Household Consumption and Electronic Money Transactions in Indonesia: VECM Approach

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Article Information

Abstract

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The high contribution of household consumption to GDP reflects the significant level of public consumption in Indonesia. This is evident from the annual increase in transactions through digital payment system, which facilitate easier for people to consume goods and services. Previous studies have offered various perspectives on the impact of electronic money transactions on household consumption, in both the short and long run. Therefore, this study aims to analyze the relationship between electronic money transactions and household consumption in Indonesia. By employing the Vector Error Correction Model (VECM) and examining data from 2009Q1 to 2022Q4, the study aims to provide insights into the dynamics of short-term and long-term relationships among electronic money transactions, household consumption expenditure, real income, and interest rates. Based on the results in the short term, it was found that electronic money and real income are positively related to household consumption expenditure in Indonesia. With the increase in electronic money transactions and people's income levels rising, households tend to spend more money, contributing to increased societal consumption. However, this positive relationship does not persist in the long term, suggesting that electronic money does not significantly impact household spending patterns over extended periods. Real income, on the other hand, continues to have a consistent effect in the long term. Furthermore, interest rates do not significantly influence consumption expenditure in either the short or long term. This implies that changes in interest rates do not notably affect consumer behaviour regarding spending habits in Indonesia.

INTRODUCTION

It cannot be denied that the development of technology is slowly changing human life all over the world. Technology development is currently considered to provide convenience and comfort to its users, especially in human and cultural life (Driskell, 2022; Irtyshcheva et al., 2021; Çalışkan, 2015). Many economists and social scientists believe that technological advancements are one of the primary drivers of economic growth in countries, regions, and cities. The development of better technology, every country will try to apply good technology to advance its economy. One of the goals of a country is to strive for the welfare of its people by creating good economic growth (Kim & Lee, 2009).

Advancements in technology have a impact on the development of transaction payment systems (Al Qardh et al., 2019). Development of payment instruments also takes different forms and continues to change, starting with payment instruments in the form of coins and conventional banknotes, and now has evolved with technology into data that can be placed in a medium called electronic money (Bank Indonesia, 2009). Electronic payments offer quick and convenient consumption processes compared to cash transaction cost, which often incur varuius transaction costs. Furthermore, the use of electronic payments eliminates concerns about the security risks associated with carrying large amounts of cash, as highlighted by Bajaj & Damodaran (2022).

The public very well receives the use of electronic money. By reducing banknotes, transactions will run faster and bigger (Suseco, 2016). The factors of convenience and usefulness influence the decision to use electronic money (Susanto et al., 2022). Based on data from Bank Indonesia (2023), the volume of electronic money transactions in Indonesia is increasing yearly. The increase started in 2018, which amounted to 285,756 million transactions. Then, in 2019, it increased to 587,798 million transactions; in 2020, the peak number of electronic money used was 1,253,622 million transactions and in 2021, it decreased by 549,381 million because of COVID-19. From 2022 to 2023, digital economic and financial transactions will grow rapidly due to increased acceptance and preference for online shopping, the breadth and ease of digital payment systems, and the speed of digital banking. Based on Figure 1 below, it can be concluded that the increase in electronic money transactions over the past 15 years indicates that the public has become accustomed to and adapted to the development of existing payment systems.
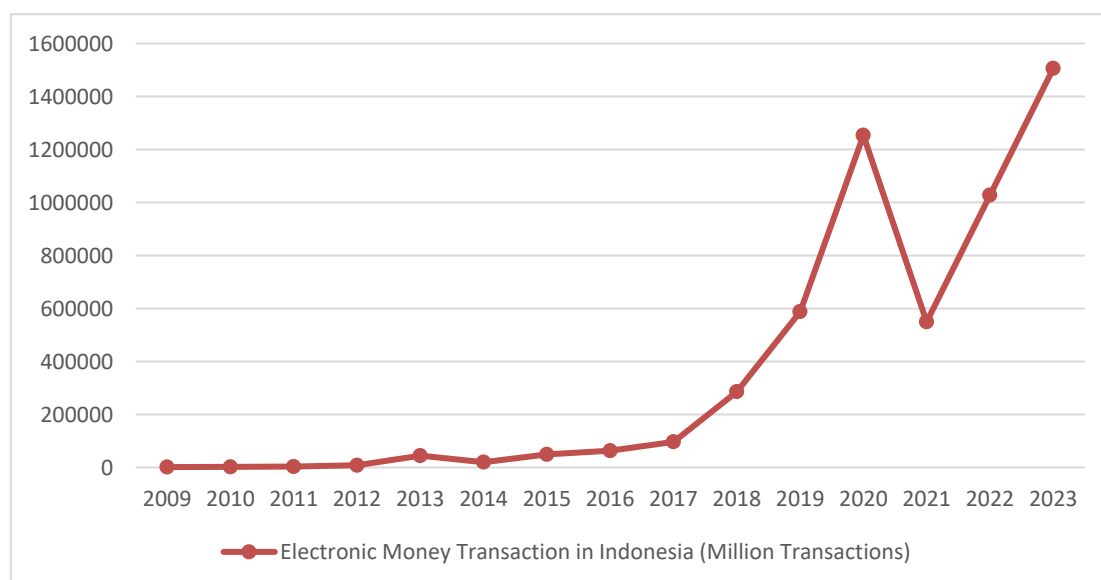

Figure 1. Electronic Money Transactions in Indonesia
Source: Bank Indonesia, 2023 (Processed)

The convenience of digital payments indirectly allows people to make transactions easily. Online shopping facilities' availability helps consumers shop anywhere and anytime, as payments can be made with electronic money. In addition, using electronic money also reduces the risk of losing money (security) and transaction costs for its users (Nasr & Safira, 2020). Thus, the use of electronic money makes community consumption transactions more efficient. The convenience of digital payments also affects the consumption behaviour of the community (Manurung et al., 2019).

The use of electronic money indirectly impacts a country's economic growth not only in the short term but also in the long term. Payments with electronic money systems facilitate economic transactions (Pang & Gai, 2022; Tee & Ong, 2016; Tran & Wang, 2023). As electronic money becomes a primary medium for consumption, increased consumer spending indirectly contributes to overall economic growth. While consumption will impact economic fluctuations, it also affects a country's interest rates in the long term (Puspitasari et al., 2021).

Some previous studies have provided insights into this issue from different perspectives. Referring to research conducted by (Yusuf et al., 2022), the increase in electronic money transactions increases in the Indonesian economy. It indicates an increase in public consumption in the short term, and no relationship exists in the long term. This result is different from the results of research by Tshukudu (2018). He investigated the link between Botswana's household consumption and the adoption of electronic money. He found that the use of electronic money has no impact on household consumption in the short term. It does have long-term impact. Household consumption influences the uptake of electronic money in the short term and vice versa. Over time, household consumption has no bearing on the spread of electronic money. There are differences in the results obtained from existing studies. Therefore, researchers are interested in further analyzing Indonesia's dynamic relationship between household expenditure and electronic money transactions.

Table 1. Distribution of GDP by Expenditure at Constant Prices (Percentage of Age) in Indonesia (2017-2022)

Components of GDP Expenditure	2017	2018	2019	2020	2021	2022
Household Consumption Expenditure	54,27	54,21	54,22	53,90	53,03	52,84
LNPRT Consumption Expenditure	1,37	1,18	1,24	1,22	1,19	1,19
Government Consumption Expenditure	7,98	7,95	7,82	7,98	8,19	7,43
Gross Domestic Fixed Capital Formation	32,57	33,04	32,86	31,89	31,92	31,48
Inventory Change	1,28	1,89	1,19	0,48	0,56	0,60
Exports of Goods and Services	21,65	21,93	20,78	19,43	22,10	24,41
Less Imports of Goods and Services	19,82	21,13	18,69	15,72	18,93	20,63
Statistic Dispensation	0,93	0,94	0,58	0,65	1,93	2,68
GDP	100	100	100	100	100	100

Source: BPS, 2023 (Processed)

Based on Table 1, we can see that the largest component is household consumption expenditure. In 2017, the amount of household consumption was 5,379,628.6 billion IDR. Then, in 2018, it was 5,651,456.3 billion IDR, and in 2019, it was 5,936,399.47 billion IDR and fell in 2020 by 5,780,223.44 billion IDR, and in 2021, it rose again to 5,896,706.85 billion IDR until in 2022 it was 11,710,397.80 billion IDR. Despite the up-and-down trend in household consumption, household consumption contributes the most to Indonesia's GDP (Badan Pusat Statistik, 2023).

With the significant contribution of household consumption to GDP in Indonesia, it is evident that public consumption plays a substantial role in the ecoonomy. The increasing number of digital payment system transactions undoubtedly facilitates consumption for people. Electronic money's convenience, security, and low-risk costs affect household consumption.

Apart from looking at the influence of electronic Money on household consumption, we can also see the impact of consumption on the demand for electronic Money. Increasing public consumption increases the demand for existing electronic Money (Maengkom et al., 2022). The amount of consumption expenditure incurred by the community is determined by how much income the community has, so every increase in income will increase household consumption, and the demand for electronic Money will increase. If we look at the research, there is a reciprocal relationship between electronic Money and household consumption expenditure.

Previous research found differences in the relationship between electronic Money and household consumption expenditure in the short and long term. The relationship between electronic money transactions and household consumption expenditure in Indonesia will be further analyzed using a different analysis method and updating the data period, namely 2009 - 2022.

The link between household consumption and electronic money transactions has been widely studied. Two theories predict how electronic money transactions will increase household consumption expenditure. They are Cambridge Theory (Marshall- Pigou) and Consumption Theory with the Life Cycle Hypothesis.

Cambridge Theory (Marshall-Pigou) explains that money functions as a medium of exchange. This approach explains that people's demand for money arises from their need for a highly liquid means of payment to conduct transactions. This theory posits that there are several indicators related to the incentives that economic actors obtain when holding money, as well as their decision-making behaviour, which is influenced by the analysis of the cost-benefit of each individual in determining the demand for money within their budget for transaction. Therefore, the demand for money is being influenced not only by the number of transactions and institutional factors but also by the interest rate, the wealth of the community, and the community's expectations for the future.

The money demand equation becomes:

$$Md = k \times P \times y \quad .... \quad (1)$$

Where, Md is Money demand, k is constant, p is Price level, and y is real income.

The equation above explains that the demand for money is proportional to nominal income. The value of k can change according to the behaviour of individuals who use their money as a medium to store their wealth.

Consumption Theory with the Life Cycle Hypothesis explains that a person's socioeconomic factors greatly affect the person's consumption pattern. This theory divides people into three parts: (1) a person is zero years old until a certain age where they can generate their income and experience dissaving (consuming but not generating income). (2) A person is of working age (can generate his income) until he is exactly at the age when he cannot work so he will experience saving. (3) A person in old age who cannot generate income. In this condition, the person will be dissaving again.

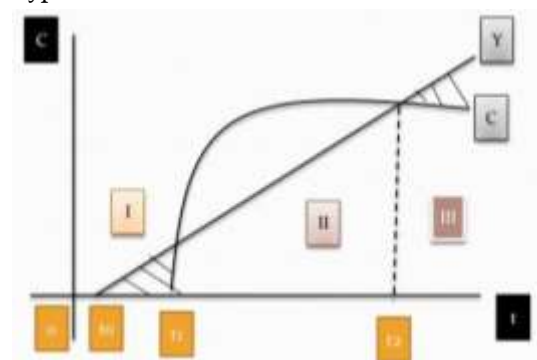The consumption theory with the life cycle hypothesis can be seen in the curve below

Figure 2. Consumption Theory Curve with Life Cycle Hypothesis
Source: Authors Ilustration, 2023

The curve above explains the stages of a person's consumption expenditure depending on age. As a person gets older, the level of consumption will increase, but the ability to earn income will decrease. Stage I explains that at ages 0 to t0, a person will make consumption expenditures in a dissaving condition. People can fulfil their needs at this age but still depend on others.

In stage II, where the age is t1 to t2, a person shows full consumption and the ability to earn income. Then, when a person is already old, he cannot work and generate income. In this condition, people will return to the dissaving condition. The form of consumption equation in this theory is:

$$C = AW \quad\text{...(2)}$$

Or specifically:

$$C = A\,AT + Y^L + A\,(T-1)Y^{LE} \quad\text{.............(3)}$$

Where, C is consumption expenditure, a is MPC, which depends on the age factor, W is the present value of income from wealth, income from labour services, and income from wages expected to be received over a lifetime. Wages expected to be received over a lifetime, A isWealth, YL is Income from labour, YLE is Expected lifetime earnings starting today and T is Remaining life of a person calculated from today.

This research refers to the results of Zhou (2022), which found that digital payments are essential in promoting household consumption expenditure and sustainable economic development. It was found that the increase in digital payments stimulates consumer demand to support sustainable economic development. This result is reinforced by Tshukudu (2018), who claims that the causal impact of household consumption and electronic money penetration is only in the short term. The results also confirm that household consumption will be predicted in the long run when electronic payment technology is developed. In the long term, electronic money can affect people's expenditure on consumption.

Unlike the finding of Yusuf et al. (2022), using electronic money in the short term is positively related to the development of the Indonesian economy. Meanwhile, the volume of electronic money transactions has no relationship with the development of the Indonesian economy in the long term. This research is supported by Ramadani (2016) if the use of electronic money with student consumption expenditure is positively and significantly related. This is due to the convenience of e-money, making it easier for students to make transactions.

Research conducted by Hou & Shen (2021) shows that digital payments increase consumer satisfaction in transactions, facilitate deliberate mental account adjustments, and result in more unplanned consumption. The stimulating effect is more significant in the long term, with a low level of self-control, and integrated financial services provide access to liquidity and help with smooth consumption. Li et al. (2022) found that digital financial inclusion affects household consumption. An increase in digital financial inclusion in nearby provinces can reduce household consumption in nearby provinces. It is found that the effect of digital financial inclusion on household consumption is greater for rural households than for urban households.

In addition, Maengkom et al. (2022) found that interest rates are significantly negatively related to the demand for electronic money and public consumption is positively related to the demand for electronic money. Ramadani (2016) states that private savings positively affect non-cash transactions in the long and short term.

Pang & Gai (2022) said the effect of digital payments is better in developed countries than in developing countries. Electronic money is a medium for people to consume. When consumption increases, it will increase the economy of a country. Sreenu (2020) has had positive results in using non-cash policies to promote economic growth in India in long-term conditions. In the short term, the use of non-cash hurts economic growth. So, the cashless payment system cannot have a positive impact on economic growth directly.

With the increasing prevalence of electronic money transactions globally, including in Indonesia, it is imperative to comprehensively analyze how this digital payment method impacts consumer spending behaviour. The Vector Error Correction Model (VECM) can accommodate short-term and long-term analyses from 2009Q1 to 2022Q4. The urgency of this study aims to provide insight into the dynamics between e-money transactions, household consumption expenditure, real GDP, and interest rates in the short and long run.

Overall, the urgency of this study is to provide valuable insights for policymakers, businesses, and individuals on the implications of e-money adoption on household consumption dynamics in Indonesia to aid decision-making and formulation of appropriate policies.

RESEARCH METHODS

To achieve the relationship between Household Consumption and Electronic Money Transactions, the analysis technique in this study uses a quantitative approach using the Vector Error Correction Model (VECM). The VECM method is an advanced analysis of VAR (Vector Auto Regression). VECM analysis is intended to see short-term and long-term relationships in variables. This method also shows the two-way relationship between existing variables.

VECM is a vector auto-regression model aimed at non-stationary data which cointegration exists. The presence of cointegration in it makes the VECM model a restricted VAR. This method can be used when the data obtained is stationary in the first difference, and all variables must be stationary at the same level, i.e. differentiated in the first derivative.

The steps that will be taken to test the model in the study are: (1) Pass the data stationarity test using the Augmented Dickey-Fuller Test (ADF), (2) Determination of the optimal lag length which aims to avoid any autocorrelation that occurs, (3) We conducted a stability test with the aim that the estimation carried out would be stable and later obtained a valid IRF (Impulse Response Function) value, (4) passed the cointegration test using Johansen

cointegration. Suppose there is cointegration in the variables used. In that case, the model certainly shows a long-term relationship between variables, (5) Granger causality testing to see whether variable x causes y or y causes x, or both affect each other, and whether there is no relationship between the two. If all tests are met, the VECM model estimation analysis can be carried out. (6) Next, the analysis is carried out to determine the response of an endogenous variable to shocks from other variables. IRF is intended to see the current effect of the dependent variable when the effect or change in the independent variable is obtained by one standard deviation. (7) Finally, a variance decomposition test is carried out to see the total variance as a function of the variance in other variables so that part of the variance and certain variables can be obtained from the total variance. Variance decomposition shows the %age of influence each variable has on other variables at different times.

The VECM model has a particular Error Correction Term (ECT) form. In this study, to see the relationship between the development of electronic Money, income, interest rates, and consumption expenditure in the short and long term, the four-variate Granger Causality model based on the Vector Error Correction Model (VECM) is explained as follows.

$$\Delta LPK_t = \alpha_0 + \sum_{i=1}^{m} a_{1i}\Delta LPK_{t-i} + \sum_{i=1}^{m} a_{2i}\Delta LNUE_{ti} + \sum_{i=1}^{m} a_{3i}\Delta PDB_{ti} + \sum_{i=1}^{m} a_{4i}\Delta r_{t-i} + a_5 ECT_{t-1} + \mu_t \dots\dots\dots\dots (4)$$

$$\Delta LNUE_t = \gamma_0 + \sum_{i=1}^{m} \gamma_{1i}\Delta LPK_{t-i} + \sum_{i=1}^{m} \gamma_{2i}\Delta LNUE_{t-I} + \sum_{i=1}^{m} \gamma_{3i}\Delta PDB_{t-i} + \sum_{i=1}^{m} \gamma_{4i}\Delta r_{t-i} + \gamma_5 ECT_{t-1} + \varepsilon_t \dots\dots\dots\dots (5)$$

$$\Delta PDB_t = \delta_0 + \sum_{i=1}^{m} \delta_{1i}\Delta LPK_{t-I} + \sum_{i=1}^{m} \delta_{2i}\Delta LNUE_{t-i} + \sum_{i=1}^{m} \delta_{3i}\Delta PDB_{t-i} + \sum_{i=1}^{m} \delta_{4i}\Delta r_{t-i} + \delta_5 ECT_{t-1} + \sigma_t \dots\dots\dots\dots (6)$$

$$\Delta r_t = \beta_0 + \sum_{i=1}^{m} \beta_{1i}\Delta LPK_{t-I} + \sum_{i=1}^{m} \beta_{2i}\Delta LNUE_{t-i} + \sum_{i=1}^{m} \beta_{3i}\Delta PDB_{t-i} + \sum_{i=1}^{m} \beta_{4i}\Delta r_{t-i} + \beta_5 ECT_{t-1} + \eta_t \dots\dots\dots\dots (7)$$

Where LPK is the Logarithm of Consumption Expenditure, LNUE is the Logarithm of Electronic Money, Transaction Volume, PDB is Gross Domestic Income, r is Interest Rate, ECTt-

1 is Error Correction Term Lagged One, Period, Δ is Vector of First Derivatives of Variables, μ, ε, σ, η is Mutually Uncorrelated White Noise Residuals.

Table 2. Definitions Variables

Variable	Definition
Household Consumption Expenditure	Household consumption expenditure is expenditure that households use for consumption.
Electronic Money Transactions	A means of payment that is in electronic form and whose value is placed in a specific form, either in the form of a server or a chip.
Income	The total added value of goods and services produced by various production units in a country within a year.
Interest rate	The ratio of the return of some investments to the return for investors.

Source: Data Processed, 2023

RESULTS AND DISCUSSION

The first stage in conducting the test in this study is to see the stationarity of each variable. In testing stationarity, the ADF (Augmented Dickey-Fuller) test method is used, which will see the stationarity of each variable at the level and first difference level. The ADF test checks for time series in which descriptive statistics such as mean, variance, and covariance do not vary significantly over time (Dickey & Fuller, 1981). An existing variable is stationary when the probability value is smaller than the significance level. To meet the VECM standard, all variables must be stationary at the first difference level.

Table 3. Unit Root Test for Level and 1st Difference using Augmented Dickey-Fuller Test

Variables	Unit Root Test in Level	Unit Root Test in 1st Difference
LNUE	-0.7567	0.0000***
PDB	-0.0051	0.0000***
R	-0.2513	0.0036**
LPK	-0.0012	0.0000***

Note : Level of Significance : 1%***, 5%**, 10%*
Source: Data Processed, 2023

Based on the results in Table 3, it can be seen that all variables are stationary in the 1st difference level. The probability value of all variables is below the value of α<0.05. It can be concluded that none of the variables studied are indicated to have unit root problems. This condition means that there is no spurious regression. The research can be carried out to the next stage.

Table 4. Optimal Lag Length Test Results

Lag	LogL	LR	FPE	AIC	SC	HQ
1	-598.1160	NA	213108.0	23.6198	24.22023	23.85002
2	-520.8319	130.7884*	20355.50*	21.26276*	22.46353*	21.72311*
3	-511.7872	13.91487	27245.12	21.53028	23.33143	22.22080

Source: Data Processed, 2023

Based on the results in Table 4, in determining the optimal lag, it can be seen from the smallest lag value in the LR (Likelihood Ratio), FPE (Final Prediction Error), AIC (Akaike Information Center), SIC (Schwarz Information Criterion), and HQ (Hannon-Quin

Criterion) tests. In this study, the most appropriate optimal lag is at lag 2.

Table 5. AR Roots Table

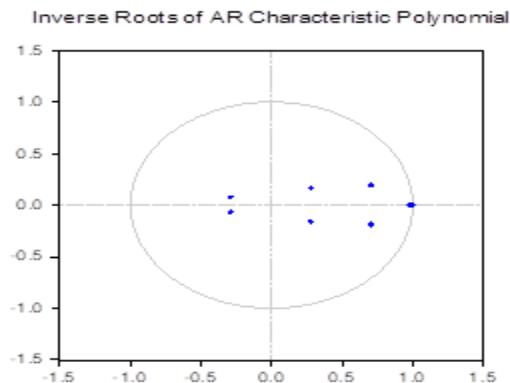| Root	Modulus
0.997926	0.997926
0.976853	0.976853
0.707528 - 0.188946i	0.732323
0.707528 + 0.188946i	0.732323
0.280478 - 0.161746i	0.323774
0.280478 + 0.161746i	0.323774
-0.288593 - 0.072073i	0.297456
-0.288593 + 0.072073i	0.297456

Source: Data Processed, 2023

Figure 2. AR Roots Graph
Source: Data Processed, 2023

The next step is to conduct a stability test. The stability of the data is checked through the AR root table and AR root graph tests. Table 5 shows that in the AR Roots test, the modulus value is smaller than 1. Figure 2 shows the AR roots graph test, where all points (dots) are in the circle so that the model under study is declared stable with the optimal lag that has been determined.

Table 6. Cointegration Test (Trace)

Hypothesized No. of CE(s)	Trace Statistic			Max-Eigen		
	Statistic	Critical Value	Prob.**	Statistic	Critical Value	Prob.**
None *	206.9609	47.85613	0.0000	177.5486	27.58434	0.0001
At most 1	29.41229	29.79707	0.0553	22.13470	21.13162	0.0360
At most 2	7.277582	15.49471	0.5456	6.357683	14.26460	0.5678
At most 3	0.919899	3.841466	0.3375	0.919899	3.841466	0.3375

Source: Data Processed, 2023

Furthermore, the cointegration test is conducted to analyze the long-term relationship, specifically to see the similarity of movement and stability of the relationship in the variables studied. To indicate the number of cointegrating ranks, two likelihood ratio (LR) test statistics, namely the trace and the maximum Eigenvalue tests (Johansen, 1988). Table 6 shows the results of the Johansen cointegration test, where the trace probability value is smaller than 0.05. One cointegration is indicated in the variables studied. The probability value at the maximum

eigenvalue is 0.0001, and the AT most 1 value is 0.0360, smaller than the significance level (5%). It can be concluded that there are two cointegration equations. This indicates that changes in consumption expenditure, electronic Money, income, and interest rates have a long-term relationship, and these variables meet the VECM (Vector Error Correction Model).

Table 7. Causality Granger Test

Null Hypothesis:	Obs	F-Statistic	Prob.**
LNUE does not Granger Cause LPK	53	4.80668	0.0125**
LPK does not Granger Cause LNUE		0.39126	0.6783
PDB does not Granger Cause LPK	53	3.85982	0.0279**
LPK does not Granger Cause PDB		229.042	3.E-25**
R does not Granger Cause LPK	53	2.13745	0.1290
LPK does not Granger Cause R		0.89268	0.89268
PDB does not Granger Cause LNUE	54	1.03201	0.3639
LNUE does not Granger Cause PDB		3.29774	0.0453**
R does not Granger Cause LNUE	54	1.29004	0.2844
LNUE does not Granger Cause R		1.81071	0.1743
R does not Granger Cause PDB	54	2.54599	0.0887*
PDB does not Granger Cause R		1.13949	0.3283

Source: Data Processed, 2023

The Granger causality test is used to see whether or not there is a reciprocal relationship between variables. Table 7 illustrates the results of the causality test in this study. The probability value must be less than 0.05 for the null hypothesis to be rejected and indicate that a variable affects another variable. The Granger causality test shows that the LNUE has a causal relationship with the LPK with a probability value 0.0125.

The PDB has a causal relationship with the LPK variable, with a probability of 0.0279. The LPK has a causal relationship with the LNUE with a 3x 10-25 probability, smaller than the 5% significance level. The LNUE also has a causal relationship with PDB with a probability value 0.0453. Based on the results of this test, it is concluded that the LPK is causally related to the LNUE in one direction, the PDB and LPK are mutually causally related (two-way), and the LNUE is causally related to the PDB in one direction.

Table 8. Estimation Results of The VECM Model in The Short Run and The Long Run

Variables	Coefficient	T-Statistic	Description
Short Run Result			
D(LPK(-1))	-0.244704	[-10.1677]	Significant
D(LPK(-2))	-0.195384	[-4.03974]	Significant
D(LNUE(-1))	0.014240	[3.72379]	Significant
D(LNUE(-2))	0.008910	[2.40271]	Significant
D(PDB(-1))	8.28E-08	[4.36119]	Significant
D(PDB(-2))	-5.92E-09	[-0.80872]	Not Significant
D(R(-1))	-0.000890	[0.30088]	Not Significant
D(R(-2))	0.001583	[0.53077]	Not Significant
Long Run Result			
D(LPK(-1))	1.000000		
D(LNUE(-1))	0.025734	[1.54726]	Not Significant
D(PDB(-1))	1.35E-07	[7.19286]	Significant
D(R(-1))	-0.007005	[-1.40926]	Not Significant

Source: Data Processed, 2023

Table 8 explains the Vector Error Correction Model (VECM) estimation results in the short and long term. If the series are cointegrated, the VECM analysis is appropriate for determining long- and short-run relationships (Engle, Robert F. and Granger, 2012). First, in the short term, the results show that LNUE in lag 1 significantly affects LPK at 1%, 5%, and 10% error rates with a coefficient of 0.01424. In lag 2, it can be seen that LNUE has a significant effect at the 5% and 10% error rates with a coefficient of 0.008910. It can be concluded that a 1% increase in electronic Money will increase consumption expenditure by 0.01424% at lag 1 and by 0.00891% at lag 2. This implies that the impact of electronic money on consumption expenditure persists into the subsequent period, although slightly diminished compared to the immediate lag.

This result is supported by research conducted by Yusuf et al. (2022), which states that the increase in the use of electronic Money indicates an increase in the volume of electronic money transactions, leading to an increase in public consumption. In addition, Saraswati et al. (2020) research states that financial technology development affects consumption expenditure in Indonesia. With complete information about the benefits of fintech, people will be more willing and comfortable to use it as a means of payment. Electronic payments can encourage an individual's decision to buy, which impacts increasing household consumption in Nigeria Oyelami et al. (2020).

The increase in electronic money transactions over the past ten years indicates that people are getting used to and adapting to the development of existing payment systems. It will also increase economic growth. Electronic Money can help people be more productive with its convenience and security. In increasing the use of electronic Money in Indonesia, there is a need for adequate information and accessibility in all corners of the existing regions. People in urban areas enjoy digital payment systems, and in all remote areas in Indonesia, they can access payments using electronic money. government must improve infrastructure and technology in all regions so the entire community can access information and digital payments. If these conditions are met, all Indonesian people can feel the digital payment system, especially using electronic Money, which provides convenience in the community's economic activities, especially for consumption.

PDB significantly affects LPK at lag 1 at an error rate of 1%, 5%, or 10%, with a coefficient of 8.28 x 10-8 at lag 1. In lag 2 PDB does not significantly affect LPK. So when there is a 1% increase in PDB at lag 1, it will not increase consumption expenditure by 8.28 x 10-8. The interest rate does not significantly affect LPK. This implies that the statistical significance of the effect of PDB on consumption expenditure at lag 1 shows its actual impact is very small, especially in the short term. Furthermore, interest rates do not play a significant role in influencing consumption expenditure in Indonesia.

Second, electronic Money does not significantly affect consumption expenditure in the long term. This implies that changes in electronic money transactions over extended periods do not lead to notable changes in consumption behaviour among households in Indonesia. PDB significantly affects household consumption expenditure at 1%, 5%, and 10% error rates with a coefficient of 1.35 x10-7, and it can be explained that an increase of 1 unit of PDB will reduce LPK by 1.35 x10-7. This means that while PDB has a statistically significant effect on consumption expenditure, the impact is minimal.

The reduction in consumption expenditure per unit increase in PDB is almost negligible. Interest rates do not significantly affect LPK. Overall, long-term dynamics between key economic variables and household consumption expenditure highlight the relatively minor role of electronic money and interest rates compared to the more substantial influence of income (as represented by PDB) on consumption behavior.
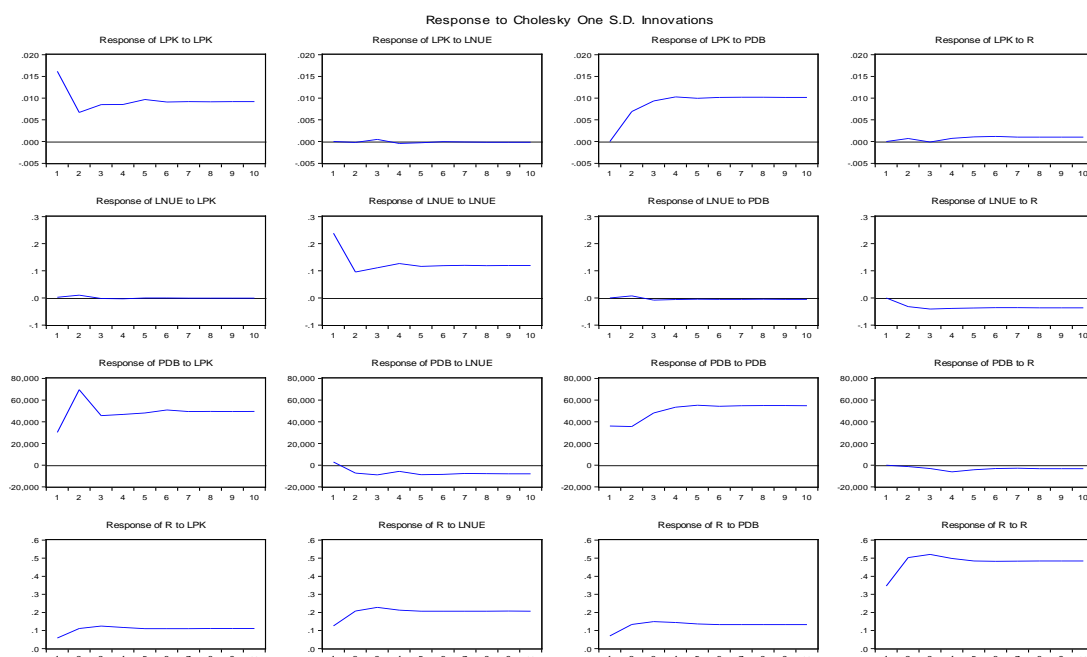
Figure 3. Impulse Response Function Test Result
Source: Data Processed, 2023

Figure 3 shows the results of the Impulse Response Function (IRF) test, where IRF aims to see the shock response to a variable both in the short and long term. Suppose the line looks like a movement that leads to an equilibrium point. In that case, the response of a variable due to a shock will disappear over time so that the shock does not permanently affect the variable under study. Since there are four variables tested, the test results above are the response of each variable due to shocks to other variables.

The response of consumption expenditure to electronic money shocks tends to affect household consumption expenditure negatively. At the beginning of the period, when there is a shock from LNUE, it tends to be responded to by LPK, as seen from the immediate decline in the second period. Then there was an increase in the third period, and in the fourth period, it was again responded to with a decreasing value.

Then, in the fifth period, there was an increase. In the sixth period, it decreased again until the seventh period. In the eighth period, the response of the LPK to the LNUE shock tends to be stable until the end of the period. It can be seen that the response of consumption expenditure begins to disappear, or the LNUE variable shocks are increasingly not felt. It is concluded that the LPK responded to shocks experienced by electronic money at the beginning of the period. However, in the long run, the response began to disappear and was no longer felt by the LPK.

The response of LPK to income shocks over ten periods is a positive trend. In the second and third periods, PDB shocks are responded to positively by the LPK, with a decrease in that period. Then, in the fourth period, a shock to PDB increases LPK. From the fifth period until the end of the PDB, shocks tend to be stable, as seen from the few changes that occurred during that period. It can be concluded that when there is a shock to income at the beginning of the period, consumption expenditure responds very well, with the line tending to increase. However, from the middle to the end of the period, the line tends to be stable, so it can be interpreted that shocks from PDB tend not to be responded to by household consumption expenditure in the long run.

The response of the LPK, when there is a shock to R (the interest rate), is above the horizontal line, and the response tends to be positive. It can be seen that since the second period, the shock to R has responded positively,

with the LPK line tending to increase. Then, in the third period, it responded negatively with a decrease in the line, and the value tended to increase in the fourth period. In the seventh period, the shock to R decreases the value of LPK, and in the eighth period, until the end, it has begun not to respond, so the response in that period tends to be stable. It can be concluded that shocks from R at the beginning of the period are responded to by consumption expenditure.

However, in the long run, the shocks are responded to slowly so that shocks from R can be interpreted as not being felt by household consumption expenditure. R is intended to achieve the target or objective of monetary policy. Therefore, R does not directly affect consumption expenditure and requires a long path to affect consumption by the theory.

Table 9. Results of Variance Decomposition of Indonesia's Consumption Expenditure

Period	S.E.	D(LPK)	D(LNUE)	D(R)	D(PDB)
1	0.008158	100.0000	0.000000	0.000000	0.000000
2	0.008510	91.92687	1.655460	4.016915	2.400759
3	0.011053	55.44850	1.412504	6.160465	36.97853
4	0.012623	42.79955	2.718566	7.525553	46.95633
5	0.013978	35.16915	2.271360	9.723909	52.83558
6	0.015201	29.87272	2.630793	10.76631	56.73018
7	0.016381	25.98287	2.664323	11.14171	60.21110
8	0.017524	22.92978	2.573055	11.78438	62.71279
9	0.018564	20.58960	2.664150	12.20309	64.54316
10	0.019551	18.73363	2.627296	12.51066	66.12841

Source: Data Processed, 2023

Table 9 shows the results of the Variance Decomposition (VD) test, which explains how large a proportion of the movement or change in consumption expenditure (as an endogenous variable) will be due to a shock in the next ten years. The contribution of electronic money is one of the variables that contribute to changes in consumption expenditure, seen in the second period as an increase of 1.65%, the third period as 1.41%, and the third period as 2.71%. However, in the fifth period, the contribution decreased by only 2.271%, and from the sixth to the tenth period, it continued to increase by 2.6%, although in the eighth period, it decreased. However, its contribution was still around 2.5%. Moreover, it is concluded that in 10 periods, the contribution of electronic Money tends to increase household consumption expenditure.

The contribution of PDB plays a major role in household consumption expenditure. In the second period, it increased by 2.4% ; in period 3, it increased by 36.97%. The fifth to sixth periods increased by 52.83% and 56.73%, and until the tenth period, the contribution value

tended to increase to 66.12%. Variable R also contributes to changes in consumption expenditure. This can be seen in the second period, there was an increase of 4.69%. In the third period, it increased again by 9.56% and continued to increase its contribution until the ninth and tenth periods, whereas in the ninth period, the increase was 19.01%. In the tenth period, it was 19.51%.

This study's results align with research conducted by J. Li et al. (2023), who used Chinese Household Financial Survey Data from 2011 to 2017. The results showed that electronic payments encourage urban, highly educated, and young households to consume significantly more goods. A study by Hou et al. (2021) found that households using digital payments spend 20.63% more than households using alternative payment methods. The convenience of digital payments makes consumer transactions more feasible, leading to increased impulsive spending. The stimulative effect is stronger in households with poor self-control and during prolonged consumption.

Moreover, integrated financial services facilitate seamless consumption and give access to liquidity. Li et al. (2022), digital payments have significantly boosted rural household consumption, especially in areas with lower access to traditional finance. Hasan et al. (2012) state that the transition to efficient electronic payment systems has positively impacted GDP, consumption, and trade. Similar conclusions are also shared by Klapper & Singer (2014) that the rapid development of digital platforms and payment platforms provide the speed, security, transparency, and cost-efficiency needed to increase consumption of goods and services, both domestically and internationally.

CONCLUSION

Based on the results of the VECM analysis, an increase in the use of electronic money can increase household consumption in Indonesia in the short term. The efficiency and convenience provided by electronic money encourage people to increase their consumption. Electronic money does not significantly affect household consumption expenditure in the long run. In the short and long term, when people's income increases, they will tend to increase their consumption compared to their previous income. Interest rates are not significantly related to consumption expenditure in the short or long term. Based on the variance decomposition data, it is explained that the proportion of income plays a large role compared to other variables when there is a shock or change in consumption expenditure in Indonesia.

The amount of income owned by the community will affect its consumption. The use of electronic money also plays a role in household consumption. It can be seen when there are shocks to consumption expenditure over time, and electronic money contributes to it. Based on this, it can be seen that people have begun to adapt to using electronic money as a payment system when consuming. The use of electronic money is expected to increase economic growth in Indonesia, which is indirectly the result of an increase in household consumption expenditure. Increased economic growth, of course, will improve the community's welfare, starting with high employment and increased productivity levels so that Indonesia's quality of life will improve.

In the long run, electronic Money is not significantly related to public consumption expenditure. It is hoped that Bank Indonesia, as the central bank of the government, can issue policies regarding digital payments that are evenly distributed in all corners of the regions in Indonesia to increase public access to digital finance. To support this, the government plays an essential role in developing infrastructure to support the increase in the reach of technology and information regarding digital payment systems so that not only urban communities feel this digital payment. This distribution is expected to increase public consumption expenditure in Indonesia. Furthermore, there is no long-term relationship between the use of electronic money and household consumption expenditure. It is hoped that, over time, further research can add other variables and use other research methods to perfect the analysis of the results of this study..

REFERENCES

Al Qardh, J., Tarantang, J., Awwaliyah, A., Astuti, M., & Munawaroh, M. (n.d.). *60 IAIN Palangka Raya [Perkembangan Sistem Pembayaran Digital Pada Era Revolusi Industri 4.0 Di Indonesia]*.

Applied econometric time series. (1995). *Journal of Macroeconomics*, *17*(3), 543. https://doi.org/10.1016/0164-0704(95)80068-9

Badan Pusat Statistik. (2023). Pertumbuhan Ekonomi Indonesia Triwulan I-2023. *Www.Bps.Go.Id, No. 34/05/*(13), 16. https://www.bps.go.id/pressrelease/2023/05/05/1998/ekonomi-indonesia-triwulan-i-2023-tumbuh-5-03-persen--y-on-y-.html

Bajaj, A., & Damodaran, N. (2022). Consumer payment choice and the heterogeneous impact of India's demonetization. *Journal of Economic Dynamics and Control*, *137*. https://doi.org/10.1016/j.jedc.2022.104329

Bank Indonesia. (2009). Uang Elektronik (Electronic Money) PBI No.11/12/PBI/2009. *Peraturan Bank Indonesia*, *1*, 1–53. https://www.bi.go.id/elicensing/helps/PBI_111209-Emoney.pdf

Dickey, D. A., & Fuller, W. A. (1981). Time Series With a Unit Root. *Econometrica*, *49*(4), 1059.

Driskell, D. (2022). Impact of New Technologies on Economy and Society: A Literature Review. *International Journal of Social Science Research and*

Review, *5*(7), 127–134.

Engle, Robert F. and Granger, C. W. J. (2012). *Co-Integration and Error Correction : Representation, Estimation ,*. *55*(2), 251–276.

Hasan, I., De Renzis, T., & Schmiedel, H. (2012). Retail Payments and Economic Growth. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.2100651

Hou, L., Hsueh, S. C., & Zhang, S. (2021). Digital Payments and Households' Consumption: A Mental Accounting Interpretation. *Emerging Markets Finance and Trade*, *57*(7), 2079–2093. https://doi.org/10.1080/1540496X.2021.1887727

Hou, L., & Shen, W. (n.d.). *Digital Currency and Regulatory Responses: A Tale of Two Alternative Money Models*.

Irtyshcheva, I., Stehnei, M., Popadynets, N., Bogatyrev, K., Boiko, Y., Kramarenko, I., Senkevich, O., Hryshyna, N., Kozak, I., & Ishchenko, O. (2021). The effect of digital technology development on economic growth. *International Journal of Data and Network Science*, *5*(1), 25–36. https://doi.org/10.5267/j.ijdns.2020.11.006

Johansen, S. (1988). Statistical analysis of cointegration vectors. *Journal of Economic Dynamics and Control*, *12*(2–3), 231–254. https://doi.org/10.1016/0165-1889(88)90041-3

Kim, Y. J., & Lee, J.-W. (2009). *ADB Economics Working Paper Series Technological Change, Human Capital Structure, and Multiple Growth Paths*. 149.

Klapper, L., & Singer, D. (2014). The Opportunities of Digitizing Payments. *Creating 21st Century Abundance through Public Policy Innovation*, 54–125. https://documents.worldbank.org/en/publication/documents-reports/documentdetail/188451468336589650/the-opportunities-of-digitizing-payments

Li, C., Sun, S., Jiang, C., & Li, D. (2022). Digital Payments and Rural Consumption Structure: Evidence from China. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.4185418

Li, J., Luo, S., & Zhou, G. (2023). Electronic payment, natural environment, and household consumption: Evidence from China household finance survey. *International Review of Financial Analysis*, *85*(November 2022), 102472. https://doi.org/10.1016/j.irfa.2022.102472

Li, Y., Long, H., & Ouyang, J. (2022). Digital Financial Inclusion, Spatial Spillover, and Household Consumption: Evidence from China. *Complexity*, *2022*. https://doi.org/10.1155/2022/8240806

Manurung, E., Effrida, E., & Gondowonto, A. J. (2019). Effect Of Financial Performance, Good Corporate Governance, And Corporate Size On Corporate Value In Food And Beverages. *International Journal of Economics and Financial Issues*, *9*(6), 100–105. https://doi.org/10.32479/ijefi.8828

Nasr, S. A., & Safira, A. (2020). Determinants OF Eco-Conscious Consumen Behavior Of Muslims In Indonesia Using The Theory Of Planned Behavior. *ASEAN Marketing Journal*, *12*(1). https://doi.org/10.21002/amj.v12i1.12888

Oyelami, L. O., Adebiyi, S. O., & Adekunle, B. S. (2020). Electronic payment adoption and consumers' spending growth: empirical evidence from Nigeria. *Future Business Journal*, *6*(1). https://doi.org/10.1186/s43093-020-00022-z

Pang, C., & Gai, Y. (2022). Research on Efficiency in Financing of Small and Medium Companies Based on DEA Method. *Discrete Dynamics in Nature and Society*, *2022*. https://doi.org/10.1155/2022/4914151

Puspitasari, V. E., Yetty, F., & Nugraheni, S. (2021). Pengaruh Literasi Keuangan Syariah, Persepsi Imbal Hasil, dan Motivasi terhadap Minat Investasi di Pasar Modal Syariah. *Journal of Islamic Economics and Finance Studies*, *2*(2), 122. https://doi.org/10.47700/jiefes.v2i2.3292

Ramadani, L. (2016). Pengaruh Penggunaan Kartu Debit dan Uang Elektronik (E-Money) Terhadap Pengeluaran Konsumsi Mahasiswa. *Jurnal Ekonomi Dan Ekonomi Studi Pembangunan*, *8*(1), 1–8. https://doi.org/10.17977/um002v8i12016p001

Saraswati, B. D., Maski, G., Kaluge, D., & Sakti, R. K. (2020). The effect of financial inclusion and financial technology on the effectiveness of the Indonesian monetary policy. *Business: Theory and Practice*, *21*(1), 230–243. https://doi.org/10.3846/BTP.2020.10396

Sreenu, N. (2020). Cashless Payment Policy and Its Effects on Economic Growth of India: An Exploratory Study. *ACM Transactions on Management Information Systems*, *11*(3). https://doi.org/10.1145/3391402

Susanto, E., Solikin, I., & Purnomo, B. S. (2022). A Review of Digital Payment Adoption in Asia. *Advanced International Journal of Business, Entrepreneurship and SMEs*, *4*(11), 01–15. https://doi.org/10.35631/aijbes.411001

Suseco, T. (2016). Effect of e-Money to Economic Performance (A Comparative Study of Selected Countries). *The 2016 International Conference of Management Sciences*, *November*, 9–12.

Tshukudu, M. K. (2018). The Relationship Between Electronic-Money Penetration and Household Consumption: VECM Granger Causality Analysis. *Botswana Institute For Development Policy Analysis Working Paper*, 1–20. http://knowledge.bidpa.bw:8080/xmlui/handle/123456789/131

Yusuf, D. Y., Kristiyanto, S., Studi, P., Pembangunan, E., Ekonomi, F., Bisnis, D., Wijaya, U., & Surabaya, K. (2022). *Transaksi Digital Perbankan dan Dampaknya dengan Perekonomian Indonesia* (Vol. 03, Issue 2).

Zhou, J. (2022.). *Debt, Financial Vulnerability, and Repayment Behaviour in Older Canadian Households*.