The Impact of Covid-19 Pandemic on Electronic Money Transactions
(A Study Case in Indonesia)

Carmelita Vivi Septianurmayanti(✉) and Ahmad Danu Prasetyo

School of Business and Management, Institut Teknologi Bandung, Bandung, Indonesia
carmelita_vivi@sbm-itb.ac.id

Abstract. The rapid technological development has influenced Indonesia's payment system. Due to the pandemic, people tend to seek cashless payment methods to limit physical contact. By using monthly time-series data from Bank Indonesia and Yahoo finance website during 2015–2020, to investigate the influence of the Covid-19 epidemic on E-Money transactions in Indonesia, this study uses the Mann-Whitney U test and Ordinary Least Square (OLS) regression methods. The findings reveal that before and after the application of PSBB in Indonesia, the volume and nominal value of E-Money transactions were significantly different. Moreover, Covid-19 correlates positively with the nominal value of E-Money. Inflation negatively correlates with E-Money, whereas the stock market has no impact on E-Money.

Keywords: e-money · Covid-19 · Cashless · Inflation rate · Stock market · Indonesia

1 Introduction

A global pandemic epidemic known as Coronavirus or Covid-19 occurred in late December 2019. This virus was found in Wuhan, China, and spread rapidly around the world, including Asia. On March 2, 2020, the first case of Covid-19 was reported in Indonesia. The frequency of Covid-19 cases in the country has risen dramatically since then. In response to the epidemic, the Indonesian government implemented Pembatasan Sosial Berskala Besar (PSBB), on May 4, 2020, which confines individuals to stay at their homes (self-quarantine). As a result, this strategy has physically restricted human contacts and movements. Moreover, implementing lockdowns, which shut down activities that entail contact and human gathering, such as airports, train stations, and malls, is an even more extensive procedure. This move also has an impact on service industries such as school, offices, and commerce, as it necessitates the implementation of an online system [1]. The Covid-19 phenomena has had an impact on the entire financial system. It has also shifted people's digital consumption habits toward a cashless society, as evidenced by the fact that Indonesians now have access to the internet in excess of 180 million individuals [2].

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In order to avoid the spread of virus, every stakeholder, including WHO, government, and companies, is pushing consumers to use cashless or contactless payment technology (E-Money). This has changed people's business practices, and not just because of the adoption of digital payment systems like debit or credit cards, as well as through the use of E-Money and digital wallets [3], the simplicity of usage, a rise in the demand for essential items in the immediate term, and a lack of formal banking access due to operation hours constraints have all contributed to this trend [4]. It is also expected that E-Money transactions will skyrocket after the epidemic struck or during the 'new normal' era. Statistics from Bank Indonesia back up this claim, which demonstrates that when the PSBB is implemented in May 2020, digital transactions or E-Money climbed by 64.48%, whereas the amount of digital transactions climbed by 37.35% [5].

This article aims to see if there are any notable differences in Indonesian E-Money transactions before and during PSBB. We analyze both the transaction volumes and transaction nominal of E-Money. Second, we investigated the influence of the Covid-19 outbreak on E-Money transactions in Indonesia. Moreover, we investigate the correlation between E-Money transactions against inflation and the stock market during Covid-19 periods.

This paper structure consists as follows. Section 1 describes the study background and research questions. Section 2 explain the previous study related to E-Money transaction. The data collection and methodology used in this study are discussed in Sect. 3. In Sect. 4, the important findings are examined, and in Sect. 5, the conclusion is presented.

2 Literature Review

Our review article concentrates on the insights on the use of E-Money and payment technologies on the Indonesia market, and emphasizes evidence gaps and areas for future research. The physical distancing strategy in response to Covid-19 has had a substantial impact on socioeconomics [6, 7], finance [8], and supply chain [9, 10]. Previous study has also revealed the pandemic's impact overall on business [11].

There are numerous literature studies concerning the correlation among Covid-19 and E-Money. However, studies reviewing the impact of pandemic on E-Money transactions remain scarce. Fatoni et al., [12] examine the effect of Covid-19 on consumer behaviour in e-wallets usage using a qualitative descriptive study. They argue that Covid-19 has had a significant negative effect on the Indonesian economy. Consumer behaviour shifted toward cashless payment as a result of the deployment of PSBB and physical distancing. Furthermore, Tut, [4] looks on the consequences of the Covid-19 pandemic on financial institutions and consumers' acceptance of FinTech in payments. They conclude that, while Covid-19 originally had a negative influence on FinTech uptake, good short-term policy changes have alleviated some of the adverse consequences. They say that, with the exception of charge cards, all electronic payment card usage has decreased throughout the epidemic. We are seeing an increase in the charge cards usage as clients move to less expensive payment methods. Furthermore, the epidemic has heightened interbank contagion and liquidity worries, limiting domestic and international electronic financial transactions via RTGS. The plague has also lowered commercial banks' asset and balance sheet quality. As global economic activity has slowed, remittance inflows through

Fig. 1. Account ownership and e-money usage across socioeconomic status.

FinTech platforms have declined considerably. Pambudi and Rahadi [13], conduct a similar study. They conclude that the supply of the money, electronic data capturing, other non-cash payments, and revenue from customers could affect E-Money. There are also several literatures that examine the aspects that can affect the usage of E-Money during the pandemic see for instance [14–17]. Furthermore, these literatures employ the relationship between inflation and stock market to E-Money see for instance [18–20].

Our study considers the impact of Covid-19 pandemic on E-Money transactions in Indonesia. There are numerous essential reasons why Indonesia can be used as a natural research. Indonesia has the fourth-largest population in the world and the tenth-largest purchasing power parity economy [21], and around 73.7% of Indonesian connected to the Internet [22]. The ratio of banking assets constitutes about 55.01% of Gross Domestic Product (GDP) at the end of 2019 [23]. The second column of Fig. 1 shows the prevalence of E-Money usage by education, urban development, and age [24]. We see a notable steep slope throughout education levels with considerably higher levels of education. We also notice inequalities across age groupings, where people aged 55+ are the least to utilize E-Money.

This indicates that Indonesia's financial system may be vulnerable to contagion risks associated with the Covid-19 pandemic. These are research gaps in terms of our research. Thus, this study is employed to fill the gap. In this regard, our paper makes several contributions that differ from other literatures. Our paper is the first to look at inflation and the stock market as control factors for E-Money transactions.

After examining the literature review and research aims, we can infer that Covid-19 is used as a dummy variable, along with inflation and the stock market as a control variable in the study framework. Those are variables which affect E-money transaction demand.

Table 1. Descriptive statistics analysis results

Variables	N	Minimum	Maximum	Mean	Std. Deviation
Volume of E-Money	72	17.00	20.06	18.7410	.97059
Nominal of E-Money	72	12.41	16.91	14.6778	1.47136
Covid-19	72	0	1	0.11	0.316
Inflation	72	0.0132	0.0726	0.036642	0.0147118
Stock market	72	−0.1676	0.0944	0.002764	0.0419371
Valid N (listwise)	72				

3 Data and Methodology

3.1 Data Set

Our study adopts a statistical analysis approach using secondary data. The secondary data was gathered from Bank Indonesia's official website, and it is a monthly report on E-Money transactions and inflation. Additionally, the Jakarta Composite Index (JKSE) monthly report from Yahoo Finance for the data period from January 1, 2015 to December 31, 2020. This paper describes the Covid-19 pandemic as the period from May 2020 to December 2020, starting with the first application of PSBB in May 2020. Table 1 presents descriptive statistics of our study variables. The E-Money transactions volume and nominal value data are transformed into a natural logarithm (ln).

3.2 Methodology

There are two methods that are used in this study. The data is analysed using IBM SPSS 25 as the statistical programming. To begin, a hypothesis test utilizing the Mann-Whitney U Test to know if there is a difference in E-Money transactions before and after PSBB was introduced in Indonesia. This test used comparable data for before (September 2019 to April 2020) and after (May to December 2020) the PSBB in Indonesia, which is 8 samples. The hypothesis of this test stated as follows:

3.2.1 Volume of E-Money Transactions Hypothesis

H_0: The volume of E-Money transactions in Indonesia did not differ significantly before and after PSBB was introduced.

H_1: The volume of E-Money transactions in Indonesia differed significantly before and after PSBB was introduced.

3.2.2 Nominal Value of E-Money Transactions Hypothesis

H_0: The nominal value of E-Money transactions did not differ significantly before and after PSBB was introduced.

H_1: The nominal value of E-Money transactions differed significantly before and after PSBB was introduced.

Second, the contribution of the predictor variables, namely Dummy, is determined using the classical assumption test (Normality, Multicollinearity, and Heteroscedasticity Test) followed by the Ordinary Least Square (OLS) regression. Covid-19 (X1) is a numeric variable that describes the circumstances before (0) and after (1) Covid-19. On the dependent variable, Inflation (X2) and the Stock market (X3) are given as percentages. Meanwhile, E-Money transaction volume (Y1) and Nominal value (Y2) are stated in transaction units and million Indonesian Rupiah (IDR), respectively.

4 Result and Findings

4.1 Before and After the Implementation of PSBB in Indonesia, There Were Differences in E-Money Transactions

The Mann-Whitney U Test is a statistical procedure that compares the averages or means, under different situations, as well as the standard deviations, of two related groups to check if there is a statistically significant distinction between them. This test is used in this research since it can be used for data with a small sample size, which is the minimum sample per group must be ≥ 2 [25]. Table 2 summarizes the Mann-Whitney U test result.

From Table 2 it is shown that the sig. (2-tailed) for volume and nominal are 0.001 and 0.021, respectively which is less than the alpha of 0.05. As a result, the null hypothesis is ruled out. According to the data there is a substantial variation in the E-money transactions both volume and nominal before and after the adoption of PSBB.

4.2 The Impact of the Covid-19 Pandemic on Indonesian E-Money

4.2.1 Ordinary Least Square Regression

After all the classical assumptions requirements are fulfilled and 72 samples were found to be relevant and trustworthy, the regression analysis is conducted. The result of this regression analysis is expressed in the following Table 3.

Table 2. Mann-Whitney U test results

Test Statistics[a]		
	Volume	Nominal
Mann-Whitney U	2.000	10.000
Wilcoxon W	38.000	46.000
Z	−3.151	−2.310
Asymp. Sig. (2-tailed)	0.002	0.021
Exact Sig. [2*(1-tailed Sig.)]	0.001[b]	0.021[b]

[a] Grouping Variable: X1

[b] Not corrected for ties.

Table 3. Statistical model summary result

Model 1				
Model Summary[b]				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.707[a]	0.500	0.478	0.70136
Model 2				
Model Summary[d]				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
2	0.740[c]	0.548	0.528	1.01109

[a] Predictors: (Constant), Covid-19, Inflation, Stock
[b] Dependent Variable: Volume of E-Money
[c] Predictors: (Constant), Covid-19, Inflation, Stock
[d] Dependent Variable: Nominal of E-Money

The R-value indicates the strength of the association among independent variables (Covid-19, Inflation, and Stock market), and dependent variable (volume of E-Money), as shown in Table 3 for model 1. This value indicates that the predictor and response variables have a significant relationship. The R2 value indicates that the variables Covid-19, inflation, and the stock market can explain 0.500 or 50% of the volume of E-Money transactions. Meanwhile, there are several factors that aren't included in the regression model account for 50% of the remainder. The adjusted R square value of 0.478 shows a 50% correction to R square. The magnitude of the variation in the regression model is 0.70136, as indicated by the Std. Error of the Estimate value of 0.70136.

In addition, for model 2, the R-value of 0.740 indicates the strength of the relationship between predictor factors and the response variable (volume of E-Money). This value indicates that the predictor and response variables have a close relationship. The variable Covid-19, inflation, and the stock market can explain 0.548 or 54.8% of the nominal of E-Money transactions, according to the R Square or R^2. Other factors not incorporated in the regression model account for the remaining 45.2%. The modified R square value of 0.582 indicates that R square has been corrected by 54.8%. The Std. Error of the Estimate value of 1.01109 indicates that the regression model has many variations.

The analysis of variance (ANOVA) was employed to determine the results: whether the model already accurately represented the observation data. As given in the Table 4, the F-sig result is used to interpret the result.

The Table 4 shows that the F-value (i.e., Sig.) for both models is 0.000, which is below the alpha of 0.05. This result indicates that the result is not limited to the sample of the study. It is already well representing the model in the regression, which means the model is considered as good.

According to Table 5, the inflation variable is negative and significant to the volume of E-Money with a coefficient of −44.913 and a sig. value of 0.000, whereas the Covid-19 and stock market variables are positive and insignificant to the volume of E-Money with coefficients of 0.176 and 3.224, respectively, and sig. values of 0.565 and 0.114,

Table 4. Statistical Analysis of Variance (Anova) result

Model 1						
ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	33.436	3	11.145	22.657	0.000[b]
	Residual	33.450	68	0.492		
	Total	66.886	71			
Model 2						
ANOVA[c]						
Model		Sum of Squares	df	Mean Square	F	Sig.
2	Regression	84.190	3	28.063	27.451	0.000[d]
	Residual	69.517	68	1.022		
	Total	153.707	71			

[a] Dependent Variable: Volume of E-Money
[b] Predictors: (Constant), Covid-19, Inflation, Stock market
[c]Dependent Variable: Nominal of E-Money
[d]Predictors: (Constant), Covid-19, Inflation, Stock market

both of which are greater than alpha of 0.05. The Covid-19 is discovered in the second model to be positive and significant to the nominal value of E-Money with coefficient and sig. value is 0.923 and 0.039. Inflation variable is negative and significant to the nominal value of E-Money with a coefficient and sig. value is −62.977 and 0.000, while the stock market variable is positive and insignificant to the nominal value of E-Money with a coefficient and sig. value is 4.603 and 0.118.

4.2.2 Discussion

In accordance with the findings of the above study, it is obvious that the Covid-19 has a beneficial impact on E-Money transactions. The government's implemented regulations, such as PSBB and lockdown, imply that the longer this pandemic last, the more infected individuals there will be, producing changes in people's routines that have resulted in the 'New Normal.' These factors will eventually lead to an increase in E-Money transactions. This discovery is also in line with Trisnowati et al., [26] previous research, they discovered that E-Money transactions changed statistically significantly before and after the Covid-19 epidemic. Furthermore, Tut [4] concludes that mobile banking agents, transaction values, and volume have all increased. They claim that the customers may now take advantage of the Covid-19 pandemic to use FinTech and financial intermediaries to adapt to predicted payment alternations in the future. In addition, according to Ganesh et al., [27], the breakout of Covid-19 might expedite the world's move to digital payments. Payment systems have also proven to be reliable and durable, with a

Table 5. Statistical overall regression coefficients result

Model 1						
Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	*Std. Error*	*Beta*		
1	(Constant)	20.358	0.269		75.737	0.000
	Covid-19	0.176	0.304	0.057	0.578	0.565
	Inflation	−44.913	6.491	−0.681	−6.919	0.000
	Stock market	3.224	2.016	0.139	1.599	0.114
Model 2						
Coefficients[b]						
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	*Std. Error*	*Beta*		
2	(Constant)	16.870	0.388		43.535	0.000
	Covid-19	0.923	0.439	0.199	2.105	0.039
	Inflation	−62.977	9.358	−0.630	−6.730	0.000
	Stock market	4.603	2.906	0.131	1.584	0.118

[a] Dependent Variable: Volume of E-Money
[b] Dependent Variable: Nominal of E-Money

high public trust in them. Another study conducted by Fatoni et al., [12] discovered that combining PSBB and physical separation causes customers to alter their purchase habits from physical to online, resulting in increased online sales. "Activity in Jakarta's central business area declined by 53% from February to the end of March 2020," according to data from Analytics Data Advertising (ADA). Naturally, this has an impact on the usage of e-wallets in transactions that formerly relied on cash. When social distancing was adopted, the usage of online purchasing apps increased by 300%, according to ADA.

On the other hand, inflation has had a detrimental influence on E-Money transactions. It happened because the Covid-19 outbreak had a negative influence on the Indonesian economy, as it coincided with inflationary financial markets and increasing commodity prices, triggering a shift in consumer buying patterns [11]. The negative effect result is also linked to present inflationary conditions in Indonesia amid the Covid-19 epidemic. In August, Indonesia's Consumer Price Index (CPI) dropped to 1.32%, according to the Central Bureau of Statistics (BPS). In addition, inflationary trends emerged as a result of a rise in layoffs and the Work From Home (WFH) program. According to Yuniarti et al., [28], increasing the total of positive incidents influences Indonesian inflation, with each extra case lowering the inflation figure by 5.14×10^{-5}. The use of

E-Money increased simultaneously, resulting in a negative association between inflation and E-Money transactions.

In addition, regression analysis results reveal that the stock market has no substantial influence on E-Money. This conclusion is in line with the findings of a prior research by Aimon et al., [18] that stated in Indonesia, there was no link between stock and E-Money. In light of the present pandemic problem, we find that customer demand is dwindling. However, the supply (seller) grew at the same time, as seen by the Indonesia Composite Index (IDX composite) price, which fell sharply and on March 20, 2020, it hit its lowest point.

There is no theoretical explanation for this occurrence. Nonetheless, the most significant aspect in the stock market is that the stock market is shaped by the psychology of its investors [29, 30]. Generally, the price created in the market represents the investor's belief in the firm's future fundamentals [31]. The author offers own theory regarding why there is a misalignment between stock and electronic money in Indonesia. It occurs in consequence of Covid-19 breakouts induce investors to become pessimistic (fear) as a result of investor predictions of future corporate performance disruption induced by Covid-19 [32]; in other words, there is more uncertainty about the company's fundamentals in the future, resulting in a large sell-off and a drop in the stock price. Furthermore, investors are sceptical of forecasting when the pandemic will end. As a result, their investment decisions are influenced by their pessimism.

Simply put, the company's fundamentals were expected to deteriorate, according to investors. As a result, Indonesia's stock market values have dropped, resulting in a high level of volatility in the stock index and a significant deviation in the stock market price from its intrinsic value. As a result, the author might deduce that the stock market's fundamental asset is the company itself. The stock market might be highly volatile for no apparent reason in short period of time, but in the long term, the stock price will represent the state of the company's fundamentals. Analysing financial accounts to see if the firm is profitable, has good leverage, or generates cash flows is one of many techniques to examine the company's fundamentals. However, in the author's perspective, one of the factors influencing investors' "fear" is the bad performance of the firms in which they invest as a consequence of the epidemic. This is backed by several studies undertaken by [32–34]. As a result, in Indonesia, the stock market and electronic money have nothing to do with each other, talking about correlation.

5 Conclusion

In conclusion this article employs the affect of the ongoing Covid-19 pandemic on E-Money transactions. This study may be concluded based on the analysis findings, as given in the preceding section: (i) Before and after the deployment of PSBB in Indonesia, there is a substantial change in the volume and nominal of E-Money transactions, according to the Mann-Whitney U result. (ii) In the first model, only the inflation variable (X2) contributes considerably to the volume of E-Money, according to the OLS regression analysis (Y1). The Covid-19 (X1) and stock market (X3) factors, on the other hand, had no substantial impact on E-Money volume. As a result, inflation negatively influences the volume of E-Money. The Covid-19 (X1) and inflation (X2) variables are shown to

contribute considerably to the nominal of E-Money (Y2) in the second model, however the stock market (X3) variable has no effect on the nominal of E-Money (Y2). As a result, Covid-19 has a beneficial influence on the nominal of E-Money. Inflation has a detrimental influence on the nominal value of E-Money.

Throughout this paper's results, the author provides several recommendations: (i) For the Infrastructure Provider such as government, bank, and Financial Services Authority (OJK): to offer financial service infrastructure, policy, and regulation as well as encourage the usage of electronic money in rural regions through establishing branch banks or broadening the scope of laku pandai (LP) and Layanan Keuangan Digital (LKD), that OJK and BI, govern, respectively, to involve merchant sellers and make the top-up service more convenient. They should also protect consumers' personal information and financial transactions. (ii) For the Consumers: to stop the Covid-19 virus from spreading, the adoption of E-money as a safe and secure cashless transaction mechanism should be expanded. (iii) For Fintech Companies or Digital Payment Issuers: providing user-friendly software and public incentives to encourage individuals to embrace cashless payments to accommodate consumers in remote areas. (iv) For Businesses: to secure the effectiveness of the supply chain during the pandemic and minimize corporate loss, boost internet marketing channels and establish E-money as a cashless payment system. (v) For Further Studies: Interest rates, customer income, and variables impacting the Gross Domestic Product are all possible indicators of E-Money transactions (GDP), should be considered and incorporated, as this comes highly recommended for the consistency of outcomes in studies on similar topics.

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