International Journal of Psychosocial Rehabilitation, Vol. 24, Issue 01, 2020
ISSN: 1475-7192

Influence of Cryptocurrency on the Economy Of 5 ASEAN Country

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Abstract---*A cryptocurrency is a digital currency designed to work as a standard of exchange that uses cryptography for safekeeping (D'Alfonso, Langer, & Vandelis, 2016). In the world of cryptocurrency, there are over 800 types of cryptocurrency for people to choose, but the most significant & widely used is Bitcoin. In 2008, Satoshi Nakamoto was first established the Bitcoin and Bitcoin is designed as a peer-to-peer network which prevents cash from double-spending (D'Alfonso et al., 2016). Bitcoin is a new form of secure currency that does not need a bank government agency or middleman to operate. As a result, it effects a monetary system which operates outside government regulation, threatens the consistency of financial systems and financial sovereignty of countries. It is a fully digital currency and to exchange bitcoins between computer a peer-to-peer network is required. The whole point is, it shares stuff by letting people make copies to download. The people with having system just carry out transaction among themselves what is called a decentralized network or blockchain. Blockchain uses to structure all the data, which allow the creation of decentralized digital ledgers where a person cannot hack another transaction. Furthermore, blockchain record all the transaction and act as an accounting system (Gandal & Halaburda, 2010).*

Keywords---*Cryptocurrency, ASEAN, Blockchain*

I. Introduction

Blockchain record every bitcoin transaction that has ever happened. Even though it is a central record, there is no official handling of the ledger and keep on tracking everybody's money as done by the bank. Therefore, anyone can be volunteer to keep the record of updated blockchains with a record of all the new transactions. There are number of people who are doing this job of tracking the record of similar things to make it sure that all the recorded transactions are accurate.

Bitcoin one of the fastest growing assets in all history. The bitcoin system in the unit of account is bitcoin. Firms who own the computing power and participate in the Bitcoin Network are consist of miners and nodes. Motivated by rewards (the release of new bitcoin) and transaction fees paid in bitcoin. They have an authority to decentralized the credibility of the Bitcoin Network (Kotobi & Bilen, 2017). Bitcoin used as alternative units called mBTC (millibitcoin) and satoshi in a small amount of bitcoin. A satoshi is one of the smallest amounts inside bitcoin representing 0.00000001 bitcoin divisible to eight decimals, one hundred millionth of a bitcoin. 0.001 bitcoin is the same as equal to a milli-bitcoin, one thousandth of a bitcoin or 100,000 satoshi (Seetharaman, Saravanan, Patwa, & Mehta, 2017).

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The internet has a significant role in the development and performance of economies in most of the country in the world. Thus, one of the inventions and innovation emerge from the development of the internet is digital currencies. One of the forms of digital currencies is cryptocurrency which are purely digital and used primarily online as describe by (Gandal & Halaburda, 2010). The paper also stated that the earliest form of cryptocurrency called Bitcoin was introduced in 2009. However, it takes several years later for the Bitcoin to enter the mainstream media attention.

Another source of journal by (D'Alfonso et al., 2016), describe the underlying principle of cryptocurrency which is standard of exchange that uses cryptography for safekeeping. After the successful introduction of Bitcoin to the mainstream, cryptocurrency world offers over 800 types of cryptocurrency. It is a new form of secure currency that does not need a bank government agency or middleman to operate. As a result, it's effects a certain part monetary system operates outside government regulation, threatens the consistency of financial systems and financial sovereignty of countries. In Malaysia, cryptocurrency is regulated by the central Bank of Malaysia through the enactment of regulation under policy paper 'Anti-Money Laundering and Counter Financing of Terrorism Policy for Digital Currencies". This show the concern of government toward cryptocurrency.

This study is to identify the cryptocurrency influence on the economy of five South East Asia countries. In the research, the time frame selected were from 2009 to 2017 and the data is collected on monthly basis. The data collected are from the secondary sources to determine the changes of money supply as one of the economic indicators of a country. The main objective of the research is to study the influence of cryptocurrency on the economy of five South East Asia using money supply indicator. Furthermore, the influence on the money supply is analyses using inflation, key interest rate, currency exchange rate, Bitcoin number in circulation and Bitcoin market capitalization variables.

II. LITERATURE REVIEW

A study by Khvan, (2016) focuses on the US money supply and explains the history regarding the bitcoin development and analyse either cryptocurrency is becoming the primary means of payments for the goods and services, which is replacing the familiar world currency.

Seetharaman et al., (2017) were the authors of "Impact of Bitcoin as a World Currency": understand multiple factors which are translating Bitcoin that is gaining momentum in various fields of global finance and how disruptive it can be. Another study by Khvan (2016) analyse the cryptocurrency impact on the Russian economy.

Money Supply

The central bank in most of the country is aware of the influence of cryptocurrency toward a country's currency which is mainly based on the "fiat money" (Šurda, 2012). Thus, the fundamental exchange rate of a currency is based on the demand and supply of the currency toward another currency between two countries. The money supply as an economic indicator in the economy is view as inflation rises, the money supply should decrease. The more expensive a foreign currency is, the more money supply should be in the economy. The impact of Bitcoin market capital is positive toward the money supply (Khvan, 2016).

Inflation

Majority of cryptocurrencies have been designed to decrease the impact of new units, which make it reach a cap on the total value of the currencies to prevent high inflation (Pärlstrand & Rydén, 2015). Mining adds more currency to the existing supply of the cryptocurrency, thus ensuring a steady supply and preventing inflation, which would otherwise be

caused by increasing demand and limited supply (Syed, Moge, & Siddiqui, 2016). Bitcoin was designed to follow a currency supply plan alike a gold standard monetary policy. This means that there is a cap on the total amount of Bitcoins that can be mined. Once the cap is reached, the currency is supposed to be inflation-free (Nica, Piotrowska, & Schenk-Hoppé, 2017). Nakamoto, the creator of Bitcoin seemed to believe that a decreasing supply of money will not lead to inflation (Iwamura, Kitamura, & Matsumoto, 2014).

Venezuela, where the inflation was recorded highest in 2017 to 1600% (as predicted by the IMF), has some firms which started accepting payments in only bitcoins (Nica et al., 2017). Venezuela's President Nicolas Maduro developed policies to allow a significant use of bitcoin. The question is Why did Nakamoto set a limit of total Bitcoin issues? It seemed to be believed that supply of money is decreasing but this will not impact on inflation (Iwamura, Kitamura, & Matsumoto, 2014).

Key Interest Rate

Central bank fiat created currency which aimed to ensure appropriate liquidity in an economy. But the price of this is determined by the supply and demand which is measured by the domestic market's interest rate and an international exchange rate. The tightening of the monetary policy raises short-term interest rates which discourage borrowing and curtail lending. Higher interest rates tend to bolster the foreign exchange rate. Both exchange rate and interest rates are influenced by the central bank (Dodwell, 2015).

Exchange Rate

While bitcoin prices themselves are highly volatile and only weakly correlated with conventional nominal exchange rates. Monetary tightening raises short-term interest rates to curtail lending and discourage borrowing. Higher interest rates tend to bolster the foreign exchange rate. The central bank influences the interest rate and the exchange rate (Dodwell, 2015). The Bitcoin to the US dollar exchange rate has been very volatile and fluctuating significantly. Although Bitcoin was designed as a medium of exchange, it is now more as an investment tool (Bueno, Fortes, & Vlachoski, 2017).

Bitcoin circulation and capitalization

Multidirectional influence of the number of bitcoins in circulation and their market capitalization. money supply. if the number of bitcoins in the economy increases, the money supply will decrease. Cryptocurrency exchanges scattered across the globe offer platforms on which tokens are bought and sold, often with wild price fluctuations. Why did Nakamoto set a limit of total Bitcoin issues? Because he seemed to believe that a decreasing supply of money will not lead to inflation(Iwamura et al., 2014).

Thus, the hypothesis being studies are as follows:

H1 : There is a significant impact between inflation and money supply in the economy

H2 : There is a significant impact between key interest rate and money supply in the economy

H3 : There is a significant impact between currency exchange rate and money supply in the economy

H4 : There is a significant impact between Bitcoin number in circulation and money supply in the economy

H5 : There is a significant impact between Bitcoin market capital and money supply in the economy

III. Methodology

This research describes about the purpose of causal study and experimental research which explore the effect of money supply aggregate on the cryptocurrency determinant for causal study and the economic or cryptocurrency variable are manipulated to determine the effect on the money supply aggregate. The economic theory has many factor and effect between the variable in order to best explain the relationship between the variable. The experiment involves manipulation of the independent variable cryptocurrency determinant to observe the effect on the dependent variable money supply aggregate.

Data Collection

A data to performed statistical analysis was obtained from secondary sources as data collection instrument. The data is gathered from different type of resources such as official statistical data publish by the Central Bank and the Bitcoin market historical data publish by the Bitcoin market watch website such as bitcoincharts.com and coinmarketcap.com that offer the data regarding the Bitcoin market in the world. Next, all the variable collected range from April 2013 until march 2018. The starting data duration is different from each country as the Bitcoin market from each of the country establish at a different time frame. Thus, all the data collected is depend on the market establishment in a country and the availability of the data. The Bitcoin market is generally new in South East Asia Region. Therefore, the data collection is limited to a given period of the Bitcoin market in a country involves.

For the data analysis used to achieve the goal research. This research used a "Regression Analysis Of Cryptocurrency Influence On the Russian Economy" (Khvan, 2016) regarding the correct used of the data variable and quantitative unit . The values are selected for each month from April 2013 to March 2018 to constructed a regression model for the following data.

Table 1: Definition of Variables

Variable	Description
M1	Money supply (monetary aggregate M1), USD
P	Monthly growth of price level (the rate of increase in CPI to the previous month)
KEY_INTEREST_RATE	The Central Bank Key rate, %
DOLLAR	Weighted average exchange rate to USD
BTC_NUMBER	The number bitcoins in circulation in Malaysia, (number of bitcoins in circulation multiplied by the exchange rate), USD
BTC_CAP	The market capitalization of Bitcoin (bitcoins capitalization multiplied by the exchange rate), USD

Sample Selection

In cryptocurrency world, there are more than 800 types of digital currency as describe by (D'Alfonso et al., 2016). Thus, Bitcoin is the most popular digital currency in the world and have highest market capitalization among digital currency. Bitcoin was used in this research in order to have strong data because of its history and the earliest form of cryptocurrency. Therefore, Bitcoin number in domestic circulation and Bitcoin capitalization in the world are included. Furthermore, after

further research from various research paper conclude that our decision to use this variable would impact on money supply in a country. The Bitcoin variable used to represent the cryptocurrency is included as the target sampling in this research to identify the impact on the money supply in circulation.

In this research, the data collected which comprise of 42 months (Malaysia), 60 months (Singapore and Thailand) and 50 months (Indonesia) in the time frame within 2013 until 2018 and year duration within 6 years. Monthly data was used in this study to increase the sample size used in this research. The data duration is varied depend on the Bitcoin domestic market in a country. Different country has different data variation because of Bitcoin market establishment in South East Asia country is still new. The secondary data collected is from various sources of statistical data from Central Bank of Malaysia source from (Malaysia, 2018), Monetary Authority of Singapore sources from (SGD & SGD, 2017), Bank Sentral Republik Indonesia source from (Indonesia, 2018) and Bank of Thailand source from (Bank of Thailand, 2018).

The monthly money aggregate in circulation, consumer price index (CPI), central bank key interest rate, foreign exchange rate, Bitcoin number in domestic circulation and Bitcoin market capitalization in the world were extracted and recorded in ascending order which from oldest to the latest data. Next, all the data in the form of domestic currency is convert to USD currency calculated and recorded. The data were calculated and convert in Microsoft Excel and the data was recalculated to maintain consistency and accuracy compared with previous calculation.

Regression Model

The dependent variable outcome in the multiple linear regression model was computed using a few variables. The aim of the method is to interpret the correlation between variable. The method of statistical used in the research is Ordinary Least Square (OLS). The method used is to determine and estimate the relationship between two variables using the data collected. Thus, the multiple regression is constructed as below:

$$\ln y = B0 + B1DBi + B2DBi + B3DBi + B4X1 + B5X2 + B6X3 + B7 \ln X4 + B8 \ln X5 + e \quad (1)$$

where;

y = The money supply aggregate, M1 in domestic circulation

B0 = Intercept

B1, B2, B3 = Dummy

B4, B5, B6, B7, B8 = Coefficient of Regression

e = Error Term

IV. RESULTS

Diagnostics

The correlation was carried out next to investigate the magnitude of correlation between the variable. Pearson correlation ranges from -1.0 to +1.0. Based on the result above, we found out that there is correlation between inflation, key interest rate, dollar and bitcoin number in circulation.

Table 2: Pearson Correlation

Correlations

		M1 (USD)	P(2010=100)	Key_Interest_ Rate	Dollar	ln_BTC_Cap (USD)	ln_BTC_Num ber (USD)	Singapore	Indonesia	Thailand
M1 (USD)	Pearson Correlation	1	-.816**	.507**	-.991**	-.034	-.495**	.432**	-.993**	.245**
	Sig. (2-tailed)		.000	.000	.000	.624	.000	.000	.000	.000
	N	212	212	212	212	212	212	212	212	212

There is a serios multicollinearity problem occur with variable key interest rate and foreign exchange as Variance Inflation Factor (VIF) is more than 10. However, the majority of the variable which is inflation, Bitcoin capitalization and Bitcoin number in circulation indicating that there is no multicollinearity which is more than 10. Tolerance cutoff when less than 0.1 will indicate that VIF is more than 10 which is a problematic.

Table 3: Variance Inflating Factor

Coefficients[a]

Model		Collinearity Statistics	
		Tolerance	VIF
1	P(2010=100)	.109	9.142
	Key_Interest_Rate	.046	21.934
	Dollar	.003	369.259
	ln_BTC_Cap (USD)	.269	3.715
	ln_BTC_Number (USD)	.153	6.557
	Singapore	.033	30.286
	Indonesia	.003	381.577
	Thailand	.099	10.056

a. Dependent Variable: M1 (USD)

The Durbin Watson value is 0.458 situated between 0 and dl (1.643). Thus, this indicate that the data have positive autocorrelation.

Multiple Regressions

Throughout the empirical analysis, confidence level of 5% or p-value = 0.05 were used as a standard in determining the significant of results. When the p-value is greater than 0.05, the regressed model and variables are significant. The result regarding the empirical result of the model is record as below.

Table 4: Regression Results

	Coefficient	**p-value**
Constant, B0	9.403	0.00
Singapore, B1	0.37	0.00
Indonesia, B2	-7.237	0.00
Thailand, B3	-0.513	0.00
P, B4	-0.005	0.00
Key_Interest_Rate, B5	0.000	0.38
Dollar, B6	0.071	0.11
ln_BTC_Number, B7	-0.022	0.00
ln_BTC_Cap, B8	0.71	0.00
R2	0.82	
Adjusted R2	0.78	

V. Discussion

The main objective of the research is to study the influence of cryptocurrency on the economy of five South East Asia using money supply indicator. Furthermore, the influence on the money supply is analyze using inflation, key interest rate, currency exchange rate, Bitcoin number in circulation and Bitcoin market capitalization variables. Five (5) hypothesis were developed and SPSS software is used to run the analysis. The study tested five (5) hypotheses which three (3) are supported.

Table 5: Summary of Results

Hypothesis	Outcome
H1	Supported
H2	Not Supported
H3	Not Supported
H4	Supported
H5	Supported

The first research question is "Is there any significant impact between inflation and money supply rate in the economy" hypothesis 1 is formed to determine the effect of inflation on money supply rate in the economy. The result is found to be significant, thus Hypothesis 1 is supported. It indicates that there are some dependencies is not followed the concept of economy, if the inflation increases, the money supply should reduce. The explanation is the money aggregate M1 includes not just cash in circulation but fund on settlement and current bank account. The price increase encourages the consumer and businesses to keep their money in longer term deposit or transfer their account in foreign bank including cryptocurrency.

The second research question is "Is there any significant impact between interest rate and money supply in the economy" hypothesis 2 is formed to determine the effect of key interest rate on money supply rate in the economy. The result is not found to be significant, thus Hypothesis 2 is not supported. This can be interpreted by people will keep their money in the long-term deposit as the interest rate increase cause the demand of money decrease. Thus, central bank will apply the policy of increase the supply of money in the circulation. This explained why there is no significant relationship between money supply and key interest rate. Because the policy of central bank impose to the interest rate is not determined by the supply of money in circulation.

The third research question is "Is there any significant impact between currency exchange rate and money supply in the economy" hypothesis 3 is formed to determine the effect of foreign exchange rate on money supply rate in the economy. The result is not found to be significant, thus Hypothesis 3 is not supported. The significant value shows that the hypothesis independent variable (foreign exchange) has a negative relationship with dependent variable (money supply) with amount of 0.110 and it is more than 0.05. The model predicts that a 1% increase in weighted average exchange rate to USD leads to an increase in money aggregate of money supply M1 in circulation by 0.0017 unit. This situation can be explained by the demand of the local currency increase cause by increasing in export and economic growth. Thus, the money supply in the circulation increasing due to foreign country investment and spending. The more expensive a foreign currency is, the more money supply should be in the economy.

The forth research question is "Is there any significant impact between Bitcoin number in circulation and money supply in the economy" hypothesis 4 is formed to determine the effect of Bitcoin number in circulation on money supply rate in the economy. The result is found to be significant, thus Hypothesis 4 is supported. The significant value proofs that the hypothesis independent value (bitcoin cap) has a positive relationship with dependent variable (money supply) with

amount of 0.000. if bitcoin capitalization increase, the money supply should increase due to high demand of local currency due to the adoption of cryptocurrency.

The fifth research question is "Is there any significant impact between Bitcoin number in circulation and money supply in the economy" hypothesis 5 is formed to determine the effect of Bitcoin number in circulation on money supply rate in the economy. The result is found to be significant, thus Hypothesis 5 is supported. The significant value shows that the hypothesis independent variable (bitcoin number) has a positive relationship with dependent variable (money supply) with amount of 0.000. The model predicts that a 1% increase in the number of bitcoins in circulation leads to a decrease money aggregate of money supply M1 in circulation by 0.022 unit.

VI. Conclusion

By referring the empirical analysis result, all of the independent variable has positive and significant impact on MYR/USD exchange rate whereas the dollar and key interest rate show insignificant result. The model predicts that a 1% increase in monthly growth of price level leads to an increase in Money aggregate of money supply M1 in circulation by 0.5 unit. There are some dependencies is not followed the concept of economy, if the inflation increases, the money supply should reduce. The explanation is the money aggregate M1 includes not just cash in circulation but fund on settlement and current bank account. The price increase encourages the consumer and businesses to keep their money in longer term deposit or transfer their account in foreign bank including cryptocurrency.

The model predicts that a 1% increase in Key Interest Rate (Central Bank Key Rate) leads to increase in money aggregate of money supply M1 in circulation by 1.1 unit. This can be interpreted by people will keep their money in the long-term deposit as the interest rate increase cause the demand of money decrease. Thus, central bank will apply the policy of increase the supply of money in the circulation. This explained why there is no significant relationship between money supply and key interest rate. Because the policy of central bank impose to the interest rate is not determine by the supply of money circulation.

The model predicts that a 1% increase in weighted average exchange rate to USD leads to an increase in money aggregate of money supply M1 in circulation by 0.0017 unit. This situation can be explained by the demand of the local currency increase cause by increasing in export and economic growth. Thus, the money supply in the circulation increasing due to foreign country investment and spending. The more expensive a foreign currency is the more money supply should be in the economy. There is no relationship between money supply and exchange rate because exchange rate determines by the increase of export, economy growth and others indicator not only by the money supply indicator.

The model predicts that a 1% increase in the market capitalization of Bitcoin leads to an increase in money aggregate of money supply M1 in circulation by 0.071 unit. If bitcoin capitalization increase, the money supply should increase due to high demand of local currency due to the adoption of cryptocurrency.

The model predicts that a 1% increase in the number of bitcoins in circulation leads to a decrease money aggregate of money supply M1 in circulation by 0.022 unit. The increasing number of Bitcoin in the economy, the money supply will decrease explain by the people transfer/convert their money in the form of cryptocurrency.

VII. Recommendations

The result of this study provides an insight for policy makers and future researcher on cryptocurrency that have impact on the economy in term of money supply indicator. In this study, monthly data regarding the exchange rate and bitcoin number in circulation is collected. This might have problem to determine the actual volatility as monthly data might not

respond and track the data precisely. Future researcher can use the weekly and daily data due to high frequency and larger sample size contain more information. Future researcher is advisable to replace insignificant variable with another variable. Include macroeconomics factors such as gross domestic production, deposit and income. Lastly, this study can be a reference for future research regarding cryptocurrency other than Bitcoin such as Ethereum and Dash.

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