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The Speed of Adjustment Effect of Non Cash Payment System to Indonesia's Economic Growth

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Abstract

This study aims to prove the speed of adjusting the non-cash payment system with indicators of a card-based payment instrument indicator (APMK) was measured by the transaction value of an ATM/debit card, the value of credit card transactions, and the value of e-money transactions to Indonesia's economic growth.The analytical model used was the dynamic autoregressive lag distribution (ARDL) specification, according to Koyck's approach, and error correction models (ECM). The results of the study shown that the speed of adjustment of the non-cash payment system with the indicator of card-based payment instruments (APMK), as well as the value of e-money transactions on Indonesia's economic growth during the period of 2010. Q1 to 2020. Q4 was rejecting the proposed hypothesis because the adjustment speed was less than 1 (has a slow response). Similarly, the results of the proof of the ECM model shown that between the observation variables there were no balance or short-term or long-term relationship. The development of the digital economy and finance in Indonesia, which was marked by the non cash payment system, was not yet dominant, meaning that the payment system made by the public was still dominated by the cash payment system. Therefore, efforts to strengthen the digital economy and finance ecosystem must be more intense and sustainable.

Keywords: *non-cash payment system, speed of adjustment, economic growth Indonesia*

1. Introduction

The trend of economic and financial digitization in Indonesia presents both opportunities and risks. The development of digital technology and innovation has an impact on the development of a payment system that is convenient, fast, and efficient and facilitates all elements for the same purpose of the financial-economy. Economic digitalization has proven to have brought various changes, with the digital economy at least providing economic benefits in achieving efficiency, reducing production costs, collaboration, connecting one party to another, therefore, digital transformation should be used as an alternative solution as a new economic growth engine. .

The magnitude of the contribution of the digital economy to the size of the economy can be observed from online trade which has changed the world economic landscape as the "new face" of the global economy, referring to the McKinsey report (2018), at least online trade has an impact in four areas. First, financial benefits. Provide tremendous economic benefits for the economy of a nation, for example Indonesia as the largest market for e-commerce in Southeast Asia. Its current value is approximately 2.5 billion dollars and is predicted to be 20 billion dollars in 2022 (setneg.go.id, 2019).

One of the contributors to the development of the digital economy in Indonesia is the development of instruments and payment systems. The payment system by definition is a system that includes a set of rules, institutions, and mechanisms used to carry out the transfer of funds, in order to fulfill an obligation arising from an economic activity. The Payment System was born at the same time as the concept of 'money' as a medium of change or intermediary in goods, services and financial transactions.

Broadly speaking, the payment system is divided into two, namely cash payment systems and non-cash payment systems. The basic difference lies in the instruments used. Cash payment system using currency (banknotes and metal) as a means of payment. Whereas in the non-cash payment system, the instruments used are in the form of payment instruments using cards (APMK), checks,transfer form , debit notes, as well as electronic money or e-money (cardsbased and server based).

A cashless payment system is an economic activity in which buying and selling goods and services are carried out without using physical cash (Paul and Friday, 2012) but using an electronic payment system (e-payment) use check. Electronic payments are part of non-cash payments that use electronic money (e-money) as a medium of exchange without

making physical contact with the transacting party (Snellman, Vesala and Humphrey, 2001). Thus, electronic payments are payments caused by the use of debit cards, credit cards, mobile wallets, and automated teller machines (ATMs) (Oginni et al, 2013). In addition, check payments are considered as non-cash payments (Tee and Ong, 2016) because the payment medium using checks in transactions is not made in cash.Furthermore, non-cash payments have gradually complemented and replaced the role of cash payments based on currency, especially paper money (Scholnick et al, 2008). The economic implications of non-cash payments have been proven from the point of view of banking, financial economics, macroeconomics, monetary and economic regulation (Renzis and Schmiedel, 2012; Oginni et al, 2013; Oyewole et al, 2013; Zandi et al, 2013; Tee and Ong, 2016; Zandi et al, 2016; Mushkudiani, 2018).

Based on economic point of view reflected by the development or increase in Gross Domestic Product (GDP) and economic growth, in relation to the non-cash payment system, which is theoretically explained through the traditional neo-classical growth theory. The theory implicitly explains that output growth always comes from one or more of three factors, namely an increase in the quality and quantity of labor, additional capital (savings and investment) and technological improvements (Todaro and Smith, 2008:55).

Complementing the above theory based on a new growth theory which provides a theoretical framework in analyzing endogenous growth. Where economic growth is the result of the economic system, therefore technological progress is one of the driving forces (endogenous), which also means that growth is part of the decision of economic actors to invest in knowledge (Mankiw, 2006:96).

Indonesia's economic growth rate every quarter from 2010 to 2019 tends to fluctuate. Where the average economic growth of Indonesia in the last 10 years is still around 5.3 percent, which is in accordance with the established macro indicators. In 2010 the fourth quarter (Q1) was 6.81 percent, then experienced a contraction of 5.58 percent in 2013 in Q4. Furthermore, Indonesia's economic growth continued to contract by 4.97 percent in 2019 in Q4 (BPS, 2020).

Comprehensive evidence is needed regarding the theoretical statement which says that the driving factor for economic growth is the improvement and development of technology. It is known that technological developments in the financial and monetary sector have been adopted, implemented as well as strategic solutions, which are expressly stated in the blueprint of Bank Indonesia regarding the Indonesian Payment System 2025 (SPI 2025),namely a smooth payment system and a well-functioning monetary system as well as financial system stability, y, which in itself will become the basis for economic growth, prosperity, and financial system stability (BI, 2020:4).

Technological innovation as the basis for developing non-cash payment systems and instruments in Indonesia in relation to economic growth can be traced through various empirical studies. The results of the study in question reveal that the application of non-cash payments has an effect on economic growth and development (Hasan et al, 2012; Zandi, Singh and Irving, 2013; Mieseigha and Ogbodo, 2013; Kumari and Khanna, 2017; Sreenu, 2020)

This study will prove that non-cash payment systems with card-based payment instruments (APMK) indicators as measured by the value of ATM/debit card transactions, and the value of credit card transactions, as well as the value of e-money transactions have an influence on Indonesia's economic growth during the 2010 period Q1 to 2020.Q4. The proof as well as the results in this study consists of two stages, the first stage is proving the speed of adjustment, and the second stage is proving the statistical significance of the influence of non-cash payment system indicators on Indonesia's economic growth.

This research continues to support and is expected to also contribute to previous empirical studies, related to the effect of non-cash payment system indicators on economic growth. Several empirical studies that have been carried out previously can be expressed as follows.There is a positive relationship between the value of payments using transfers, ATM cards, credit cards to economic growth. The reciprocal relationship between the value of payments and the use of ATMs, credit cards and economic growth (Grzelczak and Pastusiak, 2020). Zandi, Singh and Irving (2013) found some evidence that there is a long-term shift to credit cards, debit cards and other non-cash payments to drive economic growth in 56 countries around the world. In the long term, there is a significant effect of implementing non-cash payments on the economies of five countries, namely Austria, Belgium, France, Germany, and Portugal for the period 2000-2012. The study of Tee and Ong (2016) shows that there is a positive relationship between non-cash payments (payments using credit cards, e-money, payments using checks and telegraphic transfers) on economic growth, and only proven in the long term. Oyewole et al. (2013) concluded that the adoption of electronic payments (debit cards and credit cards) encourages trade and economic growth in Nigeria. Prabheesh and Rahman (2019) prove that credit cards have an effect on equitable consumption in Indonesia. They examine the role of credit cards in relation to the transmission of monetary policy in Indonesia, which has previously been studied by Sharma et al. (2018), Juhro and Iyke (2019). Similar to this research, Narayan (2019) also proves that financial technology plays a very important role in Indonesia's economic growth.

However, this is contrary to the results of several studies which reveal that the impact of implementing non-cash payments on economic growth can only be observed over a longer period. Therefore, activities to promotenon cash payments in many countries will not have a direct impact on the economy (Grzelczak and Pastusiak; 2020). The conclusion of further research is that there is no conclusive evidence on how the implementation of non-cash payments can affect the economy. The results of empirical studies in several Western European countries prove that non-cash payments using debit cards are not significant for economic growth. Non-cash payments may have a positive impact on economic activity (Hasan et al. 2012; Oyewole et al. 2013; Zandi et al. 2013) but also provide opportunities for financial irregularities or corruption (Park 2012), as well as weak control over monetary system policies (Al-laham and Al-tarawneh 2009; Ezuwore-Obodoekwe et al. 2014).

Based on the explanation above, the motivation of this research is related to the verification and analysis of speed of adjustment, the effect of non-cash payment system indicators on Indonesian economic growth. The reason for this proof is because the results of previous empirical studies have not been found, especially in Indonesia related to measuring the speed of adjustment of the non-cash payment system to economic growth. As an initial illustration of the acknowledgment that the speed of adjustment here is meant how fast the rate of delay of the non-cash payment system is for Indonesia's economic growth. The criteria for measuring the speed of adjustment are the average and median lag of each non-cash payment system indicator. The average value and media lag is a maximum of 1. If the value of the speed of adjustment is less than 1 (coefficient of adjustment speed = 1- λ) , the faster the response of the non-cash payment system to Indonesia's economic growth, and vice versa if the value of the speed of adjustment is equal to 1 then the slower the response of the non-cash payment system to Indonesia’s economic growth

Based on the above background, the problems formulation of this research are . (1) How fast is the adjustment of the non-cash payment system with indicators of card-based payment instruments (APMK) as measured by the transaction value of ATM/debit cards, and the value of credit card transactions, as well as the value of e-money transactions on Indonesia's economic growth during the 2010 period .Q1 to 2020.Q4? (2) Does the non-cash payment system with card-based payment instruments (APMK) indicators as measured by the transaction value of ATM/debit cards, and the value of credit card transactions, as well as the value of e-money transactions affect Indonesia's economic growth rate during the 2010 period. Q1 to 2020.Q4?

The results of this study provide benefits and contributions that are academically expected to deepen understanding of the non-cash payment system. Meanwhile, practically it is expected to be able to produce recommendations for payment system policies in Indonesia, which also functions as a medium for socializing cashless society.

2. Literature Review

2.1 Theoretical Foundation

(1) Economic Growth Theory

According to classical economics by Adam Smith, classical economic growth is influenced by two main factors, namely total output growth and population growth. Economic growth is strongly influenced by the productivity of sectors in using their production factors. Productivity can be increased through various means of education, training and better management (Sukirno, 2008:433). According to the traditional neo-classical growth theory, output growth always comes from one or more of three factors, namely an increase in the quality and quantity of labor, additional capital (savings and investment) and technological improvements (Todaro and Smith, 2008:55).

Mankiw, Romer and Weil (MRW) modified the neo-classical growth model in which they proposed the use of the variable human capital accumulation. The source of economic growth thus comes from the growth of capital, labor and human capital. The estimation results generated from the MRW model are actually better than the neo-classical model (Mankiw, 2006:93)

The new growth theory provides a theoretical framework for analyzing endogenous growth. Economic growth is a result of the economic system. Technological progress is endogenous, growth is part of the decision of economic actors to invest in knowledge. The role of capital is greater than just part of income if the capital that grows is not only physical capital but involves human capital. Capital accumulation is the main source of economic growth (Mankiw, 2006:96).

(2) Payment System

Payment system is a system that regulates contracts, operating facilities and technical mechanisms used for the delivery, ratification, and receipt of payment instructions, as well as the fulfillment of payment obligations collected through the

exchange of "value" between individuals, banks and other institutions both domestically and between countries (cross-country (Pohan, 2011:70).

With the advancement of technology and the need for practical and inexpensive means of payment, in several countries, electronic payment products known as electronic money (e-money) have been developed, whose characteristics are different from the previously mentioned electronic payments, because each payment made done using e-money does not always require an authorization process and is online directly with the customer's account at the bank (when making a payment it is not charged to the customer's account at the bank). E-money is a stored value product where a number of values (monetary value) have been recorded in the payment instrument used (prepaid) (www.bi.go.id).

(3) Non-Cash Payments

A non-cash payment system is a system in which there are regulations, contracts, technicians and facilities as a means for the process of submitting, ratifying or paying instructions that help facilitate the smooth exchange of "value" between individuals and other parties such as banks and domestic institutions as well as internationally (Manani, 2009). According to Bank Indonesia (2004), non-cash payment instruments can be divided into three categories based on the physical instruments used, namely: paper-based instruments, card-based instruments, and electronic-based instruments.

Non-cash payment instruments can be classified into two groups, namely payment instruments for credit transfers and payment instruments for debit transfers. Banks and non-bank institutions that implement non-cash payment systems also present non-cash transaction tools, namely: credit cards, and Account Based Cards (ATM/Debit Cards) Electronic Money (E-Money)/.

Electronic money (e-money) is a stored value product or prepaid card where the amount of money is in an electronic card or can also be called electronic equipment. The money can be obtained electronically because the process is through depositing a certain amount of cash to the bank and then from the bank transferring the money by means of transferring funds or money electronically to the owner. After that the owner will be able to make buying and selling transactions with the card. Where the amount of balance on the card can be reduced or increased. The decrease in the arena of the owner making purchases of goods and then the balance will increase if the owner makes a top up (Bank for International Settlement/BIS, 1996).

2.2 Previous Research

Grzelczak, M., &Pastusiak, R. (2020) their research on Cashless Payments and Economic Growth in Selected European Countries. The aim is to find answers to the following research questions: What is the share of current payments using certain forms of non-cash payments in total payment ?; What forms of non-cash payments are associated with economic growth as measured by real GDP per capita in the Central and Eastern European and Western European country groups?; What is the relationship between the value of non-cash payments and economic growth as measured by real GDP per capita in the Central and Eastern European and Western European country groups? The findings reveal that there is a strong correlation between real GDP per capita and the value of payments with the use of payment instruments such as transfer orders, payment cards, e-money. In Western European countries, a growing payment infrastructure makes payments using e-money instruments increasingly popular. Another fact reveals that Western European countries have more consolidated payment networks, more developed infrastructure - payment cards are accepted by the majority of users. In these countries, the average value of payments in the analyzed period is five times higher than in Central and Eastern European countries.

Teck-Lee Wong, Tien-Ming Yip, Wee-Yeap Lau (2020) conducted research on Cashless Payments and Economic Growth: Evidence from Selected OECD Countries. This study uses non-cash payments as the independent variable and economic growth as the dependent variable. The method used in this study is the panel data method. The results show that based on annual data from 2007 to 2016, the results also show that non-cash payments increase economic growth in OECD countries. Specifically, the effect of increasing growth is found in debit cards, payments while credit cards, e-money and check payments have no impact on economic growth.

Ayu Nursari, I Wayan Suparta, Yoke Moelgini (2019) conducted a study on the Effect of Non-Cash Payments on the Amount of Money Demanded by Society (M1) and the Economy. In this study, using Debit/ATM Cards, Credit Cards, E Money, Clearing, RTGS as variables that affect the amount of money demanded by the public (M1) and the economy. This study uses the Error Correction Model (ECM) method. The results showed that Debit/ATM Cards, Credit Cards, E Money, Clearing, RTGS had a positive effect on the economy and demand for cash in Indonesian society.

Opi Chanty Mahendra (2019) conducted a study on the Effect of the Non-Cash Payment System and Inflation on Indonesia's Economic Growth. This study uses the rate of users of ATM/debit cards, credit cards, and the inflation rate as

variables that affect economic growth (Y) in Indonesia. This research uses multiple linear regression analysis method. The results showed that ATM/debit cards, credit cards and inflation had a significant effect on Indonesia's economic growth.

Fabiola Ismanda (2019) conducted a study on the Analysis of the Effect of APMK and E-Money as non-cash payment instruments on interest rates and economic growth in Indonesia. This study uses debit cards, credit cards, e-money as variables that affect interest rates and economic growth. This research uses multiple linear regression analysis method. The results show that debit cards, credit cards, e-money have a significant effect on interest rates and economic growth during 2014 - 2017

Neetu Kumari and Jhanvi Khanna (2017) conducted a research on Cashless Payment: A Behavioral Change To Economic Growth. The analytical method used in this research is using descriptive method. The results show that a policy direction is needed to use a non-cash payment system in order to change/increase a country's economic growth.

Mark Zandi (2016) conducted research on The Impact of Electronic Payments on Economic Growth. In this study, non-cash payments were used as the independent variable and economic growth as the dependent variable. The method used is descriptive method. The results show that the use of electronic payments increases consumption and economic growth, using a sample of 70 countries/regions which proves that electronic payments have a positive effect on economic growth.

Hock-Han Tee and Hway-Boon Ong (2016) conducted research on Cashless Payment And Economic Growth. In this study using checks, fast transfers, payment cards (debit; credit), e-money as a variable (X) that affects economic growth (Y). The research model uses the Vector Error Correction Model (VECM) method. The results show that in the long term checks, fast transfers, payment cards (debit; credit), e-money have a significant effect on the economic growth of the 5 sample countries.

Rismawati Dewi Rukmana (2016) conducted a study on the Impact of the Development of Non-Cash Payments on Indonesia's Economic Growth. In this study using Debit/ATM Cards, Credit Cards as variables that affect economic growth (Y). This study uses the Error Correction Model (ECM) analysis method. The results showed that the transaction value of ATM/debit cards, and credit cards had no significant effect on Indonesia's economic growth.

Oginni, O.S., Gambo, E.-M. J., Abba, M., and Onuh, M. E. (2013). The title of the research is Electronic Payment System and Economic Growth: A Review of Transition to Cashless Economy in Nigeria. This study aims to explore the relationship between electronic payment systems and economic growth as a way of assessing the current transition to a cashless economy in Nigeria. Data were analyzed using OLS and TSLS methods for 7 years (2005-2012). The results of the study show a significant positive relationship between the electronic payment system and economic growth in real GDP per capita and trade per capita. Only the value of using debit/ATM cards was proven to contribute positively to economic growth while other electronic payment channels contributed negatively. Therefore, the current cashless policy must be adapted to the electronic payment system that effectiveness and other factors that are highly relevant to a successful transition to a cashless economy should be prioritized

2.3 Hypothesis

(1) It is suspected that the speed of adjustment of the non-cash payment system with indicators of card-based payment instruments (APMK) as measured by the value of ATM/debit card transactions, and the value of credit card transactions, as well as the value of e-money transactions on Indonesia's economic growth during the period of 2010. Q1 to 2020.Q4, is less than 1.
(2) It is suspected that a non-cash payment system with card-based payment instruments (APMK) indicators as measured by the transaction value of ATM/debit cards, and the value of credit card transactions, as well as the value of e-money transactions affected Indonesia's economic growth rate during the 2010 period. Q1 to 2020.Q4?

3. Research Method

The research design in this study used a quantitative approach and the type of research used is explanatory research. Moreover, case study method is used as data collection method. The data collection technique used was through two approaches, namely the library method and the documentation method.

The types of data used in this research are quantitative data and qualitative data. Based on the source, the data used in this study is secondary data. The secondary data was taken from publication of Bank Indonesia (http://www.bi.go.id), BPS (http://www.bps.go.id).

3.1 Identification and Classification of Variables

In accordance with the research objectives and the proposed hypothesis, the main variables observed are: ATM/debit transaction value, credit card transaction value, e-money transaction value, and economic growth rate.After identifying the variables, the variables are classified into two parts: Dependent Variable, which is a variable whose value depends on other variables. In this study, the dependent variable is Indonesia's economic growth rate. Independent variable namely a variable whose value or magnitude is not influenced by others. In this study, the independent variables were the value of ATM/debit card transactions, the value of credit card transactions, and the value of e-money transactions.

3.2 Variable Operational Definition

The classified variables can be defined as follows.

a. ATM/Debit Card Transaction Value

The transaction value of an ATM/Debit card is the total transaction made by the customer as the owner of the funds (account holder) using an ATM card issued by the administering bank. Account holders or ATM card rights holders in electronic transactions through ATM machines or non-cash payment and shopping transactions with EDC machines. The value of ATM/Debit card transactions by all banks in Indonesia is recapitulated by BI and published in BI meta data I during the period 2010.Q1 – 2020.Q4, in billions of rupiah.

b. Credit card transaction value

Credit card transaction value is the total transaction by customers using credit cards issued by the operating bank to conduct buying and selling transactions (e-commerce), or electronic payments. The value of credit card transactions from all banks in Indonesia is recapitulated by BI and published in BI meta data I for the period 2010.Q1 – 2020.Q4, in billions of rupiah.

c. Value of e-money transactions

The value of e-money transactions is the total transactions made by the public using cards provided by banks or e-money card issuing institutions to make payment transactions or transaction electronically. The value of e-money transactions in Indonesia is recapitulated by BI and published in BI meta data for the period 2010.Q1 – 2020.Q4, in billions of rupiah.

d. Economic growth rate

Economic growth is the amount of production of either goods or services that have been produced by national production units (GDP) in a certain period. The economic growth rate (LPE) is calculated based on changes in GDP in a period relative to the GDP of the previous period at constant prices, which is calculated based on the following formulation

$$LPE = \frac{PDB_t - PDB_{t-1} \times 100\%}{PDB_{t-1}}$$

LPE during the period 2010.Q1 – 2020.Q4, in percent.

3.3 Analysis Procedure

Based on the considerations of the theoretical model and its suitability with the problems studied in this study, the model used is a dynamic model that considers two aspects, namely the derivation of the dynamic model and its statistical issues. In conjunction with dynamic model derivation, it can be done with autoregressive distributed lag (see for example; Gujarati, 2003; Harvey, 1990; Pindyck and Rubinfeld, 1991) and quadratic cost function approaches.

1. The autoregressive distributed lag model uses the Koyck model approach.

The procedure and stages of the analysis of the Koyck model are formulated as follows.

$\beta k = \beta 0 \lambda^k$

or $= \beta 0(1-\lambda)\lambda^k$

where : $(0 < \lambda < 1)$ is the rate of decline, or the delay of distributed lag and $1-\lambda$ is the coefficient of speed of adjustment. The value of k is the length of the lag. In the long run, the coefficientβ , is formulated as:

$$\sum \beta_k = \beta 0 \left(\frac{1}{1-\lambda}\right)$$

The regression equation is formulated as:
$Yt = \beta 0\ (1-\lambda) + \beta 1 Xt + \lambda Yt-1 + vt$
Yt = Indonesia's economic growth rate (temporary and lag periods)
Xt = the 3 instantaneous independent variables (ATM/debit card transaction value, credit card transaction value, and e-money transaction value)

Where :$vt = (ut - \lambda ut-1)$

Calculating the Median Lag (ML) which is half the time required for changes in the endogenous variable (Y), where the median lag is calculated using the following formulation:

$$\text{Median lag} = \frac{\log 2}{\log \lambda}$$

b. Calculate the weighted average of the lags, using the following formulation:

$$\text{Koyck Model} = \text{Mean lag} = \frac{\lambda}{1-\lambda}$$

Median lag and mean lag are values used to measure the speed of Y response due to changes in the X value.

c. Adaptive Expectations Model

$Y_t = \beta 0 + \beta 1 Xt^* + ut$
X* shows the value of X at equilibrium, thus all point values are the same, with the formulation:
$X^* - X^*_{t-1} = \gamma (X^* - X^*_{t-1})$

By moving$_{t-1}$, from the left to the right, we get:
$X_t^* = \gamma X_t + (1-\gamma) X^*_{t-1}$
Furthermore, this value is substituted again into Y, we get the equation:

$Y_t = \beta 0 + \beta 1 [\gamma X_t + (1+\gamma)) X^*_{t-1}] + u_t$
$Y_t = \beta 0 + \beta 1 \gamma X_t + \beta 1 (1+\gamma) X^*_{t-1} + u_t$
Through algebraic manipulation, we multiply the lag by 1- λ, and multiplied by the equation Y above, it will produce the equationAdaptive Expectation:

$Y_t = \gamma\beta 0 + \beta 1 \gamma X_t + (1+\gamma) Y_{t-1} + u_t - (1-\gamma) u_{t-1}$
$Y_t = \gamma\beta 0 + \beta 1 \gamma X_t + (1+\gamma) Y_{t-1} + v_t$
Where, $v_t = u_t - (1-\gamma) u_{t-1}$
d. Stock Adjusment/ Partial Adjustment Model (PAM)

The regression equation with PAM is modeled as follows.

$Y_t^* = \beta 0 + \beta 1 X_t + u_t$
Y* shows the variable Y is the optimum value in the long run and unobservable, so that.

$Y_t - Y_{t-1} = \delta (Y_t^* - Y_{t-1})$
δ, is the coefficient of speed of adjustment. By moving the value ofY_{t-1} to the left side, the following equation will be obtained:

$Y_t = \delta Y_t^* + (1-\delta) Y_{t-1}$

Substitute with the original equation to get a new long-run equation whose coefficients have been adjusted:

$Yt = \delta(\beta 0 + \beta 1 Xt + u_t) + (1-\delta) Y_{t-1}$

$Yt = \delta\beta 0 + \delta\beta 1 + (1-\delta) Y_{t-1} + \delta u_t$

2. Cointegration Approach and Error Correction Model (ECM)

The integration approach is concerned with efforts to avoid spurious regression which will result in inefficient estimator regression coefficients and the general standardized test will be wrong. In this regard, it is necessary to first believe that the data set to be used is stationary. To see whether the behavior of the data is stationary or not, unit roots and degree of integration can be tested.

a. Stationary and Non Stationary
b. Unit Root and Degree of Cointegration Tes

To perform the unit root test developed by Dickey-Fuller (1979,1981:1051-1072) B^k with the following autoregressive model estimation.

$$DXt = b0 + b1\, BXt + (ciB + \ldots + ck\, B^k)\, DX_t \quad \ldots\ldots (1)$$

$$DXt = d0 + d1T + d2BX_t + (eiB + \ldots + ek\, B^k) DX_t \quad \ldots\ldots (2)$$

Where :

$BXt = X_{t-1}$

$DXt = Xt - X_{t-1}$

T =Show time trend

X_t = is the observed variable in period t

B =a lag operator

$k = N^{1/3}$. N is the number of observations.

The degree of integration test is carried out to determine at what degree (order) the observed data will be stationary. The degree of integration test is carried out if the unit root test reveals the fact that the observed data is not stationary. The degree of integration test is carried out by estimating the following Autoregressive Model (Insukindro, 1992):

$$D2Xt = f0 + f1BDXt + \sum giB^i D2Xt \quad \ldots\ldots (3)$$

$$D2Xt = h0 + h1T + h2BDXt + \sum iiB^i D2Xy \quad \ldots\ldots (4)$$

Where

$D2X_t = DXt - DX_{t-1}$

$BDXt = DX_{t-1}$

c. Co integration Test

The co integration test is a continuation of the unit roots test and the degree of integration test. To be able to perform the co integration test, it must be believed beforehand that the related variables in this approach have the same degree of integration or not. In general, most of the discussion on related issues focuses more on variables that integrate zero [I (0) or one I(1)].

A set of variables whose time series X is said to be cointegrated to degrees d, b or written CI (d,b), if every element of X integrates to degrees d or I(d) and there is a vector k that is not equal to zero so that W = k ' XI(d,b), where b > 0 and k is a cointegration vector. The CRDW (Cointegrating Regression Durbin Watson), DF (Dickey-Fuller) and ADF (Augmented Dickey-Fuller) tests are the preferred statistical tests in this approach. To calculate CRDW, DF and ADF, estimated with the following cointegration regression using the OLS methodE_t

$$Y_t = j0 + j1\, X1_t + j2\, X2_t + j3\, X3_t + E_t \quad \ldots\ldots (5)$$

Where

Y_t= Economic growth rate
X1 = ATM/debit transaction value
X2 = credit card transaction value
X3 = E – money transaction value
E_t =resudial

Then the following regression is estimated by OLS:
$DE_t = k1B\ E_t$……...…… (6)
$DE_t = m1B\ E_t + niBD\ E_t$ …… (7)

The statistical value of CRDW is indicated by the value of the DW statistic in equation (5) and the statistic of DF and ADF is indicated by the ratioBE_t to the coefficient in equation (6) and (7). The main purpose of the cointegration test is to examine whetherthe residual cointegration regression is stationary or not. By comparing the values ofabove with the table values of CRDW, DF and ADF

d. Error Correction Model (ECM)Y_t
The error correction specification covers models in both level and difference. Harmonic error correction mechanism with equilibrium behavior long-term. The Error Correction Model (ECM) can be formulated as follows:
$DY_t = p0 + p1\ DXt + p2\ BXt + p3\ V$ …….. (8)
Where :
$DY_t = Y_t - BY_t$
$DX_t = X_t - BX_t$
V = correction Variabel (∑ BXt - BYt)
t = time
B = lag operator.
To verify and test the hypotheses of the analytical model using the following criteria:
(1). Statistical Criteria Test (First Order Test)
To test the accuracy of the model and the effect of the independent variable on the variable dependent partially and simultaneously used statistical tests Z and F (Gujarati, 2003). The level of conformity test (Goodness of Fit test) is marked by using the coefficient of determination approach (R2), which explains the magnitude of the variation in the explanatory variable (the dependent variable) which is able to be explained by the variable
Independent. The amount of R2 is formulated as follows.

$$R^2 = 1 - \frac{JKK}{JKT}$$

JKK = sum of errors quadratic
JKT = sum of total quadratic.

(2). Second Order Test
a. Heteroscedasticity (Heteroskedastisitas)
b. Autocorelation (Autokorelasi)
c. Multicolinearity (Multikolinearitas

4. Result and Discussion

This research model uses a dynamic model that emphasizes the observation of the lag distribution which involves changes from time to time. The dynamic model is implemented with the Koyck model. The essence of the dynamic model expects

that the time period (lag) of the observation variable of the observation period is lower than the explanatory variable. If the research results produce a low / small number of lags 1 - 4 then the response between times is relatively fast. This means that the targets of the monetary policy taken are relatively responsive. The results of the study are as follows

4.1 Research Results

1. Stationarity test explains all stationary variables at the first degree (first difference) as shown in table 1 below.

Table 1. Data Stationary Test of Augmented Dickey Fuller Method at 1st Different

Variable	Unit Root Test					
	Level					
	Test Equation					
	ADF (N)	Prob	ADF (I)	Prob	ADF (T&I)	Prob
EG	-5.62233	0.0000	-6.26457	0.0000	-6.503521	0.0000
ADB	2.388050	0.9952	-0.87922	0.7853	-2.74567	0.2245
KD	0.089639	0.7059	-1.99471	0.2880	-1.430699	0.8374
EM	4.731029	1.0000	3.619547	1.0000	1.176088	0.9999

Source: Secondary Data, processed

The table above shows the results of the ADF unit root in the first difference (degree one) of all the observed variables. Overall, the variables used in the research are stationary at the first degree or are concluded to accept the Ha hypothesis, which means that all variables do not contain unit roots. It is proven that the calculated ADF value is greater than the table ADF value (McKinnon critical value). Because the data is stationary, it is hoped that the use of data in the tested degree analysis will not cause spurious regression. Therefore, it can be continued to the next stage, namely testing the degree of integration.

2. Integration Degree Test

After all variables pass the unit root test, the next step is the degree of integration test. This test was conducted to determine whether all observation variables in the previous period were stationary at the same degree, namely the first difference. Observational variables in the previous period appeared after reducing the research variables and then retesting them. The following are the results of the degree of integration test.

Table 2 Test of Degree of Integration with ADF (First Difference)

Variable	Unit Root Test					
	1^{st}					
	Test Equation					
	ADF (N)	Prob	ADF (I)	Prob	ADF (T&I)	Prob
EG	-7.29392	0.0000	-7.20164	0.0000	-7.104137	0.0000
ADB	-5.95602	0.0000	-7.22512	0.0000	-7.175857	0.0000
KD	-6.24238	0.0000	-6.19889	0.0000	-6.400385	0.0000
EM	-3.27923	0.0016	-3.83272	0.0053	-5.130391	0.0008

Source: Secondary Data, processed

The table above shows that all stationary variables are at the same degree, namely first difference (degree one) in the ADF test with time trend (T). All variables have a t-count value greater than the t-table or can also be seen based on the probability value less than 0.05. On the DF test without time trend and intercept, with intercept without time trend as well as using intercept and time trend, the results show that all variables have probability values less than 0.05.

3. Cointegration Regression Test

All variables in this study have passed the unit roots test. The next step is a cointegration test to determine the long-term balance or stability between the observed variables. This research uses cointegration test with Johansen's approach. The hypothesis of the Johansen cointegration test is as follows.

H0 : there is no cointegration relationship.

Ha: there is a cointegration relationship

Table 3 Regression Cointegration "Johansen Cointegration Test"

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.975368	216.1424	47.85613	0.0001
At most 1 *	0.647019	67.99389	29.79707	0.0000
At most 2 *	0.479020	26.34030	15.49471	0.0008
At most 3	0.006443	0.258548	3.841466	0.6111

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.975368	148.1485	27.58434	0.0001
At most 1 *	0.647019	41.65360	21.13162	0.0000
At most 2 *	0.479020	26.08175	14.26460	0.0005
At most 3	0.006443	0.258548	3.841466	0.6111

Max-Eigenvalue test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Based on the table above, the results of the cointegration test at the first degree (1st difference) prove that the H0 hypothesis is rejected or there is a long-term relationship between the non-cash payment system and economic growth. This is evidenced by the Trace Statistics value in the table where the Trace Statistics value is greater than the Critical Value at 5 percent, which indicates that there is cointegration. So it can be concluded that the cointegration test results using the Trace Statistics value indicate that there are at least 3 cointegration equations that can be formed

While the cointegration test results using the Max-Eigen Statistic value produce the same decision as the cointegration test with Trace Statistics, the null hypothesis (H0) is rejected if the Max-Eigen value is greater than the critical value at 5 percent. In the table above, there are three Max-Eigen values that are greater than the critical value. This means that the hypothesis H0 is rejected or there is a cointegration relationship. Thus it can be concluded from the Cointegration Test based on the Max-Eigen Statistical value that there is a minimum3 cointegration equations that can be formed.

The existence of cointegration is also proven by the probability value. If the probability value shows a value smaller than α= 5 percent or 0.05, then the hypothesis H0 is rejected and Ha is accepted or in other words there is a long-term relationship between the cash payment system and Indonesia's economic growth during the 2010-2020 period.

4. Error Correction Models (ECM)

After fulfilling the stationary test, integration test and cointegration test, the next step is to form the ECM equation. The results of the ECM estimation are presented in the following table.

Table 4. Estimation Results of ECM Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Keterangan
C	1.492905	1.783512	0.837059	0.4084	
DKDT	2.30E-08	1.26E-08	1.823994	0.0770	Sig **
DKKT	-1.16E-07	1.54E-07	-0.750097	0.4584	Tdk. sig
DEMT	2.64E-08	1.82E-07	0.144913	0.8856	Tdk. sig
DKDT(-1)	4.64E-08	1.19E-08	3.909765	0.0004	Sig *
DKKT(-1)	-3.75E-07	1.50E-07	-2.509408	0.0170	Sig *
DEMT(-1)	1.66E-07	1.99E-07	0.833111	0.4106	Tdk.Sig
ECT	-5.01E-10	1.46E-09	-0.342845	0.7338	Tdk.Sig
R-squared	0.412429	F-statistic		3.409340	
Adj R-sq	0.291459	Prob(F-statistic)		0.007233	
		Durbin-Watson stat		2.188155	

Description: Sig* (Significant at 5% APLha) Sig** (Significant at 10% APLHA)

Based on the table above, the following equation can be arranged.

DEG= 1.492905 + 2.30E-08* DKDT - 1.16E-07 * DKKT + 2.64E-08* DEMT + 4.64E-08*DKDT (-1) - 3.75E-07* DKKT (-1) + 1.66E-07 * DEMT (-1) - 5.01E-10* ECT

Based on the above equation, it can be interpreted that the constant value in the model equation is 1.4929, meaning that if the independent variable in the model is constant or fixed, then in the short term economic growth has increased by 1.49 percent (cateris paribus).

The debit card transaction value variable (DKDt) has a positive regression coefficient of 0.000000023, meaning that if the debit card/ATM transaction value has increased by 1 million rupiah, in the short term economic growth (EG) has increased by 0.000000023 percent (cateris paribus).

The variable value of credit card transactions (DKKt) has a negative regression coefficient of 0.0000000116, meaning that if the value of credit card transactions (DKKt) has increased by 1 million rupiah, in the short term economic growth (EG) has decreased by 0.0000000116 percent (cateris paribus).

The variable value of E-money transactions has a positive regression coefficient of 0.0000000264, meaning that if the value of E-Money transactions (DEMt) increases by 1 million rupiah, in the short term economic growth (EG) will increase by 0.0000000264 percent.

The Error Correction Terms (ECT) value has a negative regression coefficient of 0.000000005. This means that about 0.0000005 percent of the discrepancy between the actual value of economic growth in the short term and the equilibrium value of the percentage of economic growth in the long term will be corrected every quarter. However, the ECT probability value produced is not significant which indicates that the independent variables (debit/ATM card transaction values, credit cards, and e-money) and the dependent variable (economic growth) do not have a balanced relationship in the short term and in the long term.

5. Hypothesis test

(1). Partial Test

Partial test using the tstatistical test to test the significance of the regression coefficient of each independent variable (debit/ATM card transaction value, credit card, and e-money) on the dependent variable (economic growth), with the level of confidence or alpha used in this study is by 5%.

Based on table 4 above, it shows that the t value for the first differentiation variable from the transaction value of ATM/Debit cards in the short term (DKDt) is 1.8239. When compared with the t table (at 5% alpha) which is 1.96, it can be concluded that the value of t count < t table (1.8239 < 1.96). Thus H0 is accepted, but if we use a real level or alpha of 10% with a t table value of 1.64, then t count > t table (1.8239 > 1.64). At the 10% real level, it is concluded that H0 is rejected (Ha is accepted). This means that the transaction value of debit/ATM cards in the short term can affect economic growth

The t-value of the first differentiation variable from the value of short-term credit card transactions (DKKt) is -0.7500. When compared with the t table (at 5% alpha) which is -1.96, it can be concluded that the value of t count > t table (-0.7500 > - 1.96). Thus H0 is accepted (Ha is rejected). It means transaction value Credit cards in the short term have no effect on economic growth.

The t-value of the first differentiation variable from the value of e-money transactions in the short term (DEMt) is 0.1449. When compared with the t table (at alpha 5%) which is 1.96, it can be concluded that the value of t count < t table (0.1449 < 1.96). Thus H0 is accepted (Ha is rejected). This means that the value of e-money transactions in the short term has no effect on economic growth.

Based on the short-term equation, using the ECM method produces the ECT coefficient. This coefficient measures the regress and response of each period that deviates from equilibrium. According to Widarjono (2007) the ECT imbalance correction coefficient in the form of absolute values explains how fast the time is needed to get the balance value. However, because the ECT probability value is not significant (ECT t-count value = -0.3428), then in the long term the variables contained in the model are not in balance.

(2). Simultaneous Test (F Test)

The simultaneous test is intended to examine the overall (simultaneous) effect of the research variables, namely the transaction value of debit/ATM cards (KDt), credit cards (KKt), and e-money (EMt) on economic growth. The approach used to test simultaneously is using the F test. Based on table 4 above, the calculated F value is 3.4093. If the calculated F value is compared with the F-table value at aplha 5%, it is 2.6260. Then the calculated F value > F table (3.4093 > 2.6260). Thus it is concluded that Ho is rejected or Ha is accepted. This means that simultaneously the transaction value of debit/ATM cards (KDt), credit cards (KKt), and e-money (EMt) has an effect on economic growth.

(3). Coefficient of Determination (R2)

Based on the same table (table 4), the coefficient of determination R2 is 0.4124 (Adj R2 = 0.2914). This means that the variation of all independent variables in the model, namely KDt, KKt, and EMt, is able to explain variations in economic growth of 41.24 percent. The ability of other variables besides KDt, KKt, and EMt such as cash transaction value, BI RTGS transaction value, inflation, investment was only able to explain 58.76 percent of economic growth (EGt) during the research period.

Classic assumption test

(1). Heteroscedasticity Test

Heteroscedasticity is a regression problem in which the disturbance factor does not have the same variance or the variance is not constant. This will raise various problems, namely the OLS estimator is biased, the variance of the OLS coefficient tends to be large. In this study will use the White test method (attachment XI), based on this method all variables are not significant, meaning that H0 is accepted or Ha is rejected. So it's concluded that the ECM model has a minimum (constant) variance, thus the Homoscedasticity assumption is fulfilled or there is no heteroscedasticity.

(2). Autocorrelation Test

Autocorrelation indicates a correlation (relationship) between members of a series of observations or there is a relationship between previous data and subsequent data in time series data. If the model contains autocorrelation, the estimated parameters will be biased and the variation is no longer minimum and the model will be inefficient. In the study of autocorrelation detection using the Durbin-Watson test (D-W test), to determine whether there is autocorrelation in the model.

The autocorrelation test using the D-W test obtained a calculated D-W value of 2.188155, when compared to the dl-du table at 5 percent alpha. With the amount of data (n) as many as 42 and the variables in the model (k) as many as 7, the value of dl = 1.189 and du = 1.895. So it can be concluded that the calculated DW value is greater than the value of dl and du (2.188155 > 1.895. Because H0 is accepted or Ha is rejected, it means that the test results are in the non-autocorrelation area criteria. It means that the observation model does not have a serial correlation of residual variables over time. observation.

(3). Multicollinearity Test

Multicollinearity is a linear relationship between independent variables in the regression model. To test the presence or absence of multicollinearity in the model, the researcher used the Variance Inflation Factors (VIF) method. The rule of thumb of this method is that if the VIF value is less than 10, there is no multicollinearity in the model. Based on the multicollinearity test in this study, all VIF values have a value of less than 10, the VIF value of debit/ATM card transactions (KDT = 3.871680; credit card transaction value (KKT) = 3.642625, and the value of e-money transactions (EMT)) = 1.230947). So it can be concluded that the model used does not contain elements of multicollinearity.

4.2 Discussion

Based on the results of the analysis, it is known that the variable value of ATM/debit card transactions (KDT) in the short and long term has different effects on economic growth in Indonesia. In the short term, the value of ATM/debit card transactions has a positive and significant impact. This means that an increase or decrease in the value of ATM/debit card transactions in Indonesia has a significant effect on economic growth conditions in Indonesia in the short term. Meanwhile, in the long term, the value of ATM/debit card transactions also has a positive relationship but no significant effect. The results of this study are in line with research by Oyewole et al (2012) which states that transactions using ATM/debit cards have a positive relationship to economic growth.

In the short term, the effect of the ATM/debit transaction value is caused by from the efficiency caused by non-cash payments such as aspects of security, convenience and ease of doing transactions. An increase in the value of ATM/debit transactions may result in a decrease in the public's demand for money. Theoretically, a decrease in the demand for money will cause a decrease in interest rates in the money market, so that people tend to hold money for transaction motives accompanied by an increase in the desire to keep money in banks. This will make borrowing costs more competitive, with implications for increased investment funds, increased real output, economic growth, and people's welfare.

Meanwhile, in the long term, the transaction value of ATM/debit cards has no significant effect on economic growth, this is due to the increase in the value of ATM/debit transactions which is also in line with the circulating currency with an equally increasing trend. This indicates that people use cash in their transactions and use non-cash payment instruments such as ATM/debit cards as a complement.

In the long term, there are indications that an increase in the value of ATM/debit card transactions has not been able to affect economic growth in Indonesia. This is supported by data that the use of transactions using ATM/debit cards is still dominated by transactions, for example in shopping with cash payments compared to non-cash transactions.

The next discussion is related to the value of credit card transactions, where this variable has a negative relationship, and does not have a significant effect in the long term but has a significant effect in the short term on economic growth. The increasing growth in the value of credit card transactions does not contribute to increasing economic growth in Indonesia. This is supported by empirical facts conducted by Rukmana (2016) where the value of credit card transactions has no significant effect on economic growth in Indonesia, both in the long and short term.

Credit card ownership is only a new pattern or lifestyle and is not a mainstay of people's transactions (Snellman, et al, 2000). In using a credit card, the consumer credit interest rate must be paid by the user. This is one of the considerations of the community to use a credit card or not. If the consumer credit interest rate charged by the party issuing the credit card is too high, then people tend to reduce the use of credit cards. Remember, the credit card owner is the bank that pays in

advance for the transactions made by the user. Then, the user must pay in the form of debt to the issuer or bank along with the additional credit interest that was previously determined

The value of electronic money transactions (e-money) as a result of the evidence reveals that neither in the short term nor in the long term has a significant effect on economic growth. In other words, the increasing growth in the value of electronic money transactions (e-money) has not been able to affect economic growth in Indonesia. This is because the use of e-money causes a shift in public deposits in banks from savings and time deposits. In other conditions, if there is a transfer of funds from banks to non-bank institutions, the implication is that the use of e-money will only encourage the velocity of money, and has no indication of encouraging economic growth.

The results of this study are in accordance with research conducted by Susilawati (2019) but contradicts research conducted by Warjiyo (2006) which states that the presence of non-cash payment instruments provides positive benefits for the economy, where non-cash payments can increase financial efficiency and productivity which in turn can encourage activities in the real sector, which in turn can encourage economic growth and improve people's welfare.

The impact of implementing non-cash payments on economic growth can only be observed over a longer period. Therefore, measures that promote non- cash payments in many countries will not have a direct impact on the economy. In addition, the impact of the non-cash payment system on economic growth may differ depending on the form or type of non-cash payment.

5 Conclusions and Suggestions

5.1 Conclusion

Based on the results of the research and discussion, several conclusions can be drawn.

(1) In the short term, it is found that only the variable value of ATM/debit card payment transactions has a positive and significant effect on economic growth during the study period. This is due to the effect of efficiency caused by non-cash payments. An increase in the value of ATM/debit transactions can have an impact on reducing the demand for money from the public. Theoretically, a decrease in the demand for money will cause a decrease in interest rates in the money market so that people will prefer to use this transaction which is accompanied by saving money in the bank. This will make borrowing costs more competitive, thereby increasing investment, increasing real output, economic growth as well as people's welfare.

(2) In the long term, all the variables used in this study have no effect on economic growth during the study period. This is because payments made in Indonesia are still dominated by cash transactions. People still use cash more often and use non-cash payments as a complement to cash payments.

(3) The variables used in this study have not been able to provide a long-term balance to economic growth. As a result of many factors outside the model that have a greater contribution to Indonesia's economic growth but are not used in the model, factors such as knowledge of technology, education, income so that the variables used in the study cannot provide a balance for economic growth in the long term.

5.2 Suggestions

(1) Changes in the current payment technique from a cash payment system to a completely non-cash system in the short term are difficult to achieve, for that the strategy that can be taken is to innovate continuously in the use of technology and payment structures supported by the expansion of public accessibility to transactions non-cash.

(2) It is hoped that the monetary authority will make policies in order to promote a non-cash payment system, one of which is by giving priority to debit card payment instruments. The consequence of this policy is that the government can gain economic benefits from non-cash transactions.

(3) Apart from the context of the observed variables, the thing that should be considered at the same time as a consideration for similar studies in the future is the element of trust from the community. Because it is suspected that there is little doubt about the level of public trust in policy-making institutions, and not only in banks, the success of the community in understanding and implementing the use of transaction tools with a non-cash system.

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