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The Impact of Electronic Money on The Efficiency of The Payment System And The Substitution of Cash In Indonesia

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Abstract: This study examines aspects of the development of non-cash payment instruments, especially electronic money in the period 2007-2017 in Indonesia using data sourced from BPS and Bank Indonesia. The Central Bank has an efficiency principle that the providers of the payment system should be widely used so that the cost will be cheaper. The development of electronic money means of payment in the payment system as well as having several advantages certainly have an impact on the other means of payment, either a cash payment instruments as well as noncash. We estimate electronic money to private consumption expenditure and narrow money using Vector Error Correction Model (VECM). This research found that electronic money increases private consumption expenditures as a proxy for the efficiency. On the other hand, the result showed that electronic money decreases narrow money (M1).

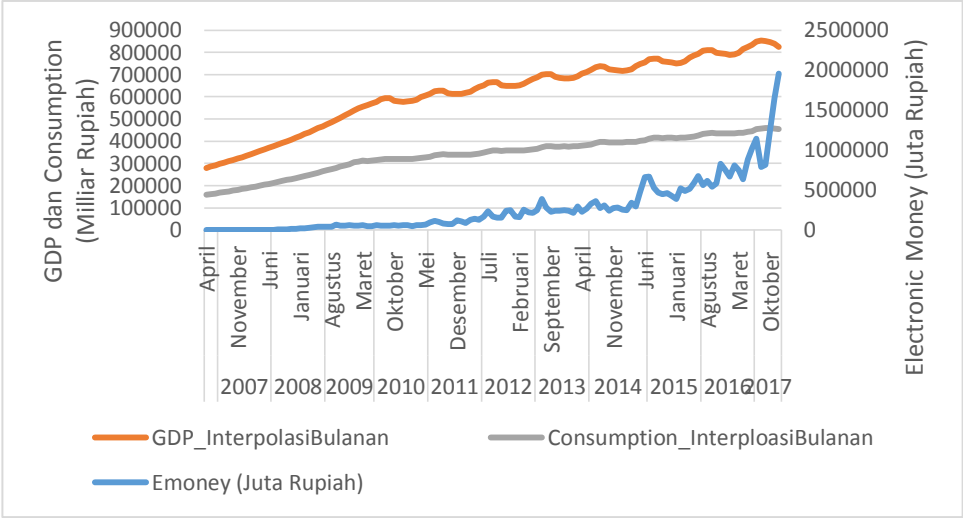
Keywords: Electronic money; efficiency of the payment system; narrow money

Introduction

Berger & Hancock (1996) consider the risks and costs associated with payments as "transaction costs". Payments are considered efficient if: the payment is located on the frontier that minimizes the cost for the overall risk level and minimizes the risk for a certain level of cost (technically efficient).

At the beginning of the emergence of the value of e-money transactions was recorded at 809.95 Million Rupiah in 2007, in 2017 the value of electronic money transactions reached 1.9 billion Rupiah. This is also in line with the development of consumption levels and GDP which continues to increase every year. Electronic money is essentially the same as money, used as a means of payment. The effect of the money supply on the economy has been explained by Classical and Keynesian. Classical economists have the view that money has no effect on increasing economic output. This is an interesting question whether the efficiency generated by electronic money will affect the growth of consumption levels resulting in an increase in GDP.

Figure 1. **The development of Electronic Money Transactions, the level of consumption, and the GDP in Indonesia 2007-2017**



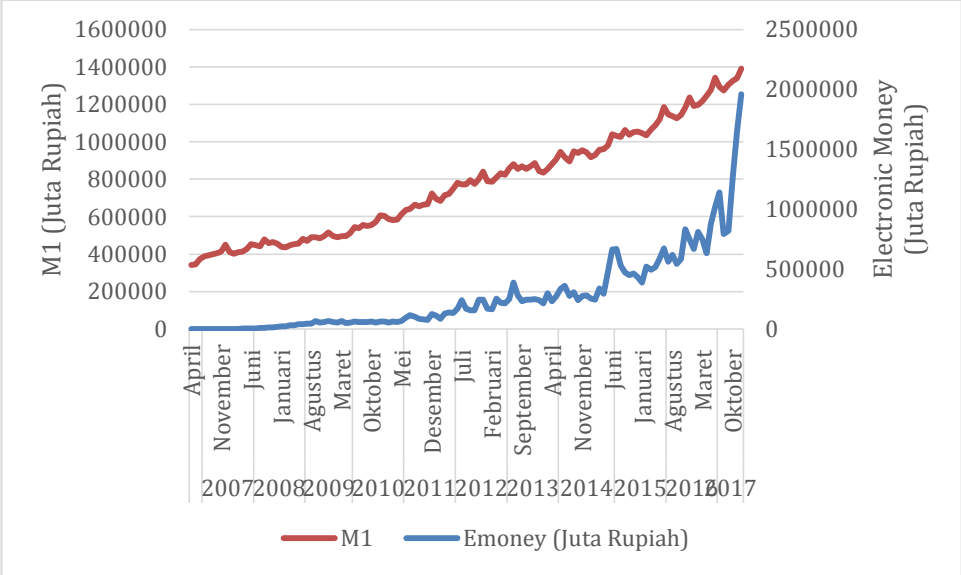
Source : BI and BPS

Moosa (1997) explains the concept of money neutrality, which is an expression of the quantity theory of money, refers to the hypothesis that changes in the quantity of money affect nominal variables, but not real variables, which are variables in the macroeconomic system. The importance of assumptions on the neutrality theory can be illustrated using a model of inflation. Inflation rate equal to the rate of monetary expansion reduced the growth rate of demand for money resulting from the growth of real output. If the money is not neutral, then the monetary expansion will lead to a rise in real output and consequently an increase in the demand for money. Generate excess money supply lower and resulting in a smaller increase in the price level. In the short term, there will be an increase in real output through short-term relationships Phillips who suggested that the difference between the growth rate of real output and long-term depends on the actual positive inflationary expectations errors. The finding that money affect nominal variables, but not real variables, variables in longterm shows that money is neutral in the long run. Policy implications from these findings emerge from the proposition that the effectiveness of monetary policy as a tool of anti-inflation stabilization depends on the existence of a stable relationship and well understood the relationship between money and prices.

The development of electronic money means of payment in the payment system as well as having several advantages certainly have an impact on the other means of payment, either a cash payment instruments as well as noncash.

Statistical data show that the increase in electronic money and narrow money (M1) continued to experience an increase in each period. However, the growth tends to fluctuate from its growth. Adopting the Baumol model related to demand for money by modifying non-cash payments, financial innovations related to the function of payment instruments, in particular, have an impact on cash. Development of noncash payments encouraged individuals to create a wide choice of means of payment for minimizing the cost.

Figure 2. **The Development Of Transactions Electronic Money And Narrow Money (M1) in Indonesia 2007-2017**



Source : Bank Indonesia

Palley (2001) argues that the emergence of electronic money not only affects policy but is also a challenge to the existing money theory, it will affect the definition change of the monetary base. A new definition of money after the emergence of electronic money. The use of electronic money payments continues to increase, of course, have an impact on other payment instruments, whether non-cash or cash. Clemons (1996) stated several reasons for replacing cash and increasing the use of non-payment in cash. The main reasons are: reducing the handling cost (including the cost of security cash), improving ease of use, and reduce the cost of money creation.

Papilloud (2014) considers there should be clarity on the electronic money as a more rational payment instrument, payment instruments chosen by consumers may not be optimal. Merchants typically enter the transaction costs in the price of goods and services that they offer so that consumers bear the burden and pay more for their purchases. Palley (2001) stated that payment instrument innovations and the emergence of electronic money could eventually replace existing money, both currency and demand deposits

Literature Review

Ten Raa & Shestalova (2004) There are two ways to estimate the cost size. The first approach to estimating the size of the cost is to use transaction supply side transaction data, which is the cost to facilitate payment infrastructure, usually related to the institutional). According to Hancock & Humprey (1998) it is difficult to obtain the required data. Data on the cost of payment is fragmented and often patentable, so no cross-section or time series data exists on payment fees incurred by payers, payees or banks. Transaction fees for currency are related to cash management, transportation, depositing, re-operation, and theft. The cost of non-cash payment is related to the cost of installation, maintenance, and modernization of POS machines (selling points), and previous leases. Data for non-cash payment infrastructure so far only available data on the number of reader machines at

Bank Indonesia and unavailability of cost data to facilitate infrastructure of non-cash payment instruments.

The second approach, the analysis is only seen from the side of the consumer economy with the perceived cost or perceived by the consumer itself. Singh (2017) states one of the ways economic agents make payment instruments more attractive to consumers is the advantage of making transactions via electronic money is getting attractive discounts (cash back). For example: In Indonesia, there are some goods and services where when consumers use transportation services or buy food will be charged a discount if pay by using e-money compared with cash. With the same level of income but at a lower cost due to payment efficiency, it is assumed that the people can increase their consumption level. Daniel (1994) explains that consumers make decisions for consumption and saving involves choice between various payment media instruments in their transaction activities. The choice between paying by cash or non-cash is determined by costs and benefits, including consideration of time spent in transactions and risks incurred from each instrument of payment.

The benefits of payment instruments are good at saving time and costs. Changes in payment innovation affect the habits of buying behavior, and their need for payment services (Dahlberg et al., 2008). Lower transaction costs obtained by consumers from the use of digital money will encourage public consumption and demand for goods and services which in turn have the potential to encourage real sector activities and can stimulate economic activity (Dias, 2000).

Using a micro analysis, Boeschoten (1998) argues a parameter transaction cost adjust to demand, assuming minimizing cost behavior. Some benefit or advantage from the use of e-money compared with the cash or other noncash means of payment, among other things: faster and more convenient than cash.

Chatterjee & Rose (2012) explained that the use of electronic money affects consumers' decisions in making purchases and by using various types of payment methods, consumers have their own experience when using different payment instruments, from cash to non-cash payment instruments. However, the payment system has a relationship with consumer behavior is the scope that must be explored (Pulina, 2011).

Prelec and Loewenstein (1998) argues that the benefits of the non-payment of cash instruments as ' clutch '. Specifically, define the clutch as the relationship between the psychological benefits of the means of payment which are then associated with the consumption of an item or service. But the ' clutch ' not only means it will instantly push the level of consumption, but the ' clutch ' could be interpreted as an intention to do the anchoring of consumption. Policies using electronic money in a country brings the characteristics of a new consumption environment thereby affecting the psychological relationship between benefits and payments.

Soman (2001) consumers currently have the opportunity to pay for purchases with payment amounts with the ever-increasing payment mechanism. The spread of this payment mechanism is accompanied by very little research about the effect of the mechanism of payments on consumer behavior. A little understanding of the special role played by payment mechanisms in influencing the behavior of consumers in the future. In particular, the specific payment mechanism makes the consumer feel the cost in the past getting relatively low due to the efficiency and therefore affect the intention to purchase additional products or can be said to raise the level of consumption.

Mallat (2007) the new payment instruments have the potential to increase the convenience of payment and lowering transaction costs. The benefits derived from the non-payment of cash compared to traditional payment instruments, i.e. the possibility to save time and possible nonpayment anywhere. Compliance with the consumer purchase transaction payment and customs is also expected to have an impact on the adoption of the use of electronic money. Non-payment of cash is expected to increase consumer comfort by reducing the demand for coins and cash in small transactions and increase the availability of payment opportunities

There are several empirical studies that examine the effect of electronic money on consumption and economic growth. Zhou (2008) electronic money has developed very quickly and attracted many people's attention. In the modern economy, money has played a very important role. Because the development of e-money is very quick, it takes the impact on M1 and GDP. Electronic payments as argued by (Taddesse & Kidan 2005) have a significant number of economic benefits apart from their convenience and safety. These benefits when maximized can go a long way in contributing immensely to economic development of a nation. Electronic payments can thus lower transaction costs stimulate higher consumption and GDP, increase government efficiency boost financial intermediation and improve financial transparency". They further added that "Governments play a critically important role in creating an environment in which these benefits can be achieved in a way consistent with their own economic development plans". Ragavanther (2016) Cash really is king, but a few countries are a step head of the rest in toppling its throne. Given that the cost of handling cash is high, it is the interest of government, banks, and business to push for the change toward cashless. In some countries, effective policies have made difference, whereas, in others, it is thanks to consumers being more open to using mobile or plastic payments. Here's a look at the same countries that are really making a move toward becoming cashless. According to Zandi, Koropeckyj, Singh, & Matsiras (2016), the increasing use of non-cash payment instruments in various countries is a question of whether it brings benefits to the macroeconomy. The impact of increased electronic payment is expected to have an effect on the rate of consumption. The estimate is to estimate the impact of rising consumption on economic output as measured by GDP. Tee & Ong (2016) found that any policies related to non-cash payments will not directly affect the economy, but the impact of increased cashless payments significantly affects economic growth in the long term. Marshall & Coke (2016) states that e-money has a long-term relationship to economic growth in Jamaica. Seetharaman and Raj (2009) argue the purpose of electronic payments is to increase people's purchasing power.

Based on the above description, it can be concluded that the influence of electronic money on payment efficiency in this research is identified by how the influence to the increase of society consumption level in long term.

Instrument payments consist of non-cash payments and cash payments, non-cash payment is viewed from its purpose and function the same as a cash payment, which is equally a great tool to do the payment transaction. That sets it apart is just another form of non-cash payment instruments and these advantages are owned by non-cash payment such as easier and safer to perform the transaction.

The payment system has been undergoing evolution, development of the role of money as a means of payment continues to undergo changes exist. Along with the development of technology, a variety of noncash payment instruments began to appear in various other

existing between the means of payment using the card and electronic money. E-money is different from other noncash means of payment such as debit and credit cards. Credit card and the debit card does not constitute "products" but rather "prepaid access products". Stojanovic (2001) revealed that e-money stored value products are where the amount of value has been recorded in the means of payment used (prepaid). Lots of benefits derived from the use of e-money, especially buyers (consumer) and sellers (merchants), e-money making transactions easier and more secure. Tufano (2003) financial innovation is often seen from the shape of a product or process innovation of the product, the function of financial innovation system can affect moving funds across time and space.

The use of electronic money payments continues to increase, of course, have an impact on other payment instruments, whether non-cash or cash. It will also affect changes in M1 and M2. In this case, this study will only see the impact of electronic money on M1, because it wants to see first hand the impact on cash. Thus in analyzing the increase of electronic money transactions to cash whether it is substitution or complementary. The development of electronic money transactions will affect M1. Electronic money is likely to affect consumer behavior in economic activity, alleged that electronic money into a payment instrument that will replace cash so that the relationship of electronic money and M1 have a negative relationship.Palley (2001) argue that the payment instrument revolution leads to new methods of transaction and payment and the appearance of electronic money in the end can replace existing money, both currency and demand deposit for transaction purposes. In addition, it is known that currency ratio represents cash and demand deposits which are also part of non-cash payment instruments.

According to Berlian (2017), the balance of monetary as one of the requirements to achieve the balance of the economy, can be achieved with the arrangements established by the Monetary Authority (Bank Indonesia, the central bank and the government, represented by the Minister of Finance) should be able to predict the number of currency created, and also controls the ability of commercial banks which creates demand deposits (demand deposits). Innovation in payment systems can lead to complications in the use of target quantities of monetary control (Woodford, 2000). The development of the electronic money payment system implies a change in the concept of money supply in the narrow sense (M1) and in a broad sense (M2). Electronic money is a stored-value or pre-paid product in which a certain amount of money is stored in an electronic media owned by a person. Electronic money may be issued at the expense of an existing customer account at a commercial bank or with a cash deposit. Characteristics of electronic money that has a float of funds that can be used at any time as a means of payment, then this type of funds can be categorized as a very liquid fund or can be synchronized with cash (cash) or demand deposits. The development of a savings payment system as underlying causes a shift in the saving function of an irrevocable savings to become a kind of savings that can be withdrawn at any time as in demand deposits, it is necessary to consider the classification of savings as part of narrow money (M1) in the category of money shepherd is no longer M2.

There are several empirical studies that examine the effect of electronic money to money demand. The problem that then arises in the context of changes in the payment system is the possibility of a change in the behavior of the community between the choice of holding cash and non cash and using payment instruments that have an impact on the economy. Humprey (1996) tested several countries found 119 million non-cash transactions. On average each person performs 165 non-cash transactions annually and 35% of them are electronic payments. The change of behavior between holding cash for each person and

annual statistics of non cash payment. It was found that cash and non cash had a negative relationship, resulting in substitution between cash and non-cash.

Snellman, Vesala, & Humphrey (2001) examined the substitution of noncash payments against cash transactions. The non-cash substitution of cash is the same throughout the country and the development stages of each country in this substitution process depend heavily on non-cash payment infrastructure. The discovery of a negative relationship between the value of non-cash payments with cash in the ten countries. In Palley (2001)study, Innovation in the payment system introduces e-money that is likely to replace the existing money. Oyelami & Yinusa (2013) examines alternative payment instruments against currency demand and monetary policy using monthly data from 2008-2010 in Nigeria. Using the Vector Error Correction Model (VCEM) found that internet payment and mobile money substitute the currency, while credit cards have a positive relationship. Electronic money is a breakthrough in payment systems that have significant development over money in other forms (Vlasov, 2017). A study of the effect of non-cash payment instruments in Indonesia was made by Sahabat (2009) but did not yet include electronic money in the scope of research.

Objectives

This study aims to contribute for the literature, especially on the relationship between the electronic money, private consumption expenditure, and narrow money which is focused on estimate and identify the long-term effect of electronic money to private consumption expenditure. Second is estimate and identify the long-term effect of electronic money to narrow money. And third is identify how long the response time from the shock caused by the variable electronic money

Methods

Data analysis is done through a series of stages of testing using Vector Regression (VAR). The VAR model is first introduced by Sims (1980) as an alternative to the equation model approach with consideration of minimizing approach theory that aims to be able to capture economic phenomena with good. Sims argued that if there is a simultaneous relationship between the variables examined, the use of the structural approach over modeling simultaneous equations usually apply economic theory in his attempts to describe the relationship between variables to be tested (Ekananda, 2016).

Vector Error Correction Model is derived from the VAR model to analyze more thoroughly if you want to consider the behavior of the data that are not stationary (Ekananda, 2016). the In order for analysis are not generated from a spurious regression then variables in the VAR model derived at level I in order to be retrieved data is stationary the present level. Previous data had to be tested on the condition I (1) differentiation in the VAR system produces the equation VECM.

Analysis of the VECM considers moving data fluctuations around the trend long term so that the VECM model used to analyze the existence of the dependent variable on the correction due to the condition of imbalance on a few variables.

To examine the effect of electronic money to private consumption expenditure, we follows the study of Zandi, Koropeckyj, Singh, & Matsiras (2016), Tee & Ong (2016), Marshall & Coke (2016) with modification in estimation method and variables. The purpose of this research is to identify the dynamic and long-term relationship between electronic money, consumption level, real GDP, interest rate, and consumer price index. We estimate

electronic money to private consumption expenditure using Vector Error Correction Model (VECM), as follows:

$$\Delta Y_t = \beta_0 + \sum_{i=1}^{n} \Gamma \Delta Y_{t-i} + \gamma_1 ECT_{t-i} + \varepsilon_t$$

Where ΔY_t is first difference matrix with explanation stated below:

$$\begin{pmatrix} \Delta lnConsumption_t \\ \Delta SBKredit_t \\ \Delta lnGDPRiil_t \\ \Delta lnIHK_t \\ \Delta lnEmoney_t \end{pmatrix}$$

Variables were transformed into natural logarithm form except variable in percentage unit. Variable used in this research comprise among others, as follows: $lnconsumption_t$ is private consumption expenditure, $SBKredit_t$ is interest rate, $lnGDPRiil_t$ is real GDP, LnIHK is consumer price index and $LnEmoney_t$ is transaction value using electronic money.

β_0 is a constant vector for each of the above mentioned variables, $\sum_{i=1}^{n} \Gamma \Delta Y_{t-i}$ is a matrix consisting of a parameter matrix (Γ) and a variable component matrix in lag form of first difference is (ΔY_{t-i}), where matrix for ΔY_{t-i} is

$$\begin{pmatrix} \Delta lnConsumption_{t-1} \\ \Delta SBKredit_{t-1} \\ \Delta lnGDPRiil_{t-1} \\ \Delta lnIHK_{t-1} \\ \Delta lnEmoney_{t-1} \end{pmatrix}$$

We estimate electronic money effect to narrow money demand referring to Rinaldi (2001) with modification in estimation method and variables. We estimate payment system innovation to narrow demand using Vector Error Correction Model (VECM), as follows:

$$\Delta Y_t = \beta_0 + \sum_{i=1}^{n} \Gamma \Delta Y_{t-i} + \gamma_1 ECT_{t-i} + \varepsilon_t$$

Where ΔY_t is first difference matrix with explanation stated below:

$$\begin{pmatrix} \Delta LnM1_t \\ \Delta BI\_Rate_t \\ \Delta lnGDPRiil_t \\ \Delta SBDeposito_t \\ \Delta CurrencyRatio_t \\ \Delta LnEMoney_t \end{pmatrix}$$

where matrix for ΔY_{t-i} is

$$\begin{pmatrix} \Delta LnM1_{t-1} \\ \Delta BI\_Rate_{t-1} \\ \Delta lnGDPRiil_{t-1} \\ \Delta SBDeposito_{t-1} \\ \Delta CurrencyRatio_{t-1} \\ \Delta LnEMoney_{t-1} \end{pmatrix}$$

Variables used to estimate electronic money effect to narrow money demand in this research comprise among others, as follow: $LnM1_t$ is M1 or narrow money, BI_Rate_t is Bank Indonesia Rate, $lnGDPRiil_t$ is real GDP, $SBDeposito_t$ is time deposit rate, $CurrentyRatio_t$ is Ratio between Currency Outside Commercial and Rural Banks and Cash in Bank Vaults, $LnEmoney_t$ is transaction value using electronic money.

Required data are available from Statistik Ekonomi Indonesia (SEKI) - BI, dan BPS. Data used in this research in the last 11 years (2007 - 2017). Selection of period during the last 11 years (2007 - 2017) due to e-money data that only available from 2007.

Hypothesis

The hypothesis built and will be tested in this study comprise as follows:

1. Electronic money will lead to increase in private consumption expenditure.
2. Electronic money will lead to decrease in narrow money (M1).

Findings

In the first stage, the characteristics of the data were tested using the unit root test. This test is applied to see the stationary conditions to be observed. The unit root testing method used in this study is Augmented Dickey-Fuller (ADF). The results obtained all variable stationary on 1st difference or in other words the variable is stationary on degrees integration one or I (1).

Table 1. **Root Unit Test Function Efficiency of Payment System**

Variable	Stationer Test			
	Level		1st Difference	
	ADF	Prob	ADF	Prob
Emoney	0.690662	0.9996	-8.594283	0.0000
Consumption	-4.610087	0.0015	-9.998390	0.0000
GDP Riil	-6.840615	0.0000	-5.297041	0.0001
SB_Kredit	-1.534101	0.8128	-4.335730	0.0039
IHK	-2.762215	0.2141	-8.131244	0.0000

The next stage is the determination of the optimal lag length. The optimal lag is very important because the independent variable used is none other than the endogenous variable of the lag.

Getting longer lag used will reduce the degree of freedom and the number of observations, while the lag that is too short will produce the wrong specifications (Gujarati, 1997). The issue of the determination of the length of the lag is also increasingly important along with the presumption that the selection of the proper lag will result in residual are Gaussian (free from the problems of autocorrelation and heterokedastisitas) (Gujarati, 2003). If the selected optimal lag too short then it is feared could not explain the dynamics of the model thoroughly. For the determination of the optimal lag level typically used values Akaike Information Criteria (AIC), the Final Prediction Error (FPE), Hannan-Quinn Information Criterion (HQ), and Schwarz Information Criterion (SC) the smallest . The magnitude of the selected lag is the lag that produces a value of AIC most small. AIC value calculation for each lag indicates that the minimum AIC obtained when 8 lag for the variables in the function of the efficiency of the payment.

Table 2. **Calculation of optimal lag of variables in the payment efficiency function**

Lag	LogL	LR	FPE	AIC	SC	HQ
1	1155.998	NA	5.24e-15	-18.69418	-18.11654	-18.45958
2	1243.333	160.2350	1.87e-15	-19.72452	-18.56923	-19.25531
3	1303.295	105.0568	1.05e-15	-20.30240	-18.56947*	-19.59859
4	1351.177	79.93477	7.29e-16	-20.68061	-18.37004	-19.74220
5	1405.264	85.82367	4.58e-16	-21.16138	-18.27317	-19.98837
6	1479.250	111.2859	2.08e-16	-21.97108	-18.50523	-20.56347
7	1538.188	83.77896	1.23e-16	-22.53203	-18.48853	-20.88981*
8	1577.072	52.05903*	1.02e-16*	-22.76151*	-18.14037	-20.88469

Cointegration is a long-term relationship that is used to determine whether two or more variables have a relationship long-term balance. In the data, variables have been stationary means that variable cointegrated or have a long-term relationship. The detection of the presence of Cointegration is done by the method of Johansen. The cointegration testing criteria in this study are based on greater statistic trace than the 5 percent critical value then an alternative hypothesis that summarizes the amount of cointegration is accepted so that it is known how many equations are integrated into the system. If the test proves that there is a cointegration vector then we will apply VECM for estimation. Cointegration testing can be done by using the optimal lag length that has been obtained, namely, lag 8. Because the selected lag is 7, the lag on the cointegration test is 1 (minus 1 because the variable is differentiated).

Cointegration testing (as shown in Appendix 1) shows that the trace test indicated that there were 3 cointegration. The relationship of mutual influence can be seen from the cointegration that occurs between the variables themselves. Based on the cointegration test there is a cointegration equation at a significant level of 5 percent. Then it can be concluded that the data are cointegrated. This shows that there is a long-term relationship between the variables of the level of consumption, loan interest rates, real GDP, CPI, electronic money. Co-integration of a variable shows the right signal to use VECM.

In accordance with the results of the stationary test and data cointegration test, the model estimation is done by Vector Error Correction Model (VECM). The use of the VECM method in this study is more to look at the long-term equilibrium relationship of cointegrated equations. From the results of the cointegration test on VECM analysis can be obtained a long-term coefficient matrix for the function of payment system efficiency. The interpretation explains that between the variable efficiency of payment (consumption level) has a long-term relationship with GDP, Electronic Money, Interest Rates, CPI.

Table 3. ***VECM test results***

Cointegrating Eq:	CointEq1	CointEq2	CointEq3		
LNCONSUMPTION(-1)	1.000000	0.000000	0.000000		
LN_GDP_RIIL(-1)	0.000000	1.000000	0.000000		
LNIHK(-1)	0.000000	0.000000	1.000000		
SB_KREDIT(-1)	-0.267290	-0.075682	0.110081		
	(0.10933)	(0.02066)	(0.02963)		
	[-2.44480]	[-3.66277]	[3.71522]		
LNEMONEY(-1)	-0.533699	-0.191219	0.020847		
	(0.07611)	(0.01439)	(0.02063)		
	[-7.01183]	[-13.2929]	[1.01060]		
C	-2.823933	-10.00920	-6.653196		
R-squared	0.973223	0.936324	0.407377	0.407606	0.593517
Adj. R-squared	0.960814	0.906816	0.132747	0.133082	0.405147
Sum sq. resids	0.000191	0.000955	0.146263	1.414587	2.134324
S.E. equation	0.001525	0.003413	0.042234	0.131343	0.161333
F-statistic	78.42910	31.73090	1.483366	1.484775	3.150804
Log likelihood	636.5969	539.1619	234.7557	97.47008	72.58569
Akaike AIC	-9.877635	-8.267138	-3.235631	-0.966448	-0.555135
Schwarz SC	-8.976512	-7.366016	-2.334509	-0.065325	0.345987
Mean dependent	0.008716	0.007770	-0.001603	-0.030826	0.063327
S.D. dependent	0.007706	0.011179	0.045351	0.141065	0.209179

The results of the estimation of the long-term equation as shown in table 3 can be formulated as follows:

LnCons = 2.823 + 0.267 SBKredit + 0.533 LnEmoney

Significant variables to explain the payment efficiency variable (Ln Consumption) are the Interest Rates and Electronic Money . The Interest rate variable has a statistic -2.44480 and electronic money has a statistic -7.01183. It is said to be significant because the t-statistics are outside the interval -1.98 and 1.98. The VECM test model of the payment efficiency function can be said to lead to long-term balance. This can be seen from the negative Error Correction Term (ECT) value (-) that is equal to -0.000480.

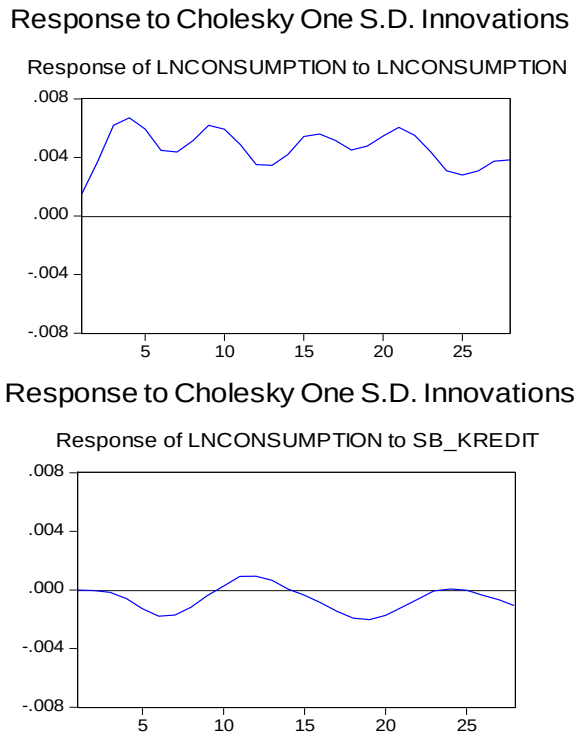
The results in the 2007-2017 study period found that an increase in electronic money by 1 percent would cause an increase in the consumption level of 0.533 percent. This shows the efficiency of payments caused by transactions using electronic money. Analysis of payment efficiency in this study is seen from the consumer side with the costs felt by consumers themselves. These costs can be in the form of benefits obtained from the use of electronic money payment instruments. The benefits of using electronic money in Indonesia can be felt from the benefits gained such as saving time due to easy transactions and also discounts offered by economic agents so that the perceived costs are relatively lower. With the same level of income but with lower costs due to payment efficiency, people can increase purchasing probability from the benefits derived from using electronic money. The ease and benefits of electronic money can increase consumers' desire to increase their level of consumption, this shows the efficiency of payments. An increase in the interest rate of 1 percent will cause an increase in consumption by 0.267 percent. Based on the theory of temporal consumption, the problem that changes in interest rates not only affect the substitution effect but also seen in the income effect. If the majority of the population

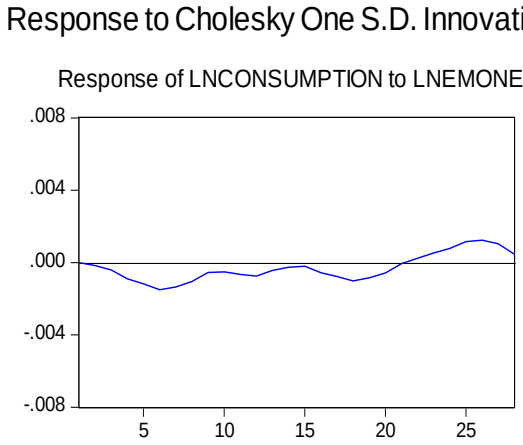
is a net saver (having the ability to save) the increase in interest rate will affect the higher consumption increase than before.

The response function to shock or shock serves to see the response of the dynamics of each variable if there is a certain shock of one standard error. This response shows the influence of a variable shock. Analysis of the response to shock in this study aims to determine the role of electronic money variables on payment efficiency functions. The horizontal axis is the time in the next month after the shock occurs, while vertical is the response value.

The results of impulse response processing in the figure show that in general it is seen that the effect of electronic money on payment efficiency in Indonesia tends to fluctuate. The response of credit interest rates to the highest level of consumption occurred in the 11th period with a level of 0.09%. The effect of shock electronic money on the highest level of consumption occurs in the 25th period with a level of 0.12% then converges on a positive balance.

Figure 3. **Impulse Response Function of Payment Efficiency**





From the results of the cointegration test on VECM analysis can be obtained a long-term coefficient matrix for the M1 money demand function. The interpretation explains that between the variables M1 has a long-term relationship with the BI Rate, Real GDP, deposit interest rates, Currency Ratio, Electronic Money.

Table 4. ***VECM test results***

Cointegrating Eq:	CointEq1	CointEq2	CointEq3
LNM1(-1)	1.000000	0.000000	0.000000
LN_GDP_RIIL(-1)	0.000000	1.000000	0.000000
SB_DEPOSITO(-1)	0.000000	0.000000	1.000000
BI_RATE(-1)	0.040677	-0.005978	-2.132900
	(0.01955)	(0.00657)	(0.45026)
	[2.08028]	[-0.90962]	[-4.73707]
LNEMONEY(-1)	0.102659	-0.103371	-3.431761
	(0.02484)	(0.00835)	(0.57203)
	[4.13250]	[-12.3809]	[-5.99928]
CURRENTYRATIO(-1)	-0.169515	0.047153	-1.006607
	(0.11814)	(0.03971)	(2.72032)
	[-1.43490]	[1.18758]	[-0.37003]
@TREND(07M04)	-0.013733	-0.002343	0.122958
C	-13.23540	-12.15296	43.81959

R-squared	0.668796	0.885734	0.718629	0.552089	0.558317	0.730664
Adj. R-squared	0.505239	0.829307	0.579680	0.330898	0.340201	0.597658
Sum sq. resids	0.038656	0.001730	1.935937	2.068835	2.354458	10.90975
S.E. equation	0.021846	0.004621	0.154598	0.159816	0.170492	0.366999
F-statistic	4.089058	15.69683	5.171893	2.495987	2.559732	5.493477
Log likelihood	318.3709	507.8814	79.63870	75.58866	67.69983	-25.83429
Akaike AIC	-4.547064	-7.653794	-0.633421	-0.567027	-0.437702	1.095644
Schwarz SC	-3.604729	-6.711459	0.308914	0.375308	0.504633	2.037979
Mean dependent	0.010131	0.007868	-0.011066	-0.032787	0.065654	0.010582
S.D. dependent	0.031058	0.011185	0.238459	0.195377	0.209893	0.578585

The results of the long-term equation estimation as shown in table 4 can be formulated as follows:

$$LnM1 = 13.23540 + 0.013733t - 0.040677\ BI\ Rate - 0.102659\ LnEmoney + 0.1695\ CurrencyRatio$$

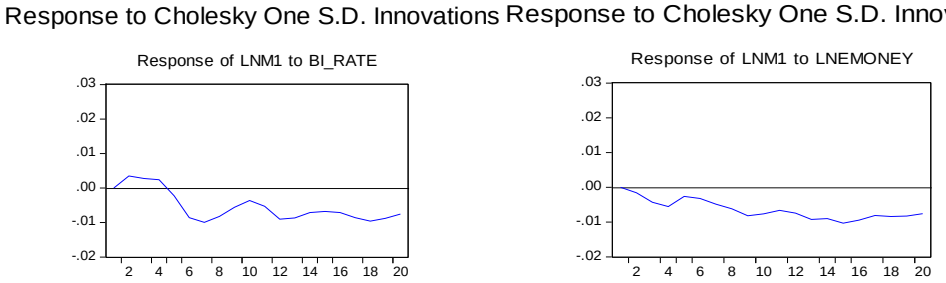
Significant variables to explain the money demand variable (M1) are the variable BI Rate, Currency Ratio, and Electronic Money. The BI Rate variable has a tstatistic of 2.08028, Currency Ratio has a statistic -1.4349 and Electronic money has a tstatistic of 4.13250. It is said to be significant because the t-statistics are outside the interval -1.97 and 1.97. The VECM model test results with the money demand function can be said to lead to long-term balance. This can be seen in the negative (-) ECT (Error Correction Model) of -0.532691. The increase in narrow money, in the long run, is influenced by the Currency ratio and electronic money. The increase in the currency ratio by 1 percent will cause an increase in the M1 level of 0.1695 percent. A positive relationship between M1 and Currency Ratio indicates that currency growth will increase the cash component contained in narrow money. The higher the currency ratio shows the high level of cash compared to deposits (a component that can be converted into electronic money). The increase of electronic money by 1 percent will cause a decrease in the M1 growth rate of 0.102659 percent.

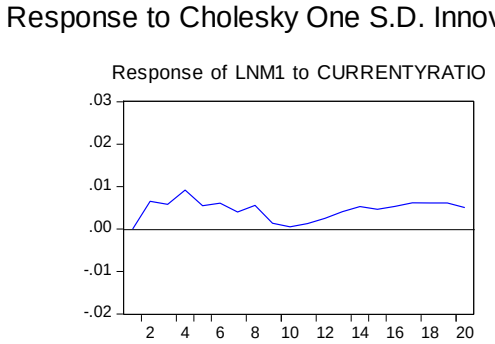
These results are in accordance with the theory that shows the substitution of payment instruments caused by transactions using electronic money. The development of electronic payments has been proven by the substitution of the use of cash, as a result of ease and speed that are relatively the same as the relatively lower transaction costs. Lots of benefits from electronic money make transactions more comfortable and attractive to the public. Statistics also show the value of electronic money transactions continues to increase over time after their appearance in 2007. This further strengthens the electronic money potential to reduce cash growth in Indonesia.

The response to shock analysis in this study aims to determine the role of electronic money variables on the money demand function. The horizontal axis is the time in the next month after the shock occurs, while vertical is the response value.

The result of impulse response processing in the figure shows that in general it is seen that the effect of electronic money on the demand for money in Indonesia tends to fluctuate. The highest effect of the BI Rate shock on M1 occurred in the second period with a level of 0.03% and then converged on the negative balance. The highest effect of the shock currency ratio on M1 occurs in the 4th period with the level of 0.09% and then converges on the positive balance. The effect of shock electronic money on M1 occurs in the 5th period with the level of -0.03% then converges on a negative balance.

Figure 4. **Impulse Response Money Demand Function**





Conclusion

This study examines aspects of the development of non-cash payment instruments, especially electronic money in the period 2007-2017 in Indonesia using data sourced from BPS and Bank Indonesia. Based on the results discussed in the previous chapter, it can be concluded that there are several things related to this study. From the VECM estimation test results on the efficiency of payment and money demand function variables obtained that the increase in the level of consumption and M1 growth, in the long run, is influenced by electronic money. In the long-term analysis of electronic money growth has a positive and significant impact on the level of consumption. The increase of electronic money by 1 percent will increase the consumption level by 0.5336 percent. In the analysis of long-term electronic money growth has a negative and significant impact on narrow money growth (M1). An increase of 1 percent in electronic money will reduce narrow money (M1) by 0.102659 percent. This study only identifies the impact of electronic money increases in Indonesia, in examining the impact of non-cash payments should also take into account other non-cash payment instruments. This research can be further developed by examining better the effects of electronic money on the efficiency of payments, especially by using a transaction cost proxy.

References

Berger Allen, Hancock Diana, M. C. J. (1996). A Framework for Analyzing Efficiency , Risks , Costs , and Innovations in the Payments System Author (s): Allen N . Berger , Diana Hancock and Jeffrey C . Marquardt Source. Payment Sy. *Journal of Money, Credit and Banking*, 28(4), 696–732.

Berlian et al. (2017). Pattern Of Demand For Money. *Sriwijaya International Journal of Dynamic Economics Business,* 1(3), 267–276 https://doi.org/10.29259/sijdeb.v1i3.267-276

Boeschoten, W. C. (1998). Cash Management: Payment Patterns and the Demand for Money. *De Economist*, 146(1), 117–142. https://doi.org/10.1023/A:1003258026314

Chatterjee, P., & Rose, R. L. (2012). Do Payment Mechanisms Change the Way Consumers Perceive Products? *Journal of Consumer Research*, 38(6), 1129–1139. https://doi.org/10.1086/661730

Dahlberg, T., Mallat, N., Ondrus, J., & Zmijewska, A. (2008). Past, present and future of mobile payments research: A literature review. *Electronic Commerce Research and Applications*, 7(2), 165–181. https://doi.org/10.1016/j.elerap.2007.02.001

Daniels, K. N., & Murphy, N. B. (2017). The Impact of Technological Change on the Currency Behavior of Households : An Empirical Cross-section Study Author (s): Kenneth N . Daniels and Neil B . Murphy Published by : Ohio State University Press Stable URL : http://www.jstor.org/stable/2077952, 26(4), 867–874.

Dias, Joilson. (2000). The Digital Money : Review of Literature and Simulations of Welfare Improvement of this Technological Advance. Department of Economic. State of Maringa Brazil

Mallat, N. (2007). Exploring Consumer Adoption of Mobile Payments - A qualitative study. *Journal of Strategic Information Systems*, 16(4), 413–432. https://doi.org/10.1016/j.jsis.2007.08.001

Marshall, M., & Coke, O. (2016). A Sectoral Analysis of E-money Consumption and Growth. *Social and Economic Studies*, 65(2–3), 69–98.

Moosa, I. A. (1997). Testing the long-run neutrality of money in a developing economy: The case of India. *Journal of Development Economics*, 53(1), 139–155. https://doi.org/10.1016/S0304-3878(97)00006-0

Oyelami, L. O., & Yinusa, D. O. (2013). Alternative Payment Systems Implication for Currency Demand and Monetary Policy in Developing Economy: A Case Study of Nigeria. *International Journal of Humanities and Social Science*, 3(20), 253–260. Retrieved from www.ijhssnet.com

Palley, T. I. (2001). The E-money Revolution: Challenges and Implications for Monetary policy. *Journal of Post Keynesian Economics*, 24(2), 217–233. https://doi.org/10.1080/01603477.2001.11490324

Prelec, D., & Loewenstein, G. (1998). The Red and the Black: Mental Accounting of Savings and Debit. *Marketing Science*, 17(1), pp. 4–28.

Rinaldi, L. (2001). Payment Cards and Money Demand in Belgium. *International Economics Working Papers*, *01.16*(July), 1–29.

Romer, D. 2012. Advanced Macroeconomics, 4th Edition. New York: McGrawHill

Soman, D. (2001). Effects of Payment Mechanism on Spending Behavior: The Role of Rehearsal and Immediacy of Payments. *Journal of Consumer Research*, *27*(4), 460–474. https://doi.org/10.1086/319621

Sahabat, Imamuddin. (2009). Pengaruh Inovasi Sistem Pembayaran Terhadap Permintaan Uang di Indonesia. (*Effect of Payment System Innovations on Money Demand in Indonesia*). Thesis. Universitas Indonesia.

Seetharaman, A., and John Rudolph Raj. 2009. "Evolution, Development and Growth of Electronic Money." *International Journal of E-Adoption* 1(1): 76-94.

Singh, S. (2017). Study of Consumer Perception of Digital Payment Mode. *Journal of Internet Banking and Commerce*, *22*(3), 1–7. Retrieved from http://www.icommercecentral.com/open-access/study-of-consumer-perception-of-digital-payment-mode.pdf

Snellman, J. S., Vesala, J. M., & Humphrey, D. B. (2001). Substitution of Noncash Payment Instruments for Cash in Europe. *Journal of Financial Services Research*, *19*(2–3), 131–145. https://doi.org/10.1023/A:1011151219545

Stojanovic, A. (2001). E-Money in Transitional Economies. *Comparative Economic Studies*, 43(1), 101–118.

Syarifuddin, F., Hidayat, A., & Tarsidin, T. (2009). Dampak Peningkatan Pembayaran Non-Tunai Terhadap Perekonomian Dan Implikasinya Terhadap Pengendalian Moneter Di Indonesia. (Impact of Increasing Non-Cash Payments on the Economy and Its Implications for Monetary Control in Indonesia). *Buletin Ekonomi Moneter Dan Perbankan Bank Indonesia*, 369–402. Retrieved from http://www.journalbankindonesia.org/index.php/BEMP/article/view/346

Taddesse, W., & Kidan, T. G. (2005). E-payment:Challenges and Opportunities in Ethiopia. *E-Payment : Challenges and Opportunities in Ethiopia*, (October).

Ten Raa, T., & Shestalova, V. (2004). Empirical evidence on payment media costs and switch points. *Journal of Banking and Finance*, *28*(1), 203–213. https://doi.org/10.1016/S0378-4266(02)00404-1

Tee, H.-H., & Ong, H.-B. (2016). Cashless payment and economic growth. *Financial Innovation*, *2*(1), 4. https://doi.org/10.1186/s40854-016-0023-z

Vlasov, A. V. (2017). The Evolution of E-Money, *XX*(1), 215–224.

Woodford, Michael. (2000). Monetary Policy in a World Without Money. *International Finance*, Vol.3. No.2,pp.229-260

Zandi, M., Koropeckyj, S., Singh, V., & Matsiras, P. (2016). The impact of electronic payments on economic growth. *Moody's Analytics*, 31. Retrieved from https://btca-prod.s3.amazonaws.com/documents/218/english_attachments/impact-of-electronic-payments-on-economic-growth.pdf?1470192661

Zhou, H. (2009). The impact of E-money on the economy. *2009 WRI World Congress on Computer Science and Information Engineering, CSIE 2009*, *3*(May 1994), 126–130. https://doi.org/10.1109/CSIE.2009.194