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Non-Cash Instruments and Money Supply in Indonesia During Pandemic Covid-19

Skolastika Ferlicia[1], Suhel[2], Sri Andaiyani[3*]
[1,2,3]Faculty of Economics, Universitas Sriwijaya, Indonesia
E-mail: [1]01021181823024@student.unsri.ac.id, [2]suhel@fe.unsri.ac.id,
[3]sriandaiyani@fe.unsri.ac.id
[*]**Corresponding author**

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Abstract

The emergence of the Covid-19 pandemic phenomenon at the end of 2019 caused non-cash transactions to increase, but several macro variables decreased. The study investigates the relationship between Non-Cash Transactions (through APMK and E-money proxies), National Income (GDP), Money Supply (M0), and Velocity of Money with the Vector Auto Regression method. The data was used from 2010 to 2021 at three different times, before Covid-19 and during Covid-19. Our result confirms that there was a relationship between money supply and non-cash transactions, the positive response occurred in all periods, and the negative response occurred during the Covid-19 pandemic. National income positively impacts money supply and velocity of money during all periods and Covid-19. It implicates that electronic money should be increased because it accelerates the circulation of money and can increase the flow of goods and services.

Keywords:

e-money; APMK; national income; money supply; velocity of money; covid-19

How to Cite:

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INTRODUCTION

The current flow of technology has caused changes in various sectors in every country in the world, including Indonesia. For the economic sector, the payment system has not escaped technological advances. Changes in people's lifestyles and increased efficiency lead to the availability of facilities supporting acceleration to reduce distance and time barriers. The development of transportation and telecommunications facilities will considerably impact transactions related to payments made by economic actors (Gintting et al. 2018).

The use of cash as a means of payment has slowly been shifted due to payment system technology that gives rise to cashless transactions that are considered safer, faster, easier, and more efficient. Formal institutions as regulators and supervisors of payment systems in Indonesia, namely Bank Indonesia, support the existence of a system that can be applied as a non-cash payment through its delivered instruments, namely Paper Based, Card Based, and Electronic Based (Rahmawati et al., 2020). In this study, the authors will focus on payment using cards (APMK) and e-money transactions as non-cash payment instruments commonly used by society today because a smooth payment system can directly affect the circulation of money (velocity of money) in the economic economy of a country (Berger & Humphrey, 1997).

The year 2020 began with a phenomenon that caused the economy and all its structures to experience shocks. The phenomenon is the Covid-19 outbreak caused by the SARS-CoV-2 virus since the end of 2019. The outbreak has caused 238,521,855 confirmed cases and 4,863,818 deaths worldwide (WHO, 2021). The government, in various ways, seeks to minimize the spread of the virus, including in the field of payment systems. The implementation of Large-Scale Social Restrictions and Implementation of Restrictions on Community Activities) reduced economic activity outside the home. Almost everything is done from home, including transactions. Therefore, many transactions carried out by the community are non-cash, which led to an increase in non-cash transactions that, in this study, were proxied through the value of e-money and APMK transactions (Revate, 2021). The Covid-19 pandemic significantly changed consumers' purchasing decisions and payment processes (Manoharan et al., 2021).

Figure 1 illustrates the growth of non-cash transactions, namely E-money (green line) and APMK (blue line). It can be seen that the e-money trend line in 2010-2019 continues to increase. A drastic increase occurred in 2018 of 200.73 percent from 2017 before the Covid-19 pandemic. This increase in transactions is in line with the program launched by Bank Indonesia known as National Non-Cash Movement (GNNT) in 2014. APMK in 2021 was the highest growth during the study period, which was 37 percent. This is the impact of innovation in the form of facilities, functions, and various facilities offered by the bank.

In the Baumol model adopted by Igamo & Falianty (2018) regarding the demand for money through the modification of cashless payments, financial innovations related to the function of payment instruments, particularly, have an impact on cash. The development of cashless payments encourages individuals to make a wide selection of

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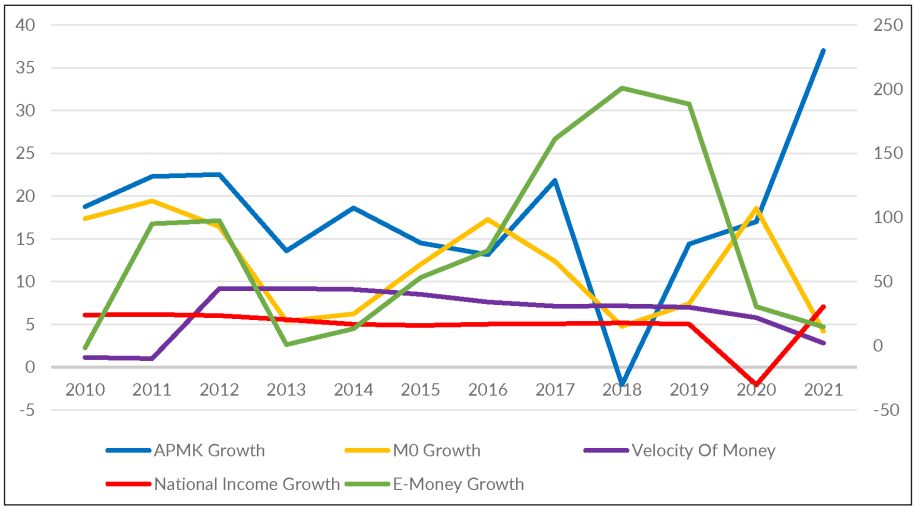
payment instruments to minimize costs. Another thing that caused the growth of APMK is the increasing number of total merchants serving transactions with Electronic Fund Transfer-Point of Sales (EFT-POS), whose mechanism is to transfer cardholder funds online to the relevant merchants (Istanto & Fauzie, 2014).

Figure 1. Trends in E-Money, APMK, Money Supply, National Income, and Velocity of Money in Indonesia



This study focuses on the Covid-19 pandemic that has swept the world since the end of 2019, which has led to more changes in people's behavior in consuming digital needs (Pambudi & Rahadi, 2021). Based on the phenomenon seen in figure 1, it can be seen that the growth of APMK increased drastically from 2019 to 2021. This shows the behavior of people increasingly rampant in using non-cash instruments in transactions. On the growth of E-money, it can be seen that from 2019 to 2021, it continued to experience growth, only not too drastically, which was 188.31 percent, 30.44 percent, and 14.71 percent, respectively. The value of electronic money transactions was recorded not to decrease during the pandemic. Instead, the value increased. This proves that this type of money is increasingly in demand by the public to transact during the pandemic.

The development of technology that causes people to increasingly use cashless causes the increased use of non-cash instruments in Indonesia. As a result of the use of non-cash instruments, payments become faster and smoother, which will affect the velocity of money (Lu & Su, 2017). According to Irving Fisher's theory, when the use of non-cash payments is more widely used, it will make the payment less using cash so that the use of Kartal money (M0) will decrease and the turnover of money will increase. The velocity of money will be related to economic activities. As the velocity of money increases, it can be attributed to the developing economy through its rising national income. From another point of view, the impact of the money supply on the economy has been expressed by Classical and Keynesian economists. Classical economists have the view that money will not affect increasing economic output. It is interesting whether electronic money produces efficiencies affecting consumption growth so that GDP increases (Igamo & Falianty, 2018).

Based on the description above, the relationship between non-cash instruments, money circulation, the velocity of money, and national income can be drawn.

Previous researchers have conducted various studies on electronic transactions, money supply, money turnover, and national income. Research from the country of Indonesia conducted by Lukmanulhakim (2016) resulted in the findings that E-money, Credit Cards, and Debit Cards have a long-term effect on changes in money turnover but do not affect in the short term so that in the short term, the turnover of money in Indonesia tends to remain. The research was supported by Fauzukhaq et al. (2019) that the amount of electronic money spread and the quantity of EDC machines affected the turnover of money in Indonesia significantly.

The results of the study are not in line with the implementation of research by Gintting et al. (2018) and Lintangsari et al. (2018) that e-money, credit, and debit card transactions do not significantly affect the velocity of money in Indonesia but affect the money supply (M1) significantly. Another study by Tee & Ong (2016) showed that the impact of the implementation of non-cash payments in five EU countries on economic development could only be observed significantly in the long term. Therefore, any policy to affect non-cash payments cannot directly affect the economy.

Another study by Igamo & Falianty (2018) found that electronic money positively impacts consumption growth and negatively impacts M1 growth in the long run. While according to Djaballah (2020), mobile money positively and significantly affects the money supply, both in little money and broad money. Pambudi & Rahadi (2021) found that E-money can be affected by money supply, EDC, other non-cash payments (debit cards and credit cards), and customer income during Pandemic Covid-19 in line with Revate (2021) that digital payment systems are increasing during the Covid-19 pandemic in India.

In contrast to previous studies, the novelty in this study is the comparison of the overall period and the Covid-19 pandemic period, as well as the relationship between each variable, all of which are considered endogenous variables. Based on the differences in the results of previous research and the methods, places, and times of research, researchers now want to analyze the comparison of the relationship between non-cash transactions through e-money and APMK, which stands for means of payment using cards, the amount of money circulation (M0), the velocity of money and national income in Indonesia before and during the Covid-19 pandemic.

This research is fundamental because it can contribute to the economy, especially during the Covid-19 pandemic as it is now so that non-cash payments are more widely used by the community and can decrease M1 growth to create payment system stability and increase national income. Policymakers can set policies related to non-cash to launch and improve the economy. In addition, this study was conducted by researchers as a filler for previous research gaps due to the lack of research references that discuss the relationship between non-cash instruments, national income, the velocity of money, and money turnover in Indonesia before and during Covid-19, this is done to realize an efficient payment system and finally be able to increase national income in the country of Indonesia.

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METHODS

This study examined the relationship between cashless payment instruments (e-money and APMK), national income (GDP), money supply (M0), and the velocity of money. The data collection technique in this study is secondary data. The discussion in this study includes two analyzes there are time series data in the period 2010-2021 (quarterly) and comparisons before and during Covid-19 taken in data from May 2018 to November 2019 (Before Covid-19) and December 2019 to July 2021 (during Covid-19) in Indonesia. The data source was obtained from the Website of Bank Indonesia and the Badan Pusat Statistik Indonesia.

The relationships between variables are analyzed through the Vector Auto Regression (VAR) analysis technique which aims to see whether there is a reciprocal relationship between economic variables and the long-term response based on data where all variables are considered endogenous variables. In this testing, VAR is tested through stationarity test, Granger Causality test, Cointegration test, Lag optimum Test, Impulse Response Function, and Variance Decomposition Test. The equation model used is as follows:

$$\mathrm{EM}_t = a_1 + a_2 EM_{t-1} + a_3 APMK_{t-1} + a_4 JUB_{t-1} + a_5 VOM_{t-1} + a_6 PDB_{t-1} e_{yt}$$
$$\mathrm{APMK}_t = a_1 + a_2 APMK_{t-1} + a_3 EM_{t-1} + a_4 JUB_{t-1} + a_5 VOM_{t-1} + a_6 PDB_{t-1} e_{yt}$$
$$\mathrm{JUB}_t = a_1 + a_2 JUB_{t-1} + a_3 EM_{t-1} + a_4 APMK_{t-1} + a_5 VOM_{t-1} + a_6 PDB_{t-1} e_{yt}$$
$$\mathrm{VOM}_t = a_1 + a_2 VOM_{t-1} + a_3 EM_{t-1} + a_4 APMK_{t-1} + a_5 JUB_{t-1} + a_6 PDB_{t-1} e_{yt}$$
$$\mathrm{PDB}_t = a_1 + a_2 PDB_{t-1} + a_3 EM_{t-1} + a_4 APMK_{t-1} + a_5 JUB_{t-1} + a_6 VOM_{t-1} e_{yt}$$

Where EM is the transaction value of E-money, APMK is the number of Circulating APMK, JUB is M0 or primary money, VOM is the velocity of money, and PDB is GDP on a constant price basis. The above equation shows the relationship between E-money, APMK, Money Supply, Velocity of Money, and Gross Domestic Product, and each variable affects those variables in the previous period and other variables.

RESULT AND DISCUSSION

Based on the results of causality tests that have been carried out, it can be concluded that overall, E-money has a one-way causality with APMK and VOM, while before the pandemic, E-money had a one-way causality with M0. During the overall period and before the pandemic, APMK has one-way causality with VOM, whereas, during the pandemic, APMK has a one-way causality to E-money and M0. M0 has a one-way causality to E-money, APMK, GDP, and VOM. Before the pandemic, M0 also had a one-way causality with E-money, while during the pandemic, M0 had a one-way causality to GDP. Overall GDP has a one-way causality against APMK, M0, and VOM, while before the pandemic, GDP has a one-way causality only to VOM. Before the pandemic, VOM variables had a one-way causality to the E-money variable, and the same thing also happened in the period during the pandemic. During the pandemic, VOM has a one-way causality to APMK and GDP.

Table 1. Causality Granger Test

Period	Hypothesis	Prob.
All Period	E-money has Granger Cause APMK	0.0205
	M0 has Granger Cause E-money	0.0004
	E-money has Granger Cause VOM	0.0294
	PDB has Granger Cause APMK	0.0183
	M0 has Granger Cause APMK	0.0015
	APMK has Granger Cause VOM	0.0037
	M0 has Granger Cause PDB	0.0055
	PDB has Granger Cause M0	0.0002
	PDB has Granger Cause VOM	0.0099
	M0 has Granger Cause VOM.	0.0191
Before Pandemic Covid-19	M0 has Granger Cause E-Money	0.0224
	E-money has Granger Cause M0	0.0580
	VOM has Granger Cause E-money	0.0533
	APMK has Granger Cause VOM	0.0556
	PDB has Granger Cause VOM	0.0193
During Pandemic Covid-19	APMK has Granger Cause E-Money	0.0370
	VOM has Granger Cause E-Money	0.0041
	APMK has Granger Cause M0	0.0027
	VOM has Granger Cause APMK	0.0493
	M0 has Granger Cause PDB	0.0530
	VOM has Granger Cause PDB	0.0082

Table 1 shows that all variables, namely E-money, APMK, GDP, Money Supply (M0), and money turnover (VOM), have been stationary at the first difference level. This is done because the data has not experienced stationarity at the level. In the first difference, all variables are stationary at critical values α = 5% or prob < 5%, which means that all variables are stationary at the first difference.

Table 2. Stationarity Test

Variable	Prob. 1st difference			
	All Period	Before Covid-19	During Covid-19	Description
E-Money	0.0000	0.0001	0.0018	Stationer
APMK	0.0000	0.0824	0.0085	Stationer
PDB	0.0000	0.0069	0.0123	Stationer
M0	0.0054	0.0003	0.0038	Stationer
VOM	0.0000	0.0002	0.0000	Stationer

Table 2 and Table 3 shows that lag 3 is the most optimal. This is based on the consideration that lags three recommended by the test methods IR, FPE, AIC, and HQ are indicated by the number of asterisks (*) indicating optimal lag among other lags.

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Table 3. Lag Optimum Test All Period

Lag	Testing Methods					
	LogL	LR	FPE	AIC	SC	HQ
1	210.0509	106.2067	1.31e-10	-8.573852	-7.332659*	-8.118906
2	243.9718	50.07368	9.05e-11	-8.998656	-6.723136	-8.164588
3	278.4706	42.71278*	6.62e-11*	-9.450979*	-6.141132	-8.237789*

Based on Table 4 shows that before the Covid-19 pandemic took place, lag 2 was the most optimal. This is based on the consideration that lags two are recommended by the test methods, namely LR, FPE, AIC, and SC, indicated by the number of asterisks (*) indicating optimal lag among other lags.

Table 4. Lag Optimum Test Pandemic Covid-19 Period

Method/Period	Lag 1		Lag 2	
	Before Covid-19	During Covid-19	Before Covid-19	During Covid-19
LogL	209.4112	221.7245	316.1043	284.0872
LR	35.76637	43.16004	66.68314*	38.97667*
FPE	1.52e-16	3.26e-17	2.18e-20*	1.20e-18*
AIC	-22.426	-23.966	-32.63803*	-28.63590*
SC	-20.978	-22.517	-29.98226*	-25.98012*

Based on the results of the Johansen test in the Table 5, it appears that *the Trace Statistic* > *Critical Value* with α = 0.05 (179.5085 > 69.81889) and *Max-Eigen Statistic* > *Critical Value* with α = 0.0.5 (93.56714 > 33.87687). This indicates the existence of a cointegration relationship between variables. The existence of cointegration among variables indicates that the variables in the model have a relationship between balance and similarity of movement.

Table 5. Cointegration Test (Trace Statistic)

Period	Eigenvalue	Trace Stat.	Critical Value	Prob.**
All Period	0.892234	179.5085	69.81889	0.0000
Before Covid-19	0.991693	197.1358	69.81889	0.0000
During Covid-19	0.959945	120.2795	69.81889	0.0000

Based on the results of the Johansen test before the Covid-19 pandemic, it appears that the Trace Statistic > Critical Value with α = 0.05 (197.1358 > 69.81889) and the Max-Eigen Statistic value > Critical Value with α = 0.0.5 (120.2795 > 69.81889). This shows that during the study period, there was a cointegration relationship between variables.

Table 6. Cointegration Test (Max-Eigen Statistic)

Period	Eigenvalue	Max-Eigen Statistic	Critical Value	Prob.**
All Period	0.892234	93.56714	33.87687	0.0000
Before Covid-19	0.991693	81.44200	33.87687	0.0000
During Covid-19	0.959945	54.69757	33.87687	0.0001

Table t is obtained by 1.67866. Based on the estimates in Table 7, an analysis can be carried out on the relationship of GDP with e-money, APMK, M0, and VOM. The estimation results show that variables that have a significant relationship to the value of e-money, namely variables APMK(-1) and VOM(-1), are evidenced by the value of t-calculate > t-table. Variables that have a significant relationship with APMK are the APMK(-1) variables themselves. Variables that have a significant relationship with GDP are pbd(-2) variables themselves. Variables that are significantly related to M0 are variables APMK(-2), GDP(-1), and M0(-1). Based on the results of VAR estimates, no variables were found that were significantly related to VOM. If the change in APMK in the previous quarter increased by 1 percent, it would cause the change in E-money in this quarter to increase by 3.10474 percent, and if the change in money turnover one quarter ago increased by 1 percent, it would cause e-money to increase by 1.85668 percent.

Table 7. Vector Auto Regression

Period	Variable	EM	APMK	PDB	M0	V
All Period	APMK(-1)	-3.10474	-2.75678	Not sig.	Not sig.	Not sig.
	APMK(-2)	Not sig.	Not sig.	Not sig.	2.27340	Not sig.
	PDB(-1)	Not sig.	Not sig.	Not sig.	4.16172	Not sig.
	PDB(-2)	Not sig.	Not sig.	-3.58162	Not sig.	Not sig.
	M0(-1)	Not sig.	Not sig.	Not sig.	-4.06733	Not sig.
	FROM(-1)	1.85668	Not sig.	Not sig.	Not sig.	Not sig.
Before Covid-19	E-Money(-1)	2.58891	Not sig.	4.14799	Not sig.	Not sig.
	E-Money(-2)	Not sig.	Not sig.	3.09798	1.95279	Not sig.
	APMK(-1)	Not sig.	Not sig.	Not sig.	-3.07145	Not sig.
	APMK(-2)	Not sig.	4.52590	4.26771	Not sig.	Not sig.
	PDB(-1)	Not sig.	Not sig.	10.0133	3.97571	Not sig.
	PDB(-2)	Not sig.	Not sig.	Not sig.	-3.35421	Not sig.
	M0(-1)	-2.30116	-0.64048	1.85858	-2.84189	Not sig.
	M0(-2)	Not sig.	Not sig.	3.58847]	-2.95830	Not sig.
	FROM(-1)	Not sig.	Not sig.	2.66155	-1.76090	Not sig.
	FROM(-2)	1.80965	0.08764	1.78650	-3.05395	Not sig.
During Covid-19	APMK(-1)	1.73356	Not sig.	Not sig.	1.85897	Not sig.
	PDB(-1)	Not sig.	Not sig.	3.12127	Not sig.	Not sig.
	FROM(-1)	-2.50914	0.13132	2.07608	0.15897	-3.13544
	FROM(-2)	Not sig.	Not sig.	Not sig.	Not sig.	-1.87886

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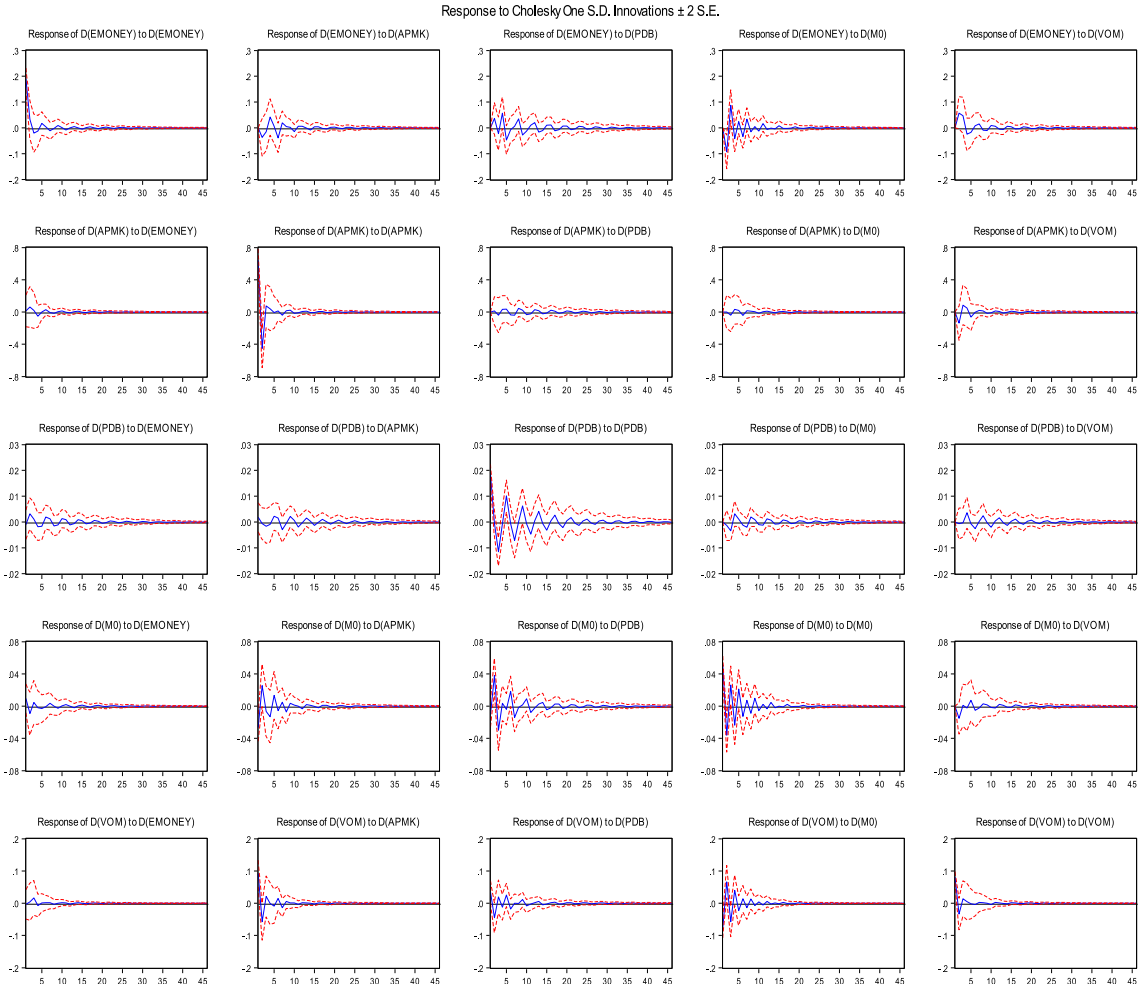
If the previous two-quarter APMK change increases by 1 percent, it will cause the M0 change in this quarter to increase by 2.27340 percent, and if the GDP change one quarter ago increased by 1 percent, it would cause E-money to increase by 4.16172 percent. When the previous month's M0 change increased by 1 percent, it would cause the M0 change in the quarter decreased by 4.06733 percent. In determining dependent variables, it can be seen from the information in the table where there is R-squared whose value is the largest. The most extensive R-squared result is from the variable M0, which is worth 0.708746. It concludes that their independent variables can explain 71 percent of M0 variables. Then 29% of M0 variables can be explained by other variables outside the model.

Figure 2. Impulse Response Function All Period



Reaching the balance. Based on Figure 2, it can be seen that the M0 variable response to E-money continues to fluctuate but more dominantly looks like a positive response, and it takes about four years for M0 to occur. It is also seen that E-money's response to APMK fluctuated over 35 research periods or about eight years for E-money to reach its balance. E-money variables respond positively to VOM variables and achieve

balance in the 25th or 5th period. APMK's response to VOM is also seen in the graph above, continues to fluctuate but shows a positive response, and it takes 20 quarters or five years for APMK to reach the balance.

The GDP response to APMK is highly volatile, and it takes 24 periods of regulation or about six years for GDP to reach its balance, in addition, as well. It has seen a response to fluctuating GDP to M0, which tends to experience a positive response and shake during the 30 study periods. It was also seen that the GDP response to VOM was dominant in responding positively and experiencing shocks during the 25 study periods. The M0 response to APMK continued to be contradictory but predominantly negative and shook during the 20 study periods, while the M0 response to GDP experienced a strong response. The M0 response to VOM fluctuated over 15 periods of the study and tended to show a negative response.

Figure 3. Impulse Response Function Before Covid-19

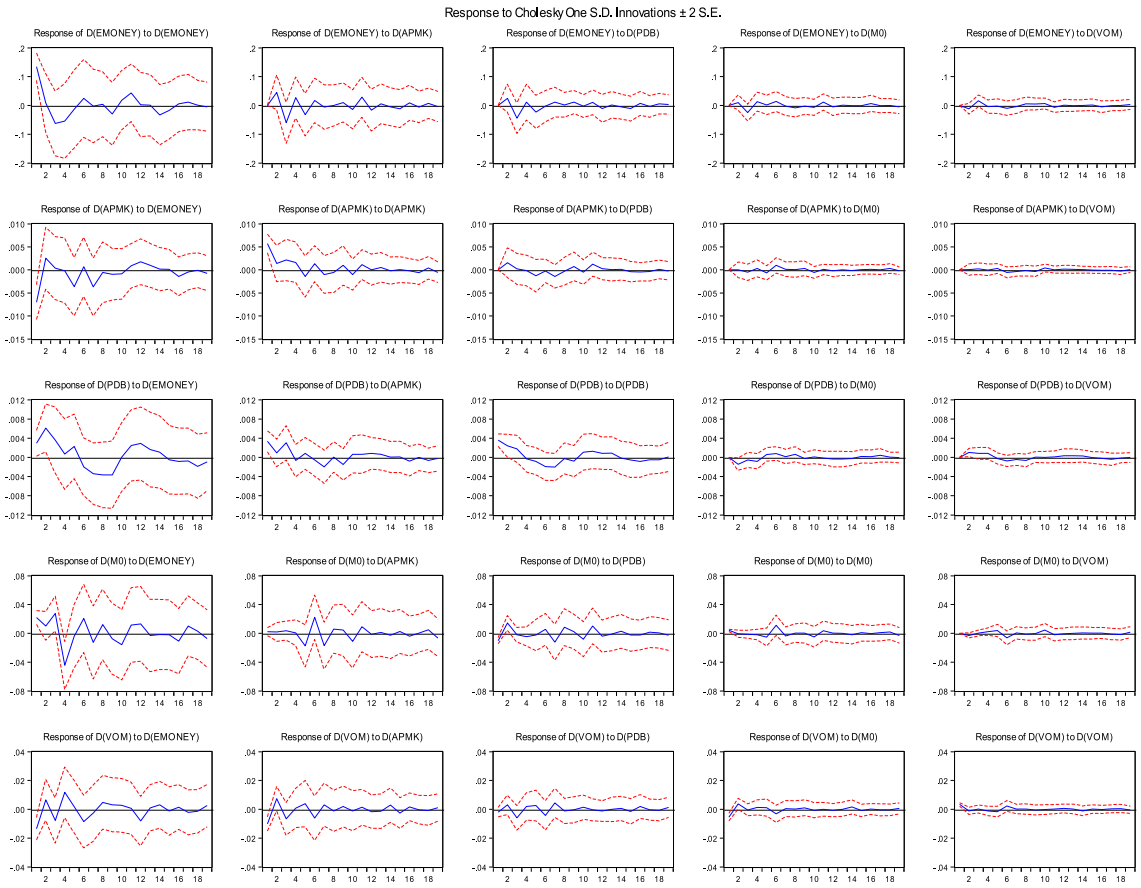


Figure 3 shows that E-money's response to M0 fluctuates but is predominantly negative, and it takes 11 months of research period for E-money to strike a balance. An APMK response to VOM shows a positive response and experiences shocks for ten months to achieve equilibrium. The GDP response to VOM was shaking during the 8-month study period but predominantly showed a positive response. The M0 variable showed a

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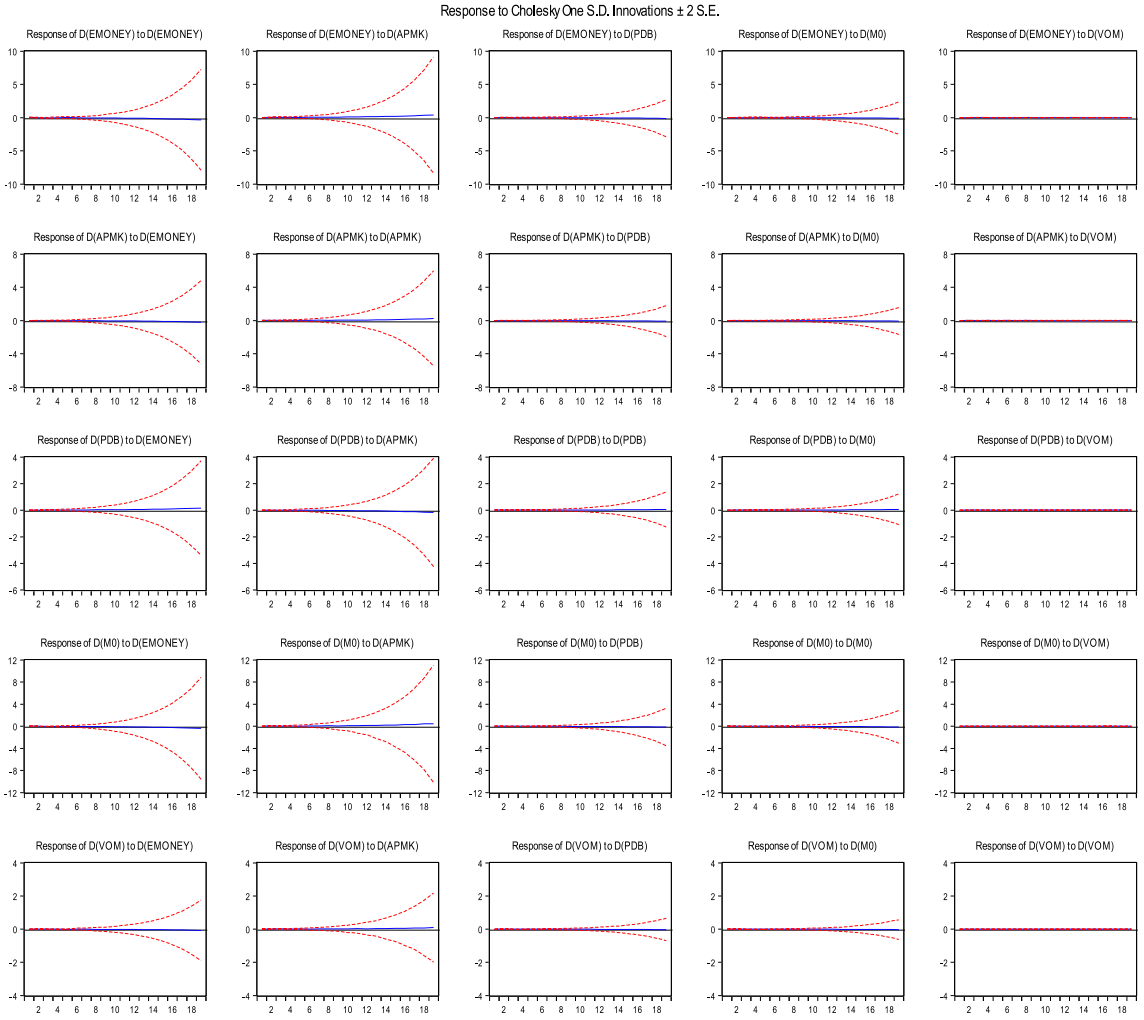
negative response to the E-money variable and was seen to experience shocks during the 19 study periods. A positive response was shown by VOM variables to E-money and experienced shocks during the19 years of the study.

Figure 4. Impulse Response Function During Covid-19



Based on Figure 4, it can be seen that APMK's response to E-money was on balance during the nine months of the study period and began to show a negative response until the end of the period. It was also seen that the APMK response to M0 did not experience shocks and positive response for ten months, then showed a negative response at the end of the period. The M0 response to GDP was seen in balance during the 9-month study period, and then GDP responded negatively. At eight months, the VOM variable research period reached its equilibrium point, then responded positively to e-money. The VOM variable indicates a negative response to APMK after the previous eight months reaching the equilibrium point. The variable response of VOM to GDP was seen during the 9-month study period to strike a balance, then VOM responded to GDP with a positive response.

Based on the error variance value from table 8, it can be concluded that E-money changes are more dominantly influenced by e-money itself than by M0 (money supply), GDP (national income), VOM, and APMK. Changes in APMK variables are more dominantly influenced by APMK itself, VOM, GDP, E-money, APMK, and M0. The percentage contribution to variable GDP is more influenced by GDP, M0, VOM, E-money, and APMK. Changes in the dominant M0 variable are influenced by the M0 variable, GDP, APMK, VOM, and E-money. More dominant VOM variables are formed by the contribution of variables M0, APMK, VOM, GDP, and E-money.

Table 8. Variance Decomposition Test All Period

Dep / Ind	EM	APMK	PDB	M0	VOM
EM	46.95939	6.622143	11.67029	26.13486	8.613317
APMK	1.257869	91.47510	1.533051	0.793424	4.940554
PDB	3.643680	3.567326	84.39400	4.512345	3.882653
M0	2.003982	16.27787	26.56251	52.21964	2.935991
VOM	0.853266	29.98392	11.77348	38.70060	18.68872

Based on the error variance value from table 9, it can be concluded that before the Covid-19 pandemic, E-money changes were more dominantly influenced by GDP, E-money itself, than by APMK, M0, and VOM. Changes in APMK variables are more dominantly influenced by the APMK variables themselves, GDP, E-money, M0, and VOM. The percentage contribution to variable GDP is more influenced by E-money, GDP itself, APMK, M0, and VOM. Changes in the dominant M0 variable are influenced by E-money, GDP, M0 itself, APMK, and VOM. The velocity of money is more dominantly formed by the contribution of variables E-money, GDP, M0, APMK, and VOM.

Table 9 Variance Decomposition Test Before Covid-19

Dep / Ind	EM	APMK	PDB	M0	VOM
EM	29.51039	23.54082	33.38549	12.93369	0.629605
APMK	14.12224	40.88699	31.68606	13.21867	0.086036
PDB	58.79123	9.453228	26.70249	4.336334	0.716721
M0	55.18591	8.050704	19.70715	15.59702	1.459218
VOM	31.95524	10.35759	29.53043	25.54358	2.613166

Based on the error variance value from table 10, it can be concluded that during the Covid-19 pandemic, E-money changes are more dominantly influenced by E-money itself than by M0, GDP, VOM, and APMK. Changes in APMK variables are more dominantly influenced by the variables of APMK itself, VOM, GDP, E-money, and M0. The percentage contribution to variable GDP is more influenced by GDP, M0, VOM, E-money, and APMK. Changes in the dominant M0 variable are influenced by M0 itself,

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GDP, APMK, VOM, and APMK. Vom variables are more dominantly formed by the contribution of variables M0, APMK, VOM, GDP, and E-money.

The findings obtained from the results of the estimate that there is an all period of found one-way causality of the monetary base to E-money with a positive response in line with Fatmawati & Tuliana (2019) and Saraswati & Mukhlis (2018) when a monetary base increase causes E-money increase too, it is because a complementary effect when E-money and monetary base complement each other, while in the period before the Covid-19 pandemic there was a relationship between monetary base and E-money with a negative response. The negative response shown by the monetary base to E-money shows that when the monetary base increases, there is a decrease in E-money because E-money is a substitution of the monetary base following the theory that indicates the substitution of payment instruments caused by transactions using electronic money (Igamo & Falianty, 2018).

Table 10. Variance Decomposition Test During Covid-19

Dep / Ind	EM	APMK	PDB	M0	VOM
EM	46.95939	6.622143	11.67029	26.13486	8.613317
APMK	1.257869	91.47510	1.533051	0.793424	4.940554
PDB	3.643680	3.567326	84.39400	4.512345	3.882653
M0	2.003982	16.27787	26.56251	52.21964	2.935991
VOM	0.853266	29.98392	11.77348	38.70060	18.68872

During the Covid-19 pandemic period, there was a one-way relationship between the velocity of money towards E-money with a positive response in line with Kartika & Nugroho (2015) research that when the velocity of money increases, it will also be followed by an increase in the development of digital finance in a country that accelerates the rate of velocity of money such as with the presence of money electronics. It was also found that APMK's relationship with E-money with negative responses before and during the pandemic was in line with Pranoto & Salsabila (2018) research that e-money is easier and faster to use than AMPK and many promotions that can be obtained by using e-money.

In the all period found one-way causality of the variable E-money to APMK with a negative response following Pambudi & Rahadi (2018) and Tee & Ong (2016) that the use of electronic money in Indonesia can shift the number of credit card users whose users are getting smaller because they are replaced with electronic money whose transaction process is faster, easier and liquid. It was also found that the relationship of GDP to APMK with a positive response supported by the research of Arifin & Oktavilia (2020) that the increase in national income was also accompanied by an increase in public transactions towards electronic payments (APMK) because the amount of public income became a benchmark for the significant level of consumption expenditure through non-cash payments.

It was also found that the monetary base relationship to APMK with a negative response was in line with Saraswati & Mukhlis (2018) and Zahara (2018). In Indonesia, the use of cash is increasing and is still in demand as a tool to transact, but the use of

APMK tends to decrease because, in non-cash transactions, people prefer to use electronic money, as evidenced by the increase in electronic transactions in Indonesia. While during the pandemic, money turnover has a one-way causality with APMK with a negative response, this is to value of APMK transactions grows negatively in the rapid velocity of money.

In all periods found, two-way causality between monetary base and GDP in a positive manner in line with research Alam et al. (2020) and Mishchenko et al. (2018) show that GDP causes the monetary base to increase to balance the demand for money, whereas the increased monetary base encourages an increase in GDP. During the Covid-19 pandemic period, there was a one-way relationship between money turnover to GDP in a positive manner because during the *Covid-19* pandemic, government and household consumption played an active role in boosting economic growth, the ethics of people's purchasing power increases, the turnover of money will increase through transactions carried out by the community.

During the Covid-19 pandemic period, non-cash instruments affect the monetary base. During the pandemic, APMK had a one-way causality towards the monetary base with a positive response in line with Fatmawati & Yuliana (2019) research where the use of non-cash transactions was more carried out for cash withdrawals because there were still many ordinary people and not all shops, MSMEs, markets and mini markets that imposed non-cash payments. In the all period found one-way causality of E-money to the velocity of money positively in line with Lukmanulhakim (2016), Fauzukhaq et al. (2019) research that e-money can increase the velocity of money through the ease and efficiency created from these payment instruments because the time of hand transfer between sellers and buyers (Rahmawati et al., 2020).

In the all period found one-way causality of GDP to the velocity of money positively, similar things happened in the period before the pandemic following Keynes Theory and in line with Sari & Greek (2019 research that when GDP increases mean that people also experience an increase in income that will encourage people to transact so that consumption increases. In all periods found, one-way causality of the variable monetary base to the velocity of money negatively in line with Irving Fisher's theory that if in transacting more cash or checks, then more money is used to make payments generated through the same nominal income so that the acceleration of the velocity of money will fall (Gintting et al., 2018).

CONCLUSION

During the general period and the pandemic period, there was a relationship between money supply and non-cash transactions (APMK and E-money), a positive response occurred in the period in general, and a negative response occurred during the Covid-19 pandemic period. In general and during the pandemic, national income is positively affected by the money supply and velocity of money. In general and during the Covid-19 pandemic period, GDP affects the velocity of money positively, while in the general period, non-cash instruments (E-money and APMK) affect the velocity of money positively.

This research implies that people as money users can choose the type of money

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used based on the place and situation, but now electronic money is starting to be favored because of its ease and convenience in transacting so that it will increase the velocity of money in Indonesia. Electronic money can reduce the money supply M0 and increase goods and services so that all work becomes efficient. Financial institutions and related authorities can support and facilitate electronic payments with regulation, protection, and equitable distribution of electronic money to various regions in Indonesia that can attract people to use it to increase efficiency at various levels of society.

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