Causality of the Growth of Bitcoin Prices with Monetary Conditions in Indonesia

Hasdi Aimon¹, Hari Setia Putra², Farid Husein³

¹Universitas Negeri Padang, Indonesia, † hasdi_aimon@fe.unp.ac.id
²Universitas Negeri Padang, Indonesia, † hari.putra@fe.unp.ac.id
³Universitas Negeri Padang, Indonesia, † faridhuseinaziz@gmail.com

Abstract

Virtual currency has been a hot topic for discussion lately. One of the popular virtual currencies is bitcoin which has a status as a commodity in Indonesia today. The purpose of this study is to determine whether there is influence and causality between bitcoin and monetary variables in Indonesia. The study used time series data in monthly form March 2012 to July 2019. The study used Johansen’s co integration test, vector auto regression estimation, granger causality test, forecasting with Impulse Response Function (IRF), and decomposition variance analysis. In this research, it is known that in the long run the growth of bitcoin prices, the exchange rate, inflation, the price of gold, and interest rates do not have balance and similarity in movement. Causally there is a direct relationship between the price of gold and the exchange rate with the consumer price index. In the VAR estimation it is known that bitcoin price growth affects the consumer price index in Indonesia, and the consumer price index affects the price of gold. In impulse response function forecasting there are positive and negative responses of each variable in the study of other variables. In decomposition variance analysis, it is known that the contribution of influence of a variable is more dominated by the variable itself when shock or shock occurs.

Keywords: Bitcoin, monetary variable, vector auto regression

Introduction

After the end of the 2008 financial crisis which had an impact on almost all countries, an idea of virtual currency emerged. Virtual currency is a digital based currency with a very secret security code. One of the most popular forms of virtual currency today is bitcoin. Bitcoin has been released since 2010. The circulation of bitcoin gave birth to various views that ended on the contention in various countries. This also happened in Indonesia. Bitcoin is the most popular cryptocurrency and is superior to 1500 other forms of cryptocurrency. Since it was first launched in 2010, bitcoin has grown rapidly (Wallace, 2011). Nowadays bitcoin is one of the investment instruments, for example when someone invests USD1000 in bitcoin in 2010, then in the next seven years namely in 2017 the return of profits will be around USD81 million (Phillip, Chan & Peiris, 2018). From this story can be seen that the exchange rate BITC o in developing very rapidly. Based on (Dastgir, Demir, Downing, Gozgor, & Lau, 2019) found that there is a causal relationship between bitcoin, bitcoin return, and bitcoin trends in google trends. This gives a signal that the bitcoin trend depends on the digital world today.

Some countries in the world have legalized bitcoin, such us Australia and Japan. In Indonesia, where bitcoin when it has been recognized as a commodity. This has been stated and approved by the Ministry of Trade through Bapappeti (Commodity Futures Trading Regulatory Agency). The existence of Bitcoin in Indonesia is only limited to commodities, this is because Bank Indonesia and the Financial Services Authority still prohibit the use of bitcoin as a means of payment. It is clear that the position of bitcoin in Indonesia is strengthened by the issuance of four Bapappeti regulations which legalize bitcoin, including regulation No. 2 of 2019 concerning the organization of commodity physical markets on the Futures Exchange, regulation No. 3 of 2019 concerning commodities which can be subject to futures contracts, sharia derivative contracts and other derivative contracts traded on the Futures Exchange, regulation No. 4 of 2019 concerning the technical
provisions for the operation of digital physical gold markets on the Futures Exchange, and the last is Bappeti regulation No. 5 of 2019 concerning the technical provisions for the operation of the physical market of crypto assets on the Futures Exchange.

![Figure 1 Development of Bitcoin Price Year 2012-2019](image)

Based on research (Narayan, Narayan, Eki Rahman, & Setiawan, 2019) found that when there is an increase in bitcoin price growth, an increase in inflation the exchange rate will appreciate, and the velocity of money will decrease. Based on these findings it can be concluded that the growth of bitcoin prices is very much for the monetary system in Indonesia. However, based on research (Aharon & Qadan, 2018) found that the movement of bitcoin is outside the speculation of capital markets, bonds and commodities. This indicates that there will be an impact arising from the movement of the bitcoin. In a previous study (Holub & Johnson, 2019) proved that during 2017, 8 of the 13 currencies showed that when there was an increase in the price of bitcoin indicated there would be a spreading impact on their monetary conditions. However, the other five countries do not have a wide spread impact because of the existence of clear regulations which make the impact of bitcoin movements narrow. In addition to the impact of the spread caused by bitcoin there are new findings based on research (Kim, Lee, & Kang, 2019) although market bitcoin less stable while in 2017, due to the lag for the introduction of futures markets, in line with the time in the future bitcoin will tend to be stable. However, in the following year a finding (Almudhaf, 2018) showed that there were inefficiencies in bitcoin pricing so practitioners were encouraged to introduce the digital currency market, specifically bitcoin. Beyond the doubts and risks predicted in the future caused by bitcoin, it is necessary to study how the influence of the reality and the long-term relationship of bitcoin with monetary variables in Indonesia. So that it is known and can be formulated new policies and strategies to minimize the risks that may arise from new goods on the commodity market.

**Methods**

The type of data used in this study is secondary data in the form of time series data. Data is presented monthly from March 2012 to July 2019. This study is supported by 435 samples of five variables. In this study the data used are bitcoin data, the rupiah exchange rate, Bank Indonesia interest rates, inflation, and the price of gold. To test the relationship between the growth of bitcoin prices with the exchange rate,
interest rates, consumer price indexes, and the price of gold, several tests are performed first. First, the test carried out was stationarity using the unit root test from the Augmented Dicky Fuller test (ADF Test).

Table 1 Variables Used

| Variable       | Definition                                                      | Source          |
|----------------|-----------------------------------------------------------------|-----------------|
| Bitcoin        | Bitcoin data taken is data from monthly average prices          | Investing.com   |
| Exchange rate  | The exchange rate data used is the average exchange rate every month | Bank Indonesia |
| Interest rate  | The interest rates used in this article are the reference rates released by Bank Indonesia | Bank Indonesia |
| Consumer price index | The Consumer Price Index in this study illustrates the inflation conditions that occur every month | Financial Database |
| Gold price     | The price of gold used is the world price of gold with a monthly average | Investing.com |

Furthermore, to find out the optimal lag that is used in research, an estimation is performed. To find out how the relationship of variables that exist in the long run, Johansen's co integration test was performed. To find out how the influence between variables were analyzed using VAR models (Vector Auto Regression), and analysis of impulse response function, and variance analysis decomposition. According to (Lin, Law, Ho, & Sambasivan, 2019) the vector auto regression method is suitable for research with variables in a lot of time series. Vector auto regression was first coined by Sims in 1980 which is generally used in macroeconomic analysis. At present the VAR method has developed further, such as VAR panels and others. The model used is a general model of VAR in this study, namely

\[
A_t = \alpha_1 + \sum \beta_{1i} Y_{t-1} + \sum \chi_{t-1} + \varepsilon_t \\
B_t = \alpha_2 + \sum \beta_{2i} Y_{t-1} + \sum \chi_{t-1} + \varepsilon_t \\
C_t = \alpha_3 + \sum \beta_{3i} Y_{t-1} + \sum \chi_{t-1} + \varepsilon_t \\
D_t = \alpha_4 + \sum \beta_{4i} Y_{t-1} + \sum \chi_{t-1} + \varepsilon_t \\
E_t = \alpha_5 + \sum \beta_{5i} Y_{t-1} + \sum \chi_{t-1} + \varepsilon_t
\]

Results and Discussion

The first test carried out was the stationarity test. The purpose of this test is to find out whether the data is stationary or not. According to (Zulfiqar Bagus Pambuko, 2018) time series data which often causes spurious regression problems. The symptoms of spurious regression are high R-square value, statistically t-value and statistically significant F but dw value is smaller than 0.5. This is also because the data used is time series data which has a tendency to contain unit roots (unit root). Data is not stationary if the average value and variance are constant. In addition, a stationary test was also carried out to see whether the random walk pattern or not. Stationarity tests were carried out for each variable in the study, namely the price of bitcoin, interest rates, exchange rates, the price of gold, and the consumer price index. The test is carried out using a five percent real level. In concluding later, a variable is said to have no unit roots if the ADF-test value (Augmented Dickey Fuller Test) is greater than its critical value or the critical value of five percent (MacKinnon Critical Value). From the tests conducted, all variables are not stationary at the level. However, all variables in the study are stationary at the first difference and second difference levels. After the stationarity test was conducted with the Philips Peron test the results also showed that all variables in the study were stationary at the first difference and second difference levels. Stationary test results are presented in table two and table three.
### Table 2 Augmented Dickey Fuller Stationary Test Results (ADF-Test)

| Variable           | Root Test Unit on | ADF Test Statistics | Critical Values 5% | Information |
|--------------------|-------------------|----------------------|--------------------|-------------|
| Bitcoin            | 1st Difference    | -8.817506            | -2.895109          | Stationary  |
| Interest rate      | 1st Difference    | -3.891014            | -2.895109          | Stationary  |
| Exchange rate      | 1st Difference    | -9.763201            | -2.895109          | Stationary  |
| Gold price         | 1st Difference    | -8.562451            | -2.895109          | Stationary  |
| Consumer Price Index | 1st Difference   | -8.450069            | -2.895109          | Stationary  |

Source: Author’s processed results

### Table 3 Philips Peron Stationarity Test Results

Null Hypothesis: Unit root (individual unit root process)
Series: BTC, BI_RATE, ER, P_GOLD, CPI
Date: 09/28/19 Time: 10:45
Sample: 2012M01 2019M12
Exogenous variables: Individual effects
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 435
Cross-sections included: 5

| Method               | Statistics | Prob. ** |
|----------------------|------------|----------|
| PP - Fisher Chi-square | 164,332    | 0.0000   |
| PP - Choi Z-stat      | -11,7480   | 0.0000   |

Source: Author’s processed results

### Optimal Lag (Lag Length Criteria)

Besides needing to test the stationarity of the data used in each variable also requires determining the lag length used. Determination of lag is very important in estimating the VAR model. Determination of the lag length is intended to avoid autocorrelation problems in the VAR model. Many methods are used in determining the length of the lag, including the Akaike Information Criteria (AIC), the Schawarz information criteria, and Hannan Quinnon. Here are the results of determining the length of the lag.

### Table 4 Results of Determining the Optimal Lag Length

| Lag | Log L  | LR   | FPE   | AIC     | SC    | HQ     |
|-----|--------|------|-------|---------|-------|--------|
| 0   | -2213,670 | NA   | 4.26e + 17 | 54.78197 | 54.92977 | 54.84127 |
| 1   | -1708,827 | 934.8933 | 3.05e + 12 * | 42.93401 | 43.82084 * | 43.28982 * |
| 2   | -1690,429 | 31,80027 | 3.61e + 12 | 43,09700 | 44.72286 | 43.74932 |
| 3   | -1658,634 | 51,02914 | 3.11e + 12 | 42,92922 * | 45.29411 | 43.87805 |
| 4   | -1640,916 | 26,24834 | 3.85e + 12 | 43.10903 | 46.21295 | 44.35437 |
| 5   | -1612,534 | 38,54270 * | 3.75e + 12 | 43,02554 | 46,86489 | 44,56738 |
| 6   | -1594,116 | 22,73922 | 4.82e + 12 | 43.18804 | 47,77001 | 45,02639 |
| 7   | -1573,414 | 23,00224 | 6.09e + 12 | 43,29417 | 48,61516 | 45,42902 |
| 8   | -1549,880 | 23,24322 | 7.57e + 12 | 43,30307 | 49,39039 | 45,76173 |

Source: Author’s processed results

From the results of determining the lag it can be seen that the optimal lag that can be used is lag 1 for further testing.
Co-Integration Test

According to (Eroğlu, 2019) at this time many researchers make co-integration test as a test to determine the long-term relationship of the research variable, so that it looks integrated or not. Co-integration test is conducted to find out how the balance of research variables is in the long run. The main thing that is seen from the balance there was movement and stability of the relationship of each variable in this study. The co-integration test used in this study is the Johansen’s co-integration test method.

| Hypothesized No. of CE (s) | Eigenvalue | Trace Statistics | 0.05 Critical Value | Prob. ** |
|---------------------------|------------|-----------------|---------------------|---------|
| None                      | 0.245390   | 37.48256        | 47.85613            | 0.3251  |
| At most 1                 | 0.077810   | 13686889        | 29.79707            | 0.8789  |
| At most 2                 | 0.046120   | 6.302522        | 15.49471            | 0.6598  |
| At most 3                 | 0.025731   | 2.241793        | 3.841466            | 0.1343  |

| Hypothesized No. of CE (s) | Eigenvalue | Max-Eigen Statistics | 0.05 Critical Value | Prob. ** |
|---------------------------|------------|---------------------|---------------------|---------|
| None                      | 0.245390   | 24,21367            | 27,58434            | 0.1274  |
| At most 1                 | 0.077810   | 6.666367            | 21.13162            | 0.9552  |
| At most 2                 | 0.046120   | 4.060728            | 14646460            | 0.8529  |
| At most 3                 | 0.025731   | 2.241793            | 3.841466            | 0.1343  |

Source: Author’s processed results

Co-integration test results using the Johansen’s method show a trace statistic value of 37.48256 smaller than the critical value of 47.85613 which indicates that in this study there was no co-integration. The trace statistic value of 13.26889 is smaller than the critical value in alpha 0.05 which is 29.79707 indicating there is no co-integration. Then, seen from the maximum Eigen statistical value that is 24.21367, it is smaller than the critical value of 0.05 which is 27.58434 indicating that in the variable there are no co-integrated equations. The statistical max-eigen value of 6.966367 is smaller than the critical value which also indicates there is no co-integration. So, it can be concluded that after the Johansen’s co-integration test was conducted there was no co-integration between variables in the research in the long run. This indicates the movement of bitcoin prices, exchange rates, inflation, gold prices, and interest rates do not have balance and similarity in movement in the long run.

Granger Causality Test

Causality test is performed to determine whether each variable has a causality relationship between one variable and another. In the granger causality test it will be known how causality of each of the two variables. In the granger causality test it can be seen that a variable has a causality relationship with other variables when the probability value is smaller than alpha five percent (0.05). So when the probability is
greater than 0.05, the variable does not have a causal relationship with other variables. From table 7 tab below it can be seen that between a bitcoin with interest rates do not have a causal relationship and do not influence each other. This can be seen from the probability value respectively 0.8413 and 0.4365 greater than alpha 0.05. Between bitcoin and the consumer price index also have no causality relationship. This can be seen from the probability value respectively 0.1274 and 0.6180 greater than alpha 0.05. Between bitcoin, the price of gold and the exchange rate also does not have relationship influential mutual causality and statistical significance.

Table 6 Granger Causality Test Results

| Variable                                | F-Statistics | Probability |
|-----------------------------------------|--------------|-------------|
| Bitcoin with interest rates             | 0.27779      | 0.8413      |
| Interest rates with Bitcoin             | 0.91727      | 0.4365      |
| Consumer price index with bitcoin      | 1.95574      | 0.1274      |
| Bitcoin with a consumer price index    | 0.59825      | 0.6180      |
| Exchange rates with bitcoin            | 0.63499      | 0.5947      |
| Bitcoin with exchange rates            | 0.81236      | 0.4908      |
| The price of gold with bitcoin         | 0.30373      | 0.8226      |
| Bitcoin with the price of gold         | 0.40154      | 0.7523      |
| Interest rates at the price of gold    | 0.17172      | 0.9152      |
| The price of gold at interest rates    | 1.67303      | 0.1795      |
| Consumer price index with the price of gold | 8,72660 | 5.E-05      |
| The price of gold with the Consumer Price Index | 2,88930  | 0.0406      |
| Exchange rates with the price of gold  | 0.62067      | 0.6037      |
| The price of gold with an exchange rate | 0.49170     | 0.6891      |
| Consumer price index with interest rates | 1.06731   | 0.3678      |
| Interest rates with the consumer price index | 0.23714 | 0.8702      |
| Exchange rates with interest rates     | 1.89198      | 0.1377      |
| Interest rates at exchange rates       | 1,35838      | 0.2616      |
| Exchange rates with the consumer price index | 0.20030 | 0.8959      |
| Consumer price index with exchange rates | 2.91204    | 0.0395      |

Source: Author’s processed results

This can be seen from the large probability value of alpha 0.05. Interest rates with gold prices are statistically equally significant influence. This can be seen from the probability value respectively 0.9152 and 0.1795 greater than 0.05. The consumer price index has no statistically significant effect on the price of gold. It is characterized by a probability value of 5, 05 greater than 0.05. However, the price of gold has a significant effect on the consumer price index with a probability of 0.0406 less than 0.05. So that there is directional causality between the price of gold with the consumer price index which is a reflection of the inflation rate in Indonesia. The exchange rate and the price of gold do not have a causal relationship because the probability values are 0.6037 and 0.6891, respectively, greater than 0.05. The same thing happens between the consumer price index with interest rates that also do not have a causality relationship. The probability values are 0.3678 and 0.8702, respectively, greater than 0.05. Interest rates with exchange rates also do not have a causality relationship. However, between the consumer price index and the exchange rate there is a direct causal relationship between these variables.

VAR Model Estimation Results

From the estimation results of the VAR model in table 7 a decision was made based on a significant level of alpha value of 0.05. The decision is made by comparing the value of t table with the calculated t value. The t table value in this study at the level of 0.05 is 1.9893. If t arithmetic is greater than the variable is declared to
have a significant effect, and vice versa. From the estimation results it can be seen that bitcoin price growth affects the consumer price index with a value of 1.99763 greater than the value of t table 1.9893. Consumer price index affects the price of gold with a value of 3.47168 greater than the value of t table 1.9893. So it can be concluded that those who have an influence on other variables in the study are bitcoin and the consumer price index, while the exchange rate, interest rates, and gold prices have no significant effect in the study.

Table 7 Estimated Results of the VAR Model

| BTC (-1) | BTC (-2) | BI_RATE (-1) | BI_RATE (-2) | CPI (-1) | CPI (-2) | ER (-1) | ER (-2) | P_GOLD (-1) | P_GOLD (-2) | C |
|----------|----------|--------------|-------------|----------|----------|---------|---------|-------------|-------------| ---|
| 8.47442  | -1.03078 | 1.09403      | -0.98646    | -0.40364 | 0.91614  | -1.43480| 0.08032 | -0.67239    | 0.60236     | -1.20586 |
| -0.15779 | 1.47841  | 9.57592      | -1.24458    | -1.11617 | 0.92548  | -2.03919| -1.02825| -1.00915    | -0.56712    | 2.43355  |
| 1.99763  | -1.20201 | 1.01196      | -1.08025    | 9.99827  | -1.28434 | -2.03919| 0.58135 | -1.28148    | 0.18157     | 3.04541  |
| -1.43408 | 1.59530  | 1.25933      | -0.70012    | 0.66252  | 0.10076  | 5.33989 | -0.72286   | -1.23272    | -0.38473   | 0.46423  |
| 1.35599  | -0.96856 | -0.75149     | 0.45675     | 3.47168  | -3.46265 | 0.03572 | 0.45812    | 7.67110     | -0.06793   | 1.18910  |

Source: Author’s processed results

Impulse Response Function (IRF) Analysis

Impulse response analysis is performed with a purpose to examine the surprise response of a variable to other variables in the study. This analysis assumes that each variable in the study does not have a correlation with each other. The final goal of the impulse response function analysis is to find out how long the effect of shock or shock has on other variables. IRF analysis can also be used to see which variable gives the biggest response to variables when shock occurs.

Figure 1 shows the graph of the impulse response function analysis. The vertical axis in the graph illustrates the standard deviation. This value is used to see the response of a variable when a shock occurs. The horizontal axis shows the length of the period of response that occurs after a shock or shock. The existence of a positive response is shown when the response is above the horizontal axis. Conversely, a negative response is shown when the response is below the horizontal axis. IRF analysis of bitcoin as a response illustrates that in the next 25 time periods the highest response is bitcoin to the consumer price index with a positive response which is expected to be stable in the twenty-fourth period. The next highest response is followed by the price of gold which is expected to be stable in the twenty-fourth period. Bitcoin gets a negative response from interest rates which tend to be stable in the twenty-fifth period. Bitcoin response to bitcoin itself is negative and is expected to be stable in the twenty-fifth period. A high response is also seen by the exchange rate which initially gave a negative response in the second to the sixth period and returned to stable to the horizontal axis in the twenty-third period.

IRF analysis with the interest rate gets the highest response from the interest rate itself. The interest rate is expected to stabilize after the twenty-fourth period. Interest rates have received a high positive response from bitcoin which is expected to stabilize in the twenty-fifth period. Consumer price indexes, exchange rates, and gold prices give a negative response to interest rates. However, when the variable tends to approach the standard value of zero deviation and is expected to be stable in the twenty-second period.
Figure 2 Impulse Response Function (IRF)
Source: Author’s processed results
IRF analysis with the consumer price index which shows the highest positive response by the consumer price index itself. The consumer price index is expected to stabilize in the fourteenth period. The highest response is always indicated by the interest rate which tends to approach the standard deviation of zero. Interest rates are expected to stabilize in the seventeenth period. The consumer price index received the highest negative response from the price of gold. However, the price of gold is expected to stabilize in the eighteenth period. A negative response to the consumer price index is also shown by bitcoin which initially showed a positive response in the initial to eighth period and showed a negative response in the ninth. Bitcoin is expected to stabilize in the twentieth period. The exchange rate gives not too high a response to the consumer price index with a graph that tends to approach the standard deviation of zero. The exchange rate is expected to stabilize in the eighteenth period.

IRF analysis with the exchange rate gets the highest response by interest rates. Interest rates are expected to stabilize in the twenty-second period. A positive response to the exchange rate is also shown by bitcoin and the consumer price index which are expected to be stable in the twelfth period. The negative response is shown by the exchange rate itself which is expected to be stable in the sixteenth period. The price of gold also showed a negative response and is expected to stabilize in the seventeenth period.

IRF analysis with the price of gold obtained a fairly positive response from several variables. The highest response is indicated by the price of gold itself which is expected to be stable in the twentieth period. Consumer price index shows a positive response but tends to approach the value of the standard deviation. It is estimated that the consumer price index will be stable in the seventeenth period. The negative response shown by bitcoin and interest rates that are both expected to be stable in the twentieth period. The exchange rate initially showed a negative response to the price of gold, but in the seventeenth period there was a positive response from the exchange rate. It is estimated that the exchange rate will stabilize in the seventeenth period.

**Decomposition Variance Analysis (VD)**

Decomposition variance analysis is performed with the aim of estimating how much a variable contributes to changing the variable itself and changing other variables in the future. In this decomposition variance analysis, the unit used is the percentage. From table 8 it can be seen that the variables that affect bitcoin and contribute most to bitcoin are bitcoin itself. The table shows how the percentage development and contribution of each variable to bitcoin. Of the 25 periods the largest contribution of bitcoin is at an average of 76.30%. Although the contribution of bitcoin is quite large in the 25 periods, the contribution trend tends to decrease from one period to the period. This can be seen from the percentage of contributions in the twenty-fifth period which only reached 62.78%. The percentage is much smaller when compared to the average contribution of the bitcoin. The smallest contribution was shown by the price of gold which only contributed by an average of 0.64%. A fairly good contribution was given by the exchange rate variable, with an average of 12.87%. Interest rates only contributed by an average of 2.33%, and the consumer price index contributed an average of 7.85%.

Analysis of the decomposition variance of the highest interest rates is influenced by the interest rate itself. The percentage level is also quite high, with an average of 76.18%. However, other variables contributed quite low to interest rates, with an average of only 8.34% of bitcoin, 8.71% of the consumer price index, 5.48% of the price of gold, and 1.27% of the exchange rate. Analysis of decomposition variance on the consumer price index shows that the consumer price index itself and the price of gold are the highest contributors. Consequently, the consumer price index contributed an average of 57.14% and the price of gold with an average of 38.00%. However, other variables make a small contribution to the consumer price index. Consequently, the average contribution of other variables is 0.99% of bitcoin, 2.83% of interest rates, 1.02% of exchange rates.
Table 8 Analysis of the Bitcoin Decomposition Variant

| Period | SE          | BTC          | BI_RATE      | CPI        | ER          | P_GOLD      |
|--------|-------------|--------------|--------------|------------|-------------|-------------|
| 1      | 1032,528    | 100,0000     | 0.000000     | 0.000000   | 0.000000    | 0.000000    |
| 2      | 1424,616    | 98,22783     | 0.451037     | 0.020766   | 0.000000    | 0.000000    |
| 3      | 1656,557    | 96,15953     | 0.514412     | 0.027162   | 0.000000    | 0.000000    |
| 4      | 1822,278    | 93,62652     | 0.449227     | 0.180230   | 0.000000    | 0.000000    |
| 5      | 1956,564    | 90,63809     | 0.389737     | 0.747312   | 0.000000    | 0.000000    |
| 6      | 2069,258    | 87,53796     | 0.361927     | 3.072846   | 0.000000    | 0.000000    |
| 7      | 2163,619    | 84,59333     | 0.374074     | 1.046563   | 0.000000    | 0.000000    |
| 8      | 2242,047    | 81,92029     | 0.433380     | 1.986457   | 0.000000    | 0.000000    |
| 9      | 2306,917    | 79,54276     | 0.545171     | 4.079071   | 0.000000    | 0.000000    |
| 10     | 2360,501    | 77,44293     | 0.711787     | 6.028647   | 0.000000    | 0.000000    |
| 11     | 2404,864    | 75,58820     | 0.932635     | 7.040738   | 0.000000    | 0.000000    |
| 12     | 2441,818    | 73,94390     | 1.204656     | 7.986647   | 0.000000    | 0.000000    |
| 13     | 2472,909    | 72,47866     | 1.522877     | 8.842657   | 0.000000    | 0.000000    |
| 14     | 2499,422    | 71,16610     | 1.880936     | 9.673638   | 0.000000    | 0.000000    |
| 15     | 2522,403    | 69,98473     | 2.271585     | 10.41589   | 0.000000    | 0.000000    |
| 16     | 2542,689    | 68,91733     | 2.687133     | 11.09280   | 0.000000    | 0.000000    |
| 17     | 2560,938    | 67,95004     | 3.119818     | 11.70663   | 0.000000    | 0.000000    |
| 18     | 2577,657    | 67,07164     | 3.562127     | 12.26005   | 0.000000    | 0.000000    |
| 19     | 2593,231    | 66,27292     | 4.007042     | 12.76014   | 0.000000    | 0.000000    |
| 20     | 2607,945    | 65,54615     | 4.448224     | 13.19827   | 0.000000    | 0.000000    |
| 21     | 2622,004    | 64,88470     | 4.880139     | 13.59005   | 0.000000    | 0.000000    |
| 22     | 2635,550    | 64,28279     | 5.298118     | 13.93526   | 0.000000    | 0.000000    |
| 23     | 2648,676    | 63,73525     | 5.698377     | 14.37776   | 0.000000    | 0.000000    |
| 24     | 2661,441    | 63,23737     | 6.077991     | 14.50139   | 0.000000    | 0.000000    |
| 25     | 2673,875    | 62,78486     | 6.434839     | 14.72994   | 0.000000    | 0.000000    |

Source: Author’s processed results

Analysis of decomposition variance on the exchange rate shows that the biggest contribution to the exchange rate is the exchange rate itself with an average contribution of 50.71%. However, the contribution to the exchange rate shows a downward trend from the first period to the twenty-fifth period. This can be seen from the contribution in the twenty-fifth period which reached 33.79% lower than the average contribution. The high contribution to the exchange rate was also shown by the gold price with an average of 26.76%. The price of gold shows a trend of contributions that tends to increase from each period. This can be seen clearly from the percentage contribution of gold prices which reached 36.75% in the twenty-fifth period greater than the average contribution. Interest rates also showed a fairly high contribution to the exchange rate with an average of 19.05%. If seen further, interest rates also have a positive trend in contributing to the exchange rate. This can be seen from the contribution that tends to increase every period, especially in the twenty-fifth period which reached 24.31% greater than the average contribution. The lowest contribution to the exchange rate is shown by the bitcoin variable and the consumer price index which respectively contributed 1.83% and 1.64% respectively.

Analysis of decomposition variance on the price of gold shows that the price of gold has the highest contribution to itself. The percentage of gold price contribution from the first to the twenty-fifth period reached an average of 50.60%. If observed for a long time there was a shock or shock, the contribution of the price of gold is quite volatile. A fairly good contribution to the price of gold was also shown by the consumer...
price index and the exchange rate with an average of 16.17% and 16.69% respectively. Both of these variables have a downward trend in contributions. This can be seen from the contribution value in the twenty-fifth period which is below the average contribution, which is 15.41% and 15.03%. Interest rates provide a positive trend in contributions to the price of gold with an average contribution of 7.17%. However, bitcoin contributes a tendency to decline but is stable, with an average contribution of 9.36%.

Table 9 Analysis of the Interest Rate Decomposition Variant

| Period | SE  | BTC      | BI_RATE | CPI       | ER        | P_GOLD    |
|--------|-----|----------|---------|-----------|-----------|-----------|
| 1      | 0.207062 | 0.287996 | 99,71200 | 0.000000  | 0.000000  | 0.000000  |
| 2      | 0.313643 | 0.476692 | 97.79055 | 0.958408  | 0.311976  | 3.66296   |
| 3      | 0.393468 | 0.305844 | 95,05610 | 2.346113  | 0.437227  | 1.854712  |
| 4      | 0.461909 | 0.407730 | 91,33719 | 4.150838  | 0.437941  | 3.662396  |
| 5      | 0.523486 | 0.839561 | 87,44875 | 6.076255  | 0.386273  | 5.249158  |
| 6      | 0.578903 | 1.486592 | 84,07215 | 7.769218  | 0.323540  | 6.348504  |
| 7      | 0.628600 | 2.280553 | 81,37811 | 9.065919  | 0.275179  | 7.000235  |
| 8      | 0.673335 | 3.185165 | 79,26344 | 9.969761  | 0.257122  | 7.324511  |
| 9      | 0.713914 | 4.170627 | 77,56566 | 10.55398  | 0.278011  | 7.431718  |
| 10     | 0.751008 | 5.208224 | 76,14872 | 10.90046  | 0.340771  | 7.401829  |
| 11     | 0.785119 | 6.271909 | 74,91845 | 11.07731  | 0.442225  | 7.288107  |
| 12     | 0.816613 | 7.339811 | 73,81512 | 11.13549  | 0.584557  | 7.125022  |
| 13     | 0.845757 | 8.394578 | 72,80242 | 11.11168  | 0.756493  | 6.934823  |
| 14     | 0.872757 | 9.423017 | 71,85883 | 11.03199  | 0.954172  | 6.731992  |
| 15     | 0.897776 | 10.41548 | 70,97166 | 10.91509  | 1.171724  | 6.526055  |
| 16     | 0.920951 | 11.3655 | 70,13342 | 10.77444  | 1.403627  | 6.323298  |
| 17     | 0.942398 | 12.26777 | 69,33967 | 10.61982  | 1.649403  | 6.127837  |
| 18     | 0.962224 | 13,12051 | 68,58766 | 10.45834  | 1.891202  | 5.942288  |
| 19     | 0.980524 | 13.92217 | 67,87561 | 10.29518  | 2.138815  | 5.686820  |
| 20     | 0.997388 | 14.62725 | 67,20227 | 10.13405  | 2.384648  | 5.606464  |
| 21     | 1.012901 | 15.37231 | 66,56662 | 9.977568  | 2.626175  | 5.457326  |
| 22     | 1.027144 | 16.02258 | 65,96775 | 9.827542  | 2.861374  | 5.320751  |
| 23     | 1.040195 | 16.62502 | 65,40473 | 9.685159  | 3.088667  | 5.196428  |
| 24     | 1.052129 | 17.18154 | 64,87658 | 9.551138  | 3.306857  | 5.083881  |
| 25     | 1.063019 | 17,69426 | 64,38228 | 9.425854  | 3.515074  | 4.982522  |

Source: Author’s processed results
Table 10 Analysis of the Decomposition Variant of the Consumer Price Index

| Period | SE     | BTC    | BL_RATE | CPI     | ER      | P_GOLD |
|--------|--------|--------|---------|---------|---------|--------|
| 1      | 0.570849| 0.014280| 2.489380| 97.49634| 0.000000| 0.000000|
| 2      | 0.908322| 0.842190| 4.131168| 91.31428| 0.453809| 3.258555|
| 3      | 1.143273| 1.463179| 4.814487| 82.90794| 0.812457| 10.00194|
| 4      | 1.321107| 1.624748| 4.816140| 74.97460| 1.060696| 17.52381|
| 5      | 1.467014| 1.561507| 4.524001| 68.58055| 1.223854| 24.11009|
| 6      | 1.592746| 1.428052| 4.171260| 63.78194| 1.323289| 29.29546|
| 7      | 1.704377| 1.286381| 3.843179| 60.25999| 1.374985| 33.23546|
| 8      | 1.805560| 1.157560| 3.557907| 57.65672| 1.391377| 36.23644|
| 9      | 1.898640| 1.048060| 3.312589| 55.68472| 1.382395| 38.57223|
| 10     | 1.985157| 0.959221| 3.100254| 54.14050| 1.358578| 40.44145|
| 11     | 2.066160| 0.890469| 2.914557| 52.88841| 1.317862| 41.98870|
| 12     | 2.142403| 0.840461| 2.750611| 51.84062| 1.272881| 43.29543|
| 13     | 2.214461| 0.807522| 2.604777| 50.94049| 1.224265| 44.42925|
| 14     | 2.282792| 0.789846| 2.474306| 50.15097| 1.174409| 45.41047|
| 15     | 2.347776| 0.785599| 2.357052| 49.44710| 1.129940| 46.28526|
| 16     | 2.409727| 0.792986| 2.251286| 48.81143| 1.077147| 47.06715|
| 17     | 2.468916| 0.810301| 2.155572| 48.23136| 1.031617| 47.77115|
| 18     | 2.525568| 0.835953| 2.068699| 47.69748| 0.988845| 48.40902|
| 19     | 2.579881| 0.868489| 1.989634| 47.20265| 0.949059| 48.99017|
| 20     | 2.632023| 0.906592| 1.917491| 46.74130| 0.912337| 49.52228|
| 21     | 2.682141| 0.940088| 1.851501| 46.30908| 0.878648| 50.111168|
| 22     | 2.730365| 0.994035| 1.791004| 45.90252| 0.847889| 50.46365|
| 23     | 2.776807| 1.042222| 1.735423| 45.51882| 0.819910| 50.88262|
| 24     | 2.821569| 1.093155| 1.684257| 45.15570| 0.794530| 51.27235|
| 25     | 2.864743| 1.144049| 1.637069| 44.81128| 0.771356| 51.63604|

Source: Author's processed results

Table 11 Analysis of Exchange Rate Decomposition Variants

| Period | SE     | BTC    | BL_RATE | CPI     | ER      | P_GOLD |
|--------|--------|--------|---------|---------|---------|--------|
| 1      | 263.5862| 0.450098| 3.722077| 3.251444| 92.87638| 0.000000|
| 2      | 337.6851| 1.559522| 7.870351| 2.221102| 87.38450| 0.964523|
| 3      | 378.9300| 1.834133| 10.57195| 1.758797| 81.59300| 4.214946|
| 4      | 410.0897| 1.683336| 12.54627| 1.593764| 74.88908| 9.287547|
| 5      | 436.7045| 1.499669| 13.98663| 1.575710| 68.39881| 14.53918|
| 6      | 459.3288| 1.355707| 15.12182| 1.609446| 62.91457| 18.99845|
| 7      | 478.3358| 1.255394| 16.13213| 1.601858| 58.50618| 22.50444|
| 8      | 494.5171| 1.197115| 17.09602| 1.546430| 54.94855| 25.21188|
| 9      | 508.6793| 1.179865| 18.02496| 1.471256| 52.00812| 27.31580|
| 10     | 521.4156| 1.201465| 18.90486| 1.400259| 49.51865| 28.97476|
| 11     | 533.0996| 1.257981| 19.71905| 1.345275| 47.37346| 30.30424|
| 12     | 543.9513| 1.344241| 20.45666| 1.309802| 45.50357| 31.38573|
| 13     | 554.1002| 1.454537| 21.11359| 1.293437| 43.86166| 32.27678|
| 14     | 563.6258| 1.583186| 21.69075| 1.294463| 42.41278| 33.01882|
Table Cont...

| Period | SE            | BTC       | BI_RATE | CPI        | ER          | P_GOLD    |
|--------|---------------|-----------|---------|------------|-------------|-----------|
| 1      | 47.89406      | 1.776069  | 0.867138| 1.380905   | 18.73248    | 77.24341  |
| 2      | 69.48723      | 4.363244  | 0.965728| 1.3065     | 16.12218    | 65.81820  |
| 3      | 82.02037      | 7.160632  | 0.857377| 1.27426    | 16.12418    | 58.43179  |
| 4      | 88.88588      | 9.093105  | 0.922636| 1.24531    | 16.85237    | 54.63682  |
| 5      | 92.98410      | 10.19808  | 1.214545| 1.29079    | 17.37029    | 52.56471  |
| 6      | 95.81247      | 10.74962  | 1.729607| 1.42017    | 17.80941    | 51.29043  |
| 7      | 98.01422      | 10.95865  | 2.405162| 1.49407    | 18.04150    | 50.43907  |
| 8      | 99.81176      | 10.95959  | 3.173832| 1.71930    | 18.10315    | 49.84413  |
| 9      | 101.3640      | 10.83918  | 3.989398| 1.77199    | 18.04014    | 49.41134  |
| 10     | 102.7241      | 10.65517  | 4.824668| 1.75495    | 17.89211    | 49.07846  |
| 11     | 103.9346      | 10.44621  | 5.663437| 1.73974    | 17.68595    | 48.80331  |
| 12     | 105.0262      | 10.3778   | 6.494758| 1.71879    | 17.45498    | 48.55800  |
| 13     | 106.0228      | 10.04625  | 7.310064| 1.71149    | 17.20441    | 48.32478  |
| 14     | 106.9428      | 9.881590  | 8.102064| 1.67932    | 16.94943    | 48.09299  |
| 15     | 107.8004      | 9.749209  | 8.864500| 1.68311    | 16.69831    | 47.85680  |
| 16     | 108.6059      | 9.651280  | 9.592212| 1.66859    | 16.45690    | 47.61366  |
| 17     | 109.3667      | 9.587676  | 10.28122| 1.65387    | 16.22918    | 47.36320  |
| 18     | 110.0880      | 9.556689  | 10.92873| 1.63904    | 16.01776    | 47.10641  |
| 19     | 110.7734      | 9.555573  | 11.53307| 1.62641    | 15.82410    | 46.84512  |
| 20     | 111.4252      | 9.580965  | 12.09355| 1.60510    | 15.64884    | 46.58154  |
| 21     | 112.0449      | 9.629199  | 12.61035| 1.59043    | 15.49196    | 46.31806  |
| 22     | 112.6335      | 9.66537   | 13.848432| 15.8021    | 15.35295    | 46.05700  |
| 23     | 113.1917      | 9.779339  | 13.51683| 15.67236   | 15.23096    | 45.80052  |
| 24     | 113.7199      | 9.874171  | 13.90970| 15.54068   | 15.12491    | 45.55054  |
| 25     | 114.2187      | 9.777885  | 14.26500| 15.41480   | 15.03359    | 45.30872  |

Source: Author's processed results
Conclusions

The position of bitcoin in Indonesia has now been determined as a commodity by Bappeti in early 2019. This is marked by the issuance of four new regulations that form the legal basis for bitcoin in Indonesia. However, before 2019 bitcoin transactions already existed in Indonesia. After a number of tests, it was found that from 2012 to the beginning of the semester in 2019 there was no long-term co-integration between bitcoin, exchange rates, interest rates, gold prices, and consumer price indexes. This means that there is no balance and equality of movement in the long run between variables. However, causality is found that there is directional causality between the price of gold with the consumer price index and the consumer price index with the exchange rate. After further stimulation, bitcoin is known to have a significant effect on the consumer price index, and the consumer price index also has an effect on gold prices. After forecasting used Impulse Response Function, it is known that there exist t positive and negative response of each variable to another variable in the event of a shock. On average all variables will be stable in the eighteenth period. As for who contributes to each variable when there is a shock is more dominated by the variable itself.

References

Aharon, DY, & Qadan, M. (2018). Bitcoin and the day-of-the-week effect. Finance Research Letters, (November), 1–10. https://doi.org/10.1016/j.frl.2018.12.004

Almudhaf, F. (2018). Pricing efficiency of Bitcoin Trusts. Applied Economics Letters, 25 (7), 504–508. https://doi.org/10.1080/13504851.2017.1340564

Dastgir, S., Demir, E., Downing, G., Gozgor, G., & Lau, CKM (2019). The causal relationship between Bitcoin attention and Bitcoin returns: Evidence from the Copula-based Granger causality test. Finance Research Letters, 28 (April 2018), 160–164. https://doi.org/10.1016/j.frl.2018.04.019

Eroğlu, BA (2019). Wavelet variance ratio co-integration test and wave strapping. Journal of Multivariate Analysis, 171, 298-319. https://doi.org/10.1016/j.jmva.2018.12.011

Holub, M., & Johnson, J. (2019). The impact of the Bitcoin bubble of 2017 on Bitcoin’s P2P market. Finance Research Letters, 29, 357–362. https://doi.org/10.1016/j.frl.2018.09.001

Investing.com. (2019). investing.com. Retrieved September 29, 2019, from https://www.investing.com/crypto/bitcoin/btc-usd

Kim, W., Lee, J., & Kang, K. (2019). The effects of the introduction of Bitcoin futures on the volatility of Bitcoin returns. Finance Research Letters, (June), 1–8. https://doi.org/10.1016/j.frl.2019.06.002

Lin, WL, Law, SH, Ho, JA, & Sambasivan, M. (2019). The causality direction of corporate social responsibility - Nexus corporate financial performance: Application of Panel Vector Autoregression approach. North American Journal of Economics and Finance, 48, 401–418. https://doi.org/10.1016/j.najef.2019.03.004

Narayan, PK, Narayan, S., Eki Rahman, R., & Setiawan, I. (2019). Bitcoin price growth and Indonesia’s monetary system. Emerging Markets Review, 38, 364–376. https://doi.org/10.1016/j.ememar.2018.11.005

Phillip, A., Chan, J., & Peiris, S. (2018). A new look at Cryptocurrencies. Economics Letters, 163 , 6–9. https://doi.org/10.1016/j.econlet.2017.11.020

Wallace, B. (2011). The Rise and Fall of Bitcoin. Retrieved September 29, 2019, from Wired magazine website: https://www.wired.com/2011/11/mf_bitcoin/

Zulfikar Bagus Pambuko, N. (2018). Eviews for Basic Econometric Analysis. Magelang: UNIMMA Pres.