

## **ANALYSIS ON ELECTRONIC MONEY TRANSACTIONS ON VELOCITY OF MONEY IN ASEAN-5 COUNTRIES**

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*Abstract.* The purpose of this study is to analyze the electronic money transactions on velocity of money in ASEAN-5 countries from 2010 to 2014. For the electronic money, the data used is the volume of transactions. For the gross domestic product and money supply ( $M_1$ ), the data used are currency from each country that has been converted into US dollars. This study uses panel data model, classical assumption test (heteroscedasticity and multicollinearity test), and goodness of fit test (coefficient determination,  $f$  test, and  $t$  test) to analyze the relationship between electronic money transactions with gross domestic product, money supply ( $M_1$ ), and velocity of money. The results of this study indicate that the volumes of electronic money transactions are increasing in ASEAN-5 countries, while the velocity of money are decreasing. The gross domestic product, money supply ( $M_1$ ), and velocity of money have positive and significant relationships to electronic money transactions for 0.34%, 0.10%, and 0.49% in ASEAN-5 countries. On coefficient of determination test ( $R_2$ ), it shows that 98.41% of dependent variable (electronic money transactions) can be explained by independent variables (gross domestic product, money supply ( $M_1$ ), and velocity of money). Since there is a positive trend in electronic money transactions, the rapid development of non-cash instruments, and a significant relationship between electronic money transactions to GDP, money supply ( $M_1$ ), and velocity of money in all ASEAN-5 countries, including Indonesia, the society should relatively be ready to get into a cashless society.

*Keywords:* electronic money, GDP,  $M_1$ , velocity of money, panel data model

### **Introduction**

In 2003, ASEAN leaders have decided to form an ASEAN Economic Community (AEC) by 2020 in order to transform ASEAN into a stable, prosperous, and highly competitive region with equitable economic development, and reduced poverty and socio-economic disparities. The target date for the AEC was subsequently brought forward by 2015 due to the ASEAN perceived loss of competitiveness to India and China. The formation of AEC has brought ASEAN countries into a serious concern on economic and financial integration. As the AEC commences, ASEAN member countries are having a greater need for an integrated payment system. Under the system, individual user across ASEAN is able to make financial payments through ATMs, credit cards, or electronic money without spending a significant amount of time or money doing so. It also require the development of a seamless payment system within the region, but one of the most challenging tasks will be promoting the use of more non-cash payment methods (cashless transactions), which continues to serve a popular means of payment (WC-PSS, 2011). Cashless transactions include payment transactions made with checks, direct credit transfers, direct debits, payments with debit cards and credit cards, and also, payments with e-money and prepaid and stored-value cards. The growth of electronic money in ASEAN countries was very fast and significant. An increase of the use of electronic money means led to an increase in the demand for money. Irving Fisher (1911) stated velocity of money is a concept that is used to calculate the amount of money supply ( $M$ ) which is

linked to the price level (P) and aggregate output (Y). Velocity of money (V) can be interpreted as the average number of times per year (turnover) of one unit of currency used to purchase a total of goods and services produced in the economy. Simply that the velocity indicates how many times the money rotates in a given period. Irving Fisher (2008) reasoned that if people use electronic money, the less money it takes to make a purchase, the less money needed to perform transactions generated by the nominal income will rise as a result of velocity. But the opposite effect if the purchase of more use cash or a check, the more money that is used to make transactions generated by the same amount of nominal income, and velocity of money will go down. According to the problems above, the author is going to do further analysis about electronic money transactions on velocity of money in ASEAN-5 countries with the title: "Analysis of Electronic Money Transactions on Velocity of Money in ASEAN-5 countries".

### Theoretical Framework

Theoretically, the effects of gross domestic product, money supply (M<sub>1</sub>), and velocity of money on the electronic money transactions in this study are:

1. The increase in GDP indicates the rising incomes in society and an increase in public revenues resulted in increased personal income.
2. Increased public income curiosity attracting communities to understand financial products, for example: credit card, visa, and e-money.
3. The central bank as an institution that takes monetary policy, responding to fulfill the community needs of an up to date financial products. This response in the form of provision of financial product called e-money (electronic money).
4. Electronic money can be used for transactions where the trader does not have to carry cash. Only use the card chip and can be directly used. The more people who use these financial products would result in reduced circulation of cash (currency) in the community.
5. Decrease in currency (cash) and rising incomes are seen through the increase in GDP will cause the higher velocity of money. Because the velocity value obtained from the GDP divided by the money supply, which in this study using the M<sub>1</sub>.

The frameworks are:

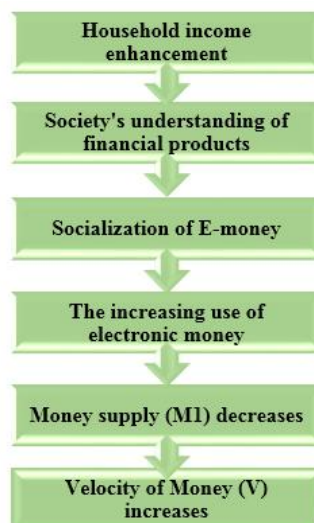


Figure 2.1. Theoretical Framework

## Methodology

### A. Research Design

The methodology that is applied by the author in this research is shown in the following diagram below.

### B. Data Panel Model

In this research, the author uses data panel model. Data panel is a combination between cross-section and time-series data. There are several approaches that the author uses regression model based on panel data model that consists of time-series and cross-section data. The several methods as followed:

#### *Random Effect*

Random Effect is a method to use in some situations where the intercept of an individual is a random and large number of populations. The difference between the cross-section and time-series in random effect model is shown by an error. This model considers that the error might be related throughout the cross-section and time-series.

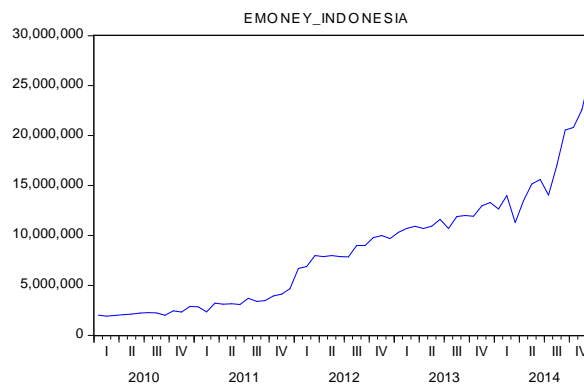
#### *Fixed Effect*

Fixed Effect is a model used in some situation when the individual specific intercept may be correlated with one or more independent variable. The existence of variables which are not included to the equations enable the existence of intercept inconsistent, which the intercept is possibly vary for the cross-section and time-series. There are three methods that the author needs to choose; moreover Hausman Test is a method to determine appropriate approach between random effect and fixed effect to analyze the regression model. If the value of Chi Square statistics is more than Chi Square table, reject  $H_0$  and accept  $H_1$ . If the value of Chi Square statistics is less than Chi Square table, accept  $H_0$  and reject  $H_1$ . Also, if the p-value exceeds  $\alpha$ , then accept  $H_0$  and use Random Effect Model. If the p-value is less than  $\alpha$ , then reject  $H_0$  and use Fixed Effect Model.

### Data Analysis

#### A. The Trend of Electronic Money Transactions in ASEAN-5 Countries Indonesia

In 2010, the volume of e-money transactions in Indonesia has reached to 26 million transactions and increasing to 203 million transactions in 2014.



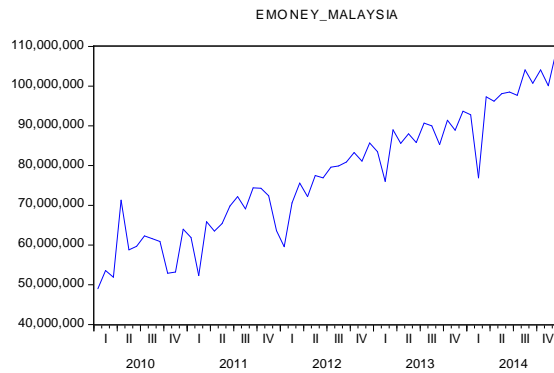
Source: Bank Indonesia Statistics

Figure 4.1 E-money in Indonesia

According to figure 4.1, it seen that e-money transactions in Indonesia are increasing from 2010 to 2014. The most increasing number of e-money transactions is occurred from 2011 to 2012 that reached by 145%. While the other increases are only 55% by 2011, 37% by 2013, and 47% by 2014. The increases caused by the awareness of the society and the government encourages in using electronic money.

### Malaysia

In 2010, the volume of e-money transactions in Malaysia has reached to 699 million transactions and increasing to 1.1 billion transactions in 2014.

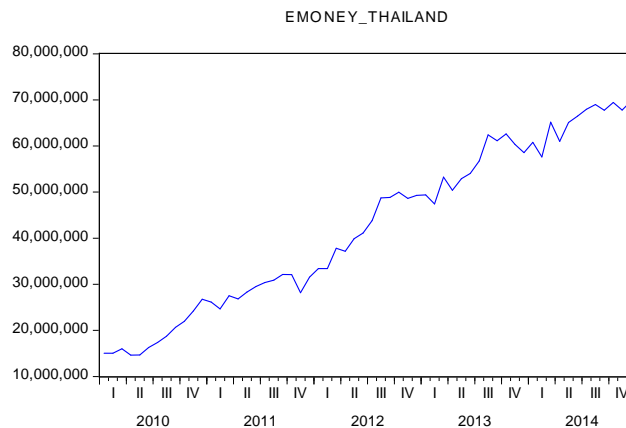


Source: Bank Negara Malaysia Statistics  
Figure 4.2 E-money in Malaysia

According to figure 4.2, it seen that e-money transactions in Malaysia are increasing from 2010 to 2014. The increasing number of e-money transactions in Malaysia are tend to be stable, which are 15% from 2010 to 2011 and 2011 to 2012, 14% from 2012 to 2013, and 12% from 2013 to 2014. The increases caused by the awareness of the society and the government encourages in using electronic money.

### Thailand

In 2010, the volume of e-money transactions in Thailand has reached to 221 million transactions and increasing to 787 million transactions in 2014.

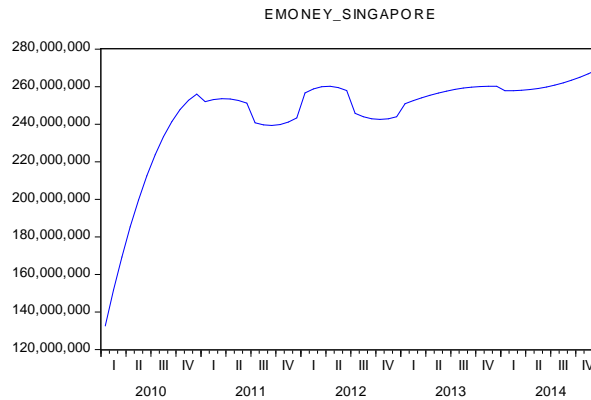


Source: Bank of Thailand Statistics  
Figure 4.3 E-money in Thailand

According to figure 4.3, it seen that e-money transactions in Malaysia are increasing from 2010 to 2014. The increasing number of e-money transactions in Malaysia are tend to be decline, which are 57% from 2010 to 2011, 47% from 2011 to 2012, 31% from 2012 to 2013, and 18% from 2013 to 2014. The increases caused by the awareness of the society and the government encourages in using electronic money.

### Singapore

In 2010, the volume of e-money transactions in Singapore has reached to 2.5 billion transactions and increasing to 3.1 billion transactions in 2014.

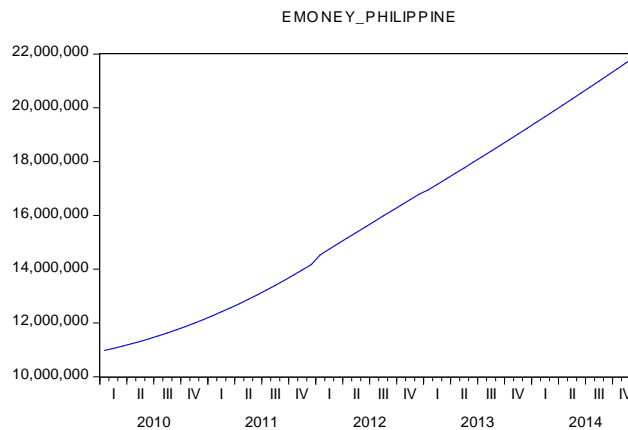


Source: Monetary Authority of Singapore Statistics  
Figure 4.4 E-money in Singapore

According to figure 4.4, it seen that e-money transactions in Singapore are increasing from 2010 to 2014. The most increasing number of e-money transactions is occurred from 2010 to 2011 that reached by 18%. While the following years increases are only 2%. The increases caused by the awareness of the society and the government encourages in using electronic money.

#### Philippine

In 2010, the volume of e-money transactions in Philippine has reached to 138 billion transactions and increasing to 248 million transactions in 2014.



Source: Bangko Sentral ng Pilipinas Statistics  
Figure 4.5 E-money in Singapore

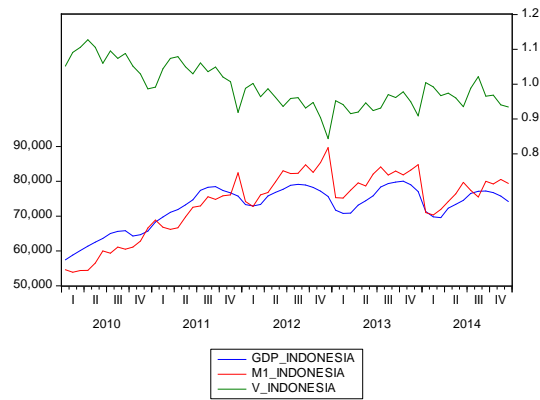
According to figure 4.5, it seen that e-money transactions in Philippine are increasing from 2010 to 2014. The increasing number of e-money transactions in Philippine are tend to be stable, which are 14% from 2010 to 2011, 19% from 2011 to 2012, 15% from 2012 to 2013, and 14% from 2013 to 2014. The increases caused by the awareness of the society and the government encourages in using electronic money.

#### B. The Growth of Velocity of Money in ASEAN-5 Countries

In this research, the velocity of money is calculated from nominal GDP (at current prices) divided by the amount of money supply (M1).

##### Indonesia

The chart below shows the growth of GDP, money supply (M1), and velocity of money during 2010-2014.

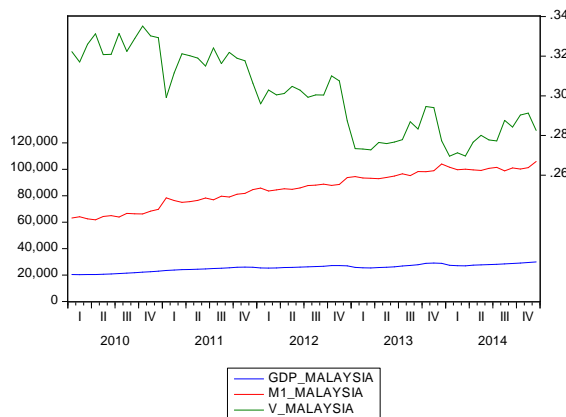


Source: Bank Indonesia Statistics  
 Figure 4.6 GDP, M1, and Velocity of Money Growth in Indonesia

The growth of velocity of money is influenced by the growth of GDP and money supply (M1). According to the graph 4.6, it shows that the velocity of money continues to fluctuate year by year. At the end of 2012, the velocity of money in Indonesia reached the most drastic decline. While in the mid-2010 the velocity of money reached the highest level. The decrease caused by the increases of the money supply (M1).

Malaysia

The chart below shows the growth of GDP, money supply (M1), and velocity of money during 2010-2014.

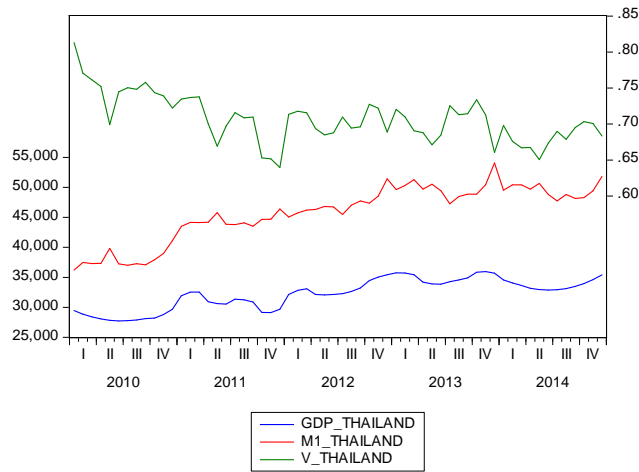


Source: Bank Negara Malaysia Statistics  
 Figure 4.7 GDP, M1, and Velocity of Money Growth in Malaysia

The growth of velocity of money is influenced by the growth of GDP and money supply (M1). According to the graph 4.7, it shows that the velocity of money continues to fluctuate year by year and tend to be decline. At the end of 2014-, the velocity of money in Malaysia reached the least level of decline. The decrease caused by the increases of the money supply (M1).

Thailand

The chart below shows the growth of GDP, money supply (M1), and velocity of money during 2010-2014



Source: Bank of Thailand Statistics

Figure 4.9 GDP, M1, and Velocity of Money Growth in Singapore

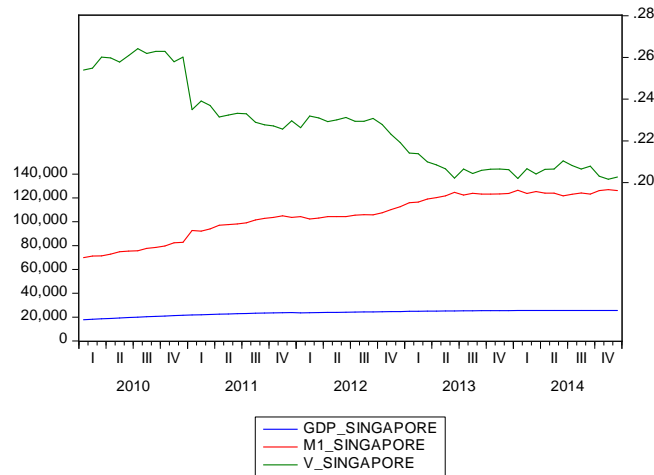
The growth of velocity of money is influenced by the growth of GDP and money supply (M1). According to the graph 4.8, it shows that the velocity of money in Thailand tend to be stable. The highest level is reached on 2010 and the lowest level is reached in the mid-2011. The decrease caused by the increases of the money supply (M1).

Table 4.1 Pooled least Square with White Test between weighted and un-weighted sum squared resid

Weighted Statistics			
		Mean dependent	7647077
R-squared	0.980472	var	1
Adjusted R-squared			5910186
	0.980003	S.D. dependent var	2
			3.39E+1
S.E. of regression	10771309	Sum squared resid	6
F-statistic	2094.362	Durbin-Watson stat	0.315773
Prob(F-statistic)	0.000000		
Unweighted Statistics			
		Mean dependent	7783796
R-squared	0.983305	var	3
Sum squared resid			0.14563
	3.29E+16	Durbin-Watson stat	0

Singapore

The chart below shows the growth of GDP, money supply (M1), and velocity of money during 2010-2014.

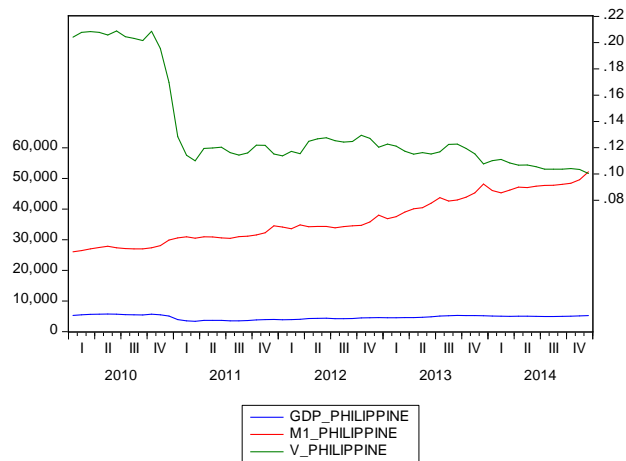


Source: Monetary Authority of Singapore Statistics  
 Figure 4.8 GDP, M1, and Velocity of Money Growth in Thailand

The growth of velocity of money is influenced by the growth of GDP and money supply (M1). According to the graph 4.9, it shows that the velocity of money in Singapore tend to be decline. The highest level is reached on 2010 and the lowest level is reached in the end of 2014. The decreases caused by the increases of the money supply (M1).

Philippine

The chart below shows the growth of GDP, money supply (M1), and velocity of money during 2010-2014.



Source: Bangko Sentral ng Pilipinas Statistics  
 Figure 4.10 GDP, M1, and Velocity of Money Growth in Philippine

The growth of velocity of money is influenced by the growth of GDP and money supply (M1). According to the graph 4.10, it shows that the velocity of money in Philippine tend to be decline. The highest level is reached on 2010 and the lowest level is reached in the end of 2014. The decreases caused by the increases of the money supply (M1).

C. Data Analysis

Classical Linear Assumption Test

- Heteroscedasticity Test



Heteroscedasticity test is used in order to determine whether variance error is constant. The author decided to use pooled least square test to detect the heteroscedasticity. The pooled least square test is comparing the weighted and un-weighted sum squared resid. The Pooled least Square table is shown below.

From the table above, the weighted squared resid statistics is 3.39E+16, which is higher than the un-weighted sum squared resid, 3.29E+16. It means that the author should accept Ho or no heteroscedasticity.

- Multicollinearity Test

Multicollinearity test is used in order to determine whether the independent variable has a perfect linear relationship with any other independent variables. This test is conducted using the Pair-Wise Correlation Matrix to determine the multicollinearity. The Pair-Wise correlation matrix should not be more than 0.80.

Table 4.2 Pair-Wise Correlation Matrix

	GDP?	M1?	V?
GDP?	1.000000	0.218555	0.632072
M1?	0.218555	1.000000	0.483552
V?	0.632072	0.483552	1.000000

According to table 4.2, there is no correlation between each independent variable since there is no value of more than 0.8. Data that is identified as multicollinearity is if the correlation coefficient between independent variables are more than one or equal to 0.8 (Gujarati, 2003). So, it can be concluded that there is no multicollinearity between the independent variables.

Regression Analysis

Table 4.4 Fixed Effect Model

Correlated Random Effects - Hausman Test  
 Pool: POOL  
 Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	5.82646	8	3 0.0204

There are three approaches to analyze the data panel model. The first test is using Pooled Least Square but data panel has been use in this research, then the pooled least square specifications are not fit with panel data so the pooled least square is ignored. (Econometrics Book, Bank Indonesia). However, fixed effect and random effect model will be used to continue the method in this regression analysis. The author conducts the hausman test to choose fixed effect or random effect model that will be used in this research.

According to table 4.3, the result shows that p-value is 0.0204, which is less than the significance level of 0.05. It concludes that the panel data model is using Fixed Effect approach to evaluate the output of regression model by goodness of fit.

Table 4.3 Hausman Test

Dependent Variable: EMONEY?  
Method: Pooled Least Squares

Date: 08/20/15 Time: 09:28  
Sample: 2010M01 2014M12  
Included observations: 60  
Cross-sections included: 5  
Total pool (balanced) observations: 300

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.281413	0.165948	-1.695793	0.0910
GDP?	0.335869	0.291566	1.151948	0.0203
M1?	0.104153	0.916154	11.36853	0.0000
V?	0.487895	0.234830	2.077645	0.0386
Fixed Effects (Cross)				
_INDONESIA--C	1.13E+08			
_MALAYSIA--C	6675284.			
_THAILAND--C	2250529			
_SINGAPORE--C	1.44E+08			
_PHILIPPINE--C	2244063.			
Effects Specification				
Cross-section fixed (dummy variables)				
	Mean dependent			7783796
R-squared	0.984077	var		3
Adjusted R-squared	0.98369	S.D. dependent		886584
		5var		79
S.E. of regression	11320774	Akaike info criterion		35.3484
Sum squared resid	3.74E+16	Schwarz criterion		35.4472
Log likelihood	5294.272	Hannan-Quinn criter.		35.3880
				1

	Durbin-Watson	0.16215
F-statistic	2578.045	stat
	0.00000	0
Prob(F-statistic)	0	

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From the model above, it can be concluded that:

The fixed effect model indicates a positive relationship between gross domestic product, money supply (M<sub>1</sub>), and velocity of money toward electronic money transactions.

The country that has highest average of electronic money transaction is Singapore.

The country that has lowest average of electronic money transaction is Indonesia.

#### Goodness of Fit

##### Coefficient of Determination (R<sup>2</sup>)

According to the table 4.4, the value of coefficient of determination (R<sup>2</sup>) is 0.984077 or 98.41% of dependent variable can be explained by independent variables, while 1.59% is explained by other variables.

#### F test

The value of F statistics from the table 4.4 is 2578.045 and it compared to F table for  $\alpha = 5\%$ ,  $df_1$  or  $(k - 1) = 3$ ,  $df_2$   $(n - k) = 277$  is 2.637193. Since F statistic is higher than F table, it means accept H<sub>1</sub>, which all independent variables have significant affect towards dependent variable.

#### T test

In this test, the p-value of each variable should be compared to the significance level of 0.05. Since all three independent variables have lower p-value than significance level, the three variables have significance influence. According to table 4.4, gross domestic product, money supply (M<sub>1</sub>), and velocity of money have positive affect towards Electronic Money Transactions since the coefficient value is positive.

#### Result Analysis

In the previous paragraph, the author has analyzed the data. Therefore, in this section the analysis will be delivered as descriptive analysis.

#### Gross Domestic Product

According to table 4.4, gross domestic product (GDP) is a significant variable that influence the electronic money transactions. There is a positive influence to electronic money transactions amounted to 0.335869, which means if the GDP increased by 1%, it will encourage an increase of 0.34% in electronic money in ASEAN-5 countries (ceteris paribus).

#### Money Supply (M<sub>1</sub>)

According to table 4.4, money supply (M<sub>1</sub>) is a significant variable that influence the electronic money transactions. There is a positive influence to electronic money transactions amounted to 0.104153, which means if the M<sub>1</sub> increased by 1%, it will encourage an increase of 0.10% in electronic money in ASEAN-5 countries (ceteris paribus).

### Velocity of Money

According to table 4.4, velocity of money is a significant variable that influence the electronic money transactions. There is a positive influence to electronic money transactions amounted to 0.487895, which means if the velocity of money increased by 1%, it will encourage an increase of 0.49% in electronic money in ASEAN-5 countries (*ceteris paribus*).

### Conclusion

Based on the analysis in the previous chapter, the author concludes that the electronic money transactions in ASEAN-5 countries have been increased from 2010 to 2014, it shows that there is a positive trend in electronic money usage. The increases caused by the awareness of the society and the government in ASEAN-5 countries that encourages in using electronic money. The velocity of money in ASEAN-5 countries tends to decrease from 2010 to 2014. It shows that there is a negative trend in velocity of money. The decreases caused by the increases of the money supply ( $M_1$ ). Then, The gross domestic product, money supply ( $M_1$ ), and velocity of money have positive and significant relationships to electronic money transactions for 0.34%, 0.10%, and 0.49% in ASEAN-5 countries.

On coefficient of determination test ( $R^2$ ), it shows that 98.41% of dependent variable can be explained by independent variables (gross domestic product, money supply ( $M_1$ ), and velocity of money), while 1.59% is explained by other variables. The country that has highest average of electronic money transaction is Singapore. The country that has lowest average of electronic money transaction is Indonesia.

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