THE IMPACT OF CASHLESS PAYMENT SYSTEMS AND MONEY SUPPLY ON MONEY CIRCULATION IN INDONESIA DURING THE 2019–2024 PERIOD

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Abstract. *The development of digital technology has driven significant changes in the payment system in Indonesia, marked by the increasing use of non-cash (cashless) payment instruments such as e-money, QRIS, and digital banking services. These changes have the potential to affect monetary mechanisms, particularly the velocity of money. In addition, the increase in the money supply (M2) as a monetary policy instrument is also an important factor in the dynamics of money circulation. This study aims to analyze the effect of cashless payment systems and the money supply on the velocity of money in Indonesia during the 2019–2024 period. The research method employed is a quantitative approach using secondary data obtained from official publications of Bank Indonesia and the Central Statistics Agency. Data analysis is conducted using multiple linear regression to examine the partial and simultaneous effects of the independent variables on the dependent variable. The results show that partially, the money supply does not have a significant effect on the velocity of money, while the cashless payment system has a positive but statistically insignificant effect. Simultaneously, both variables also do not show a significant effect on the velocity of money. Nevertheless, the high coefficient of determination indicates that cashless payment systems and the money supply have a substantial economic contribution in explaining variations in the velocity of money. This study is expected to serve as a consideration in the formulation of monetary policy and the development of digital payment systems in Indonesia.*

Keywords: *Cashless Payment; Money Supply; Payment System; Velocity of Money.*

1. INTRODUCTION

The development of information technology and digitalization has brought fundamental changes to payment systems in many countries, including Indonesia. Financial technology innovations have driven a shift in transaction patterns from the use of cash toward non-cash or cashless payment systems. Payment instruments such as electronic money (e-money), debit and credit cards, mobile banking, internet banking, and payments based on the Quick Response Code Indonesian Standard (QRIS) are increasingly used in daily economic activities. These changes not only affect transaction efficiency but also have implications for monetary mechanisms, particularly the money supply and the velocity of money in the economy.

In Indonesia, the transformation of cashless payment systems has accelerated significantly alongside the increasing penetration of the internet and the use of digital devices. Bank Indonesia, as the monetary and payment system authority, continues to promote the National Non-Cash Movement (Gerakan Nasional Non-Tunai/GNNT) to create a secure, efficient, and inclusive payment system. The digitalization of payment systems is believed to enhance economic efficiency, reduce transaction costs, and accelerate economic activities. With non-cash transactions becoming increasingly easy and fast, the circulation of money in the economy is expected to become more dynamic and more responsive to production and consumption activities.

Theoretically, the relationship between the payment system, the money supply, and the velocity of money can be explained through the quantity theory of money proposed by Irving Fisher. This theory states that the relationship between money and economic activity is

expressed by the equation MV = PY, where M represents the money supply, V denotes the velocity of money, P refers to the price level, and Y indicates real output. The velocity of money reflects how frequently money is used in economic transactions within a certain period. Changes in the payment system, particularly the shift from cash to non-cash transactions, have the potential to influence the value of V, as greater convenience and transaction speed can encourage money to circulate more rapidly within the economy.

The development of cashless payment systems is believed to have important implications for the velocity of money. Empirical studies show that the use of non-cash payment instruments tends to improve transaction efficiency and reduce frictions in economic activities, thereby potentially accelerating the circulation of money. A study by Zulfa and Syahnur (2025) found that non-cash payment instruments have a positive effect on the velocity of money in the long run. These findings indicate that the growth of cashless transactions can encourage more intensive economic activity through a faster circulation of money.

In addition to the payment system, the money supply is also an important variable in analyzing the velocity of money. In the Indonesian context, the money supply is commonly measured using the M2 monetary aggregate, which includes currency in circulation, demand deposits, and time deposits. An increase in M2 is not always followed by an increase in the velocity of money, as circulating funds may be held within the banking system or other financial instruments. Previous studies indicate that under certain conditions, high growth in the money supply can actually reduce the velocity of money if it is not accompanied by an increase in real economic activity (Moore, 2023). The period from 2019 to 2024 is highly relevant for analysis because it encompasses the pre–COVID-19 phase, the pandemic period, and the post-pandemic economic recovery. The COVID-19 pandemic significantly altered public economic behavior, particularly in terms of payment methods. Mobility restrictions and concerns over virus transmission encouraged people to shift toward non-cash transactions. Studies show that the use of e-money and digital payments increased sharply during the pandemic and contributed positively to economic activity (Gurgur & Kahveci, 2025). Data from Bank Indonesia indicate that the volume of digital payment system transactions increased very significantly during this period, while the money supply (M2) also continued to rise in response to expansionary monetary policies aimed at maintaining economic stability. However, despite the increase in the money supply, the velocity of money in Indonesia tended to fluctuate, particularly during the pandemic when economic activity slowed. This phenomenon raises an important question regarding the extent to which cashless payment systems and the money supply actually influence the velocity of money within the context of Indonesia's dynamic economy.

Various previous studies have examined the relationship between electronic payments, the money supply, and the velocity of money. A study by Mubin and Pambudi (2020) found that the use of e-money has a positive effect on the velocity of money in the long run. Meanwhile, other studies indicate that e-money plays an important role in influencing the structure of the money supply and the velocity of money (Rahmadani et al., 2024). Nevertheless, most of these studies focus their analysis on only one or two variables. As a result, there is still limited research that simultaneously examines the effects of cashless payment systems and the money supply on the velocity of money, particularly for periods that include the pandemic and post-pandemic phases.

Based on the above discussion, research on the impact of cashless payment systems and the money supply on the velocity of money in Indonesia during the 2019– 2024 period is both important and relevant. This study is expected to provide a more comprehensive understanding of the dynamics of money circulation amid the rapid digitalization of payment systems. Furthermore, the findings are anticipated to serve as a consideration for Bank Indonesia in formulating monetary policy and developing sustainable digital payment systems, as well as to act as an academic reference for future research in the fields of monetary economics and digital finance.

2. RESEARCH METHODS

This study employs a quantitative approach aimed at analyzing the impact of cashless payment systems and the money supply on the velocity of money in Indonesia during the 2019–2024 period. The quantitative approach is chosen because the research focuses on testing the relationships among variables based on numerical data and measurable statistical analysis. This method enables the researcher to identify causal relationships between independent and dependent variables objectively and to produce findings that can be generalized (Remler & van Ryzin, 2021).

The object of this study is the Indonesian economy over the period from 2019 to 2024. This period is selected because it reflects economic conditions before the COVID-19 pandemic, during the pandemic, and in the post-pandemic economic recovery phase, during which there was a significant acceleration in the adoption of non-cash payment systems. The dependent variable in this study is the velocity of money, while the independent variables consist of the payment system.

cashless payment systems and the money supply. The velocity of money is calculated based on the ratio of nominal Gross Domestic Product (GDP) to the money supply (M2), in accordance with the quantity theory of money proposed by Fisher (Nurmansyah & Thamrin, 2022).

The data used in this study are secondary data obtained from official and reliable sources. Data on cashless payment systems are taken from the Payment System Statistics publications issued by Bank Indonesia, while data on the money supply (M2) and Gross Domestic Product are obtained from Bank Indonesia's monetary reports and publications of the Central Statistics Agency. The use of secondary data is chosen because these data have undergone institutional validation processes and possess a high level of reliability, making them suitable for macroeconomic analysis (Sirodoev, 2022).

The data analysis technique used in this study is multiple linear regression analysis. This method is employed to examine the effects of two independent variables, namely the cashless payment system and the money supply, on one dependent variable, namely the velocity of money. The multiple linear regression model is chosen because it is able to explain the contribution of each independent

variable both partially and simultaneously to changes in the dependent variable (Etemadi & Khashei, 2021). Prior to regression estimation, the data are analyzed descriptively to illustrate the development of each variable over the research period.

Hypothesis testing is conducted through statistical tests, which include the coefficient of determination (R^2) to assess the model's ability to explain variations in the velocity of money, the F-test to examine the simultaneous effect of the independent variables, and the t-test to test the partial effect of each variable. In addition, classical assumption tests such as normality, multicollinearity, and heteroskedasticity tests are performed to ensure that the regression model satisfies the assumptions of the Best Linear Unbiased Estimator (BLUE). Accordingly, the estimated results are expected to be valid and can be used as a basis for drawing conclusions and formulating policy recommendations relevant to monetary authorities and the development of digital payment systems in Indonesia.

3. RESULTS AND DISCUSSION

Table 1. Results of Multiple Linear Regression Analysis

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	172.408	30.628		5.629	.011		
	Jumlah uang beredar M2 (Rp Triliun)	-.008	.005	-.958	-1.739	.180	.238	4.198
	Volume transaksi sistem pembayaran cashless (Rp Triliun)	.006	.002	1.587	2.883	.063	.238	4.198

a. Dependent Variable: Perputaran uang di Indonesia

From Table 1, the regression equation can be formulated as follows:

$$Y = 172{,}408 – 0{,}008X1 + 0{,}006X2$$

This means that the constant value of 172.408 indicates that if the money supply (M2) and the volume of cashless transactions are assumed to be zero, the velocity of money in Indonesia would remain at Rp172.408 trillion. The negative coefficient of the money supply (–0.008) indicates an inverse relationship, while the positive coefficient of cashless transactions (0.006) indicates a direct relationship with the velocity of money. The money supply variable has a significance value of 0.180, which is greater than 0.05, indicating that the money supply does not have a statistically significant partial effect on the velocity of money in Indonesia. Similarly, the volume of cashless payment transactions has a significance value of 0.063, which is also greater than the standard 5% significance level, suggesting that this variable does not have a statistically significant effect on the velocity of money.

Table 2. Results of the F-Test

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	486.810	2	243.405	5.421	.101[b]
	Residual	134.690	3	44.897		
	Total	621.500	5			

a. Dependent Variable: Perputaran uang di Indonesia

b. Predictors: (Constant), Volume transaksi sistem pembayaran cashless (Rp Triliun), Jumlah uang beredar M2 (Rp Triliun)

Based on the test results, the calculated F-value is 5.421 with a significance level of 0.101. Using the standard significance level of 0.05, this regression model is not statistically significant simultaneously because the probability value exceeds 0.05 (0.101 > 0.05). This indicates that the combination of the money supply and cashless transactions has not been able to provide a statistically significant effect on the velocity of money in Indonesia at the 95% confidence level.

Table 3. Results of the Coefficient of Determination Test

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.885[a]	.783	.639	6.700	.783	5.421	2	3	.101	2.502

a. Predictors: (Constant), Volume transaksi sistem pembayaran cashless (Rp Triliun), Jumlah uang beredar M2 (Rp Triliun)

b. Dependent Variable: Perputaran uang di Indonesia

Based on Table 3, the R Square value of 0.783 indicates that the contribution or influence of the money supply (M2) and the volume of cashless transactions on variations in the velocity of money in Indonesia is 78.3%, while the remaining 21.7% is influenced by other factors outside this model.

The results of the multiple linear regression analysis indicate that the relationship between the money supply (M2), the volume of cashless payment system transactions, and money velocity in Indonesia during the period 2019–2024 is complex and not entirely consistent with classical theoretical predictions. The resulting regression equation, $Y = 172.408 + 0.008X_1 + 0.006X_2$, suggests that the money supply variable has a negative relationship with money velocity, while the cashless transaction variable shows a positive relationship. However, both variables do not demonstrate statistically significant effects at the 5 percent significance level, either partially or simultaneously.

The negative coefficient of the money supply (M2) variable indicates that an increase in the money supply is not always followed by an increase in the velocity of money. This finding can be explained by changes in public behavior and the structure of the financial system during the

study period. In the context of the quantity theory of money proposed by Irving Fisher, the velocity of money is influenced by the intensity of goods and services transactions (Ingham, 2020). When the money supply increases but economic activity does not grow proportionally, the velocity of money may actually decline. This condition is particularly relevant during the COVID-19 pandemic, when expansionary monetary policies increased liquidity in the economy, but restrictions on economic activity caused money to remain in the banking system and financial instruments rather than circulating in real transactions (Fernandez et al., 2022).

The insignificance of the partial effect of money supply on the velocity of money is also consistent with previous empirical studies. An increase in the money supply does not automatically lead to a higher velocity of money due to factors such as liquidity preference, economic uncertainty, and the rising tendency of households to save during crisis periods. In the Indonesian context, monetary and fiscal stimulus policies during the pandemic led to a substantial increase in liquidity; however, most of these funds were allocated for financial buffers and long-term economic recovery, thereby limiting their impact on the velocity of money.

Meanwhile, the transaction volume of the cashless payment system variable shows a positive coefficient of 0.006, indicating a direct relationship with the velocity of money. This implies that an increase in non-cash transactions tends to accelerate the circulation of money in the economy. Although the t-test results indicate that the effect is not yet statistically significant at the 5 percent level, the significance value of 0.063 suggests a tendency toward significance. This indicates that the cashless payment system has strong potential to influence the velocity of money, particularly when analyzed over a longer time horizon or using higher-frequency data.

These results are consistent with the findings of Zulfa and Syahnur (2025), who state that non-cash payment instruments have a positive impact on the velocity of money in the long run. Cashless payment systems enhance transaction efficiency, reduce transaction costs, and accelerate the exchange of goods and services. However, during the relatively short observation period that includes the pandemic, this positive effect has not yet been fully reflected as statistically significant in the model. This suggests that the adoption of payment technology requires time to exert its full impact on monetary mechanisms.

The F-test results indicate that, simultaneously, the money supply and the volume of cashless transactions do not yet have a significant effect on the velocity of money in Indonesia. The calculated F-value of 5.421 with a significance level of 0.101 suggests that, at a 95 percent confidence level, the regression model is not sufficiently strong to collectively explain changes in the velocity of money. This finding can be understood given that the velocity of money is influenced by various other macroeconomic factors such as inflation, interest rates, consumption levels, investment, and economic growth, which were not included in this research model (Van, 2020).

Nevertheless, the coefficient of determination test results show a relatively high R Square value of 0.783. This value indicates that 78.3 percent of the variation in the velocity of money can be explained by variations in the money supply and the volume of cashless transactions. The high R Square value suggests that, from an economic perspective, these two variables make a substantial contribution to explaining the dynamics of the velocity of money, even though their effects are not yet statistically significant. The difference between statistical significance and economic significance may arise due to limitations in the number of observations, data volatility during the pandemic, and structural changes in the Indonesian economy.

The period from 2019 to 2024 was marked by significant economic shocks, particularly due to the COVID-19 pandemic. Under these conditions, relationships among monetary variables tend to be distorted. Research by Agur et al. (2020) shows that during the pandemic there was a significant surge in digital transactions, while the velocity of money temporarily declined due to weakened consumption and investment. This condition explains why the increase in cashless transactions has not yet been fully able to significantly drive the velocity of money in the short

run.

Overall, the results of this study indicate that cashless payment systems have the potential to increase the velocity of money in Indonesia, although their impact has not yet been statistically significant during the study period. In contrast, an increase in the money supply does not necessarily correspond to an increase in the velocity of money, particularly under conditions of economic uncertainty. These findings provide important implications for monetary policy, suggesting that increases in liquidity should be accompanied by policies that stimulate real economic activity and promote broader utilization of digital payment systems in order to optimize the velocity of money.

CONCLUSION

Based on the results of the analysis and discussion regarding the effects of cashless payment systems and the money supply on the velocity of money in Indonesia during the period from 2019 to 2024, it can be concluded that the relationships among these monetary variables are dynamic and influenced by evolving economic conditions, particularly during the COVID-19 pandemic and the post- pandemic period. This study indicates that changes in the payment system structure as well as monetary policy do not always produce immediate and statistically significant effects on the velocity of money in the short run.

Partially, the money supply (M2) is not proven to have a significant effect on the velocity of money in Indonesia. This result indicates that an increase in liquidity in the economy does not automatically drive an increase in the speed of money circulation. This condition reflects the tendency of households and business actors to hold funds within the financial system or in investment instruments, particularly during periods of economic uncertainty. Therefore, the effectiveness of liquidity-expansion-based monetary policy is highly dependent on the response of the real sector and the level of economic activity.

Meanwhile, the cashless payment system shows a positive relationship with the velocity of money, although its effect is not yet statistically significant. This finding indicates that increased use of non-cash transactions such as e-money, QRIS, and digital transfers tends to accelerate economic transaction activity; however, its impact on the velocity of money remains gradual. This underscores that the adoption of digital payment systems requires time and adequate ecosystem support in order to exert a stronger influence on monetary mechanisms.

Simultaneously, the money supply and the cashless payment system have also not been able to exert a significant effect on the velocity of money in Indonesia. Nevertheless, the relatively high coefficient of determination indicates that, from an economic perspective, these two variables make a substantial contribution to explaining variations in the velocity of money. This suggests that other factors outside the model—such as inflation, interest rates, economic growth, and the level of household consumption—also play an important role in influencing the speed of money circulation.

Overall, the findings of this study imply that monetary policy and the development of digital payment systems need to be designed in a complementary manner. Increases in the money supply should be balanced with policies that stimulate real economic activity, while the strengthening of cashless payment systems should continue to be supported in order to enhance transaction efficiency and accelerate the velocity of money in a sustainable manner. Accordingly, effective management of payment systems and appropriate monetary policy can play an important role in maintaining the stability and dynamics of the Indonesian economy.

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