Volume 10, No 2, December 2024
ISSN : 2460-5204 eISSN : 2986-2639

E-money and card payment instruments affect money speed in Indonesia

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ABSTRACT

This comprehensive study is meticulously designed to thoroughly examine and elucidate the profound impact that electronic money, commonly referred to as e-money, along with various payment instruments that utilize cards, has on the dynamics of money circulation within the economic landscape of Indonesia. To achieve this objective, the research methodology employed in this investigation is a rigorous multiple linear regression analysis, which is conducted with the sophisticated statistical software known as EViews 9, and it is imperative to note that the type of data utilized in this research is categorized as secondary data. The secondary data, which has been meticulously gathered for the purposes of this analysis, has been sourced from reputable institutions, specifically the Central Statistics Agency and Bank Indonesia, both of which provide a wealth of information that has been systematically collected and organized for analytical scrutiny. The findings derived from this extensive study reveal that, whether examined in isolation or collectively, the total volume of electronic money currently in circulation, the quantity of Electronic Data Capture (EDC) machines operational in the market, and the various Card Payment Instruments (APMK) all exert a significant and positive influence on the overall money circulation within the Indonesian economy. Furthermore, this research contributes valuable insights into the transformative role that these modern financial instruments play in shaping monetary flows, thereby enhancing our understanding of contemporary financial practices in Indonesia. Ultimately, the implications of these findings underscore the necessity for stakeholders in the financial sector to recognize and adapt to the evolving landscape of digital payment mechanisms as they continue to permeate and redefine traditional notions of currency circulation.

Keywords: electronic money, card payment instrument, money circulation

I. INTRODUCTION

The evolution and advancement of information technology, alongside the intricate systems of trade and payment methodologies, has significantly contributed to a paradigm shift in the introduction and proliferation of novel innovations concerning the utilization of various payment instruments. One particularly noteworthy innovation that has emerged in this context is the advent of electronic payment instruments that leverage the latest developments in technology to facilitate transactions. Since the onset of the 1990s and continuing to the present day, there has been a discernible trend among individuals and businesses alike to increasingly adopt "electronic money," commonly referred to as e-money, which encompasses a variety of

tools such as internet banking platforms, debit cards, and automatic teller machine (ATM) cards.

The rapid changes brought about by technological advancements have effectively transformed the requirements and expectations of consumers who now demand payment instruments that are not only swifter but also offer greater flexibility in terms of usability and access. The evolution of payment instruments has been a continuous journey through time, starting from the primitive use of coins, progressing through conventional paper currency, and culminating in the modern era where currency has metamorphosed into forms that consist entirely of electronic data, which we now collectively refer to as electronic payment instruments. In this contemporary landscape, non-cash payment systems, which can be aptly described as electronic in nature, are experiencing an unprecedented rate of development that aligns seamlessly with the advancements in payment system technology.

To encapsulate this notion succinctly, electronic money, or e-money, can be defined as a payment mechanism that exists in an electronic format, wherein the value of the currency is securely stored within designated electronic media. Presently, the proliferation of electronic money is becoming increasingly prevalent, serving as a viable alternative to traditional non-cash payment instruments such as debit and credit cards. The versatility of electronic money allows it to be employed for an expansive array of transactions, including but not limited to shopping, toll payments, purchasing transportation tickets, and various other financial exchanges. A critical distinction between electronic money and traditional debit or credit cards lies in the fact that the funds contained within electronic money are entirely under the consumer's control, as opposed to being managed and held in trust by banks or service providers as deposits. At this juncture, it is important to note that there exist two principal types of electronic money. The first category is characterized by electronic money that is stored on a chip, which is typically embedded within a card, wherein transactions can be executed directly without necessitating an internet connection, thereby functioning in an offline capacity.

Table 1. Historical electronic money transactions

Period	Volume (Million)	Nominal (Trillion)
2013	137,9	2,9
2014	203,6	3,31
2015	535,57	5,28
2016	683,13	7,06
2017	943,31	12,37
2018	2.922,69	47,19
2019	5.226,69	145,16
2020	3.021,66	126,95

Electronic monetary instruments play a pivotal role in facilitating both convenience and security for individuals in the public domain, particularly for users who engage in financial transactions, as they significantly alleviate the burdens associated with carrying physical cash, especially when it comes to executing large monetary exchanges. Consequently, the responsibility of overseeing and ensuring the seamless operation of the payment system falls under the jurisdiction of Bank Indonesia, which serves as the principal monetary authority within the nation. The introduction of card-based payment instruments, known in the realm of finance as APMK, is intrinsically linked to the increasingly dynamic and mobile lifestyle of the community, which has led to a growing demand for payment solutions that not only guarantee safety but also offer practicality, enabling individuals to conduct transactions at any given time and from any location without undue difficulty.

Within the banking sector, the advent of technological innovations has gradually permeated the landscape, taking shape through various forms of payment cards, which include

but are not limited to Automatic Teller Machine (ATM) cards, credit cards, and debit cards, thus revolutionizing the way transactions are processed. The employment of payment cards has garnered recognition for its myriad advantages when juxtaposed with traditional cash transactions, primarily characterized by its heightened practicality, as patrons no longer find themselves encumbered by the necessity of carrying physical currency while shopping, a scenario that inherently carries the potential risk of becoming a victim of criminal activity; furthermore, payment cards are widely regarded as a more effective alternative since they eliminate the complications associated with needing precise small change for transactions (Yudhistira, 2014).

The concept of the velocity of money, frequently referred to as acceleration, serves as a crucial analytical tool employed to quantify the amount of money circulating within the economy (M), which is interrelated with the prevailing price level (P) and the aggregate output (Y), and this foundational concept was introduced and articulated by the prominent American economist, Irving Fisher. The velocity of money, often represented by the symbol V, can be comprehensively understood as the average frequency, measured annually, with which a single unit of currency is utilized to procure the totality of goods and services produced within a given economic framework. In simpler terms, acceleration elucidates the number of times money changes hands over a specified duration, thus providing insight into the fluid dynamics of economic exchanges (Khakim Abdul, 2017).

In the context of everyday transactions, the utilization of debit cards has become an entrenched practice, particularly for purchasing both goods and services, as these exchanges are facilitated through Electronic Data Capture (EDC) machines that are strategically located at various retail establishments. EDC machines, which are devices issued by financial institutions, whether they be traditional banks or non-bank entities, serve as instrumental tools that facilitate payment transactions via the swiping of debit cards, thereby enhancing the efficiency of the purchasing process. Recognizing the significance of these developments, Bank Indonesia, as the central bank of the nation, has proactively implemented a series of payment system policies designed to promote the adoption of electronic payment instruments, commonly referred to as electronic money. Among the array of policies that have been enacted, notable initiatives include the expansion of non-cash electronification efforts, which encompass the distribution of government social programs, the facilitation of payments within the transportation sector, and the management of financial transactions conducted by regional governments (Pemda), alongside additional policies aimed at bolstering the digital payment and financial ecosystem, particularly by reinforcing the implementation of the National Payment Gateway (GPN) to achieve interconnection and interoperability within the retail payment system.

Based on the comprehensive overview provided in the preceding discussion, one can infer with a high degree of certainty that the swift and unprecedented advancement of technological innovations undeniably exerts a significant influence on various facets of individuals' daily lives, particularly in relation to the facilitation and enhancement of financial transactions aimed at fulfilling essential personal and societal needs. Consequently, the author has developed a keen interest in embarking upon a methodical research endeavor that meticulously examines this pertinent issue, which has been aptly titled "The Effect of the Use of E-money and Card Payment Instruments on the Speed of Money Circulation in Indonesia."

This scholarly investigation is characterized as a quantitative research study, wherein the primary data sources utilized throughout this research process comprise carefully curated secondary data, which has been meticulously gathered from reputable institutions such as the Central Statistics Agency (BPS), Bank Indonesia, the official Bank Indonesia website, as well as a

plethora of scientific journals and other academic literature that contribute to the richness and depth of the analysis presented. Through this rigorous approach, the research aims to elucidate the intricate relationships between technological payment methods and their implications for the velocity of money within the Indonesian economy, thereby providing valuable insights into modern financial practices.

II. LITERATURE REVIEW

Electronic money, or e-money, represents a transformative shift in financial transactions, offering a fast, convenient, and secure alternative to traditional cash. Its adoption has been facilitated by advancements in financial technology, enabling seamless transactions across various sectors, including business and education. E-money enhances user experience by allowing quick payments anytime and anywhere, eliminating the need for physical currency (Ismailiyya & Nourkholid, 2024; Madykhanova et al., 2024). It also increases efficiency in business operations by reducing transaction costs and fostering digital innovation (Silalahi & Tangkudung, 2024). Furthermore, its integration into education has simplified processes for tuition and other expenses, providing ease of use and improved transaction monitoring (Sosrowidigdo, 2023).

Despite its advantages, e-money introduces significant challenges. Security and data privacy are critical concerns, necessitating robust regulatory frameworks to protect users and ensure trust (Silalahi & Tangkudung, 2024). The rapid pace of technological development also demands continuous updates to regulatory systems to address emerging risks and secure transactions (Madykhanova et al., 2024). Additionally, social impacts such as reduced personal interaction and increased consumerism pose potential drawbacks, particularly in educational and broader societal contexts (Sosrowidigdo, 2023).

Technological advancements like blockchain, digital wallets, and cryptocurrencies are reshaping the landscape of e-money and influencing its integration into national payment systems (Madykhanova et al., 2024). As e-money becomes an essential component of these systems, detailed regulatory frameworks are vital to manage its implementation and address both its benefits and drawbacks. Striking a balance between leveraging e-money's advantages and mitigating its risks is crucial for its sustainable adoption across various sectors, ensuring its positive impact on economic and social development.

The circulation of money in Indonesia is shaped by various factors, including the critical role of Bank Indonesia, the rise of non-cash transactions, and the effects of economic policies during the COVID-19 pandemic. Bank Indonesia plays a vital role in combating counterfeit money through collaborations with other agencies and public education initiatives (Faqran, 2024). However, challenges such as public reluctance to report counterfeit money and a passive flow of information to Bank Indonesia hinder these efforts. Strengthening public awareness and reporting mechanisms is essential to address these issues effectively.

Non-cash transactions, such as those involving credit cards and e-money, have significantly influenced cash circulation in Indonesia. These methods reduce the reliance on physical cash, driven by technological advancements and the COVID-19 pandemic (Panjaitan & Sitorus, 2022; Muzhaffar & Amaliah, 2024). While non-cash payments have altered money circulation dynamics, their individual impact on the overall monetary system remains moderate when considered in isolation. The transition toward a cashless society is evident, but cultural preferences and infrastructural limitations make the shift gradual and complex.

The COVID-19 pandemic further complicated the dynamics of money circulation. It led to an increased money supply and reduced electronic money usage as economic uncertainties

prompted individuals to prioritize liquidity by converting time deposits into savings (Silaswara et al., 2020). This trend was influenced by employment terminations and restricted economic activities during the pandemic. Additionally, the velocity of money in Indonesia is positively affected by non-cash transactions and interest rate policies over the long term (Sasikarani et al., 2022). These shifts underscore the need for flexible monetary policies that balance the interplay of cash and non-cash systems to adapt to sudden economic changes and ensure monetary stability.

III. METHODS

This research model is quantitative descriptive research, which is a study that seeks and describes the relationship (cause and effect) and influence of research variables to draw conclusions. The quantitative method is a method based on the philosophy of positivism that aims to describe and test the hypothesis made by the researcher. Quantitative research contains many numbers starting from collection, processing, and results that are dominated by numbers (Sugiyono 2018:15). This data is collected continuously (time series). This study uses multiple linear regression analysis tools, using the Ordinary Least Square (OLS) method which is formulated as follows:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$$

Y : Money Turnover
α : Constant
$\beta_1 \ldots \beta_3$: Regression Coefficient
X_1 : e-money in circulation (in trillion rupiah)
X_2 : APMK in circulation (in trillion rupiah)
X_3 : Number of EDC Machines in Circulation (units)
E : Standard Error

IV. RESULTS AND DISCUSSION

Throughout the extensive timeline that has elapsed since the initial establishment of the barter system, which is characterized by the direct exchange of goods and services without the use of money, there have emerged three pivotal advancements in the realm of payment instruments that warrant our attention and analysis. These significant innovations include the inception of full-bodied money, which is represented by coins that are minted from precious metals such as gold and silver; the introduction of fiat money, which refers to currency that possesses a value that is substantially greater than its intrinsic value as a commodity; and the development of checking accounts, commonly referred to as checking accounts, along with the more contemporary phenomenon of electronic money, which can be understood as a digital form of currency. In a broader context, it is important to note that the evolutionary trajectory of money appears to have culminated in the widespread acceptance and utilization of fiat money, as its presence continues to be felt in contemporary financial transactions. Nevertheless, it is imperative to recognize that the innovation surrounding payment systems has not reached a definitive conclusion, as evidenced by the ongoing advancements that have led to the emergence of electronic payment transactions, which can be classified under the umbrella of a Non-Cash Payment System.

Electronic payments, which are defined as transactions that leverage sophisticated information and communication technologies, such as Integrated Circuits (IC), cryptographic techniques, or security codes designed to protect transaction data, as well as robust communication networks, have transformed the landscape of financial transactions. The genesis

of this type of transaction can be traced back to the initial phases of transfers conducted between networks within banking institutions, which subsequently evolved to facilitate transactions between banks and their customers. Presently, we observe that electronic transactions continue to proliferate, exhibiting a diverse array of variants and applications that extend beyond the interactions between banks and their clientele, encompassing transactions that occur between customers themselves, and even interactions that take place among individuals engaged in economic activities at large, as noted by Pohan in 2011.

On the notable date of August 14, 2014, the esteemed Governor of Bank Indonesia, Agus Martowardojo, took a significant step by officially launching the National Non-Cash Movement (GNNT), an initiative that was specifically designed with the intention of enhancing public and business awareness regarding the advantages of utilizing non-cash payment methods in their financial transactions, a shift that is predicated on the premise that such methods are not only more convenient but also significantly safer and more efficient than traditional cash transactions. The momentum of innovation within the financial sector continues unabated, evolving in tandem with Bank Indonesia's overarching mission to cultivate a Less Cash Society within the Indonesian context, thereby promoting the adoption of various non-cash payment instruments, which include, but are not limited to, cards and accounts that are collectively referred to as Electronic Money (E-Money). Despite the ongoing relevance and usage of fiat money in everyday transactions, it is equally important to highlight that electronic money is gradually gaining traction and witnessing substantial growth, a phenomenon that is evidenced by the increasing number of financial institutions and organizations that are actively engaged in the issuance of electronic money products.

Table 2. t-test results

Variable	Coefficien...	Std. Error	t-Statistic	Prob.
C	3.541163	0.186010	19.03753	0.0000
X1	1.153499	0.011550	14.27980	0.0000
X2	2.50E-07	6.44E-08	16.88472	0.0005
X3	1.653536	0.023112	15.58696	0.0000

$Y = 3.541163 + 0.153499X1 - +2.50007X2 + 1.653536X3 + \varepsilon$

The Influence of the Amount of Electronic Money in Circulation on Money Circulation in Indonesia

Based on the t-test that has been conducted regarding the influence of the amount of electronic money in circulation on money circulation in Indonesia in 2014-2018 in quarters, it shows that the t-value of the amount of electronic money in circulation is 1.153499. The probability value of the t-count of the variable amount of electronic money in circulation is 0.0000 where this value is smaller than the α value of 0.05 so that it can be interpreted that the variable amount of electronic money in circulation is significant to the variable money circulation. The significant influence of the variable amount of electronic money in circulation on money circulation is in accordance with the existing hypothesis. In Indonesia, more and more e-commerce encourages people to behave consumptively, and also the need for shopping at minimarkets or food/drink outlets, even small transactions such as parking fees can be done practically using electronic money, of course the more electronic money in circulation with the existence of online transactions. In addition, starting from October 31, 2017, Indonesia has implemented a non-cash payment obligation for all toll payment transactions in accordance with the Regulation of the Minister of PUPR Number 16 of 2017, this has caused the amount of electronic money in circulation to increase rapidly so that money circulation has also increased.

The Influence of EDC Machines on Money Circulation in Indonesia

Based on the results of the t-test that has been carried out regarding the influence of electronic money reader machines on money circulation in Indonesia in 2013-2020 in the quarter The probability value of the electronic money reader machine variable is 0.0005 where this value is smaller than the α value of 0.05 so that it can be interpreted that the electronic money reader machine variable has a significant effect on the money circulation variable. The significant influence of the electronic money reader machine variable on money circulation is in accordance with the existing hypothesis. This is in line with the logic applied to electronic money, where EDC machines are needed to read data contained in electronic money. So the more supporting infrastructure for electronic money causes the use of electronic money to increase so that money circulation increases.

The influence of card-based payment instruments on money circulation in Indonesia

Based on the test results, it is known that APMK has a statistical probability value of 0.0000 <0.05, so it can be interpreted that APMK has a significant effect on money circulation. Economic transactions using card-based payment instruments show an increase over time. The period from 2009 to 2016 showed an increasing trend in terms of both transaction volume and transaction nominal. This increase is in line with the increasing development of facilities and functions offered by card-based payment instruments. Until 2016, there were 65 companies registered as debit card issuers with a total of 127,786,999 cards in circulation. The volume of debit card usage reached 5,196,512,452 transactions or 14,237,020 transactions per day, the highest among other payment instruments (Bank Indonesia 2017). In addition to debit cards, Indonesia also recognizes credit cards as one of the practical payment instrument options. Until 2016, there were 24 companies registered as credit card issuers with a total of 17,406,327 cards in circulation. The volume of credit card usage reached 305,052,297 transactions or 835,759 transactions per day. These transactions are fewer than debit card transactions (Bank Indonesia 2017). With the increase in transactions made, the APMK variable has a positive and significant effect on money circulation.

V. CONCLUSION

Based on the comprehensive findings derived from an extensive research study that was meticulously carried out to investigate the profound effects exerted by the utilization of electronic money, commonly referred to as E-Money, along with the proliferation of Electronic Data Capture (EDC) machines and various payment instruments that incorporate card technology on the overall dynamics of money circulation within the Indonesian economy during the time frame spanning from the year 2013 to the year 2020, various significant insights have been gleaned. Taking into account the meticulous data that has been systematically gathered alongside the rigorous tests that have been conducted to ascertain the relationships at play, it is possible to draw the following pivotal conclusions from this research endeavor: The overall volume of electronic money that is actively circulating within the economy exhibits a substantial and favorable impact on the mechanisms of money circulation throughout the Indonesian financial landscape. Furthermore, the proliferation and accessibility of electronic money EDC machines are found to have a noteworthy and constructive effect on the patterns of money circulation that characterize the economic environment in Indonesia. In addition, the diverse payment instruments that utilize card technology demonstrate a significant and beneficial influence on the dynamics of money circulation within the broader context of Indonesia's financial system.

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