As an Investment, Can Crypto Affect Rupiah Exchange Rate? And Vice Versa : Indonesia's Evidence

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ABSTRACT:*This study aims to analyze the impact of cryptocurrencies on the rupiah exchange rate in Indonesia in 2021. This type of research is exploratory research with the method used being a dynamic model. The data in this study is secondary data with a period of 1 year with daily data frequency. The results show that there is an interrelated influence between cryptocurrencies and exchange rates, other results also show the potential for investment in several types of crypto.*

KEYWORDS:*Crypto, Exchange Rates, VECM, Investment*

I. INTRODUCTION

The Covid-19 virus pandemic puts considerable pressure on all aspects of life around the world, this virus pandemic has an impact on important sectors in a country, not only the health sector but also the education sector, the social sector, and the worst is the economic sector. The consequences that this virus will have on the economy are significant. In Indonesia the Covid-19 virus has spread very widely, various policies have been taken by the government to suppress the spread of the Covid-19 virus. One of the policies emphasized by the Indonesian government is digitalization. With digitalization, it is hoped that each individual does not need to meet face to face to socialize directly, so the potential for the spread of the virus will be reduced. On the economic side, with digitalization.

The implementation of technology in the economic sector is common for every individual, especially in today's modern era. In connection with the massive development of economic digitization, the phenomenon of currency digitization, or cryptocurrency, emerged. Initially, this digital currency phenomenon appeared in 2008 – 2009, with Bitcoin as a digital currency at that time. However, over time, many digital currencies have emerged besides Bitcoin, for example, Ethereum, Ripple, Monero, Chainlink, Litecoin, Doge, and so on. Digital money is becoming very popular at this time, this is also happening in Indonesia, for example, the phenomenon of *"Ghozali Everyday"* (https://hot.detik.com/celeb/d-5972655/ghozali-everyday-and-everywhere),which uses the Ethereum digital currency for NFT (Non-Fungible Token) transactions. However, in Indonesia only a few individuals or groups know the essence of cryptocurrency, this happens because of the lack of literacy regarding digital finance, besides that the Indonesian government also prohibits the use of cryptocurrency as a transaction tool. Cryptocurrency in Indonesia is considered a commodity, which is regulated and supervised by the Commodity Futures Trading Regulatory Agency (Bappebti). Such conditions provide new opportunities for a handful of individuals and even groups to convert cryptocurrencies into one of the purposes of speculation. This is in line with the theory of demand for money put forward by Keynes and James Tobin, which in theory distinguishes between transaction motives and speculation.

Keynes's theory states that the demand for money for transactions depends on income (Nopirin, 1992), as well as the demand for money for transactions, another motive for the demand for money Keynes is for speculation, the purpose of speculation according to Keynes is determined by the interest rate. Over time, Keynes's theory was redeveloped by James Tobin in his writing entitled "Liquidity Preference as Behavior Towards Risk", Tobin's theory can be seen as a refinement of Keynes' theory (Nopirin, 1992), namely by stating the assumption of uncertainty and the possibility of an individual doing diversification of the form of his wealth or investment, this is also supported by Milton Friedman's statement in his writing entitled "The Quantity of Money A Restatement", which explains that an owner of wealth will always try to choose the form and combination of wealth. Referring to the assumption of Tobin and Friedman that individuals can diversify wealth, one of the factors that influence the demand for money for speculation, besides the interest rate is the availability of several alternative forms of wealth (Nopirin, 1992), these alternatives lead to the function of digital currency, in addition to as a transaction tool, it is also considered capable of potential as a form of wealth diversification or investment.

Judging from some of the volatile nature of digital money, of course, special attention is needed for investors if they want to make digital money an investment instrument, Enajero (2021), argues that cryptocurrency can function as a substitute for cash and non-cash assets, in line with Liu & Serletis (2019) also

argues that most aspects of cryptocurrencies are similar to financial assets. For example, investing in bitcoin, Matkovskyy et.al., (2020), explains the attractiveness of bitcoin investment as a hedging tool for shocks in the uncertainty of US economic policy, and also this result is useful for bitcoin market participants to better understand the nature of bitcoin and facilitate better portfolio and risk management. A study by Ghorbel and Jeribi (2021) said that during a period of stability.

Some of the most popular digital currencies in Indonesia are Bitcoin, Ethereum, Litecoin, Binance, and Cardano (www.jagoteknologi.com) but which are often used by some beginner-level digital currency investors in Indonesia, namely Ripple and DogeCoin (bisnika.hops.id). There is a fundamental factor when a digital currency will be used as an investment instrument in Indonesia, namely the Rupiah exchange rate (IDR/USD), due to the nature of digital currency which tends to fluctuate. To discuss the study of the dynamics of investing in digital currencies in Indonesia, this study has specific and general objectives, specifically to form the determinants of digital currencies, namely Ripple and DogeCoin and the rupiah exchange rate and the general objective is to analyze the dynamics of Ripple and DogeCoin when used. as an investment instrument in Indonesia.

II.   LITERATURE REVIEW

Money is one of the fundamentals of society in carrying out daily activities, especially economic activities. With the existence of technology, transactions and all forms of conventional economic activities will slowly be evicted. According to Freedman (2006), financial technology systems integrate mathematics, statistics, computing, and economics with analytical systems, it will better connect messages, transactions, order processing, and payment systems. Significantly, in line with the popularity of a technology called blockchain, Chishti & Barberis (2016) explain blockchain in essence is a public ledger that if every individual who mines a digital currency will have a copy. Blockchain is a digital system that is applied to cryptocurrencies. Rubini (2017) explains that cryptocurrency is a means of exchange, it is related to digital information exchange schemes so that cryptocurrency in this case can be interpreted as a transition from conventional transactions to digital transactions.

Concerning the exchange rate of the main currency, Correli (2018), shows the results that cryptocurrency has a relationship with three currencies, namely Thailand, Taiwan, and China, this can indicate that cryptocurrency also has the potential to have a relationship with the Indonesian currency, considering that Indonesia is also included Asian countries. A study conducted by Zhang & Wang (2020), also explains that in the short term, digital currency exchange and exchange rates need to adjust to changes in economic fundamentals and market conditions. Regarding the cryptocurrency to be studied, Setiawan argues that the return on Ripple has never reached more than 30 percent, but daily losses on Ripple have reached 40 percent, while other cryptocurrencies have never experienced this.

In contrast to the study of Gunawan et.al. (2021) who argue that some cryptocurrencies can be used as investment instruments, especially during the pandemic that occurred in Indonesia, the results of the analysis explain that Dogecoin can act as a hedging tool during a pandemic and can be one of the considerations for investors, to use Dogecoin as an alternative. investment. Enajero (2021) and Liu & Serletis (2019) study explained that cryptocurrency can be a substitute for financial and non-financial assets. To implement cryptocurrency investment in Indonesia, of course, it is necessary to consider a complex portfolio, considering that the risks faced are also high, this was disclosed by Pele, et.al., (2021) which explains that the volatility of some cryptocurrencies is considered quite high when compared to other classical assets, on the other hand, the high volatility of cryptocurrencies is also able to provide shocks to the stability of financial assets. From the various studies that have been carried out, showing different results, of course, this is an interesting topic for researchers, especially the dynamics of cryptocurrency and investment in Indonesia.

III.   RESEARCH METHODS

This research is explorative, Kuncoro (2013) explains that exploratory research is a type of research whose purpose is to develop knowledge that is still new, considering that cryptocurrency is a fairly new thing among Indonesian people. This study uses dynamic analysis techniques, dynamic analysis uses the VAR/VECM approach by assuming all the variables tested are independent, dynamic models are analytical techniques that can be used to see the effect of variables in the short and long term. The data used is secondary time series data during 2021, with data frequency per day. This research data was obtained from the sitehttps://id.investing.com. The variables studied in this study are the price of Ripple, the price of Dogecoin, and the exchange rate of the rupiah against the US dollar. There are stages of testing the VAR/VECM dynamic model, namely:

1) Stationary Test
2) Lag Criteria
3) Model Stability
4) Causality Test

5) Cointegration Test
6) Model Estimation
7) Forecasting

IV.   RESULTS AND DISCUSSION

Stationary Test

Before analyzing the time series data, it is better to know the nature of the time series data. Testing this data includes a unit root test for all research variables, a data is called stationary if the values of the mean, variance, and covariance are constant at the time of observation, below are the results of the unit root test for Ripple, Dogecoin and IDR/USD exchange rates.

Table1. Unit Root Test

Series: DOGE, EXCHANGE, RIPPLE				
			cross-	
Method	Statistics	Prob.**	sections	Obs
Null: unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-5.31290	0.0000	3	1074
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-13.3851	0.0000	3	1074
ADF - Fisher Chi-square	163.909	0.0000	3	1074
PP - Fisher Chi-square	269,151	0.0000	3	1088
** Probabilities for Fisher tests are computed using an asymptotic Chi				
-square distribution. All other tests assume asymptotic normality.				

Source: Authors,2022

It can be seen from the stationarity test results that all variables have a probability value of 0.0000, which value is smaller than 0.05 so the stationary test results indicate that all variables to be studied in the dynamic model are not indicated by the unit root. Next is the determination of the lag length criteria.

Determination of Lag Length Criteria

The purpose of this test is to determine a choice of lag length that will be used in the next test in the dynamic test. The following are the results of the test for determining the length of the lag.

Table2. Lag Length

| VAR Lag Order Selection Criteria						
lag	LogL	LR	FPE	AIC	SC	HQ
0	-1042,243	NA	0.077473	5.955802	5988800	5.968935
1	-328.9724	1410,285	0.001401	1.942862	2.074855*	1.995395*
2	-316.4379	24,56897*	0.001373*	1.922723*	2.153710	2.014654
3	-311.1578	10.25938	0.001402	1.943919	2.273901	2.075250
4	-304.5757	12.67661	0.001422	1.957696	2.386672	2.128426
* indicates lag order selected by the criterion						

Source: Authors,2022

From the results of the test for determining the recommendation or choice of lag, it can be seen that the test results indicate that lag 2 can be used as the choice with the best lag value, among all recommendations. Decision-making can be determined by the asterisk (*) on the test results. It is known that lag 2 has an asterisk in the AIC and SC tables, so that lag 2 becomes the lag that will be used in the further testing stage.

Model Stability

The stability test is one of the tests that are quite important, the purpose of this test is to review the stability of the model to be used. The stability of the model will affect the estimation results at the forecasting stage. If the results of the stability test show unstable results, the forecasting results can be concluded to have invalid results. Below is a graph of the stability test results.

Figure1. Stability Test
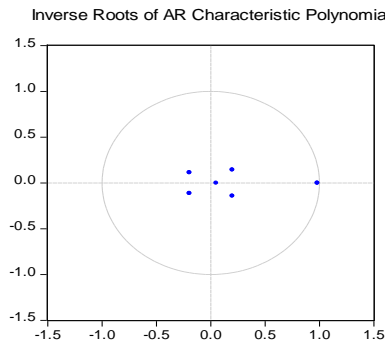
Source: Authors,2022

The basis for making decisions in the test is to know the distribution of points on the graph above, if the points are inside a circle, then the model is considered to meet the model stability requirements. It is known that the distribution of points is in a circular area, so that in this study, the model meets the stability criteria, and can be continued to the next test stage.

Cointegration Test

The cointegration test is the next step after the model is declared stable in the previous test. The test uses the Johansen approach, the purpose of the cointegration test is to determine the existence of cointegration between variables, when the test results indicate the existence of cointegration, then the Vector Error Correction Model (VECM) test can be used, but on the contrary, if there is no cointegration between variables, it will be carried out the Vector Autoregressions (VAR) approach. The following are the results of the test.

Table3. Cointegration Test

Sample (adjusted): 1/04/2021 12/31/2021				
Series: LOG(DOGE) LOG(EXCHANGE) LOG(RIPPLE)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistics	Critical Value	Prob.**
None *	0.280334	206.3187	29.79707	0.0001
At most 1 *	0.206046	89.86377	15.49471	0.0000
At most 2 *	0.022857	8.185428	3.841466	0.0042
Trace test indicates 3 cointegratingeqn(s) at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				

Source: Authors,2022

The test results show that all variables, namely Ripple, Dogecoin, and the IDR/USD exchange rate have cointegration, so the test with the VECM approach can be implemented in this research case. The next test is a causality test, using the Granger approach.

Causality Test

At this testing stage, the main goal is to know the direction of the relationship between a variable. According to Gujarati & Porter (2013), the essence of the relationship between variables cannot prove causality or the direction of the influence, but in regressions involving series data, the results can be different.

Table4. Causality Test

Pairwise Granger Causality Tests Sample: 1/01/2021 12/31/2021 Lags: 2			
Null Hypothesis:	Obs	F-Statistics	Prob.
EXCHANGE does not Granger Cause DOGE	363	0.04587	0.9552
DOGE does not Granger Cause EXCHANGE		1.27500	0.2807
RIPPLE does not Granger Cause DOGE	357	17.7514	5.E-08
DOGE does not Granger Cause RIPPLE		13.6306	2.E-06
RIPPLE does not Granger Cause EXCHANGE	357	1.03475	0.3564
EXCHANGE does not Granger Cause RIPPLE		0.99025	0.3725

Source: Authors,2022

The test results show that there are only two variables that have a causal relationship, namely Ripple and Dogecoin, both variables are digital currencies being tested. While the Rupiah/USD exchange rate has no causality with the two cryptocurrencies, this result is different from a previous study by Correli (2018), which argues that digital currencies have a relationship with major exchange rates. To find out more about the relationship between variables, the next step is to do the VECM test.

Vector Error Correction Model

This test was carried out to know the long-term and short-term relationship of cryptocurrency and the value of the rupiah. On the other hand, this test can also determine the estimation of a dynamic model, from the tested variables, the following are the results of testing with the VECM method.

Table5. VECM Test

Vector Error Correction Estimates			
Standard errors in ( ) & t-statistics in [ ]			
CointegratingEq:	CointEq1		
LOG(EXCHANGE(-1))	1.0000000		
LOG(DOGE(-1))	0.035560		
	(0.02298)		
	[1.54772]		
LOG(RIPPLE(-1))	**0.088772**		
	(0.03652)		
	[2.43090]		
C	8.631470		
Error Correction:	D(LOG(EXCHANGE))	D(LOG(DOGE))	D(LOG(RIPPLE))
CointEq1	**-0.975728**	-0.041554	-0.880239
	(0.09212)	(0.03401)	(0.22321)
	[-10.5919]	[-1.22181]	[-3,94361]
D(LOG(EXCHANGE(-1))))	0.035223	0.036824	0.679443
	(0.07601)	(0.02806)	(0.18418)
	[0.46338]	[1.31217]	[3.68906]
D(LOG(EXCHANGE(-2))))	0.023944	0.013218	0.055437
	(0.05562)	(0.02053)	(0.13476)
	[0.43053]	[0.64376]	[0.41139]
D(LOG(DOGE(-1))))	-0.013280	-0.005099	-0.086089
	(0.14471)	(0.05343)	(0.35064)
	[-0.09177]	[-0.09545]	[-0.24552]
D(LOG(DOGE(-2))))	-0.090361	-0.102314	0.471244
	(0.14104)	(0.05207)	(0.34173)
	[-0.64068]	[-1,96491]	[1.37898]
D(LOG(RIPPLE(-1))))	**0.056047**	-0.011602	-0.657018
	(0.02032)	(0.00750)	(0.04923)
	[2.75876]	[-1.54684]	[-13.3472]
D(LOG(RIPPLE(-2))))	0.027562	0.000703	-0.335366
	(0.02032)	(0.00750)	(0.04924)
	[1.35624]	[0.09374]	[-6.81070]
C	0.000794	0.009479	0.007758
	(0.01903)	(0.00703)	(0.04611)
	[0.04172]	[1.34905]	[0.16825]
R-squared	0.470916	0.027457	0.408146
adj. R-squared	0.460212	0.007782	0.396172
SD dependent	0.485271	0.132143	1.111705

Source: Authors,2022

The VECM test results show that there is a long-term and short-term relationship between cryptocurrencies and the rupiah exchange rate. In the long run, Ripple has a relationship with the rupiah exchange rate with a coefficient of 0.088772, and in the short term, it is known that Ripple on Lag 1, has a short-term relationship with the rupiah exchange rate, so it can be concluded that there is only one cryptocurrency that is significant to the rupiah exchange rate, namely Ripple. Thus, the following equation can be written:

$$Log(Exchange(-1))=0.975728(ECT)+0.088772Log(Ripple(-1))+0.056047D(Log(Ripple(-1)))\qquad (ie,(1)$$

Equation 1 above explains that the Ripple value influences changes that occur in the rupiah exchange rate. The estimation results show the Ripple coefficient value, respectively 0.088772 in the short term and 0.056047 in the long term, so when there is an increase in the Ripple value of 1 percent in the short term, it will increase the rupiah exchange rate by 0.088772 percent, while in the long term Ripple has a coefficient value of 0.056047, meaning that if there is an increase in the value of Ripple by 1 percent in the long term, it will increase the rupiah exchange rate by 0.056047 percent. Thus, it can be concluded that Ripple has a risk if it is converted as an investment instrument, this is based on the positive relationship between Ripple and the rupiah exchange rate, if there is a shock to the rupiah exchange rate, the investment portfolio in Ripple will also be affected, so there is no hedging function for shocks in the fundamental sector. The estimation results in this study are different from the previous study conducted by Gunawan (2021), who argued that some cryptocurrencies can be used as investment portfolios.

The results of the analysis which show the high risk of Ripple as an investment instrument, are also strengthened by a previous study by Setiawan (2020) who argues that the return on Ripple has never reached 30 percent, thus Ripple will have the potential to cause losses for novice investors in Indonesia, especially investors who are minimal analysis on the potential of its portfolio. However, the good news is that for digital currency Dogecoin, this type of crypto has no relationship with the fundamental sector of the rupiah exchange rate, so it can increase the opportunity for wealth diversification in crypto assets, especially Dogecoin. The lack of coherence of Dogecoin with the rupiah exchange rate will make Dogecoin safe when the exchange rate of the rupiah, which in this case is a fundamental sector, experiences shocks.

Reviewing the previous causality test, it is known that the two cryptocurrencies are related to each other, this indicates that a slight shock to the rupiah exchange rate will also be able to affect Dogecoin, considering that Dogecoin has causality with Ripple which has a relationship with the rupiah exchange rate. To review further, the next test stage is forecasting by knowing the shocks that occur in each variable, the Impulse Response Function test is a test that can be used for this purpose.

Graph1. IRF Test
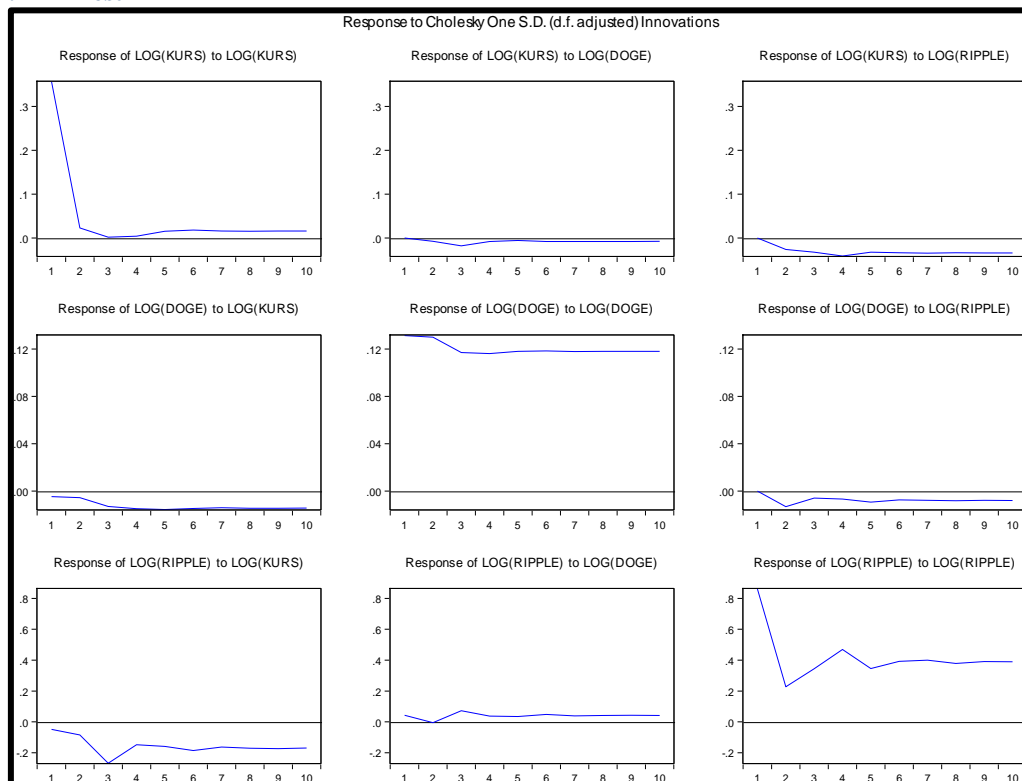
Source: Authors,2022

From the results of the Impulse Response Function test, it is known that the response of the rupiah exchange rate to changes in Dogecoin is considered stable, it can be shown in the first-row graph, second column. The graph is shown by a line that is close to the center of the equilibrium line, this shows, if there is a shock in the exchange rate caused by changes in Dogecoin, the exchange rate takes a short time to be in an equilibrium position, the resilience of the exchange rate to Dogecoin shocks is considered quite strong when viewed from the stability of the graph for 10 periods. In contrast to the graph of the response of the rupiah exchange rate to Ripple (first row of the third column), for 10 periods the rupiah exchange rate showed a fairly stable response, but the graph was a bit far from the equilibrium line, so that if there was a shock to Ripple,

The second row, the first column, shows Dogecoin's response to changes in the rupiah exchange rate, for 10 periods, the graph tends to show stable conditions, but to reach equilibrium when a shock occurs, Dogecoin takes a little longer, while in the second row, the third column, shows Dogecoin's response to the changes experienced by Ripple, during 10 periods some shocks tended to fluctuate in the first period to the 5th period, but the graph stabilized again in period 6 to the end of the period, and to reach equilibrium, Doge needed the time is quite fast when there is a shock to Ripple compared to a shock to the rupiah exchange rate.

The third row of the first column shows Ripple's response to shocks experienced by the rupiah exchange rate, the graph tends to fluctuate in the first period to the 6th period but becomes stable in the 7th period until the end of the period. The shock experienced by the rupiah exchange rate made Ripple take a long time to reach a stable condition, but the opposite happened when there was a shock experienced by Dogecoin, the Ripple chart was quite stable for 10 periods, on the other hand, Ripple also has a response which is quick to reach a state of equilibrium in the event of a shock to Dogecoin.

From the results of the IRF test, it can be seen that the rupiah exchange rate can have an impact on the volatility of crypto values, especially Ripple and Dogecoin which are one of the popular cryptos among the Indonesian people. And vice versa, crypto prices are also able to influence changes in the rupiah exchange rate, but specifically for the type of crypto Dogecoin, the impact obtained is not significant and does not provide too many risky shocks to the stability of the rupiah exchange rate, and conversely, an insignificant impact can be obtained by Dogecoin when the rupiah exchange rate experiences shock, so that the stability of Dogecoin is not disturbed.

V. CONCLUSION AND SUGGESTIONS

Based on the results of the analysis and discussion that has been carried out, there are main points that can be concluded, namely:

1) The VECM results show a long-term and short-term relationship between the rupiah exchange rate and cryptocurrencies, Ripple and Dogecoin.
2) Ripple has a causal relationship with Dogecoin, but the model does not show the direction of influence of the two types of crypto.
3) In the IRF test, it can be seen if the crypto value canaffect changes in the rupiah exchange rate, and vice versa the rupiah exchange rate is also able have an impact on changes in the crypto value, but Ripple becomes a high risk when there is a shock in the macro fundamental sector.

From the conclusions that have been written, it can be seen that Ripple has quite risky consequences if it is converted as an investment instrument, this is due to the influence of the economic fundamental sector, on the other hand, Ripple also has volatility which tends to be higher than Dogecoin, so that there will be a preference for diversification of financial assets towards Dogecoin, which is known to have a lower risk.

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