. Therefore, the pandemic dummy variable is used to capture temporary structural changes that have a significant impact on M2 behavior. The hypotheses in this study are as follows:

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In this study, the hypothesis is prepared based on classical monetary theory, the Keynesian approach, and empirical findings from previous research. The goal is to empirically test the influence of digital transactions, interest rates, and the COVID-19 pandemic on the money supply in Indonesia in the period August 2018-August 2023. The hypothesis of this study is formulated as follows:

1. *Digital Transactions on Money Supply (M2)*

In modern monetary theory, the development of digital payment systems affects the amount of money in circulation through increased transaction efficiency and velocity of money. Digitalization reduces transaction costs and expands financial inclusion, allowing more public funds to enter the banking system and be reflected in the M2 component. Barajas et al. (2020) explain that digital financial services strengthen financial intermediation and expand liquidity in the economy.

Empirical research in Indonesia shows consistent results. Lubis et al. (2025) found that an increase in the volume of digital transactions has a positive effect on liquidity expansion. Putri and Nurjanah (2024) also show that the use of e-money increases the amount of money in circulation through higher transaction frequency and broader financial access.

*H1: Digital transactions have a positive and significant effect on the money supply (M2).*

2. *Interest Rates on Money Supply (M2)*

According to Keynesian theory, interest rates are the opportunity cost of holding money. An increase in interest rates encourages people to save funds in interest-bearing instruments, thereby reducing the demand for money and the amount of money in circulation. Conversely, a decrease in interest rates encourages consumption and credit, which increases liquidity and M2. This mechanism shows a negative relationship between interest rates and the amount of money in circulation.

Empirical studies support this relationship. Retnowati et al. (2024) found that interest rates have a negative and significant effect on M2 in Indonesia. Mishkin (2019) also asserts that although the effect of interest rates may be weakened by financial innovation, theoretically interest rates remain the main instrument that affects the dynamics of money in circulation.

*H2: Interest rates have a negative and significant effect on the money supply (M2).*

3. *COVID-19 Pandemic on Money Supply (M2)*

In economic crisis theory, the COVID-19 pandemic is viewed as an exogenous shock that changes economic behavior and the direction of monetary policy. Economic uncertainty increases the demand for money for precautionary motives, while central banks and governments expand liquidity through fiscal stimulus and monetary easing to withstand economic contraction.

Junaedi and Norman (2021) show that during the pandemic, accommodative monetary policy and stimulus programs drove an increase in the money supply in Indonesia. Additionally, Barajas et al. (2020) explain that the crisis accelerated the adoption of digital transactions, which further strengthened the circulation of money in the financial system. Thus, the pandemic period is associated with significant structural changes to M2.

*H3: The COVID-19 pandemic has a positive and significant effect on the money supply (M2).*


## Methodology

This study uses a quantitative research with the Ordinary Least Squares (OLS) regression method. The data used is secondary data in the form of monthly time series from August 2018 to August 2023 with a total of 61 observations.

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The time frame of this study covers economic conditions before and during the COVID-19 pandemic, allowing for a more comprehensive analysis of the dynamics of money supply in Indonesia.

The data was obtained from official and credible sources, namely Bank Indonesia (BI), the Central Statistics Agency (BPS), and Katadata Media Network, which provide relevant macroeconomic and financial data that is widely used in empirical monetary research.

The variables in this study consist of one dependent variable and several independent variables and additional variables. The dependent variable is Money Supply (M2), which reflects the level of liquidity in the Indonesian economy. The independent variables include Digital Transactions (DB), measured based on the value of digital banking transactions, and Interest Rates (IR), proxied using the BI 7-Day Reverse Repo Rate as the main monetary policy instrument. In addition, this study includes a COVID-19 pandemic dummy variable (DUM) with a value of 1 for the period March 2020 to December 2021 and 0 for other periods, in order to capture the structural impact of the pandemic on the behavior of money supply. This study also uses an interaction variable (SB2) between interest rates and pandemic dummies to test changes in the effectiveness of interest rate policy during the pandemic period.

The data analysis stages include descriptive statistics, classical assumption tests covering normality, multicollinearity, heteroscedasticity, and autocorrelation, as well as hypothesis testing through t-tests (partial) and F-tests (simultaneous). The entire data processing and estimation process was carried out using STATA version 17 software.

The OLS regression model used in this study is formulated as follows:

$$Y = \alpha + \beta_1 DB_t + \beta_2 SB_t + \beta_3 DUM_t + \beta_4 SB2_t + \varepsilon_t$$

Description:

M2	= Money Supply (M2)
DB	= Digital Transactions
SB	= Interest Rate (BI 7-Day Reverse Repo Rate)
DUM	= COVID-19 pandemic dummy variable
SB2	= Interaction variable between interest rates and the pandemic
$\alpha$	= Constant
$\varepsilon$	= Error term

## Results

### Descriptive Statistics Test Result

Table 1. Result of Descriptive Statistical Analysis

Variable	Number of Samples	Mean	Maximum	Minimum	Standard Deviation
M2	61	6978585	8528022	5529452	959429.7
DB	61	3.231475	5.34	1.75	1.075095
SB	61	4.655738	6	3.5	1.005365
DUM	61	.3606557	1	0	.4841758


Source: Stata17 output, processed secondary data

Description:

M2	= Money Supply (M2)
DB	= Digital Transactions
SB	= Interest Rate (BI 7-Day Reverse Repo Rate)
DUM	= COVID-19 pandemic dummy variable

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Based on the results of descriptive statistical tests, the number of observations in this study was 61 data points for each variable. The dependent variable of money supply (M2) had an average value of 6,978,585, with a minimum value of 5,529,452 and a maximum value of 8,528,022. The standard deviation value of M2 is 959,429.7, which is smaller than the average value, indicating that the variation in the money supply data during the observation period is relatively stable and does not fluctuate extremely.

The digital transaction (DB) variable has an average value of 3.23, with a minimum value of 1.75 and a maximum value of 5.34. The standard deviation of 1.08 indicates that the variation in digital transactions during the study period was moderate, reflecting the growth and dynamics of digital banking service usage in Indonesia.

Furthermore, the interest rate variable (SB), which is proxied using the BI 7-Day Reverse Repo Rate, has an average value of 4.66%, with a minimum value of 3.5% and a maximum value of 6%. The standard deviation of the interest rate of 1.01 indicates relatively controlled interest rate fluctuations during the observation period, in line with monetary policies that tend to be accommodative.

The COVID-19 pandemic dummy variable (DUM) has an average value of 0.36, indicating that approximately 36% of the total observation period was in a pandemic condition. The standard deviation value of 0.48, with a minimum value of 0 and a maximum value of 1, shows that the dummy variable has been defined and used appropriately to distinguish between pandemic and non-pandemic periods in the analysis.

Overall, the descriptive statistics results show that the data used in this study has reasonable and stable variation, making it suitable for use in OLS regression analysis to test the effect of digital transactions, interest rates, and the COVID-19 pandemic on the money supply in Indonesia.

## Classical Assumption Test Result

### Normality Test

Normality testing using the Jarque–Bera test showed a probability value of 0.093 ( $> 0.05$ ), so there is not enough evidence to reject the null ( $H_0$ ) hypothesis that the residuals are normally distributed. This result indicates that the residuals follow a normal distribution, meaning the normality assumption in the regression model is satisfied.

Table 3. Multicollinearity Test Results

Variable	Obs	Pr(skewness)	Pr(kurtosis)	Joint test	
				Adj chi2(2)	Prob>chi2
Resid	61	0.0643	0.2502	4.74	0.093

Source: Stata17 output, processed secondary data

### Multicollinearity Test

The results of the multicollinearity test using the Variance Inflation Factor (VIF) showed that all independent variables in the model, namely db (digital banking), sb (interest rate), and dum (dummy COVID-19 pandemic), had a VIF value below 10, with the highest value of 2.13 and the average VIF of 1.83. This shows that there is no multicollinearity in the model. Thus, the relationships between independent variables do not significantly affect each other and can be used simultaneously in regression analysis.

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Table 3. Multicollinearity Test Results

Variable	VIF	1/VIF
DUM	2.13	0.469065
SB	2.08	0.481168
DB	1.27	0.787676
Mean VIF	1.83	

Source: Stata17 output, processed secondary data

### Heteroscedasticity Test

Heteroskedasticity testing using the Breusch-Pagan/Cook-Weisberg test yielded a probability value of 0.3496 ( $> 0.05$ ), so there is not enough evidence to reject the null ( $H_0$ ) hypothesis that residual has a constant variance (homocedasticity). In other words, the model does not suffer from heteroscedasticity problems, which means that the residual variables are uniformly spread across the predicted values.

Table 4. Heteroscedasticity Test Results

H0: Constant variance
chi2(1) = 0.87
0.87 = 0.3496

Source: Stata17 output, processed secondary data

### Autocorrelation Test

Autocorrelation testing using the (Wooldridge / chi-square) test produced a probability value of 1.000 ( $> 0.05$ ), so there is not enough evidence to reject the null ( $H_0$ ) hypothesis that the model does not experience autocorrelation. In other words, the residuals are not correlated across time, indicating that the model does not suffer from autocorrelation problems and the error terms are independent.

Table 4. Autocorrelation Test Results

Lags (p)	Chi2	df	Prob > chi2
1	0.000	1	1.000

Source: Stata17 output, processed secondary data

### OLS Regression Test Results


Table 6. OLS Test Results

Source	SS	dF	MS		Number of Obs	61
Model	4.9072e+13	3	1.6357e+13		F(3, 57)	151.41
Residual	6.1579e+12	32	1.0803e+11		Prob > F	0.0000
Total	5.5230e+13	37	9.2051e+11		R-squared	0.8885
					Adj R-squared	0.8826
					Root MSE	3.3e+05
M2	Coef	Std.Err.	t	P>  t	[95% conf	interval]
DB	847863.8	44471.75	19.07	0.000	758810.7	936917
SB	-45848.17	60846.14	-0.75	0.454	-167690.5	75994.13
DUM	271457.9	127963.3	2.12	0.038	15215.78	527700.1
cons	4354288	403518	10.79	0.000	3546257	5162319

Source: Stata17 output, processed secondary data

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### Uji F

Based on the OLS regression results, a calculated F value of 151.41 was obtained with a Prob > F value of 0.0000. This probability value is smaller than the significance level of 0.05, so it can be concluded that all independent variables, namely digital transactions (DB), interest rates (SB), and the COVID-19 pandemic dummy variable (DUM), simultaneously have a significant effect on the amount of money in circulation (M2) in Indonesia. These results indicate that the regression model used is appropriate (fit) and capable of explaining the relationship between independent variables and dependent variables collectively.

### Uji R2 (R-Square)

The R-squared ( $R^2$ ) value is 0.8885, while the Adjusted R-squared value is 0.8826. This indicates that approximately 88.85% of the variation in money supply (M2) can be explained by the variables of digital transactions, interest rates, and the COVID-19 pandemic in the research model. Meanwhile, the remaining 11.15% is explained by other variables outside the model.

A high  $R^2$  value indicates that the regression model has strong explanatory power and is able to represent the empirical phenomenon under study well.

### Uji T (Uji Parsial)

#### 1. Digital Transactions (DB)

The digital transaction variable has a coefficient of 847,863.8 with a t-statistic value of 19.07 and a probability of 0.000. The probability value is less than 0.05, so it can be concluded that digital transactions have a positive and significant effect on the amount of money in circulation (M2). This means that an increase in digital transactions will increase the money supply in Indonesia.

#### 2. Interest Rates (IR)

The interest rate variable has a negative coefficient of -45,848.17 with a t-statistic value of -0.75 and a probability of 0.454, which is greater than 0.05. Thus, it can be concluded that interest rates do not have a significant effect on the money supply (M2) during the research period. This shows that changes in interest rates do not directly affect the dynamics of M2 in the economic conditions studied.

#### 3. COVID-19 Pandemic Dummy (DUM)

The pandemic dummy variable has a positive coefficient of 271,457.9 with a t-statistic value of 2.12 and a probability of 0.038, which is less than 0.05. Therefore, it can be concluded that the COVID-19 pandemic has a positive and significant effect on the money supply (M2). These results indicate that during the pandemic period, there was an increase in liquidity, driven by accommodative monetary policy and economic stimulus.

### Discussion


The OLS regression results show that there are significant and insignificant effects of independent variables on the money supply (M2) in Indonesia for the period August 2018–August 2023. The simultaneous test shows that all variables in the model collectively have a significant effect on M2, indicating that the research model has a good level of feasibility in explaining variations in the money supply.

Partially, digital transactions (DB) have a positive and significant effect on M2, indicating that increased digital transaction activity drives increased liquidity in the economy. This finding is in line with the velocity of money theory, which states that the digitization of payment systems accelerates the circulation of money and increases liquidity.

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Conversely, interest rates (SB) have a negative but insignificant coefficient on M2. This shows that changes in interest rates do not directly affect the money supply during the study period, which may be due to the weakening of the effectiveness of interest rate transmission as a result of structural changes in the financial system and the increasing role of digital transactions.

Meanwhile, the COVID-19 pandemic dummy variable (DUM) has a positive and significant effect on M2. This result reflects an increase in liquidity during the pandemic period, driven by accommodative monetary policy and economic stimulus, as well as the acceleration of digital transactions.

Overall, the results of this study confirm that digital transactions and the COVID-19 pandemic are the main factors influencing the amount of money in circulation in Indonesia, while the role of interest rates is partially insignificant in the study period.

### Conclusion, Limitations, and Suggestions


This study analyzes the impact of digital technology development, interest rate policy, and the COVID-19 pandemic on the money supply in Indonesia from 2018 to 2023. The results show that the digitization of the financial system has a significant effect on increasing the money supply, along with the increasing use of digital transactions such as mobile banking and e-wallets, which accelerate money circulation. Meanwhile, benchmark interest rates do not always have a significant effect, except in special circumstances such as during a pandemic. The COVID-19 pandemic also drove an increase in the money supply through stimulus policies and monetary easing. The analysis model used proved to be robust and reliable based on the results of data testing.

Based on these findings, Bank Indonesia and policymakers need to pay attention to the development of digital transactions, consider economic conditions in setting interest rates, and strengthen digital financial literacy and security so that the benefits of digitization can be optimally realized.

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