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Analysis of the Impact of E-Money on the Money Supply in Indonesia

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Abstract
Purpose: This study examines the effect of e-money transactions on the money supply (M2) in Indonesia, incorporating inflation and credit card transaction value as control variables. Research Design and Methodology: A quantitative approach is applied using monthly time-series data from 2022–2024 obtained from Bank Indonesia and the Central Statistical Agency, analyzed through multiple linear regression with the Ordinary Least Squares (OLS) method and classical assumption tests. Findings and Discussion: The results indicate that e-money transactions have a positive and significant impact on the money supply, while credit card transactions have a negative and significant effect, and inflation shows no significant influence; this suggests that liquidity dynamics are increasingly shaped by digital transaction behavior rather than traditional monetary factors. Implications: The findings imply that monetary authorities should integrate the development of digital payment systems into monetary policy formulation and liquidity management, and future research may explore broader digital financial instruments and longer observation periods.

Keywords: E-Money; Digital Payment System; Money Supply (M2); Inflation; Indonesia.

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INTRODUCTION

The era of globalization, characterized by rapid advancements in information and communication technology, has significantly transformed economic systems, particularly in transaction mechanisms and payment instruments. The emergence of digital payment platforms has shifted economic actors' reliance from cash-based transactions toward more efficient non-cash instruments, improving transaction speed, reducing costs, and altering liquidity management behavior (Arner et al., 2020; Hasan et al., 2013). From a macroeconomic perspective, this transformation is essential because the function of money increasingly extends beyond physical currency into electronically stored value, thereby influencing the velocity of money and monetary transmission channels (Bech & Garratt, 2017; Mishkin, 2019). Consequently, digital payment systems should not be viewed solely as technological innovation but as a structural component of modern monetary dynamics.

In emerging economies, Indonesia represents a significant case for examining the expansion of digital payment adoption. Over the past decade, the use of non-cash payment instruments—particularly electronic money—has grown rapidly and become embedded in daily economic activity. The consistent increase in e-money transaction values during 2022–2024 indicates that electronic money has evolved from a complementary payment method into a primary transaction instrument. Such behavioral shifts in transaction preferences may influence money circulation patterns and potentially affect macroeconomic stability through changes in liquidity demand and transaction velocity (Humphrey et al., 2006; Khiaonarong & Humphrey, 2019)..

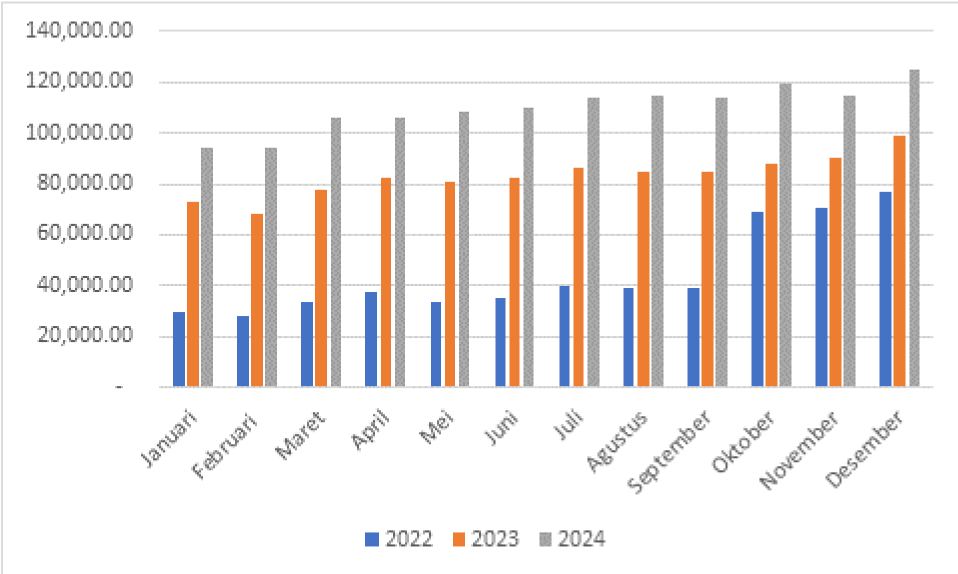

Figure 1. E-money Transaction Data in Indonesia 2022-2024 (Billion Rupiah)

Source: Bank Indonesia (2025)

Bank Indonesia defines electronic money (e-money) as a payment instrument in which monetary value is stored electronically on a server or chip and used for transactions with parties other than the issuer (Bank Indonesia, 2020). The rapid expansion of e-money usage implies that digital payment systems may affect conventional monetary indicators, particularly broad money (M2), which represents overall liquidity conditions in the economy. The growing intensity of digital transactions therefore raises questions regarding the relationship between e-money circulation and monetary aggregates, as well as its implications for monetary policy transmission mechanisms.

Previous empirical studies show that improvements in efficiency and convenience of electronic payments tend to reduce the demand for cash. Brown et al. (2022) found that the adoption of electronic payment instruments shifts consumer transaction preferences away from physical currency, while Bordo and Levin (2022) argue that digital currency innovation can reshape monetary transmission by accelerating money circulation and altering liquidity structures. These findings suggest that

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payment system innovation carries meaningful monetary consequences, although its influence on aggregates such as M2 may vary across time horizons.

Evidence from Indonesia remains inconclusive. Ferlicia et al. (2022) report a relationship between non-cash payments and the money supply, but the response fluctuates during periods of economic disturbance. Similarly, Thoyyibah (2024) and Adamy et al. (2024) show that e-money transactions significantly affect M2 in the short run, yet the effect weakens in the long run, indicating instability in the relationship.

Macroeconomic factors, particularly inflation, may moderate this interaction. Inflation affects transaction demand for money and preferences for liquid assets. Hermawan et al. (2024) demonstrate that money velocity and inflation dynamics in Indonesia are increasingly influenced by digital payment development, while Ulfah and Suriani (2025) emphasize the importance of incorporating macroeconomic variables in money demand analysis in the digital economy era. Based on this background, the present study analyzes the effect of e-money transaction value on Indonesia's money supply (M2) while controlling for inflation and credit card transactions, providing empirical evidence on how payment innovation interacts with monetary aggregates and offering policy implications for monetary authorities.

RESEARCH DESIGN AND METHODOLOGY

This research employs a robust quantitative methodology aimed at dissecting the impact of e-money transactions (electronic currency) alongside various macroeconomic factors on Indonesia's money supply during the years 2022 to 2024. This approach enables rigorous statistical hypothesis testing, yielding empirical insights that can be meticulously scrutinized. The dataset for this investigation consists of monthly time series data, culminating in a total of 36 data points processed, encompassing the entirety of the specified months.

The study scrutinizes multiple independent variables, including e-money (electronic currency), inflation rates, and credit card transaction values. The primary dependent variable under examination is the volume of money supply in Indonesia. All these variables are quantified using secondary data sourced from reputable institutions, specifically the Bank Indonesia (BI) portal for e-money, inflation, and credit card transaction values, and the Central Statistical Agency (BPS) for money supply data (M2). For data processing and analysis, this study utilized Stata software for comprehensive statistical and econometric evaluation.

The analytical technique employed is multiple linear regression using Ordinary Least Squares (OLS) estimation to assess the linear relationships between independent and dependent variables. The OLS method is favored for its capacity to deliver efficient and unbiased parameter estimates, provided classical assumptions are satisfied. Multiple linear regression is deployed to gauge the individual impacts of each independent variable on the money supply while controlling for the influence of other variables in the model simultaneously. The formulation of the multiple linear regression equation model is articulated as follows:

$$JUB_t = \beta_0 + \beta_1 EMNY_t + \beta_2 INF_t + \beta_3 NTKK_t + \varepsilon_t$$

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Where:

JUB	= Amount of money in circulation (billions of rupiah)
EMNY	= Electronic money (billions of rupiah)
INF	= Inflation (percent)
NTKK	= Credit Card Transaction Value (billions of rupiah)
β_0	= Constant
$\beta_1, \beta_2, \beta_3,$	= Independent variable coefficient
t	= *Time series (2022-2024)*
e	= Residual

In this investigation, Ordinary Least Squares regression analysis (OLS) encompasses analytical methods through various phases, including classical assumption evaluations such as the Multicollinearity Test, Normality Test, Heteroskedasticity Test, Autocorrelation Test, and Model Specification Test or Linearity Test. Beyond classical assumption evaluations, OLS analysis must also integrate model adequacy assessments in the form of Partial Test (t Test), Simultaneous Test (F Test), and the interpretation of the Coefficient of Determination (R2).

RESULT AND DISCUSSION

Table 1 OLS Model Regression Results

$$logJUB_t = 7.439 + 0.105EMNY_t - 0.006INF_t - 0.012NTKK_t$$

(0.000)* (0.013)* (0.139) (0.000)*

$R^2 = 0.803$; F-Stat = 43.49; SigF-Stat = 0.000

Diagnostic Test

(1) Multicollinearity (VIF)
EMNY = 1.10; *INF* = 1.27; *NTKK*= 1.16

(2) Normality
JB(2) = 0.123; *Prob. JB*(2) = 0.940

(3) Autocorrelation (Breusch-Godfrey)
χ^2 (1) = 3.006; *Prob.* χ^2 (1) = 0.083

(4) Heteroscedasticity (White)
χ^2 (9,13) = 8.41; Prob. χ^2 (9,13) = 0.493

(5) Linierity (Ramsey Reset)
F(3,29) = 0.58; *Prob.* F(3,29) = 0.630

Source: BPS and BI, processed. Note: *Significant at alpha = 0.01; **Significant at alpha = 0.05; ***Significant at alpha = 0.10; Numbers in parentheses are empirical probabilities (p-values)

According to Table 1, the findings from the multicollinearity assessment using the Variance Inflation Factor (VIF) reveal that every independent variable maintains VIF values beneath the significant threshold of 10, thereby confirming that multicollinearity is non-existent in the model. Additionally, the residual normality

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evaluation via the Jarque Bera test indicated a probability value exceeding the 5% significance mark, signifying that the residuals are normally distributed. Moreover, the autocorrelation examination utilizing the Breusch Godfrey test affirmed the lack of autocorrelation within the regression model.

Further testing is conducted to affirm the stability of residual variance and the adequacy of model specifications. The heteroskedasticity analysis through the White test revealed a Chi-Square probability value surpassing the 5% significance level, which leads to the conclusion that heteroskedasticity is not an issue in the model. In contrast, linearity assessments performed with the Ramsey RESET test demonstrated F-statistical probability values exceeding the 5% significance level, indicating that the regression model has been correctly specified and adheres to the linearity assumption. From the comprehensive results of the classic assumption tests, it can be deduced that the regression model, overall, fulfills the fundamental assumptions of linear regression, thus making the estimation results suitable for additional analysis and conclusions. This is further substantiated by a coefficient of determination (R^2) value of 0.803, illustrating that 80.3% of the fluctuations in the money supply (JUB) can be elucidated by e-money variables, inflation, and credit card transaction values, while the remaining 19.7% is accounted for by other external factors. Concurrently, the F-stat value of 43.49 with a probability value of 0.000 < α (5%) indicates that all independent variables collectively exert an influence on the dependent variable.

Once the model is established as statistically and econometrically sound, the analysis transitions to a partial interpretation of the impact of each independent variable. The estimates revealed that the e-money variable (EMNY) possesses a positive coefficient of 0.105 with a probability of 0.013 (<0.05), thus confirming that e-money positively and significantly affects the money supply. The inflation variable (INF) demonstrates a negative coefficient of -0.006 with a probability of 0.139 (>0.10), suggesting that inflation has a negative yet insignificant impact on the money supply throughout the study period. Conversely, the credit card transaction value variable (NTKK) displays a negative coefficient of -0.012 with a probability of 0.000 (<0.01), indicating a negative and significant effect on the money supply. Therefore, individually, e-money tends to boost the money supply, credit card transactions tend to diminish it, while inflation fails to exhibit any statistically significant influence in this model.

The estimate results revealed that e-money exerts a significant positive impact on the money supply, demonstrating that the growing adoption of e-money fuels the vibrancy of money circulation within the economy. These discoveries highlight e-money's pivotal function in enhancing both the frequency and volume of transactions through superior payment systems. Brown et al. (2022) boldly argued that the simplicity of e-money usage shapes individuals' tendencies to use cash. Likewise, Ferlicia et al. (2022) discovered a profound link between non-cash transactions and the money supply in Indonesia. Adamy et al. (2024) boldly claim that, in contrast to other non-cash methods, e-money wields a notably stronger impact on monetary aggregates in the short term. Consequently, e-money bolsters money circulation by amplifying transaction efficiency and liquidity.

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Building on these insights, the affirmative correlation between e-money and the money supply can be elucidated through economic mechanisms that spotlight transaction acceleration and heightened liquidity demands. The surging use of e-money diminishes transaction barriers and accelerates payment processes, thereby igniting economic activity and capital turnover. Brown et al. (2022) assert that while payment digitization dampens cash demand, the swift pace of transactions actually enhances the velocity of money. In alignment, Bordo & Levin (2022) stress that innovations in digital currency hold the power to transform liquidity frameworks and enhance monetary policy effectiveness. Thoyyibah (2024) empirically demonstrated that e-money transaction values positively influence the money supply in Indonesia in the short term, validating that monetary aggregates are increasingly swayed by payment advancements, transcending traditional monetary influences like inflation.

The evolution of payment systems due to e-money's ascendancy has repercussions for the interplay between inflation and the money supply. Findings indicate that when e-money variables are integrated into the model, inflation's effect on the money supply tends to diminish, signaling a transformation in the determinants of monetary aggregates. These revelations imply that the digitization of payment systems not only reshapes transaction habits but also alters conventional interpretations of short-term monetary dynamics. Thoyyibah (2024) illustrated that e-money transactions and other non-cash instruments exert a stronger influence on M2 than inflation. Moreover, Hermawan et al. (2024) elucidate that the evolution of digital payments accelerates money velocity, meaning changes in the money supply do not necessarily mirror inflationary pressures directly. Thus, these findings affirm that inflation's role as a primary determinant of monetary aggregates is likely to diminish within the realm of digital payment systems.

Such implications must be grasped through the lens of monetary transmission mechanisms in the digital economy era. Within the monetary framework, inflation and the money supply are intricately linked through the interplay of money demand and supply. However, in a digitized financial system, the effectiveness of these relationships is significantly shaped by the structure of financial intermediation and the responsiveness of monetary policy. Soedarmono et al. (2023) demonstrated that the impact of monetary variables on liquidity is increasingly dictated by monetary policy channels, particularly via banking and liquidity funding. Puspitasari et al. (2024) and Ulfah & Suriani (2025) also established that inflation in Indonesia is more significantly affected by the interplay between e-money, M1, and exchange rates than by mere fluctuations in monetary aggregates. Therefore, monetary stability in this digital era must be perceived as a product of the interaction between payment system innovations and the effectiveness of monetary policy, including the response to credit-based non-cash instruments.

Shifts in transaction behaviors due to the digitization of payments are also evident in the rising utilization of credit cards, which operate through credit mechanisms and carry fundamentally different monetary implications compared to e-money. The study's results indicated that the volume of credit card transactions had a negative and significant impact on the money supply (M2). These findings reveal that the escalation of credit-based transactions is likely to diminish the public's necessity to retain liquid cash. Empirical analyses in Indonesia illustrate that credit card usage

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acts as a substitute for cash and current account deposits, thus diminishing the monetary balance captured in M2 (Ferlicia et al., 2022; Hermawan et al., 2024). Additional studies have also indicated that a surge in credit card transactions negatively influences the demand for cash both in the short and long term. This divergence in influence further validates that non-cash payment tools operate through distinct monetary mechanisms affecting monetary aggregates.

Building upon such empirical insights, the adverse impact of credit cards on the money supply can be elucidated through the theory of money demand and monetary aggregates. In monetary discourse, credit instruments are regarded as partial substitutes for cash and transactional account balances, thereby curbing the demand for money as reflected in monetary aggregates like M2 (Bordo & Levin, 2022). While most international research has concentrated on the relationship between credit cards and money demand, the implications remain pertinent for M2 dynamics since the diminished necessity to hold liquid cash directly reduces the monetary component. Therefore, these insights imply that credit cards not only affect consumption patterns but also play a role in the dynamics of monetary aggregates through credit substitution channels, exhibiting an inverse influence compared to e-money.

CONCLUSION

This research reveals that e-money significantly boosts the money supply (M2) in Indonesia, while inflation shows no substantial effect when considering variables of digital payment systems. These outcomes suggest that the dynamics of liquidity are increasingly shaped by transaction behaviors and the frequency of digital payment tool usage. Furthermore, the data indicates that credit card transactions negatively influence M2, highlighting the substitution effect of credit for cash and liquid deposits in transaction activities. Collectively, these findings assert that non-cash payment tools carry distinct monetary implications, based on their unique characteristics and operational mechanisms.

Conceptually, this research signals a transformation in monetary transmission methods, where money supply now reflects not just inflationary pressures but also the efficiency and swiftness of money circulation propelled by payment digitization. The policy implications derived from these findings underscore the necessity of integrating digital payment system advancements into monetary policy and liquidity management strategies. Monetary authorities must enhance their inflation and interest rate control measures by closely monitoring shifts in transaction structures and the velocity of money influenced by payment innovations. From an academic perspective, this study enriches existing literature by delivering contemporary empirical evidence on the varying impacts of e-money and credit cards on monetary aggregates in developing nations, while also paving the way for advanced research into the long-term dynamics and interplay between monetary policy and the evolution of digital payment systems.

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