

## Do Monetary Variables Affect to Cryptocurrency Price? Lesson from Indonesia

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Received: June, 2018; Accepted: November, 2019; Published: November, 2019

Permalink/DOI: <http://dx.doi.org/10.17977/um002v11i22019p131>

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### Abstract

This study examines the influence of monetary variables and cryptocurrency price. The paper applied Vector Autoregression (VAR) to analyze multivariate time series data. The data used in this study is time series data from January 2014 to December 2017. The findings indicate that there is no significant influence between inflation and the cryptocurrency prices in the first period. However, the results in the second period, decomposition variant had a significant relationship and experienced a fairly rapid increase of 1.59 per cent and continued to increase until the tenth period. The interest rate variable on the price of cryptocurrency has the result of the Variant Decomposition in the first period does not have a significant relationship, while in the second period experienced a significant incline from 6.12 per cent and continued to rise until the tenth period.

**Keywords:** *Cryptocurrency, bitcoin prices, inflation, money supply*

**JEL Classification:** E43; E44, E51

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### INTRODUCTION

Financial innovation rapidly increases every year as well as globalization, financial liberalization, and deregulation. This movement should be supported by developing new legal instruments as well as technological advances in information and communication. One of the financial innovations after the financial crisis in 2008 was the existence of the cryptocurrency. Cryptocurrency is used as financial instruments and especially Bitcoin is called alternative investment with diversification benefits (Briere et al., 2013). Cryptocurrency emerged in response to the obstacles faced by the current payment system that relies heavily on third parties as a company issuing payment products that are believed to make digital transaction management such as Visa, Master card, and Paypal. Bitcoin is widely used by users in the world including in Indonesia. Bitcoin is not produced, published and supplied by a single government but made by people who use bitcoin. Indonesian is one of the countries that are potential sites for bitcoin trades. Bitcoin has been traded by many people in Indonesian since 2013.

The cryptocurrency is best known among the people with the upper-middle-class social (71%). As many as 64 per cent of the middle class are not familiar with cryptocurrency, even more than half (51%) of the lower middle class in Indonesia

are also familiar with cryptocurrency. In Indonesia, cryptocurrency has been designated as the subject of a commodity that can be traded on the futures trading market by the Ministry of Trade through the Commodity Futures Trading Supervisory Agency. In early of 2017, bitcoin, which is one type of cryptocurrency, has increased in value by more than 500 per cent, making it one of the best-performing assets. Nearly half of those who know cryptocurrency in Indonesia consider bitcoin, and another cryptocurrency as safe investment products. Even though bitcoin already traded in Indonesia, the Indonesian government does not create new rules about bitcoin. According to Bank Indonesia regulations, namely Act No. 7 of 2011 concerning currency, Law No. 6 of 2009, and Law 23 of 1999, which states that bitcoin and other digital currencies are not a valid currency or payment instruments in Indonesia. In January 2017, there were 250,000 active bitcoin users, with a trading volume worth approximately USD 1,48 million (Singgih, 2017). Many people see bitcoin as an investment, and they began to buy bitcoin on the exchange bitcoin. This is reasonable why the price of bitcoin began to be increased in 2013 until and it reached USD 7971.43 in 2018.

As previously mentioned, bitcoin is not a currency that is controlled by the government. That is why bitcoin is called decentralized currency. Therefore, bitcoin does not have any legal protection. When there is fraud related to the trading of bitcoin, no government will take any action to solve that problem. It means that the risk is higher than for conventional currency. In addition to high risk, bitcoin also has several benefits, such as the risk of low inflation. bitcoin is separated from the real economic conditions. Other currencies can lose purchasing power every year as the government continues to print money. The maximum limit for bitcoin is 21 million coins so that users will not experience the same condition as when they hold more conventional currencies. Risks to price stability of fiat currencies. This is primarily related to the money supply, the speed of rotation of cash, the interaction between economic actors as well as protection against fiat currencies.

By understanding the factors that influence the price of bitcoin allows people to try to predict the right effects in the long and short term. Hopefully, this research will provide a better perspective from bitcoin to several parties, including the Indonesian government, that make them can make regulations, and provide protection for, or prohibit, bitcoin transactions in Indonesia, such as in China. On one hand, it has made interesting progress with its price growth, but on the other hand, it is an illegal currency. This research wonders about the role of bitcoin in the future. Will bitcoin be a legal currency or just one of many investment products? Based on some previous studies, for example, Wu, Pandey, & Dba (2014) who mentioned bitcoin's role as a currency and its efficiency as an investment asset. They concluded that Bitcoin is less useful as a currency but it can play an important role in enhancing the efficiency of an investor's portfolio. Another piece of research conducted by Bergstra & Weijland (2014) said that bitcoin is a Money-Like Informational Commodity (MLIC). Jia (2013) concluded that bitcoin has its major function as a currency, but it is not yet a real currency. Das & Kannadhasan (2018) mentioned that bitcoin is insulated from global factors in the short run but cannot be denied in the medium long run. The previous study conducted by Sukamulja & Sikora (2018) remarked that the macroeconomic indicator showed by Dow Jones Industrial Average (DJIA) has a significant negative influence in the long-run and in the short-run. Sovbetov (2018) showed that cryptomarket-related factors such as

market beta, trading volume, and volatility appear to be a significant determinant for all five cryptocurrencies both in the short-run and in the long-run. Phillips & Gorse (2018) stated that that medium-term positive correlation between online factors and price strengthen significantly during bubble-like regimes of the price series; this explains why these relationships have previously been seen to appear and disappear over time.

Therefore, the purpose of this research is to provide an understanding of the effect of monetary variables on the price of cryptocurrency. This research is important because as a reference that Bitcoin is a very unique currency because it has no relationship with the government or any party, this system is decentralized, meaning that everyone can manage it, and this is unique because there is a limit to the supply of bitcoin, which is 21 million; but this is also a potential problem in the future. The historical price of bitcoin has become the biggest influence on the price of bitcoin. Some people who want to buy bitcoin always see its historical price, which tends to increase every year, and therefore people want to buy bitcoin because they think it has a bright future. This means that demand, and users, bitcoin also increases. Cryptocurrency as the findings of modern technology such as the results of other technologies such as drones, high-speed internet, as well as digital and multimedia devices, while the pro and contra on cryptocurrency development potential to create an increasingly dynamic economic activity.

## METHOD

The data were collected with reference to a currency USD converted into IDR. The variables in this study consisted of cryptocurrency, inflation, interest rates and money supply. The paper applied Vector Autoregression (VAR) to analyze multivariate time series. The data used in this study is time series data from January 2014 to December 2017. The data of Bitcoin price taken from [www.quandl.com](http://www.quandl.com) while the variable inflation, interest rates, and the money supply are collected from Statistics Indonesia (BPS). The theoretical framework indicates that the price of bitcoin and other explanatory variables are interdependent on one another. Estimated non-linear interdependence between the time series of interdependent with each other co-integration variables subject to endogen problems (Lutkepohl & Kratzig, 2004).

**Stationarity Data Test**, Stationarity test used is the ADF (Augmented Dickey Fuller) using a 5% significance level. Otherwise stationary data set if the average value and variance of the time series data did not change systematically all the time or most of the expert declared average and constant.

$$\Delta Y_t - \alpha_0 + \gamma Y_t + \sum \beta \Delta Y_{t-1} + 1 = \epsilon_t$$

Where  $\Delta Y_t$  is the first or second difference,  $\alpha_0$  is the intercept,  $\gamma$  is the observed variables, and  $\epsilon_t$  is an error term. Determination of Long Lag, before estimating VAR starts by determining what is right for the lag length of the VAR model. Determination of the optimal lag length is the most important in the estimation model VAR. If the optimal lag is too short it is feared could not explain the dynamics of the model as a whole.

**Cointegration test**, method that is performed in the Johansen cointegration test is Method developed by Johansen and Juselius (1990) and Johansen (1991).

The conduct cointegration test aims to determine whether the balance in the long term that there is equality movement and stability of the relationship between the variables in the study. If the observed variables are not cointegrated then the relevant model is unrestricted VAR models but if found long-term relationship between the variables cointegrated then applied the model is a model VECM (Vector Error Correction Model).

Estimation of VAR (Vector Autoregression) is one method that uses time series in a study, especially economics. VAR is also a very useful analytical tool, both in understanding the reciprocal relationship between economic variables, as well as in the establishment of an economic model structured. **Granger Causality Test**, is aimed to see the influences of the past on the present conditions in which this test for time series data. Test IRF (Impulse Response Functions) is to know the shock of a system VAR (Vector Autoregressive). IRF also identifies the level of responsiveness of the level of responsiveness of the dependent variable (endogenous variable) in the case of shock VAR of error term. VD test (Variance Decomposition) measures the contribution of each form of shock to the error variance. Variance decomposition aims to measure the contribution or influence the composition of each independent variable on the dependent variable.

## RESULTS AND DISCUSSION

The first test is the stationary test which uses an Augmented Dickey-Fuller (ADF) method. The purpose of this test is to examine whether the data is stationary or not. From Table 1 it can be seen that from the results of the stationary test in the level degree, all of the data are not stationary because of the t-statistic > MacKinnon's critical value. The results of the t-statistic for the variables Inflation, Money Supply, Interest rates, Cryptocurrency are as large as -2.409600, 0.052949, -0.451381, 2.377580, respectively. Therefore, the data will be tested in the first-difference degree. All of the data are already stationary in the first-difference degree because of the t-statistic < MacKinnon's critical value. The result of the ADF t-statistics for Inflation, Money Supply, Interest Rates, Cryptocurrency are as large as -6.792323, -9.366117, -6.502531, -13.89453, respectively.

Table 1. Stationary Test in the First-Difference Degree

<b>Inflation</b>	<b>t-Statistic</b>	<b>Prob.*</b>
Augmented Dickey-Fuller test statistic	-6.792323	0.0000
Test critical values: 1% level	-3.513344	
5% level	-2.897678	
10% level	-2.586103	
<b>Money Supply</b>	<b>t-Statistic</b>	<b>Prob.*</b>
Augmented Dickey-Fuller test statistic	-9.366117	0.0000
Test critical values: 1% level	-3.513344	
5% level	-2.897678	
10% level	-2.586103	
<b>Interest Rates</b>	<b>t-Statistic</b>	<b>Prob.*</b>
Augmented Dickey-Fuller test statistic	-6.502531	0.0000
Test critical values: 1% level	-3.512290	
5% level	-2.897223	
10% level	-2.585861	
<b>Cryptocurrency</b>	<b>t-Statistic</b>	<b>Prob.*</b>
Augmented Dickey-Fuller test statistic	-13.89453	0.0001

Test critical values:	1% level	-3.512290
	5% level	-2.897223
	10% level	-2.585861

Note: \*MacKinnon (1996) one-sided p-values.  
Source: Authors (2018)

Table 1 provides information about the stationary test in the first difference degree. It is known from the stationary test (Table 1), then there is no stationary data at the level because it is higher than 0.05 or 5 per cent. It requires further testing, namely the unit root test at the level of the first difference and the second difference. And the results of all the variables succeed in the first or stationary difference in the first difference so that the VAR analysis model can be continued.

Table 2. Optimal Lag Test

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-813.1640	NA	25663.21	21.50432	21.62699	21.55334
1	-731.9337	151.7724	4614.605	19.78773	20.40108*	20.03285*
2	-711.9902	35.16358	4175.166	19.68395	20.78798	20.12518
3	-707.0741	8.150308	5640.407	19.97563	21.57035	20.61296
4	-674.8218	50.07588*	3741.378*	19.54794*	21.63334	20.38137
5	-665.2289	13.88448	4555.211	19.71655	22.29262	20.74607
6	-655.8606	12.57321	5659.903	19.89107	22.95782	21.11669
7	-640.0909	19.50473	6052.576	19.89713	23.45456	21.31885

Source: Authors (2018)

Table 2 present the results of the optimal lag's determination. From the table, it can be seen that according to the SIC, the lag that should be used in this analysis is 2 because of the sign (\*) is found in the third row. After finishing with determining the optimal lag, the data are preceded by Granger's causality test. By comparing the alpha, which is 0.01, 0.05, and 0.10, with the results, Granger's causality test shows the following findings.

From the results in Table 3, it can be seen that there is a two-way relationship between Inflation and interest rates because the probability is less than the alpha. cryptocurrency not statistically significantly affect inflation and otherwise, inflation does not affect cryptocurrency with a value of 0.4980 and 0.04980 Probability which means accepting the null hypothesis that concluded that there is no causality whatsoever to these two variables. Variable of interest rates does not statistically and significantly affect inflation by 0.2310 thus accept the null hypothesis, while statistically, significant inflation affects the interest rate of 0.0018 to reject the null hypothesis. Concluded that a unidirectional causality between the variable interest rate and the inflation rate is significant only affect inflation and does not apply in reverse. The variable money supply does not significantly affect cryptocurrency with a Probability value of 0.3664 so it accepts the null hypothesis. Meanwhile, the cryptocurrency variable does not significantly affect the money supply with a Prob value of 0.5415 so that it accepts the null hypothesis. Therefore, it can be concluded that between cryptocurrency and the money supply did not occur in any causality for both these variables.

Table 3. Granger Causality Test

Null Hypothesis:	Obs	F-Statistic	Prob.
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CRYPTO does not Granger Cause Interest Rate	82	0.51287	0.6008
Interest Rate does not Granger Cause CRYPTO		2.01986	0.1396
Money Supply does not Granger Cause Interest Rate	82	0.86916	0.4234
Interest Rate does not Granger Cause Money Supply		2.11895	0.1271
Inflation does not Granger Cause Interest Rate	82	6.86068	0.0018
Interest Rate does not Granger Cause Inflation		1.49339	0.2310
Money Supply does not Granger Cause CRYPTO	82	1.01732	0.3664
CRYPTO does not Granger Cause Money Supply		0.61836	0.5415
Inflation does not Granger Cause CRYPTO	82	0.14127	0.8685
CRYPTO does not Granger Cause Inflation		0.70351	0.4980
Inflation does not Granger Cause Money Supply	82	0.83187	0.4391
Money Supply does not Granger Cause Inflation		1.38160	0.2573

Source: Authors (2018)

After discovering the relationships between the variables, we then continued with the cointegration test and the results are shown in Table 4. Based on these results, there are two cointegration equations. The first equation is the trace statistic (100.6248) > the critical value (47.85613). The second equation is the trace statistic (58.33737) > the critical value (29.79707).

Table 4. Johansen's Cointegration Test

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Probability.**
None *	0.410566	100.6248	47.85613	0.0000
At most 1 *	0.300945	58.33737	29.79707	0.0000
At most 2 *	0.195706	29.69531	15.49471	0.0002
At most 3 *	0.142214	12.27204	3.841466	0.0005

Source: Authors (2018)

Based on the cointegration test using the Johansen method, the trace statistic value at  $r = 0$  is smaller than the critical value with a significance level of 5 per cent or 0.05. This states that the dependent variable in this study there is one cointegration with a significant level of 0.05. Thus, the results of the cointegration test between three variables (inflation, money supply and interest rates toward cryptocurrency) have no relationship and income in the long run. VAR is also a very useful tool, both in understanding the reciprocal relationships between economic variables and in the formation of structured economic models (Enders, 2004). According to Gujarati (2004), there are several advantages to using VAR (Vector Autoregression) which are compared with other methods, including: (1) It's easier because it doesn't need to distinguish between independent variables and terms. (2) Simple estimation because it uses the ordinary OLS (Ordinary Least Square) method. (3) Estimation results are better than other more complicated methods.

Tabel 5. Vector Autoregression Estimates

	D(crypto)	D(interest rate)	D(Inflation)	D(moneysupply)
D(CRYPTO(-1))	-2.362185 (0.14180)	-2.05E-06 (2.9E-06)	-7.20E-06 (9.5E-06)	-8.61E-07 (6.1E-07)
	[-16.6585]	[-0.69855]	[-0.76050]	[-1.41341]
D(CRYPTO(-2))	1.318165	-7.26E-06	-1.03E-05	-1.27E-06

	(0.32439)	(6.7E-06)	(2.2E-05)	(1.4E-06)
	[ 4.06350]	[-1.08344]	[-0.47756]	[-0.91287]
D(Interest Rate(-1))	-1354.073	0.239127	0.342517	0.052820
	(5668.90)	(0.11712)	(0.37829)	(0.02435)
	[-0.23886]	[ 2.04175]	[ 0.90545]	[ 2.16955]
D(Interest Rate(-2))	3804.537	0.163856	-0.171375	-0.037739
	(5504.13)	(0.11371)	(0.36729)	(0.02364)
	[ 0.69121]	[ 1.44094]	[-0.46659]	[-1.59650]
D(Inflation(-1))	-39.74672	0.058032	0.323117	0.002378
	(1728.71)	(0.03571)	(0.11536)	(0.00742)
	[-0.02299]	[ 1.62487]	[ 2.80102]	[ 0.32031]
D(Inflation(-2))	533.2167	-0.011714	-0.241670	0.006485
	(1751.17)	(0.03618)	(0.11686)	(0.00752)
	[ 0.30449]	[-0.32378]	[-2.06811]	[ 0.86229]
D(Money Supply(-1))	12573.43	0.070195	-1.755793	-0.403484
	(25899.0)	(0.53507)	(1.72824)	(0.11123)
	[ 0.48548]	[ 0.13119]	[-1.01594]	[-3.62754]
D(Money Supply(-2))	-12328.70	-0.224105	1.121619	-0.269217
	(26073.3)	(0.53867)	(1.73987)	(0.11198)
	[-0.47285]	[-0.41603]	[ 0.64466]	[-2.40423]
C	1775.448	-0.004227	0.006286	0.062719
	(1878.96)	(0.03882)	(0.12538)	(0.00807)
	[ 0.94491]	[-0.10889]	[ 0.05014]	[ 7.77228]

Source: Author (2018)

Table 6. Vector Autoregression (Least Squares)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2111.566	1471.362	1.435109	0.1553
D(CRYPTO(-1))	-2.613052	0.137229	-19.04153	0.0000
D(Inflation(-1))	107.2715	1792.507	0.059844	0.9524
D(Interest Rate(-1))	-1322.611	5623.694	-0.235185	0.8147
D(Money Supply(-1))	23684.92	25770.33	0.919077	0.3609

Source: Authors (2018)

The supply of bitcoins has a significant effect on bitcoin's price in the short-run, and the effect is negative. This happens because when the number of bitcoins being mined increases, it means that the supply is getting closer to the maximum amount. And if the number of bitcoins reaches the maximum amount, there will be a possibility that the number of miners and/or users will decrease, bitcoin will become more centralized and this will have a negative effect, causing an increase in the transaction fees. If that happens, there will be fewer people willing to buy bitcoins and the price will also decrease. This states that the dependent variable in this study there is one cointegration with a significant level of 0.05. Thus, the results of the cointegration test between three variables (inflation, money supply, interest rates, and cryptocurrency) have no relationship and income in the long run. As mention before, one of the weaknesses of VAR or VECM is it is difficult to interpret them, so IRF and variance decomposition should be applied. Table 7 and Table 8 show the results from the IRF and variance decomposition tests.

Table 7. Impulse Response Function (IRF) Test

Period	D(Crypto)	D(Interest Rate)	D(Inflation)	D(Money Supply)
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1	9542.779 (749.752)	0.000000 (0.00000)	0.000000 (0.00000)	0.000000 (0.00000)
2	-22416.93 (2221.21)	-221.2628 (1100.17)	-19.05302 (1083.47)	496.7343 (1023.93)
3	65306.59 (7713.01)	1317.761 (2825.32)	332.2111 (2696.80)	-1861.867 (2651.83)
4	-183609.4 (27697.7)	-3431.905 (8107.57)	-521.6144 (7388.15)	5182.024 (7420.75)
5	519198.7 (96919.0)	10118.51 (22888.9)	1576.962 (21008.7)	-14599.00 (20918.5)
6	-1466912. (329529.)	-28379.42 (64752.5)	-4434.428 (59363.0)	41241.30 (59321.9)
7	4144879. (1093268)	80316.59 (183151.)	12552.08 (167721.)	-116561.2 (168260.)
8	-11711619 (3555569)	-226868.2 (518199.)	-35446.80 (473920.)	329353.3 (477570.)
9	33091926 (1.1E+07)	641079.0 (1466651)	100163.9 (1339152)	-930608.3 (1356536)
10	-93503379 (3.6E+07)	-1811387. (4152390)	-283015.7 (3784046)	2629491. (3856175)

Source: Authors (2018)

If the impulse response image has a movement that is increasingly valuable (convergence) or returning to the previous balance the response is very important the variables used will change. In this study using VAR, the last stage is the VD (Variance Decomposition) test. VAR research shows an analysis of the role of variables on other variables. VD (Variance Decomposition) is a method of arranging total variance based on the variance of other variables so that we can get the variance portion of a particular variable against total variance (Ekananda, 2016). In the first period inflation has no relationship at all between cryptocurrency, interest rates, and money supply. In the second period, it had a relationship with cryptocurrency of 1.59% and money supply of 1.03% and had no relationship to the interest rate of 0.007%. So that up to period 10, inflation, interest rates and money supply still have no relationship to cryptocurrency of 0.006%, 0.03%, and 0.07%, respectively.

Table 8. Variance Decomposition Test

Period	S.E.	D(Crypto)	D(Interest Rate)	D(Inflation)	D(Money Supply)
1	9542.779	100.0000	0.000000	0.000000	0.000000
2	24369.64	99.95015	0.008244	6.11E-05	0.041548
3	69743.41	99.88468	0.036706	0.002276	0.076340
4	196508.2	99.88473	0.035124	0.000991	0.079157
5	555428.4	99.88249	0.037584	0.000930	0.078994
6	1569349.	99.88272	0.037409	0.000915	0.078955
7	4434306.	99.88261	0.037492	0.000916	0.078986
8	12529417	99.88261	0.037482	0.000915	0.078991
9	35402668	99.88261	0.037485	0.000915	0.078991
10	1.00E+08	99.88261	0.037485	0.000915	0.078991

Source: Authors (2018)



Bitcoin is a very unique currency because it has no ties with any government or party, the system is decentralized, meaning that everyone can manage it, and it is unique because there is a limit on the supply of bitcoins, which is 21 million; but this is also a potential future problem. From the variance decomposition test, the contribution of each variable's shock and how it influences bitcoin's price can be seen. The historical price of bitcoin has become the biggest influence on the price of bitcoins. Some people who want to buy bitcoins always look at its historical price, which has tended to increase every year, and therefore people want to buy bitcoin because they think that it has a bright future. It means that the demand for, and users of, bitcoin also increases. Based on estimates made, can be seen from the VD test (Variance Decomposition) that which in the period of inflation on the price cryptocurrency fairly rapid increase amounted at 1.59%. The research conducted by Moon K. Kim Ravi Shukla (1995), which was published in the *International Journal of Managerial Finance*, shows that it allows one to carefully assess the rate of inflation because it has a strong influence on investment in the monetary sector in this case bonds and stock markets. So, the choice that can be taken by investors is the real sector. This research is in line with the previous research by Wijk (2013) that stated the role of global financial development is measured by looking at the stock exchange indices' effect on bitcoin's price. Contrary to that, this research contrasts with Kristoufek (2013) and Ciaian et al. (2014), both of whom found that bitcoin's price is not driven by macroeconomic factors alone. This research is also in line with some previous research from Buchholz et al. (2012) and Bouoiyour & Selmi (2015) that found market speculation is the primary driver of bitcoin's price. When demand increased, the price increased, because the supply is limited. We found that the price of gold has a significant effect on bitcoin's price in the short-run and long-run. This result is similar to the previous research from Zhu et al. (2017) that stated gold's price does affect the price of bitcoin in the short-run, but not in the long run.

In the first period, the interest rate only has a relationship amounting to 0.0006 per cent of the price cryptocurrency. The decline in the benchmark interest rate is still consistent with the realization and low 2017 inflation forecast as well as the 2018 and 2019 inflation forecasts which will be below the midpoint of the set target and a controlled current account deficit within safe limits. External risks, especially those related to the Fed Funds Rate (FFR) policy plan and normalization of the balance sheet of the US central bank have also been taken into account. The decline in policy rates is expected to support improvements in bank intermediation and the ongoing recovery of the domestic economy. Bank Indonesia views that the current benchmark interest rate is sufficient in accordance with the forecast for inflation and macroeconomics going forward. Bank Indonesia continues to coordinate with the Government to strengthen the policy mix in order to maintain macroeconomic stability and strengthen the momentum of economic recovery.

In the period of the Money Supply on cryptocurrency prices rose quite rapidly by 6.12 per cent. According to the classical understanding, money has no influence on the real sector, there is no influence on interest rates, employment opportunities or national income. National income is determined by the number and quality of labor, not from the capital used and technology. Money, the effect is only on the price of goods. An increase in the money supply will only result in price increases. The number of outputs produced does not change. This is often called the

classical dichotomy, namely the separation of the monetary sector from the real sector.

This is consistent with previous studies conducted by Sukamulja & Sikora (2018) showed that bitcoin has a negative correlation to the macroeconomic indicators. Bitcoin user number is increasing every year, but supplies are limited. Bitcoin prices also increased significantly every year. Macroeconomic indicators are represented by the Dow Jones Industrial Average (DJIA) has a significant negative effect in the long term and in the short term. Of IRF and test Variance Decomposition (VD), if there are no surprises in the Dow Jones, it will affect the price of bitcoin as much as 0.22%. This study is also consistent with several previous studies of Buchholz et al. (2012) and Bouoiyour and Selmi (2015) which found the market speculation is the main driver of the price of bitcoin. Further, Zhu et al. (2017) remarked that bitcoin can be treated as a speculative asset. Meanwhile, Kristoufek (2015) mentioned that the prices of bitcoins are driven by investors' interest in the crypto-currency. When demand increases, price increases, due to limited availability.

Variables (inflation, money supply, and interest rates) do not significantly influence cryptocurrency. Cryptocurrency can be said to be a long-term, cryptographic digital investment. Investment is more influenced by the real interest rate while real interest rates are influenced by interest rates. It means that when the interest rate is high then the real interest rate will also be high so that people choose to save their money in the bank rather than invest and vice versa. Thus, the amount of money in circulation becomes less. Based on the theory, the relationship between interest rates and investment is negatively related, meaning that if the interest rate decreases, investment will increase. In this case, people can use cryptocurrency as an investment because the profits obtained are so large and this investment is quite promising for the long term. Vice versa if the interest rate increases, the investment decreases, and people will prefer to save in the bank rather than invest.

If the government makes a decision regarding the price of bitcoin. Bitcoin demand also affects price changes. Bitcoin will be a more attractive investment in the coming years. The government must think about whether to make this unique currency legal or not. The price tends to increase every year and this makes people interested in investing in it. In addition, government decisions can also create more users. If bitcoin becomes a legitimate currency, the number of buyers who use bitcoin as a payment system will also increase, and the demand for bitcoin will also increase. In addition, if the government legalizes this currency, that means investors will feel safer investing in bitcoin.

## **CONCLUSION**

In this discussion, it can be seen in the Variance Decomposition (VD) test which shows that there is no significant influence in the short-term, while in the long-term there is a significant relationship between inflation and cryptocurrency prices in the first period. However, in the second period, there was a significant, long-term but not significant relationship in the short term between inflation and cryptocurrency. To understand a relationship between interest rates and the price of cryptocurrency, it can be seen from the VD (Variance Decomposition) test which

in the first period the interest rate does not have a significant short-term but significant long-term relationship with the cryptocurrency price. The relationship between money supply and the price of the cryptocurrency show that there is a significant effect in the short-term, whilst in long-term, there is no relationship between the money supply and the cryptocurrency price in the first period. In monetary variables (inflation, interest rates and the money supply) no influence on cryptocurrency.

## REFERENCES

- Bergstra, J., & Weijland, P. (2014) Bitcoin: A Money-Like Informational Commodity. Working Paper, University of Amsterdam. <http://arxiv.org/pdf/1402.4778.pdf>
- Bouoiyour, J., & Selmi, R. (2015). What does bitcoin look like? *Annals of Economics & Finance*, 16(2), 449-492.
- Briere, M., Oosterlinck, K. & Szafarz, A. (2013). Virtual currency, tangible return: Portfolio diversification with bitcoins. (*CEB Working Paper No. 13/031 September*). Université Libre de Bruxelles: Solvay Brussels School of Economics and Management, Centre Emile Bernheim.
- Ciaian, P., Rajcaniova, M., & Kancs, DA (2016). The economics of bitcoin price formation. *Applied Economics*, 48(19), 1799-1815
- Ekananda, M. (2016). *Econometric Analysis of Panel Data*. Jakarta: Mitra Wacana Media Publisher.
- Johansen, S., & Juselius, K. (1990). Maximum Likelihood Estimation and Inference on Cointegration with Applications to Demand for Money. *Oxford Bulletin of Economics and Statistics*, 52, 169-210.
- Johansen, S. (1991). Estimation and hypothesis testing of cointegration vectors in Gaussian vector autoregressive models. *Econometrica: journal of the Econometric Society*, 1551-1580.
- Kristoufek, L. (2013). Bitcoin meets Google Trends and Wikipedia: Quantifying the relationship between phenomena of the Internet era. *Scientific Reports*.
- Kristoufek, L. (2015). What Are the Main Drivers of the Bitcoin Price? Evidence From Wavelet Coherence Analysis. *PloS one*, 10(4), e0123923
- Lütkepohl, H., & Kratzig, M. (2004) *Applied Time Series Econometrics*. Cambridge University Press, Cambridge.
- Phillips, R. C., & Gorse, D. (2018). Cryptocurrency price drivers: Wavelet coherence analysis revisited. *PloS one*, 13(4), e0195200
- Singgih, V. P. (2017) . Bitcoin penetrates deeper into Indonesian market, The Jakarta Post. Retrieved from <http://www.thejakartapost.com/news/2017/01/03/bitcoin-penetrates-deeper-into-indonesian-market.html>
- Sobetov, Y. (2018). Factors Influencing Cryptocurrency Prices: Evidence from Bitcoin, Ethereum, Dash, Litecoin and Monero. *Journal of Economics and Financial Analysis*, 2(2), 1-27.
- Sukamulja, S., & Sikora, C. O. (2018). The New Era of Financial Innovation: The Determinants of Bitcoin's Price. *Journal of Indonesian Economy and Business*, 33(1), 46-64.
- Wijk, D. V. (2013). What Can Be Expected from The Bitcoin. Published Thesis Erasmus University.

- Wu, C. Y., Pandey, V. K., & DBA, C. (2014). The value of bitcoin in enhancing the efficiency of an investor's portfolio. *Journal of Financial Planning*, 27(9), 44-52.
- Zhu, Y., Dickinson, D., & Li, J. (2017). Analysis on the influence factors of Bitcoin's price based on VEC model. *Financial Innovation*, 3(1), 3-16.
- Das, D., & Kannadhasan, M. (2018). Do Global Factors Impact Bitcoin Prices? Evidence From Wavelet Approach. *Journal of Economic Research*, 23, 227-264.