The Impact of E-Money Diffusion on the Monetary Policy Effectiveness: Evidence from Indonesia

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ABSTRACT

The aims of research is to analyse the impact of e-money diffusion on the effectivity of monetary policy in Indonesia. The analytical method used is Bayesian estimation with the observation period of time series 2009.1 - 2017.12. Some of the variables used in the study are Gross Domestic Product (GDP), policy rates, inflation rates, number of electronic money transactions, total bank loans, Non-Performing Loans (NPL) to measure credit risk. The study results show that e-money has significant impact on the economic growth at the beginning of the period but declined towards a long-term balance. E-money has a significant influence on rising inflation and followed by interest rate responses that also have the same trend but do not have a significant impact in driving credit growth and credit risk. So the risk of financial system instability remains intact despite increasingly massive digital transformations.

Keywords- E-Money, Inflation, National Output, Interest Rate Policy, Monetary Policy.

1. INTRODUCTION

The economic dynamics that are increasingly fast in line with advances in information technology have important implications for the framework of monetary policy transmission mechanisms throughout the country. The existence of technology in the financial system especially the payment system not only has a positive impact on the acceleration of a country's economic growth and financial system development, but also presents its own challenges in changing the pattern of policy settings in the payment system.

The rapid of information technology based on electronic finance (e-finance) has changed the financial system which is increasingly difficult to predict. This has logical consequences for all the monetary policy operations and the credibility of the central bank to use interest rates as an instrument in achieving the ultimate goal of monetary policy. While on the other side, the dynamics of technology also have an impact on changes in agent behaviour in the economy. The use of information technology changes the behaviour of economic agents to act practically, easily and quickly so as to minimize high transaction costs and will affect changes in output and prices. E-finance disruption with all its facilities can bring together potential agents so that it has implications for the application of low interest rates and encourages credit growth which in turn affects financial stability.

The development of e-finance in Indonesia grew rapidly with the volume and value of transactions until the end of November 2018 with a total nominal transaction of 5.19 trillion (Indonesian Rupiah), up 216.46% compared to November 2017. Meanwhile the nominal growth reached 216.46 %, the volume of electronic money transactions also increased 157.31% to 330.67 million transactions from November 2017 which reached 128.51 million transactions. The increase of volume and value of electronic money (e-money) transactions is also inseparable from the increasing amount of money circulating in the community. Until November 2018, the amount of electronic money in circulation was 152.07 million, an increase of 33.72% with the same period in the previous year which was 113.72 million. Meanwhile the availability of infrastructure in the form of reader machines has also increased wherein in 2017 reached 691,331 to 923,624 in 2018. It was also followed by the amount of electronic money circulation from 90,003,848 in 2017 to 167,205,578 in 2018.

Several studies on the impact of electronic money (e-money) on the monetary policy have been carried out in various countries. The study of [1], states that the increase of e-money as a substitute for the cash of money can cause changes in the speed of money and have implications for the in-effectivity of monetary policy in countries that use money aggregates as targets of monetary policy. While [2] states that the unless of e-money can affect the short-term interest rates and it will not affect the effectivity of monetary policy. However, changes in the velocity of e-money will have the implications for the monetary policy in the long run. According to [3], in the quantity theory of money, the change of the velocity of money will have implications for inflation. While [4] developed a simulation model to determine the impact of e-money on the effectivity of monetary policy through the interest rate channel. The study results state that e-money can reduce the effectiveness of monetary policy. When high interest rates will affect the

portfolio of e-money holders or issuers who tend to hold more e-money because the yield from investment will be higher. So in this case the tightening of monetary instruments was followed by an expansion in the availability of the supply of money due to the high amount of electronic money (e-money). [5] states that e-money growth will moderate in the medium term.

Study of [6] that e-money increases the effectivity of monetary policy caused by the growth of e-money and the availability of adequate infrastructure and the existence of electronic transactions does not cause disruption in conventional payment instruments. While [7] show the results of different studies which state that the amount of e-money that it is still small compared to others has not had a significant impact on the monetary policy framework. [8] state that the efficiency of electronic money systems lies in decentralized publishing arrangements. In a competitive model, electronic money issuers can produce e-money supported by large-denominated government bonds. This raises the moral hazard incentive that requires more and more government bonds for issuers to provide the same amount of money. [9] put more emphasis on the function of using e-money which is only applied if the proportion of transactions has greater benefits or advantages and affects the size of the transaction. This will affect when e-money issuers implement sub-optimal policies that have an impact on the problem of policy coordination.

[10] in his study stressed that to anticipate an increase in interest rates, the monetary authority will simultaneously increase the money supply, this is contrary to Keynesian theory, but in the real world it can happen where e-money has become the main payment tool in the economy. While [11] emphasizes the importance of maintaining the precautionary principle in the use of e-money. [12] mentioned the need to separate cash from electronic money in minimizing the weaknesses in cash transactions and the need to formulate a policy framework that is still a question.

This study aims to identify (1) the impact of the number of e-money transactions on the effectivity of monetary policy namely inflation stability and economic growth in Indonesia; (2) the impact of the number of e-money transactions on other financial system indicators, namely the growth of bank credit in Indonesia; (3) the response of monetary policy interest rates to the influence of the e-money transactions in Indonesia.

2. RESEARCH METHODOLOGY

The data type was time series data with the period of observation during 2009.1 - 2017.12. Some of the variables used in this study are Gross Domestic Product (GDP) (y_t), policy interest rates (rp_t), domestic inflation (pi_t), bank loans in Rupiah and foreign currencies (cr_t), Non-Performing Loans (NPLs) to measure financial risk (dr_t) and the number of electronic money transactions in million

Rupiah (ue_t) units. Data sources were obtained from the Indonesian Economic and Financial Statistics from Bank Indonesia and the World Bank.

The estimation method used is Bayesian which combines current sample data with previous research to minimize error rates. The parameter used is a random variable that has a certain distribution (prior distribution) based on the researchers' beliefs and is formulated before the sample data is taken. The distribution of the sample combined with the prior distribution will produce a distribution that is the posterior distribution, that is, the degree of one's belief in a parameter after the sample has been observed [13].

The initial or prior values of the parameters in this study were obtained from the Ordinary Least Square (OLS) estimation results using multiple linear regression models and some of the results of previous empirical studies.

Table 1. Parameter Calibration

Parameter	Value	Parameter	Value
β_2	0.517	θ_1	0.984
β_3	0.0006	θ_2	0.006
β_4	0.013	θ_3	0.006
β_5	0.004	σ_1	0.930
λ_1	0.942	σ_2	0.018
λ_2	0.013	σ_3	0.038
δ_1	0.987	ϖ_1	0.963
δ_2	0.001	ϖ_1	0.051
δ_3	0.016	ϖ_1	0.030

Source: Secondary data, processed (2019)

The model specifications used are IS equation, Phillip curve, credit equation, financial risk equation, Taylor rule, electronic money transaction equation

$$y_t = \beta_1 y_{t+1} + \beta_2 y_{t-1} - \beta_3 (rp_t - pi_t) + \beta_4 cr_t + \beta_5 ue_t + \varepsilon_y$$

$$pi_t = \lambda_1 pi_{t-1} + \lambda_2 y_t + \varepsilon_\pi$$

$$cr_t = \delta_1 cr_{t-1} - \delta_2 (rp_t - pi_t) + \delta_3 y_t + \varepsilon_{cr}$$

$$dr_t = \theta_1 dr_{t-1} + \theta_2 cr_t - \theta_3 y_t + \varepsilon_{risk}$$

$$rp_t = \sigma_1 rp_{t-1} + \sigma_2 y_t + \sigma_3 pi_t + \varepsilon_{rp}$$

$$ue_t = \varpi_1 ue_{t-1} + \varpi_2 y_t + \varpi_3 rp + \varepsilon_{ue}$$

Where, Gross Domestic Product (GDP) at constant prices 2010 ( ), policy interest rates ( ), domestic inflation ( ), bank credit in Rupiah and foreign exchange ( ), Non-Performing Loans (NPL) to measure financial risk ( ) and the number of electronic money transactions in million Rupiah ( ).

3. RESULT AND DISCUSSION

3.1 The Impact of Electronic Money on Macroeconomic Indicators

The monetary policy mechanism generally starts from setting the final target to be achieved and then setting intermediate targets, operational targets and finally setting instruments which are actual variables that can be controlled to achieve operational goals [14]. Intermediate goals are needed to achieve the final target set and there is a deadline between implementing monetary policy and achieving the final goal. Therefore we need indicators to find out the policy indications called intermediate targets. The intermediate goal chosen must have a stable relationship with the final goal. Some operational target options that can be used include base money (M0) and short-term interest rates.

However, in line with the dynamics of information technology in the financial system with the increasing number of electronic-based financial product innovations such as e-money, the effectiveness of the use of policy instruments must consider the dynamics and impacts resulting from technological advances. This is an important agenda, because the central bank is faced with digital transformation and virtual economy that is so fast. Then the central bank should play an important role in controlling the supply of money and reserves at the same time owned by banks [15],[16]. The transformation of the banking and financial intermediary function from conventional systems to digital economy becomes a challenge for banks to always innovate in financial products and amidst the emergence of many financial technology companies that offer financial products. So in this case, the responsibility of central bank of Indonesia in synergizing the need for the spread of e-money and increase the effectiveness of e-money to the monetary policy [17].

The result of analysis as shown in Figure 1 below shows that the influence of e-money had a positive impact on economic growth at the beginning of the period, but declined further before the 20th horizon and reached balance of steady state. This means that the increase in electronic money has an impact on economic growth, as in Harrod Domar's growth theory that technological advances have had a positive impact on economic development.

The disruption nature that is considered inherent in every digital product in the long run has not been able to provide momentum for economic growth. As Solow's growth theory that there is diminishing of return is the existence of additional capital in this case innovation has an impact on declining production. Growth conditions that reach steady state are achieved if output growth, capital per labor is constant and where there is no technological progress. This is a challenge for the financial system to develop a framework of policy instruments in absorbing digital transformation.

But at a different level, endogenous growth theory by [18], [19] states that long-term growth is determined from within a model that focuses on modern technology in the production process. This theory does not agree with the convergence hypothesis, that technology has externalities in increasing the productivity of innovators or knowledge spill over effects.
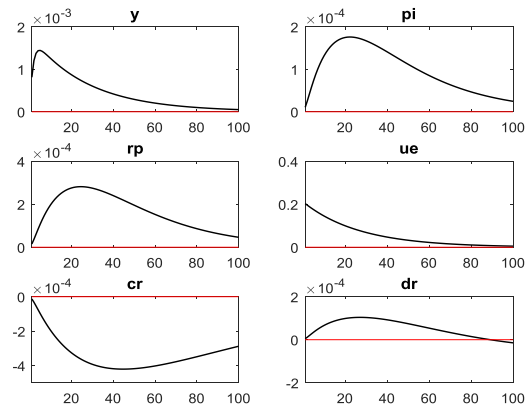

Fig. 1. Monetary Indicator Response to E-Money Shock, Source: Author's Calculation, 2019

Meanwhile, the impact of electronic money (e-money) on several main monetary indicators, namely inflation, showed a positive effect, namely the increase in e-money had an impact on rising inflation up to the 20th horizon and declining and towards steady state. This indicates that the higher use or demand for e-money in the payment system causes the people's purchasing power to increase in several periods. However, the velocity of e-money to inflation can be controlled by increasing the short term interest rate as policy rate and influencing the aggregate demand of the community.

While on the financial system indicators, the existence of e-money has not had an impact on credit growth as indicated by the negative value on the impulse response. It shows the interrelation of e-money and credit growth is very weak. The high public demand for e-money as a means of payment transactions has not yet been followed by demand for credit. In contrast to several other studies, where the use of e-money causes low interest rates, thus providing the risk of arising from moral hazard economic agents to the risk that causes an impact on financial instability.

Table 2. Variance Decomposition of E-Money and Several Macroeconomic Variables

Indicator	Eps_y	Eps_pi	Eps_cr	Eps_dr	Eps_rp	Eps_ue
y	42,69	14,74	3,43	0,00	6,20	32,95
pi	0,00	100,00	0,00	0,00	0,00	0,00
rp	0,00	77,53	0,00	0,00	22,47	0,00
ue	0,00	33,54	0,00	0,00	5,64	60,82
cr	0,02	18,26	77,69	0,00	3,81	0,22
dr	0,01	8,46	30,77	59,29	1,42	0,06

Source: Secondary data, processed (2019)

The analysis also shows the decomposition variant that the biggest contributor to inflation after interest rates is e-money, which is 33.54 percent higher than the effect of bank credit growth. This is also the case with policy interest rates which are also more influenced by e-money after economic

growth or business cycles. This indicates that the increase in the business cycle is followed by demand for digital-based financial products.

The transmission mechanism through the use of interest rates is still considered relevant in achieving a single inflation target. However, several things that need to be considered in the regulation of interest rate instruments must also consider imbalances that occur both in the financial system and the real sector, so that there is a need for strong coordination with other macroeconomic policies namely fiscal policy and consideration of risks to the financial system.

3.2. Policy Implications E-Money Utilisation in Indonesia

The importance of the electronic money as a payment tool that is innovative and practical is expected to help smooth the payment of economic activities that are mass, fast and micro, so that its development can help smooth public payment transactions (Central Bank of Indonesia, 2019). The development of e-money is also expected to be used as an alternative non-cash payment instrument that can reach people who have not yet had access to the banking system. The operation of electronic money has been regulated by Central Bank of Indonesia.

On the other side there are several benefits of e-money, but on the other side there are some risks that need to be addressed with caution from users of digital-based financial products, namely as follows (Bank Indonesia, 2019):

1. The risk of electronic money being lost and can be used by other parties, because in principle electronic money is the same as cash which if lost cannot be claimed to the issuer.
2. Risk due to the lack of understanding of users in using electronic money, such as users not realizing that the electronic money used is placed 2 (two) times on the reader for the same transaction so that the value of electronic money decreases is greater than the transaction value.

So intensive community education efforts are very important to do so that not only provide access or inclusion but also must be literate so that people become well literate both in the allocation of use, use techniques to mitigate the risk of failure or abuse.

4. CONCLUSION

Some conclusions from this study are as follows:

1. E-money has a positive impact on the economic growth in the beginning of the period but declined towards a long-term balance.
2. E-money has a significant influence on the increase in inflation and is followed by the interest rate response which also has the same trend in anticipating an increase in inflation.
3. E-money has no significant impact in driving credit growth or credit risk. So that the risk of financial

system instability is still maintained despite the development of an increasingly massive digital system. Suggestions in this study are as follows.

1. The importance of preparing the effectiveness of a framework in the mechanism of monetary policy transmission, especially in synchronizing the arrangement of interest rate instruments so that there is no trade-off among monetary policy and financial stability. The importance of synergy among monetary policy, fiscal policy and macro prudential policy in responding to the dynamics of digital transformation that is increasingly without boundaries in both the dimensions of space and time.
2. The importance of institutional arrangements for the use of electronic-based financial products and the importance of a legal umbrella in mitigating the risk of financial fraud.
3. This research is only limited to the influence or impact of e-money, it is expected to further research with more complex indicators and modeling and calculate the optimal monetary policy response.

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