# ELECTRONIC PAYMENT AND ECONOMIC GROWTH IN INDONESIA

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# ELECTRONIC PAYMENT AND ECONOMIC GROWTH IN INDONESIA

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***ABSTRACT***

*The purpose of this study is to investigate the effect of non-cash payment transactions on economic growth in Indonesia and to see the responses from supporting variables, such as the velocity of money and the price of transactions. This study involves a Vector Error Correction Model (VECM) analysis tool, using monthly time series data during 2009: 1 – 2017: 12. The results show that the payment instrument affects economic growth, especially the Card-Based Payment Instrument (CBPI). In addition, there are changes to the velocity of money and prices caused by the increase in the use of non-cash payment instruments.*

***Key Words***: *Electronic Payment, Economic Growth, Vector Error Correction Model (VECM)*

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## Introduction

Money is used as a payment instrument in every economic activity. Over time, transactions in the economy are facilitated by banknotes and non-cash instruments as information technology developments (Bank Indonesia, 2012; Fung et al., 2014). The payment channels used are increasingly varied. The role of tellers has been replaced by machines, such as Automatic Teller Machine (ATM) and Electronic Data Capture (EDC). Other payment channels considered to be highly practical and efficient are internet transactions and mobile banking.

Figure 1 shows the use of non-cash payment instruments in Indonesia tends to increase over time. These increases are in line with the improvements in fund payment services between customers and banks. In addition, the development of non-cash payment systems abroad that leads to a less-cash society also influences lifestyles and economic transactions in Indonesia (Bank Indonesia, 2011). The costs of cash transactions are pretty expensive as 5% of the sum is paid by the consumers or 3% of the total GDP is used for non-cash transaction price, including that used for money printing or seigniorage (Hancock & Humphrey, 1998) Conversely, non-cash payments systems only require one-third to a half of the costs of paper-based payment systems (Humphrey, 2001).

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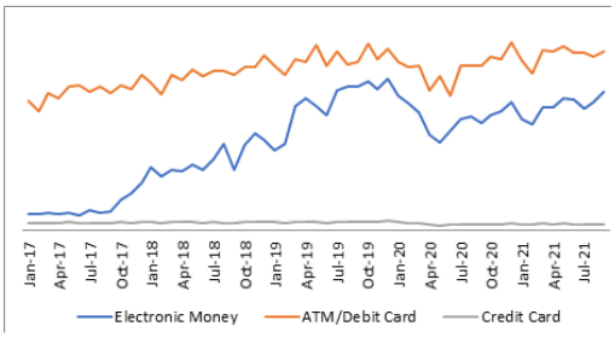


**Figure 1: Non-cash Transaction Volumes in Indonesia, 2017-2021**
Source: Bank Indonesia

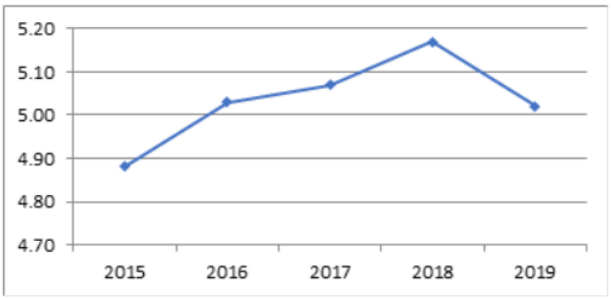


**Figure 2: The Economic Growth in Indonesia (Percent), 2015-2019**
Source: BPS (2020)

Indonesia's economic growth tends to increase over time. Figure 2 shows that Indonesia's economic growth increased in 2015-2018 and decreased in 2019. The Indonesian economy in 2019 grew 5.02 per cent, lower than the 2018 achievement of 5.17 per cent (BPS, 2020). Economic challenges caused this decline from outside and within the country. Economic challenges from abroad include the United States-China trade war, declining demand and stagnation in world commodity prices, Brexit issues, political tensions and conflicts in several regions, and the economic crisis in several Latin American countries. Meanwhile, domestic economic challenges are slowing economic growth, purchasing power, the expansion of the informal sector, the waiting list position of investors, and the tax revenue target is not being achieved (BPS, 2020).

Several studies examine the liabilities and benefits obtained while utilizing electronic payment instruments. Furthermore, technological developments in the financial system have a significant positive relationship with productivity because it reduces banking operational costs (Berger, 2003). An efficient payment system will provide a real economic boost (Banca d'Italia, 1999). While conducting a transaction with this method, the payment will be resolved faster, and they can use money again for subsequent transactions (Ireland, 1994). This case encourages people to increase their purchasing power and rate of expenditure (Coviello, 2016). When money is spent at a higher rate, it will have a multiplier effect on the economy, encouraging the number of goods and services in economic transactions (Sitorus, 2006).

Slozko and Pelo (2014) conducted a study that stated a correlation between increasing electronic transactions and the economic growth of a country, which is achieved by encouraging consumption levels. Hasan, De Renziz, and Schmiedel (2012) also found that the transition

to electronic retail payments can stimulate economic growth, consumption and trade in the European market.

Syarifuddin, Hidayat, and Tarsidin (2009) uncovered that non-cash payments decline cash holding, although there was a steady increase in the demand for M1 and M2. The appreciation of this transaction technique also impacted BI rate cuts, increasing Real GDP and decreasing price levels. Nirmala and Widodo (2011) discuss the impact of growing card payments on the economy in Indonesia. The results indicate that cash holdings declined while the stock of M1 and M2 further increased, which additionally induced GDP growth. Based on the description above, this study explores growing non-cash payment transactions on economic growth in Indonesia.

**Literature Review**

Irving Fisher developed the quantity theory of money in the early twentieth century to see the relationship between money supply and transactions. The equation for the quantity of money can be written in a mathematical equation as follows:

$$M \times V = P \times T \quad (1)$$

where:

M : Quantity of money

V : Velocity of money

P : Price level

T : Transaction amount

The right side is the equation for the number of transactions of a country in a certain period, while the left side is the equation for the quantity of money used for commerce or money supply. The velocity of money is defined as the average amount of time spent on spending goods and services produced in the economy (Mishkin, 2008).

The development of non-cash payments affects the economy and demand for currency. A shift for money ensures a change in the equilibrium of the financial market, which in turn affects the output and prices of goods in the market. This assessment is referred to as neoclassical synthesis, which leads to a slow adjustment of nominal wages and prices for stock in the economy (Syarifuddin et al., 2009). Changes in money result in a cascade of events, including alteration in balance, aggregate demand and supply, and actual output. Some studies have illustrated these events, though there is still money neutrality.

Non-cash payments stimulate business activities by encouraging owners to transact with reduced costs, labour, and time barriers. This further enhances economic activity and GDP; however, using price and production factors, their effect on output can be damaged as shown in the following equation:

$$Y = F\left(r, \frac{W}{P}, M^{l}\right) \quad (2)$$

where:

r : cost of capital

W : nominal wage

P : price level

$M^f$ : natural money balance

This effect occurs due to the efficiency of this technologically advanced system. Hence, the company has more money to spare for working capital. Furthermore, banks can also channel the elevation in M1 and M2 to real sector financing, which certainly improves output. The use of non-cash payments increases people's income through a decline in transaction costs and interest income usually obtained from cash funds held in the bank. The boost in the income received by the community encourages the consumption and demand for goods and services, thus potentially encouraging real sector activities (Dias, 2000).

Several empirical studies show that innovation using electronic money has a significant positive effect on GDP. In contrast, card-based electronic transactions facilitate community activities because cash is stored in the card. Furthermore, they do not need to withdraw money first at the bank during a circumstance of the transaction, therefore creating room for greater efficiency (Tee & Ong, 2016).

The national payment system used by each country is focused on ensuring competency. Hence its purpose is to support daily business transactions and increase their volume and value, which further produces income velocity and determines the price level based on the quantity theory of money (Muiruri, 2013). The quantity theory of money states that changes in the money supply held by the public will affect the velocity of money and will subsequently affect the price level. The use of non-cash instruments for transactions will affect the money supply, reducing the amount of currency in circulation.

The roles of cash in the economy and measurement of its purchasing power were analyzed with the quantity approach. The function of the money demand equation further explains the relationship between natural money balance (M / P) held with real income (Y). This theory illustrated that the velocity of money (V) changes if its demand function is altered. Furthermore, non-cash payment instruments are assumed to be one factor that changes this demand, which reduces the average amount of cash held by the community (Hidayati et al., 2006). This reduction further decreases the k parameter in this equation, using the Real Money Balance approach, which indicates an elevated velocity of money.

Several empirical studies analyze the effect of using non-cash payments on economic productivity and growth. Hasan et al. (2012) estimate the fundamental relationship between retail payments and overall economic growth. The dependent variable in this study is paid by card, credit transfer, direct debit, and check. In contrast, the independent variables are the logarithm of real GDP per capita, household consumption, and trade. The analytical model used in this research study is GMM (Generalized Method of Moment). This study finds that using an electronic payment system for retail is more efficient in encouraging overall economic growth, consumption, and trade.

Oyewole et al. (2013) conducted a research study on electronic payment systems and economic growth using Ordinary Least Square (OLS) and Two-Stage Least Square (2SLS). The study results show that the payment system has a significant relationship to real GDP and

trade. Still, only ATM has a positive contribution to GDP and trade in Nigeria. Meanwhile, other payment channels contributed negatively to GDP and trade. Tee and Ong (2016) examined the effects of adopting cashless payments in five European Union countries using Pedroni residual Cointegration and the Panel Vector Error Correction Model (PVECM). The VECM test shows a significant long-term relationship on all variables with economic growth, except for card payments. Using cards as a means of payment does not significantly affect economic growth and other payment methods. In the short term, there is a unidirectional causal relationship.

Wong, Lau, and Yip (2020) analyze the relationships between cashless payments and economic growth in OECD countries. The results show that cashless payment stimulates economic growth in OECD countries. The growth-enhancing effect is found in debit card payment, while e-money, credit card, and cheque payments have no impact on economic growth.

**Data and Research Method**

The data used in this study are secondary (in the form of monthly time series). Sequential data time is a set of observations obtained in a certain period, monthly, quarterly or annually (Umar, 2011). Data obtained from the Central Statistics Agency's monthly and quarterly publication reports (BPS) and Bank Indonesia (BI) were used for this study. The research period is 2009: 1 to 2017: 12 with a sample size of 108.

**Table 1: Variable, Definition, and the Source of Data**

| Variable | Definition | Source |
|---|---|---|
| Economic growth | Economic growth in this study is expressed as a change in GDP at constant prices in per cent, which is calculated using the formula: $$Economic\ growth = \frac{(GDP_t - GDP_{t-1})}{GDP_{t-1}}$$ | Central Statistics Agency (BPS) |
| Card-Based Payment Instrument (CBPI) | The transaction value of Card-Based Payment Instruments (CBPI) is the nominal of shopping transactions from credit cards and ATM and/Debit cards. | Bank Indonesia (BI) |
| Electronic money | The value of e-money transactions is the nominal of shopping transactions made using e-money. | Bank Indonesia (BI) |
| Bank Indonesia Real Time Gross Settlement (BI-RTGS) | BI-RTGS value is the nominal of transactions processed using BI-RTGS. | Bank Indonesia (BI) |
| Consumer Price Index (CPI) | In this study, the price index was measured using the Consumer Price Index (CPI) that calculates the average change in the price of goods and services consumed by households over a certain period. | Central Statistics Agency (BPS) |
| Velocity of money | The calculation of the velocity of money in this study is by Fisher's quantity theory of money, which can be formulated as follow: $$V = \frac{P \times Y}{M}$$ Where $P \times Y$ is nominal GDP and M is money supply (M1) | Bank Indonesia (BI) |

This study begins with the conception that actual sector activities (consumption) play an essential role in the economy as it is carried out by the community, which further creates fiscal transactions. The advancement of information and communication technology forms a non-cash payment mechanism that increases efficiency, quality, and quantity in economic

transactions and data, thus influencing the national income, a measure of economic growth.

The increase in non-cash transactions, including the use of cards (debit / ATM and credit), electronic money (e-money) and transfer systems (BI-RTGS), provides varying effects in the economy, which include substitution and efficiency. Substitution effect occurs on the circulating currency, which has decreased, while M1 and M2 increased. This further encourages lower interest rates and drives GDP. Meanwhile, the effect of efficiency is why transaction costs fall, as this enables easier transactions and increases the velocity of money, thus encouraging the rise of GDP. Based on the quantity theory, the increase in the velocity of money causes an elevation in prices. Running these variables effectively fosters equilibrium in the amount of money supplied and demanded; therefore, an increase in prices or inflation remains curtailed.

The analysis technique used in this study is the Vector Error Correction Model (VECM), which is often referred to as Vector Autoregression (VAR). This technique is used for non-stationary variables and possesses the potential to be cointegrated. Additional retention must be given because data are not stationary at the level but have a cointegrated relationship. Thus, there is a speed of adjustment from the short to the long term. In general, the VECM method can be written into the following equation:

$$\Delta y_t = \mu_{ox} + \mu_{ix} t + \Pi_x y_{t-1} + \sum_{i=1}^{k-1} \Gamma_{ix} \Delta y_{t-1} + \varepsilon_t \quad (3)$$

where:

$y_t$ : vector that contains the variables analyzed in the study

$\mu_{ox}$ : intercept vector

$\mu_{ix}$ : regression coefficient vector

t : time trend

$\Pi_x$ : $\alpha_x \beta'$ where b' contain long-term cointegration equations

$y_{t-1}$ : variable in-level

$\Gamma_{ix}$ : regression coefficient matrix

k-1 : ordo VECM dari VAR

$\varepsilon_t$ : error term

Furthermore, utilizing this technique requires considering a model's short- and long-term relationships or cointegration. If the tested variables are not cointegrated, then standard VAR can be applied, whose results will be identical to Ordinary Least Square (OLS). However, if the tested variables are cointegrated, the Error Correction Model (ECM) or Vector Error Correction Model (VECM) analysis technique can be used for a single equation or system equation. The assumptions that must be fulfilled include that all variables must be stationary in the VECM analysis, characterized by white noise with zero mean, boarding range, and the inexistence of a correlation between independent variables.

According to Firdaus (2011), there are several advantages in VECM analysis techniques compared to conventional econometric methods, including capturing the overall relationship of variables in the equation. This method can further avoid bias variables and be free from the various limitations of economic theory that often arise, including the symptoms of spurious

variables in conventional econometric models to avoid erroneous interpretations.

In addition to having the advantages described above, this VECM also has several disadvantages, including a theoretic model (Gujarati, 2004). The methods specialize in forecasting. Hence, they are less suitable for analyzing policies. The selection of a lag is too long in the VECM method as it causes an increasing number of problematic parameters with a degree of freedom. Finally, the difficulty in interpreting the coefficients on the estimation results is also a problem.

The model used in this study is as follows:

$$\Delta iGrowth_t = a_1 + a_{LiGrowth}\hat{}_{t-1} + \sum_{j=1}^{n} a_{11} L\Delta Growth_{t-j} + \sum_{j=1}^{n} a_{12} L\Delta Emoney_{t-j} + \sum_{j=1}^{n} a_{13} L\Delta CPBI_{t-j} + \sum_{j=1}^{n} a_{14} L\Delta BIRTGS_{t-j} + \sum_{j=1}^{n} a_{15} L\Delta CPI_{t-j} + \sum_{j=1}^{n} a_{16} L\Delta Velocity_{t-j} + \epsilon_t \quad (4)$$

$$\Delta iEmoney_t = a_2 + a_{Emoney}\hat{}_{t-1} + \sum_{j=1}^{n} a_{21} L\Delta Emoney_{t-j} + \sum_{j=1}^{n} a_{22} L\Delta Growth_{t-j} + \sum_{j=1}^{n} a_{23} L\Delta CPBI_{t-j} + \sum_{j=1}^{n} a_{24} L\Delta BIRTGS_{t-j} + \sum_{j=1}^{n} a_{25} L\Delta CPI_{t-j} + \sum_{j=1}^{n} a_{26} L\Delta Velocity_{t-j} + \epsilon_t \quad (5)$$

$$\Delta iCPBI_t = a_3 + a_{APMK}\hat{}_{t-1} + \sum_{j=1}^{n} a_{31} L\Delta CPBI_{t-j} + \sum_{j=1}^{n} a_{32} L\Delta Growth_{t-j} + \sum_{j=1}^{n} a_{33} L\Delta Emoney_{t-j} + \sum_{j=1}^{n} a_{34} L\Delta BIRTGS_{t-j} + \sum_{j=1}^{n} a_{35} L\Delta CPI_{t-j} + \sum_{j=1}^{n} a_{36} L\Delta Velocity_{t-j} + \epsilon_t \quad (6)$$

$$\Delta iBIRTGS_t = a_4 + a_{BIRTGS}\hat{}_{t-1} + \sum_{j=1}^{n} a_{41} L\Delta BIRTGS_{t-j} + \sum_{j=1}^{n} a_{42} L\Delta Growth_{t-j} + \sum_{j=1}^{n} a_{43} L\Delta Emoney_{t-j} + \sum_{j=1}^{n} a_{44} L\Delta CPBI_{t-j} + \sum_{j=1}^{n} a_{45} L\Delta CPI_{t-j} + \sum_{j=1}^{n} a_{46} L\Delta Velocity_{t-j} + \epsilon_t \quad (7)$$

$$\Delta iCPI_t = a_5 + a_{LCPI}\hat{}_{t-1} + \sum_{j=1}^{n} a_{51} L\Delta LCPI_{t-j} + \sum_{j=1}^{n} a_{52} L\Delta Growth_{t-j} + \sum_{j=1}^{n} a_{53} L\Delta Emoney_{t-j} + \sum_{j=1}^{n} a_{54} L\Delta CPBI_{t-j} + \sum_{j=1}^{n} a_{55} LBIRTGS_{t-j} + \sum_{j=1}^{n} a_{56} L\Delta Velocity_{t-j} + \epsilon_t \quad (8)$$

$$\Delta iVelocity_t = a6 + a_{LVelocity}\hat{}_{t-1} + \sum_{j=1}^{n} a_{61} L\Delta Velocity_{t-j} + \sum_{j=1}^{n} a_{62} L\Delta Growth_{t-j} + \sum_{j=1}^{n} a_{63} L\Delta Emoney_{t-j} + \sum_{j=1}^{n} a_{64} L\Delta CPBI_{t-j} + \sum_{j=1}^{n} a_{65} LBIRTGS_{t-j} + \sum_{j=1}^{n} a_{566} L\Delta CPI_{t-j} + \epsilon_t \quad (9)$$

Where:

Growth : Economic growth

E-Money : Changes in payment transactions using Electronic Money

CBPI (CBPI) : Changes in payment transactions using Card-Based Payment Instruments

BI-RTGS : Changes in payment transactions using BI-RTGS

CPI : Price level

Velocity : Money Circulation Acceleration

$a$ : Regression coefficient

$\epsilon_t$ : Error term

$\widehat{e}$ : error correction terms of long-run equilibrium regression

**Empirical Result and Discussion**

***Empirical Result***

A stationarity test is conducted before estimating these economic models. Each variable will be tested for stationarity using the unit root test, the Augmented Dickey-Fuller (ADF) test. This test's null hypothesis ($H_0$) is a unit root, so the time series data used is not stationary. The alternative hypothesis ($H_1$) states the opposite value, indicating that the absence of unit root causes time-series data to be utilized stationary. The stationarity test is the most critical stage because if a variable used is not stationary; it will result in spurious regression. The test is carried out by comparing the ADF probability (MacKinnon approximate p-value) with critical value, producing results that are as follows:

**Table 2: First Difference Levels of Dickey-Fuller Stationarity Test Results**

| Variable | ADF | MacKinnon Critical Value | | | Prob. | Stationarity |
|---|---|---|---|---|---|---|
| | | 1% | 5% | 10% | | |
| GROWTH | -10.19187 | -3.493129 | -2.888932 | -2.581453 | 0.0000 | stationer * |
| EMONEY | -10.70468 | -3.493747 | -2.8892 | -2.581596 | 0.0000 | stationer* |
| DEBIT CARD | -12.51915 | -3.493747 | -2.8892 | -2.581596 | 0.0000 | stationer * |
| BI-RTGS | -12.99181 | -3.493129 | -2.888932 | -2.581453 | 0.0000 | stationer * |
| CPI | -8.939716 | -3.493129 | -2.888932 | -2.581453 | 0.0000 | stationer * |
| V | -10.20517 | -3.493747 | -2.8892 | -2.581596 | 0.0000 | stationer * |

Note: *, **, *** significant at the level of 1%, 5% and 10%

The Augmented Dickey-Fuller stationary test results at the first difference level in Table

2 show that all variables in the study consisted of Growth, E-money, DEBIT CARD, BI-RTGS, CPI, and velocity are stationer.

The next step in the VECM test is the optimal lag test, used to determine the maximal lag limit. Determination of optimal lag is carried out via several testing criteria, which include Final Prediction Error (FPE), Akaike (AIC), Schwarz (SIC) and Hannan-Quinn (HQ) Information Criterion. This test further indicates dawdling with the most asterisks (*) as shown in the following table:

**Table 3: Optimal Length Lag Test Results**

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | -328.808 | NA | 2.68e-05 | 6.501121 | 6.654600 | 6.563285 |
| 1 | 171.1267 | 931.9167 | 3.29e-09 | -2.507315 | -1.432960* | -2.072164* |
| 2 | 221.3124 | 87.70316 | 2.51e-09 | -2.782766 | -0.787534 | -1.974628 |
| 3 | 274.8012 | 87.24388 | 1.82e-09 | -3.122354 | -0.206246 | -1.941231 |
| 4 | 303.3038 | 43.16887 | 2.18e-09 | -2.976772 | 0.860212 | -1.422662 |
| 5 | 370.7460 | 94.28820* | 1.25e-09* | -3.587301* | 1.170559 | -1.660205 |

Note: *, **, *** significant at the level of 1%, 5% and 10%

The next test further utilizes the value (lag 5) recommended by the optimal lag length test. The optimal lag length test indicates that the maximal wane was observed in lag 5, as seen in Table 3, with many asterisks (*). This optimal lag shows how many periods a variable need to receive an impact or result if a shock occurs; conversely, its removal is also used to determine the best model.

The VECM stability test is carried out to evaluate the validation of the IRF and FEVD tests. On the estimation results of the system of equations formed by using the roots of a characteristic polynomial on all variables used and multiplied by the number of lags of each system of equations estimation. Furthermore, the results indicate that the VECM assessment shows a stable condition because the root has a modulus lesser than one, indicating that the study's IRF and FEVD analysis results are valid.

A cointegration test is carried out as the main requirement of the VECM method to determine the possibility of a long-term relationship between variables in this study. This investigation uses the Johansen Cointegration Test method, characterized by two statistical assessments, namely, trace test and maximum eigenvalue test, provided that their statistical value is more significant than the critical value of 0.05.

**Table 4: Johansen Cointegration Test Results (Trace Statistic)**

| Hypothesized No. of CE(s) | Eigenvalue | Trace Statistic | 0.05 Critical Value | Prob.** |
|---|---|---|---|---|
| None * | 0.733994 | 230.9287 | 95.75366 | 0.0000 |
| At most 1 * | 0.356263 | 95.85670 | 69.81889 | 0.0001 |
| At most 2 * | 0.231179 | 50.92931 | 47.85613 | 0.0250 |
| At most 3 | 0.114639 | 24.11375 | 29.79707 | 0.1957 |
| At most 4 | 0.086613 | 11.69429 | 15.49471 | 0.1722 |
| At most 5 | 0.023768 | 2.453565 | 3.841466 | 0.1173 |

It uses trace statistics for hypothesis H0. Based on table 4, the results of the cointegration hypothesis test shows no rejected cointegration equation. This result is because the fun-

damental statistic value is greater than the critical value. Conversely, the probability is more minor than α = 5%. Thus two integration equations can be formed.

**Table 5: Johansen Cointegration Test Results (Max-Eigen Statistic)**

| Hypothesized No. of CE(s) | Eigenvalue | Max-Eigen Statistic | 0.05 Critical Value | Prob.** |
|---|---|---|---|---|
| None * | 0.733994 | 135.0720 | 40.07757 | 0.0000 |
| At most 1 * | 0.356263 | 44.92739 | 33.87687 | 0.0016 |
| At most 2 | 0.231179 | 26.81556 | 27.58434 | 0.0625 |
| At most 3 | 0.114639 | 12.41946 | 21.13162 | 0.5068 |
| At most 4 | 0.086613 | 9.240724 | 14.26460 | 0.2667 |
| At most 5 | 0.023768 | 2.453565 | 3.841466 | 0.1173 |

Table 5 shows that the results of this hypothesis test using the max-eigen statistic for hypothesis $H_0$ that there is no cointegration is rejected because the value is more significant than 0.05, with a probability smaller than α = 5%. Therefore, enhancing the propensity to form two equations.

Based on Tables 4 and 5, the Johansen Cointegration test with trace and max-eigen statistics shows a long-term balance between the studied variables. Cointegration results indicate that the movement of growth, e-money, DEBIT CARD, BI-RTGS, CPI, and velocity have a balanced relationship and the same movement in the long term. In other words, in the short-run period, all variables adjust to each other to reach long-run equilibrium. The cointegration of the data shows that the use of the VECM method for estimating the variables in this study is appropriate, so the next step is to evaluate the VECM. The VECM estimation shows the relationship between growth, e-money, DEBIT CARD, BI-RTGS, CPI, and velocity (Table 6).

**Table 6: The Results of VECM Estimation**

| Long-Term | |
|---|---|
| **Cointegrating Eq** | **CointEq1** |
| GROWTH(-1) | 1.000000 |
| EMONEY(-1) | 1.211816 |
| | (0.81527) |
| | [ 1.48640] |
| DEBITCARD(-1) | -0.499121 |
| | (0.18191) |
| | [-2.74384] |
| BIRTGS(-1) | -0.186168 |
| | (0.17659) |
| | [-1.05424] |
| CPI(-1) | -0.001126 |
| | (0.00740) |
| | [-0.15211] |

| Long-Term | | | |
|---|---|---|---|
| **Cointegrating Eq** | **CointEq1** | | |
| VELOCITY(-1) | -0.986241 | | |
| | (0.40186) | | |
| | [-2.45417] | | |
| C | -9.335347 | | |
| Short-Term | | | |
| Error Correction: | D(GROWTH) | D(CPI) | D(VELOCITY) |
| CointEq1 | -1.704635 | 0.108194 | 0.047572 |
| | (0.13350) | (0.50563) | (0.02852) |
| | [-12.7691] | [ 0.21398] | [ 1.66777] |
| D(GROWTH(-1)) | 1.024615 | -0.013385 | -0.005652 |
| | (0.09073) | (0.34364) | (0.01939) |
| | [11.2933] | [-0.03895] | [-0.29153] |
| D(GROWTH(-2)) | 0.943580 | -0.531064 | -0.005028 |
| | (0.10256) | (0.38844) | (0.02191) |
| | [ 9.20046] | [-1.36716] | [-0.22946] |
| D(GROWTH(-3)) | 0.641481 | -0.224055 | -0.054137 |
| | (0.08822) | (0.33412) | (0.01885) |
| | [ 7.27169] | [-0.67058] | [-2.87210] |
| D(GROWTH(-4)) | 0.781360 | 0.425672 | -0.015755 |
| | (0.09667) | (0.36614) | (0.02066) |
| | [ 8.08281] | [ 1.16259] | [-0.76275] |
| D(GROWTH(-5)) | 0.748497 | -0.603239 | -0.024169 |
| | (0.09752) | (0.36935) | (0.02084) |
| | [ 7.67562] | [-1.63325] | [-1.15995] |
| D(EMONEY(-1)) | 4.458866 | 6.091576 | 0.209808 |
| | (0.87695) | (3.32151) | (0.18738) |
| | [ 5.08449] | [ 1.83398] | [ 1.11969] |
| D(EMONEY(-2)) | 4.217452 | 7.948385 | 0.328569 |
| | (1.07591) | (4.07507) | (0.22989) |
| | [ 3.91989] | [ 1.95049] | [ 1.42924] |
| D(EMONEY(-3)) | 3.975236 | 9.463255 | 0.239018 |
| | (1.15754) | (4.38426) | (0.24733) |
| | [ 3.43420] | [ 2.15846] | [ 0.96637] |
| D(EMONEY(-4)) | 5.996120 | 4.845042 | 0.643702 |
| | (1.13972) | (4.31676) | (0.24353) |
| | [ 5.26104] | [ 1.12238] | [ 2.64325] |

| Long-Term | | | |
|---|---|---|---|
| **Cointegrating Eq** | | **CointEq1** | |
| D(EMONEY(-5)) | 2.967666 | -5.011692 | 0.100381 |
| | (1.08241) | (4.09971) | (0.23128) |
| | [ 2.74171] | [-1.22245] | [ 0.43402] |
| D(DEBITCARD(-1)) | -0.598900 | -1.023136 | 0.006221 |
| | (0.24399) | (0.92413) | (0.05213) |
| | [-2.45459] | [-1.10713] | [ 0.11933] |
| D(DEBITCARD(-2)) | -0.499213 | -1.676282 | -0.007303 |
| | (0.25608) | (0.96990) | (0.05472) |
| | [-1.94947] | [-1.72830] | [-0.13348] |
| D(DEBITCARD(-3)) | -1.006413 | -0.612342 | -0.023982 |
| | (0.26608) | (1.00781) | (0.05685) |
| | [-3.78233] | [-0.60760] | [-0.42182] |
| D(DEBITCARD(-4)) | -0.352243 | -0.222913 | -0.056405 |
| | (0.25131) | (0.95184) | (0.05370) |
| | [-1.40164] | [-0.23419] | [-1.05042] |
| D(DEBITCARD(-5)) | -0.379827 | 0.200772 | -0.036186 |
| | (0.23380) | (0.88553) | (0.04996) |
| | [-1.62458] | [ 0.22672] | [-0.72435] |
| D(BIRTGS(-1)) | -0.406992 | 0.382675 | 0.058945 |
| | (0.33645) | (1.27434) | (0.07189) |
| | [-1.20965] | [ 0.30029] | [ 0.81993] |
| D(BIRTGS(-2)) | 0.067613 | -0.292855 | -0.053567 |
| | (0.32308) | (1.22368) | (0.06903) |
| | [ 0.20928] | [-0.23932] | [-0.77596] |
| D(BIRTGS(-3)) | 0.183924 | -0.655662 | 0.054233 |
| | (0.32388) | (1.22671) | (0.06920) |
| | [ 0.56788] | [-0.53449] | [ 0.78367] |
| D(BIRTGS(-4)) | -0.641295 | 0.239815 | 0.041520 |
| | (0.30815) | (1.16714) | (0.06584) |
| | [-2.08111] | [ 0.20547] | [ 0.63059] |
| D(BIRTGS(-5)) | -0.045828 | 0.507685 | 0.067353 |
| | (0.33417) | (1.26570) | (0.07140) |
| | [-0.13714] | [ 0.40111] | [ 0.94328] |
| D(CPI(-1)) | -0.056428 | -0.003379 | 0.002266 |
| | (0.03136) | (0.11877) | (0.00670) |
| | [-1.79946] | [-0.02845] | [ 0.33816] |

| Long-Term | | | |
|---|---|---|---|
| **Cointegrating Eq** | | **CointEq1** | |
| D(CPI(-2)) | -0.025461 | -0.065631 | 0.004111 |
| | (0.03045) | (0.11534) | (0.00651) |
| | [-0.83607] | [-0.56902] | [ 0.63186] |
| D(CPI(-3)) | -0.001763 | -0.043382 | 0.000108 |
| | (0.02975) | (0.11269) | (0.00636) |
| | [-0.05924] | [-0.38495] | [ 0.01696] |
| D(CPI(-4)) | -0.039148 | -0.056360 | -0.002694 |
| | (0.02989) | (0.11320) | (0.00639) |
| | [-1.30981] | [-0.49787] | [-0.42189] |
| D(CPI(-5)) | 0.004030 | -0.017159 | 0.002341 |
| | (0.03027) | (0.11466) | (0.00647) |
| | [ 0.13311] | [-0.14964] | [ 0.36194] |
| D(VELOCITY(-1)) | -1.574786 | 0.316068 | -0.244997 |
| | (0.61751) | (2.33886) | (0.13194) |
| | [-2.55022] | [ 0.13514] | [-1.85682] |
| D(VELOCITY(-2)) | -1.129843 | 0.613847 | -0.256365 |
| | (0.62984) | (2.38555) | (0.13458) |
| | [-1.79386] | [ 0.25732] | [-1.90495] |
| D(VELOCITY(-3)) | -2.760057 | 2.663492 | -0.193154 |
| | (0.61363) | (2.32416) | (0.13112) |
| | [-4.49791] | [ 1.14600] | [-1.47316] |
| D(VELOCITY(-4)) | -0.149774 | 4.846183 | -0.158579 |
| | (0.63490) | (2.40473) | (0.13566) |
| | [-0.23590] | [ 2.01527] | [-1.16894] |
| D(VELOCITY(-5)) | -0.260008 | 3.171842 | -0.205623 |
| | (0.61192) | (2.31768) | (0.13075) |
| | [-0.42491] | [ 1.36854] | [-1.57264] |
| C | -0.092166 | 0.721515 | -0.030592 |
| | (0.06830) | (0.25869) | (0.01459) |
| | [-1.34941] | [ 2.78906] | [-2.09617] |
| R-squared | 0.869889 | 0.426596 | 0.589214 |
| Adj. R-squared | 0.812268 | 0.172660 | 0.407295 |

Note: ( ) = standard errors; [ ] = t-statistics
*, **, *** significant at the level of 1%, 5% and 10%
Critical score for Student's t-1% = 2.624407; 5% = 1.983264; 10% = 1.659782

Table 6 indicates that only the e-money variable has a significant positive effect on economic growth at the level of 1%. The coefficient indicates the estimation for the long-term equilibrium model. Hence the sign is read in reverse. Gujarati (2004) explains that the VECM

has several disadvantages, including its difficulty interpreting the estimated coefficients. It can also not explain the dynamic behaviour of its model. Therefore, many economists argue that the dynamism of variables can be observed utilizing Impulse Response (IRF) and Forecast Error Variance Decomposition (FEVD).

The vertical axis of the IRF graph illustrates the response to the shock impact of one variable on another. The response observed above the horizontal axis shows that the shock has a positive effect, while the reaction below the horizontal axis shows that the shock has a negative impact. Conversely, the horizontal axis indicates how long the influence occurs (annually).

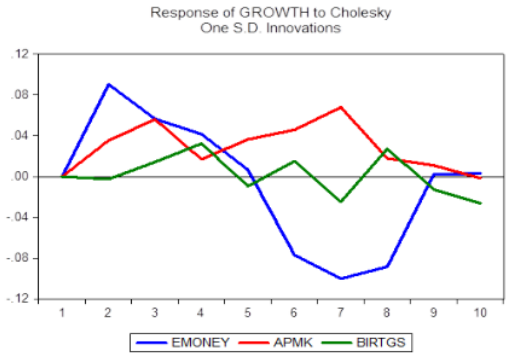


**Figure 3: Response of Economic Growth to the Shock of Non-cash Transaction Variables**

Figure 3 shows the growth response due to the distress of changes in the value of e-money, DEBIT CARD and BI-RTGS transactions. It can be seen that the growth variable gives a fairly fluctuating response to all endogenous variables used in this study. Furthermore, during the initial period, the growth variable positively responded to changes in e-money, which continued to the highest point in the second period and an equilibrium point was met in the 5th period. In addition, a negative response was observed until the 9th and 10th periods, where it further moved back to the positive axis.

Conversely, the growth response to the shocks due to changes in the DEBIT CARD variable shows a positive reaction at the beginning to the end of the forecast period, as shown in Figure 3, which further began to move towards the equilibrium point in the 10th period. The growth response on the BI-RTGS variable is positive. It can be seen from the movement of the graph. It is on the balance line at the beginning of the period. In the next period, the growth response moved towards the highest point in the 4th period and dropped to the lowest point in the 5th period. In the 6th period, growth gave a fluctuating response to the shock from the BI-RTGS up to the 10th period.

Figure 4 shows the response from the CPI to the changes in non-cash transactions in Indonesia. The results of the IRF analysis show that the CPI gave an adverse reaction to the DEBIT CARD and BI-RTGS transaction variables. However, a positive response was observed while utilizing e-money during the forecasting period. In the beginning, the chart moved up, then down to the lowest point (6th period). Next, it will up again in the 7th period, until the 10th period. CPI showed a negative response to the changes in CBPI transactions in Indonesia during the period of observation.

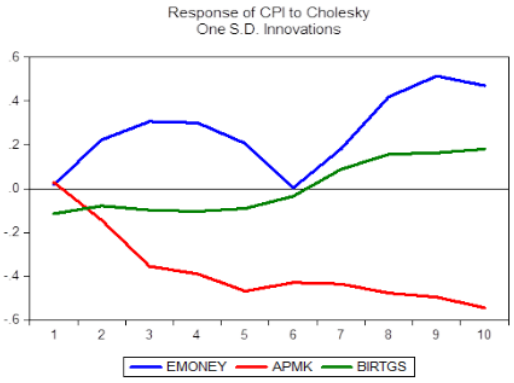


**Figure 4: CPI Response to the Shock of Non-cash Transaction Variables**

It continued downwards to the 5th period, while the 6th to 10th periods were pretty stable, although it still shows a negative trend. Initially, the CPI portrayed a downward chart to the impact of changes using BI-RTGS transaction, up to the 6th period, which was relatively stable from the 1st until the 5th period and followed with an upward trend. Furthermore, the response moved solidly in the 7th through the 10th period in the positive direction.

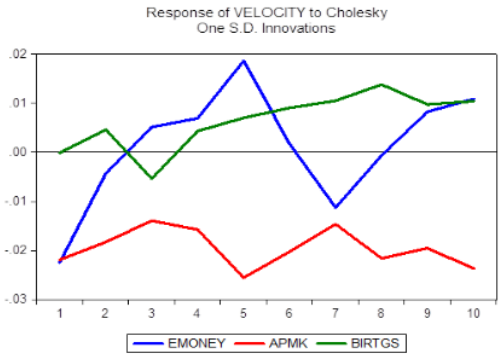


**Figure 5: Response of Velocity of Money to the Shock of Non-cash Transaction Variables**

The velocity of money response to the shock from changes in non-cash transactions fluctuated and varied (Figure 5). The impact of the shift in e-money was responded negatively by the velocity of money at the beginning of the period. Furthermore, the velocity response moves up to the highest point in the 5th period. In the 6th period, the velocity response moves down to the lowest point before finally rising again and moving steadily in the 9th period. At the beginning of the period, the velocity of money negatively responded to the shock of changes in CBPI transactions. During the ten forecasting periods, the velocity response to CBPI continues to move in the negative area. The movement of the velocity response seems to fluctuate in each period, with the lowest point being in the 5th period. The velocity response continues to move down at the end of the period. The velocity of money gave a quite volatile reaction to the changes in BI-RTGS transactions. In the first period, the speed of cash provides a positive response and moves up to the highest point in the 2nd period before moving down to the lowest point. The lowest point of velocity response to changes in BI-RTGS transactions occurred in the third period. Furthermore, the answer moved up to the second-highest point

in the 8th period and moved steadily until the end of the period.

After analyzing the dynamic behaviour through IRF, further analysis will be carried out on the characteristics of the model using FEVD. FEVD study provides information about the proportion of the shock of one variable to the surprise of other variables in the current and future periods. The discussion of FEVD in this study focuses on the value of non-cash payment transactions (e-money, DEBIT CARD, and BI-RTGS) to economic growth, price levels, and velocity of money in Indonesia. The FEVD procedure was performed by measuring the percentage of surprises for each variable. The results of the FEVD test from the economic growth can be seen in Table 7 below.

**Table 7: Results of Forecast Error Variance Decomposition (FEVD) from the Economic Growth**

| Period | S.E. | GROWTH | EMONEY | DEBIT CARD | BIRTGS | CPI | V |
|---|---|---|---|---|---|---|---|
| 1 | 0.297940 | 100.0000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 |
| 2 | 0.336339 | 88.43299 | 7.230178 | 1.114684 | 0.005633 | 3.187114 | 0.029405 |
| 3 | 0.352939 | 81.19664 | 9.130593 | 3.531104 | 0.167204 | 5.826390 | 0.148069 |
| 4 | 0.378817 | 77.76447 | 9.134205 | 3.266895 | 0.873900 | 6.609283 | 2.351245 |
| 5 | 0.393172 | 72.58266 | 8.507824 | 3.892407 | 0.869281 | 6.609731 | 7.538100 |
| 6 | 0.414729 | 66.11069 | 11.09136 | 4.722008 | 0.913748 | 6.052821 | 11.10938 |
| 7 | 0.496703 | 61.15954 | 11.80470 | 5.160296 | 0.885064 | 4.461506 | 16.52890 |
| 8 | 0.526127 | 60.20021 | 13.34249 | 4.713515 | 1.054906 | 5.584075 | 15.10481 |
| 9 | 0.530254 | 59.70748 | 13.13732 | 4.683703 | 1.095674 | 6.260379 | 15.11545 |
| 10 | 0.539759 | 59.17380 | 12.68185 | 4.521099 | 1.294824 | 6.046346 | 16.28209 |

The FEVD analysis of the growth variable in Table 7 shows that the variable estimated to have the greatest contribution to economic growth in the next ten years is the economic growth variable itself, with an average annual contribution of 72%. E-money, DEBIT CARD and BI-RTGS payment instruments contributed 9.6%, 3.5% and 0.6% respectively. In lag one, the growth variable contributes 100% to growth, while other variables do not contribute to economic growth in Indonesia. In the second period, non-cash transactions in Indonesia that contributed the most to economic growth were the e-money variable. The change from e-money contributed 7% to economic growth in Indonesia. In the next period, the contribution of e-money, CBPI, and BI-RTGS variables to economic growth in Indonesia continued to increase. The largest contribution of the e-money variable to economic growth occurred during the 8th period, which was 13.3%. The largest contribution of the CBPI variable occurred in the 7th period, and the largest contribution of BI-RTGS occurred in the last period.

**ble 8: Results of Forecast Error Variance Decomposition (FEVD) from CPI**

| Period | S.E. | GROWTH | EMONEY | DEBIT CARD | BIRTGS | CPI | V |
|---|---|---|---|---|---|---|---|
| 1 | 0.037377 | 0.118170 | 0.027230 | 0.062923 | 1.031548 | 98.76013 | 0.000000 |
| 2 | 0.042022 | 0.310563 | 1.921429 | 0.832968 | 0.740746 | 96.18936 | 0.004934 |
| 3 | 0.043930 | 0.207868 | 3.699490 | 3.793399 | 0.744459 | 91.54942 | 0.005359 |
| 4 | 0.047940 | 0.155965 | 4.514335 | 5.762214 | 0.767178 | 88.50216 | 0.298143 |
| 5 | 0.050927 | 1.430066 | 4.142604 | 7.754093 | 0.718216 | 84.52909 | 1.425936 |
| 6 | 0.055845 | 1.852370 | 3.385705 | 8.590289 | 0.602107 | 82.63549 | 2.934036 |
| 7 | 0.060578 | 2.057193 | 3.151823 | 9.078999 | 0.579254 | 81.93693 | 3.195804 |

| Period | S.E. | GROWTH | EMONEY | DEBIT CARD | BIRTGS | CPI | V |
|---|---|---|---|---|---|---|---|
| 8 | 0.063739 | 2.022474 | 4.190472 | 9.677355 | 0.704026 | 80.60382 | 2.801848 |
| 9 | 0.065634 | 1.865384 | 5.666752 | 10.32741 | 0.817620 | 78.71486 | 2.607969 |
| 10 | 0.066017 | 1.887545 | 6.542833 | 11.20177 | 0.948277 | 76.98959 | 2.429984 |

The FEVD analysis of the price level variable (CPI) in Table 8 shows that the variable estimated to have the most significant contribution to the price level in the next ten years is the price level variable itself with an average annual contribution of 98%. Meanwhile, the DEBIT CARD instrument contributed the most to the price level compared to other payment instruments, at 6.7%. Meanwhile, the average contribution of e-money and BI-RTGS to the price level was 3.7% and 0.8%, respectively. At the beginning of the period, the variable itself is the biggest contributor to the shock from changes in the price level. At the beginning of the period, the price level variable contribution was 98% and continued to decline until the end. Meanwhile, BI-RTGS contributed 1%, DEBIT CARD 0.06% and e-money 0.02%. The contribution of e-money and DEBIT CARD tends to increase over the next ten years, while BI-RTGS tends to decrease.

**Table 9: Results of Forecast Error Variance Decomposition (FEVD) from the Velocity of Money**

| Period | S.E. | GROWTH | EMONEY | DEBIT CARD | BIRTHS | CPI | V |
|---|---|---|---|---|---|---|---|
| 1 | 0.160068 | 0.711733 | 12.38635 | 11.83003 | 3.17E-05 | 2.564605 | 72.50725 |
| 2 | 0.204756 | 5.297236 | 8.260279 | 12.91079 | 0.338958 | 3.144074 | 70.04866 |
| 3 | 0.223378 | 9.511596 | 7.174283 | 13.20439 | 0.653544 | 3.277557 | 66.17863 |
| 4 | 0.249961 | 8.687792 | 7.056959 | 14.86867 | 0.815738 | 2.969781 | 65.60106 |
| 5 | 0.29012 | 8.081283 | 9.577839 | 19.3502 | 1.203387 | 2.54445 | 59.24284 |
| 6 | 0.315427 | 9.081721 | 8.83373 | 21.61023 | 1.873648 | 2.36404 | 56.23663 |
| 7 | 0.333014 | 8.651393 | 8.561882 | 20.18666 | 2.490979 | 2.303475 | 57.80561 |
| 8 | 0.358636 | 8.068237 | 7.457288 | 20.81759 | 3.502457 | 2.854013 | 57.30042 |
| 9 | 0.384921 | 7.904869 | 7.267355 | 21.48233 | 3.816844 | 3.657767 | 55.87084 |
| 10 | 0.404581 | 7.288807 | 7.398406 | 23.08933 | 4.158849 | 3.78713 | 54.27748 |

The FEVD analysis of the velocity of money variable in Table 9 shows that the variable is estimated to have the most significant contribution to the velocity of money in the next ten years. It is the velocity variable itself with an average annual contribution of 61.5% and tends to decrease during the ten year analysis period. Meanwhile, non-cash payment instruments CBPI, e-money, and BI-RTGS contributed 17.9%, 8.4%, and 1.9%, respectively. The contribution of APMK and BI-RTGS non-cash payment instruments to changes in the velocity of money tends to increase during the analysis period. The contribution of BI-RTGS to changes in velocity decreased in the second year and rose again in the third year until the last year of increase. Meanwhile, the contribution of money to speed has continued to decline for ten years.

**Discussion**

The purpose of the less-cash society implemented by the Central Bank of Indonesia and several central banks globally is to reduce the money supply and transaction costs. In addition, another goal of the less-cash society in Indonesia is to support the vision and mission of Bank Indonesia in creating an efficient, fast, secure, and reliable payment system. Bank Indonesia's success in moving towards a less visible society can be seen from the increase in

transactions using non-cash payment instruments, both card-based and electronic money, to large-scale payments using the fund transfer system. Based on the general description of the development of each non-cash payment instrument in Indonesia, it can be concluded that non-cash transactions continued to increase during the study period. Based on the number of transactions, small-scale non-cash payments such as credit cards, debit cards/ATM, and e-money still dominate non-cash payment transactions in Indonesia. Meanwhile, large-scale non-cash transactions with BI-RTGS instruments still tended to below.

The statistical data of the payment system indicates that people had a greater preference in holding the debit card and e-money; however, the utility of credit cards have a more significant nominal transaction. The average percentage of debit or ATM usage shows that 43% of these cards are for withdrawal purposes, while only 4% of activities were used for shopping.

The increasing activity of shopping using cards and the level of consumption in Indonesia show the government's success in creating a non-cash movement. A study in America by Visa (2003) found an increase in spending by consumers in the United States. At the same time, there was an increase in the use of card-payment by consumers. Increasing the use of cards as a means of payment is considered more efficient and can optimally provide faster transaction facilities. Pramono et al. (2006) stated that the issuance of non-cash payment instruments could be viewed from several points of view. The presence of non-cash payment instruments for the economy can provide benefits in the form of increased financial efficiency and productivity to encourage actual sector activities, economic growth, and public welfare.

The analysis of IRF and FEVD shows that the shock of changes in cashless payment transactions responded quite well to the variables of economic growth. This further indicates that the DEBIT CARD and BI-RTGS are predicted to increase economic development in Indonesia due to their positive effects. Conversely, transactions that utilize e-money caused a positive fiscal change only at the beginning of the period.

Based on FEVD analysis, the result indicates that e-money and DEBIT CARD transaction variables largely contribute annually to economic growth. The FEVD analysis results strengthen the IRF analysis results and prove the hypothesis in this study that non-cash transactions have a significant effect on economic growth in Indonesia. These results are supported by Syarifuddin et al. (2009) and Nirmala and Widodo (2011). Their research stated that increasing the total non-cash transactions would increase GDP, which previously caused a substitution effect by reducing the demand for currency and increasing M1 and M2. Efficient payments arise due to the use of non-cash payment instruments, which are expected to increase GDP.

Oyewole et al. (2013) mentioned that electronic payment systems have a significant relationship to GDP. However, their research shows that only payment instruments using ATMs have a statistically significant effect on GDP in Nigeria. The same result also indicates that only ATMs is having a substantial impact on the trading variable. A study conducted by Okereke (2016) states that the payment system does not affect economic growth because the ECM estimation shows that the F-count value is lower than the F-Table value.

The results of the IRF analysis show that an increase in non-cash payment transactions is expected to lower the price level, although to a small extent. It can be seen from the negative response of the price level to shocks from changes in non-cash transactions in APMK and BI-RTGS only at the beginning of the period. In contrast, the e-money variable is responded positively by the price level variable. Based on the FEVD analysis, the shock of non-

cash payment transactions contributed significantly to changes in the price level in Indonesia, especially for non-cash payment transaction variables using e-money and DEBIT CARD in small percentages. Meanwhile, BI-RTGS only contributed less than 1% to changes in the price level.

Previous research conducted by Syarifuddin et al. (2009) showed the same results. An increase in the non-cash transaction method could further reduce the price level, though relatively small. However, an increase in the velocity of money caused by electronic payment instruments causes inflation. Furthermore, this study's IRF analysis test results indicate that an increase in cashless payments is predicted to elevate the velocity of money, as can be seen in the positive feedback to the variable speed against shock, especially for e-money BI-RTGS non-cash payment transactions. Conversely, transactions that utilize DEBIT CARDS in Indonesia attracted negative feedback.

The FEVD test shows that cashless payments contribute significantly to changes in the velocity of money variable in Indonesia. This result indicates that e-money and DEBIT CARD play the most significant role on these effects. Based on the IRF and FEVD analysis, it can be concluded that the increase in non-cash transactions will increase the velocity of money. The results of this study can explain the quantity theory of money, where the use of non-cash payment instruments is assumed to be one of the factors that will change the money demand function and reduce the average amount of cash held by the public. This circumstance will further increase the velocity of money, which previously will reduce the k parameter in the quantity equation for money demand.

Priyatama and Apriansah (2010) illustrated that electronic money could change the money demand function and reduce the average amount of cash held by the public, leading to an increase in the velocity of money in the economy. A study conducted by Scholnick et al. (2008) shows that an increase in credit cards can reduce the amount of cash held by consumers. Non-cash payments make transactions more efficient and faster. It can increase people's purchasing power so that people can get money at a faster rate.

**Conclusion and Suggestions**

Based on the results of the study, it can draw several conclusions. Non-cash payments affect economic growth in Indonesia in the long and short term. However, only the CBPI payment instruments have a significant effect on economic growth, while the e-money and BI-RTGS instruments have no significant impact on economic growth in Indonesia. Second, non-cash transactions in Indonesia can encourage economic growth, lower the price level, and increase the velocity of money in Indonesia. Third, the use of non-cash payment instruments in Indonesia continues to grow. However, small-scale public non-cash transactions still tend to below. The use of non-cash payment instruments for shopping activities is still very low; only about 4% of all community activities use card-based non-cash payment instruments. The most significant percentage of community activities using cards is for cash withdrawals.

Based on the conclusions above, several policy recommendations can be proposed. Since an increase in non-cash payment transactions can increase economic growth, lower price levels, and increase the velocity of money, serious efforts are needed to increase the volume and value of non-cash payment transactions, especially BI-RTGS, e-money, credit cards, and debit cards/ATM. Banks and other financial institutions are expected to establish more relationships or cooperation with third parties to increase retail or large non-cash payments in Indonesia and improve infrastructure to support non-cash transactions. The increase in the use of non-cash payment instruments can harm the security of transactions. Therefore, Bank

Indonesia and other related financial institutions need serious efforts to ensure the safety and comfort of consumers who use non-cash payment instruments in Indonesia.

This research was carried out according to the procedure of writing scientific papers. However, it still has limitations. Non-cash payment tools or methods in Indonesia are not only DEBIT CARD, e-money, and BI-RTGS. There are still many other non-cash payment tools or methods in Indonesia. Due to limited data sources, this research only uses three tools or non-cash transaction methods. Based on metadata from the Bank Indonesia website, e-money non-cash payment instruments consist of chip and server-based electronic money. But there is no precise data on how many Indonesian transactions use chips and servers, so this study has not seen the most influential non-cash payment instruments.

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