

# The causality among e-money, manufacturing, services and money supply: an empirical evidence of ASEAN countries

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## The causality among e-money, manufacturing, services and money supply: an empirical evidence of ASEAN countries

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### Abstract

The economic transition happened in ASEAN countries caused the increased growth of e-money use. This study was established to discover the causal relation between the growth in manufacturing and service sector and the e-money usage through causality panel approach. Furthermore, this study also focused on finding the causality among the economic growth in manufacturing and service sector, e-money and money supply during 2008-2018 period in the region. The result of the study showed that: (1) there was a one-way causality between the growth in service sector and e-money use, (2) there was no causality between e-money use and the growth in manufacturing sector (3) the growth of money supply provided causal effect on the increase of e-money use.

**Keywords:** *E-money, Manufacturing sector, Money supply, Service sector*

**JEL Classification:** E5, E51, O42

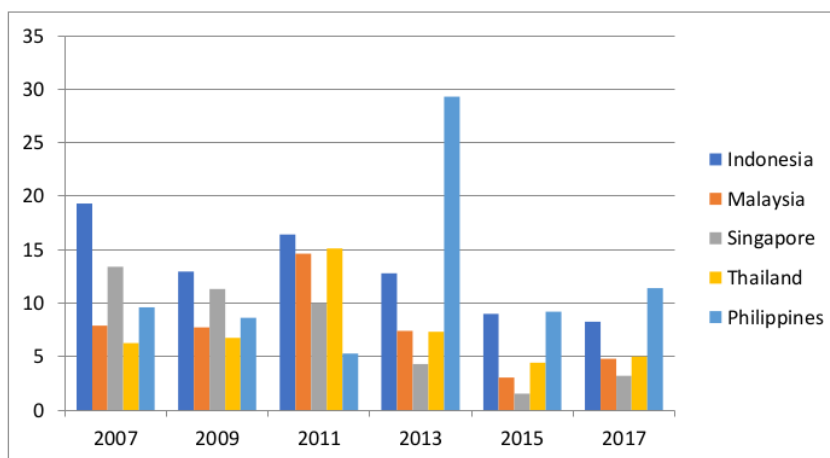
### INTRODUCTION

Money is any item or verifiable record that is generally accepted as payment for goods and services. In addition, the main functions of money are distinguished as: a medium of exchange and an installment of fee. Therefore, it can be generally acknowledged as a means of payment (Palley, 1999). However, as the economy developed, money whose function was initially as a means of payment grew into a unit of account and medium of storing wealth. Money as the economic institution served to improve human's ability to allocate economic resources (Abdulrazag et al. 2001). Its functions as an installment of fee, a deposit of value, a standard of value and a standard of payment will help humans improve the economic resource allocation efficiency which will then enhance their quality of life.

As the role of bank developed in the economy, the use of banknotes would decline and then be left behind. Public would prefer to save their money in the bank and deposit them into a saving account or current account because it was safer and more convenient (Bodeiono, 2002).

The Figure 1 displayed that the money supply in five ASEAN countries fluctuated significantly. When a crisis hit the region, there was a weakening in financial market and capital market causing a decline on macroeconomic variables in those countries. In the

same year, Indonesia had ratified their Sharia banking Act. The money supply in Malaysia either banknotes, M1 or M2 experienced a favorable growth.



Source: World Bank, 2018

**Figure 1.** The comparison of money supply in Indonesia and other ASEAN countries

Many factors affected the ups and downs of money supply in Indonesia both in narrow sense (M1) and broader sense (M2) such as credit interest rate, inflation rate, investment, government spending and foreign exchange reserves.

According to Marshall, the level of income influenced the money supply or the demand of money by the community or individuals as the owner of the wealth. In addition, that credit interest rate also provided impact on money supply and explained that speculation and the desire to speculate from individuals would cause the increase of money supply.

Indonesia, Malaysia, Singapore, Thailand and the Philippines are the countries that embrace an open economy. Cooperation between countries are established through export and import activities which require payment method that have an adequate price. In that case, the stability of currency value could affect the money supply. Also, the modernization of the economy caused changes in e-money usage. The more we use e-money, the less money supply there would be (Mankiw, 2009).

An excessive increase in the money supply could push up prices beyond the expected level and would cause an increase of inflation. As the result, the economic growth would be disrupted in the long run. On the other hand, if an increase in the money supply was too small, the economic downturn would occur. Consequently, the overall prosperity of the community would decline. These conditions motivated the government and monetary authorities to conduct efforts in controlling the money supply. This activity of controlling the money supply was commonly called monetary policy, an integral part of macroeconomic policy pursued by the monetary authority (Bank Indonesia, 2003).

The fluctuation of the money supply and the transformation of the economic structure in ASEAN countries resulted in this study that examines the causality among e-money, manufacturing, services and money supply.

## LITERATURE REVIEW

The strength of the platform business model has grown as our economy becomes progressively digital, but it also rises an uncertainty in the market. Therefore, how

industry and services react to overcome the challenges from the platform business model growth is essential. According to Jocevski et al. (2019), mobile payment is one of the strategies in the future digital transition to overcome uncertain market conditions, especially in industries and services. Modernization provided convenience in an economic activity. The movement of e-money is inseparable from the appearance of *fintech* as a new method of payment. The presence of this new industry has become an innovation in increasing industry and service growth. Milian et al., (2019) mentioned that *fintech* was a financial industry utilizing the communication availability, internet, and automatic information processing, which was closely related to economic activity, especially in the industrial and service sectors.

A regional economic growth provides a positive influence on changes in financial institutions and the economic growth and money supply have a very strong integration. In line with that, Campos et al. (2019) found out that European integration stimulated the economic growth in the region. The economic implementation in the digital transition can be seen from the Bitcoin trend as a substitute for traditional payment method. Schilling & Uhlig (2019) explained that Bitcoin money offer grew significantly with a simpler and more efficient use. In addition, e-money provided convenience in transactions (Wulandari et al., 2016). Several literature studies proved that e-money becoming a payment substitute gave benefits, especially in the service and industry sectors (Kok, 2002; Athanassiou & Mas-Guix, 2008).

Dragos et al. (2002) stated that the economies depend on each other. Their article presented a different statistical approach in analyzing the effects of money supply and inflation rates. Different monetary policies adopted by China and the United States could be a starting point in estimating inflation using data in the past and analyzing monetary policies adopted throughout the year. The model created would present different applications in China and the United States as China's economy was influenced by its political sector and unhealthy growth in money supply.

Lestari (2008) analyzed the impact of rupiah exchange rate instability on M2 money demand in Indonesia. The variables used were money demand (M2) as the dependent variables, with inflation, market interest rates, the exchange rate and real national income as the independent variables. The analysis used 4 (four) estimation methods; Vector Auto-Regression (VAR), impulse response functions test, variance decomposition test and ADL-ECM model test. The research found that there was a non-stationarity condition for time series data making macroeconomic stability difficult to achieve. Then, it took three quarters to adjust the balance between variables, and no two-way causality relationship was found for all variables. On the other hand, the M2 impulse response to the independent variable fluctuated, especially when the independent variable experienced a shock, but it could return to stable. Then, the exchange rate and M2 (money supply) relationship depended on the expectation of the money holders; therefore it was difficult to maintain a stable relationship between the exchange rate and money supply. Indonesians tend to believe that holding cash was not for transaction, but rather for precaution and speculation.

Lintangsari et al. (2011) conducted research to analyze the effect of non-cash payment methods on financial system stability in Indonesia. E-money and credit card transaction provided positive and significant influence on money supply. On the other hand, e-money transactions gave a negative effect on interest rates. However, credit card transaction had a significant and positive effect on interest rates.

Ritonga (2005) also conducted research on the effects of non-cash payment on economic growth in Indonesia. The results of the study showed that debit cards, credit

cards, and e-money had positive and significant effects on the money supply. The debit card had a significant positive effect on economic growth, but credit card had a negative effect on economic growth. Furthermore, e-money gave insignificant positive effect on economic growth, and the money supply had a positive but insignificant effect on economic growth. The analysis results showed that debit cards directly provided a positive influence on economic growth with the money supply as an intervening variable. Next, the credit card and e-money indirectly had a positive effect on economic growth with the money supply as an intervening variable.

**METHODS**

This study focused on determining the causality between economic growth in the manufacturing and service sectors, e-money and the money supply. The data used in this study were the time series data during 2008-2018 in the ASEAN Region. The data were obtained from the official website of the World Bank which included data on world development indicators and on the banking websites from the respective ASEAN countries. The details could be seen in Table 1.

**Table 1.** Variable description

Variable	Variable Description
Manufacturing MF	The economic growth in manufacturing sector during 2008-2018 in ASEAN (in %)
Service SC	The economic growth in service sector during 2008-2018 in ASEAN ( in %)
E-money E	e-money during 2008-2018 in ASEAN (in USD)
Money Supply M2	The money supply during 2008-2018 in ASEAN (in USD)

The study applied the dynamic relationship model with the Granger causality vector error correction model (VECM) with the following models:

- 1. The estimation model of manufacturing model with e-money

$$EM_{it} = a_i + \sum_{1i} \beta MF_{it-1} + \sum_{1i} EM_{it-1} + \varepsilon_{1it} \dots \dots \dots 3.1$$

$$MF_{it} = a_{2i} + \sum_{2it} \beta MF_{it-1} + \sum_{2i} EM_{it-1} + \varepsilon_{2it} \dots \dots \dots 3.2$$

- 2. The estimation model of service growth with e-money

$$EM_{it} = a_i + \sum_{1it} \beta SV_{it-1} + \sum_{1i} EM_{it-1} + \varepsilon_{1it} \dots \dots \dots 3.3$$

$$SV_{it} = a_{2i} + \sum_{2it} \beta SV_{it-1} + \sum_{2i} EM_{it-1} + \varepsilon_{2it} \dots \dots \dots 3.4$$

- 3. The estimation model of money supply (M2) with e-Money

$$EM_{it} = a_{it} + \sum_{1it} \beta M2_{it-1} + \sum_{1i} EM_{it-1} + \varepsilon_{1it} \dots \dots \dots 3.5$$

$$M2_{it} = a_{2it} + \sum_{2it} \beta M2_{it-1} + \sum_{2i} EM_{it-1} + \varepsilon_{2it} \dots \dots \dots 3.6$$

Note: EM= E-Money ; MF= Manufacturing Growth ; SV= Service Growth ; M2=Money Supply; i= ASEAN countries i= 2008-2018 t - 1= Lag.

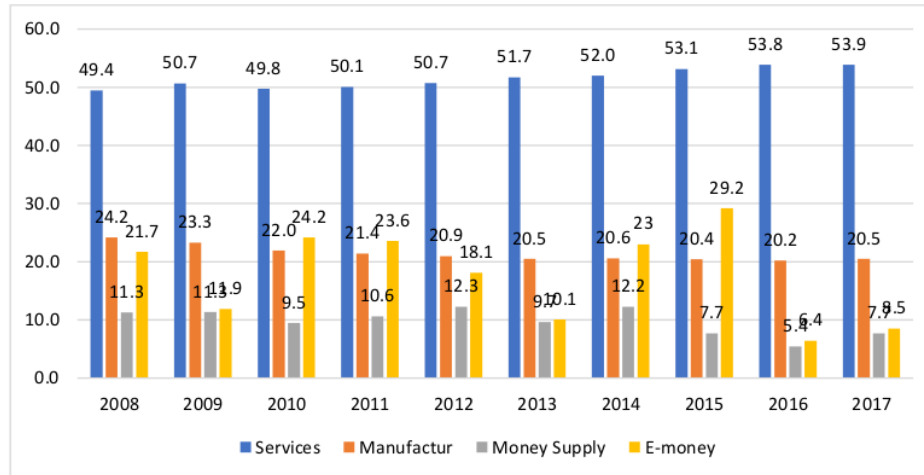
Before estimating VEC Granger causality model, several steps must be undergone such as testing stationary data with the unit root test, the im-pesaran-shin test (Pesaran et al., 2000) and Johansen co-integration test (Al-Sadoon, 2019).



## RESULTS AND DISCUSSION

### Descriptive analysis

Trends in the money supply, economic growth in the service sector and manufacturing in ASEAN countries are descriptively presented in Figure 2:



**Figure 2.** The money supply, economic growth in the service sector and manufacturing trend in ASEAN countries in the 2008-2017 period.

The trend of manufacturing growth has fluctuated descriptively during the 2008-2017 period in ASEAN countries. In line with this, the condition of the money supply and e-money fluctuates descriptively. However, in contrast to the growth in the service sector, which experienced an increase in general during the same period, the conditions indicate that there has been a transformation of the economic structure from the industrial sector to the service sector.

### Causality analysis

This research was conducted to discover the causality between economic growth in the manufacturing and service sectors, e-money and money supply. There were several testing steps conducted; stationary test, unit root test, im-pesaran-shin test (Pesaran et al., 2000), optimal lag test, and Johansen's co-integration test (Al-Sadoon, 2019). The first phase was the stationary test and im-pesaran-shin test and the result could be seen in Table 2

**Table 2.** Unit root panel first difference test

Series	t-Stat	Prob.
D(MANUFACTURING)	5.5910	0.0000
D(SERVICE)	3.3014	0.0005
D(E-MONEY)	4.6820	0.0000
D(M2)	1.6608	0.0484

Table 2 shows the results of unit root test at the first difference level. The results of economic growth in the manufacturing and service sectors, e-money and the stationary money supply at the first difference level are indicated by the probability value of im-pesaran-shin test which is smaller than the level of significance (1%, 5% and 10%). Thus,

this variable could be used to estimate the Granger causality panel with a vector error correction model (VECM).

Kao Residual Cointegration Test was conducted to determine the long-term relationship between the variables studied. Table 4 shows that the t-statistic probability which is smaller than the level of significance (1%, 5% and 10%) indicates a long-term relationship or a cointegration in the equation model.

**Table 3.** Kao residual cointegration test

	ADF	t-Statistic	Prob.
		-3.326278	0.0004
Residual variance		0.477957	
HAC variance		0.647404	

VECM estimation result shows that e-money had a one-way correlation with service growth and money supply. In another word, e-money stimulated the growth of services and the money supply, but not otherwise. The service growth and money supply did not trigger the development of e-money. On the other hand, manufacturing and e-money did not have a causality relationship. It meant that the increase in e-money use provided no impacts on the manufacturing industry. Simply put, the economic growth in ASEAN experienced a transition from industrial-based sector to service-based sector. The result was in line with the studies from Dragos et al. (2002), Lestari (2008) and Hariani et al. (2012). In conclusion, e-money had a correlation with the economic growth, as it was also stated by Chowdurry (2012) and Kartika et al (2014) in their studies.

**Table 5.** Causality Granger Test

Null Hypothesis:	Obs	F-Statistic	Prob.
E-money does not Granger Cause Manufacturing	45	0.51760	0.5999
Manufacturing does not Granger Cause E-money		0.40515	0.6696
Services does not Granger Cause E-money	45	3.20003	0.00291
E-money does not Granger Cause Services		1.45044	0.2458
E-money does not Granger Cause M2	45	2.89122	0.0957
M2 does not Granger Cause E-money		0.35941	0.5517

The findings of this study indicate that statistically e-money would grow when it is used as an electronic payment method in service-based sector. On the other hand, the growth of the manufacturing industry did not give a causal effect on e-money. Hence, transition from industrial sector to service sector stimulated e-money to expand. The use of e-money would increase as the service-based sector grew. An advance in technology led to changes in dominant sectors in the ASEAN economic growth.

Findings in this study show the transformation of economic structures in ASEAN countries from the manufacturing sector to the services. This situation resulted in a change in the use of e-money, in an effective trend of the use of e-money with the existence of digitization in the service sector impacts on the condition of the money supply.

## CONCLUSIONS AND RECOMMENDATIONS

### Conclusion

This study analyzed the causality between the economic growth in manufacturing and services, e-money and money supply which results show that there was a one-way causality between e-money with service growth and the money supply. The impact of e-money would empirically determine the growth of services and the use of e-money. Thus, the raise of digitization especially the increase of e-money would affect the service sector

and the growth of the money supply. In other word, e-money did not have any impacts on the manufacturing industry in ASEAN. The economic implication was that the growth of service sector would encourage e-money. It means that money substitution occurred when manufacturing growth existed. Changes in the economic structure from manufacturing industry to services led to more massive use of electronic money. Therefore, the monetary regulation should be developed to respond the growth of e-money as a means of payment in the future.

### Recommendations

Policy recommendations must be established. Given the increasing and unpredictable digital growth trend, it is necessary to control the use of e-money especially in the service sector so that the stability of the money supply is achieved. In addition, further studies are needed taking e-money and digitization as important aspects in determining the supply of modern money.

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