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THE VOLATILITY OF CRYPTOCURRENCY, DOLLAR AND COMPOSITE STOCK INDEX (JCI) FOR ESTIMATING VALUE AT RISK USING GARCH'S MODEL

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ABSTRACT

This study was conducted to analyze the volatility of cryptocurrencies and predict VaR or value at Risk. Variables, Dollar Index, and Composite Stock Price Index (JCI) were used as independent variables. The cryptocurrency objects in this study are Bitcoin and Ethereum which have the largest market capitalization. The data in this study uses the period January 1, 2019 to December 31, 2021. This study uses GARCH analysis, Estimation of value at risk (VaR) using the GARCH model only works well on the Dollar. This is from the validity and more value it can be seen that the VaR estimate is lower and closer to the actual loss compared to Bitcoin and Ethereum. This situation has that Bitcoin and Ethereum are unstable and high risk compared to the Dollar.

1. INTRODUCTION

Cryptocurrency is the nickname given to a system that uses cryptographic technology to securely transmit data and process digital currency exchanges in a dispersed manner [1]. Cryptocurrency is digital or virtual money that has a blockchain-based technology [2]. Digital currencies have almost identical functions to traditional currencies. The rapid development of cryptocurrencies has had an impact on Indonesia. The impact is that it attracts many millennial generations in Indonesia to make cryptocurrency as an alternative investment/trading even though it cannot be used as a means of payment because it has not been recognized as a legal payment instrument in Indonesia.

According to [3], there are several advantages and disadvantages of cryptocurrencies. The advantages are the presence of blockchain technology, using a decentralized system that is not tied to a central banking system, freedom and speed in transactions, and identity security in transactions. While the weaknesses include that cryptocurrencies have high volatility so that the risk is high, do not have an underlying asset, and are prone to be used as a means of crime.

Cryptocurrency transactions, it is very difficult to fake or manipulates because it has very good security [4]. The crypto market is experiencing very good development until now, its market capitalization is very large. So it is believed that the crypto market itself can help investors in finding big returns. This study will discuss cryptocurrencies in Bitcoin and Ethereum. In emerging cryptocurrency markets, Fundamental analysis differs from traditional financial assets (e.g. stocks, and bonds) due to different technologies and the cryptocurrency market environment in which the asset has a profit, income, or financial report [5]. The determinants of fundamental analysis of the cryptocurrency market can be seen

from market capitalization (showing altcoin performance for growth), and trading volume (showing price dynamics and altcoin liquidity). The next price (to show altcoin transaction rates/returns) in the short and long term [6]. The cryptocurrency market has exploded in recent years, becoming an industry worth USD 470 bn (Coinmarketcap.com 2018). Bitcoin (BTC) was the first currency of its kind; other alternative cryptocurrencies, 'altcoins', have since been created in an attempt to improve upon the way that their transaction value is digitally sent and received. The key innovation that can be attributed to Bitcoin's rapid success is the use of theblockchain technology, but this is challenged[7].
According to [8] Volatility is basically a natural phenomenon. Indonesia, as a developing country, is vulnerable to food price volatility. This is because basic food needs are still imported, if world food prices are unstable, it will affect the condition of domestic food prices. Cryptocurrency fundamental assets can influence price fluctuations in the cryptocurrency market based on an explanation of the difficulties arising from business phenomena and relevant research around price fluctuations in the cryptocurrency market [5]. The movement of stock prices in the Indonesian stock exchange is strongly influenced by changes that occur in both macroeconomic variables and changes in global stock exchanges. Any changes that occur in macroeconomic variables will have an impact on the movement of Indonesian stock prices [9]. The volatility of Bitcoin has been steadily decreasing throughout its lifetime. If it follows the trend of its six years of existence, it will reach the volatility levels of fiat currencies in 2019-2020 and become a functioning alternative to fiat currencies [10].
Volatility analysis will be tested using the GARCH system because the GARCH framework system is very suitable for use. GARCH is commonly used in analyzes such as rates of return and volatility. The GARCH framework can provide something that is sensitive to the assets to be measured, such as in this study cryptocurrencies, especially Bitcoin and Ethereum. In addition, this study uses the GARCH model because it has advantages over other models [11]. The reached results prove that the majority of crypto-currencies turn out to be rather effectively modulated via the TGARCH with double exponential distribution [12]. The asymmetric GARCH showed that bitcoin may be useful in risk management and ideal for risk averse investors in anticipation of negative shocks to the market [13].
Most financial time series data have shown that the conditional distribution of returns series exhibit several stylized features such as excess kurtosis, negative skewness, price jumps, leverage effects, time-varying volatility, and volatility clustering. These stylized facts and properties of the returns series have significant ramification for financial models especially risk-scenario distribution, volatility estimation and prediction [14].
In this study, the authors are interested in estimating VaR parametrically using the generalized autoregressive conditional heteroscedasticity (GARCH) model. The GARCH model is a time series statistical model to analyze the residual variance that depends on the square of the past residual and the past residual variance which was developed by Tim Bollerslev in 1986. The use of the GARCH model is considered very suitable for the analysis of the return and volatility of cryptocurrencies. [15] Concluded that iGARCH (1, 1) with normal innovations is the optimal model. Their conclusion however differs from the known stylized fact of financial time series data. In addition, the GARCH model does not see the non-constant variance (heteroscedasticity) as a problem but uses it to create a regression model in the form of the conditional mean (ARIMA) and conditional variance (GARCH). The two regression models are forming components in estimating VaR. The use of models that are in accordance with the VaR method will produce accurate calculations so as to prevent investors/traders from making mistakes in predicting future conditions.

2. METHOD

2.1 Jenis and Data Source

The type of data used is secondary data, namely the type of data obtained through the processing of the second party from the results of field research and through library research, namely research through the library. The data used, obtained through the investing.com website to gather all data of Bitcoin, Etherium, Dollar and Composite Stock Price Index (JCI).

2.2 Analysis Method

The method that will be used in this research is the quantitative method. The data used in this study is sourced from investing.com which means that this study uses secondary data. Then the data will be analyzed using the unit root test and the GARCH method.
This study uses five variables

3. RELUST AND DISCUSSION

3.1 GARCH Model Result

After conducting the data stationarity test, then the GARCH test was carried out. On daily price data to investigate Bitcoin and Ethereum volatility with past explanatory variables, Dollar Index, and Composite Stock Price Index (JCI).

Table 1. Garch Model on Bitcoin

Model		Coefficient	Std.Error	z-Statistic	Prob	AIC	Log Likelihood
GARCH (1,1)	C	1,35E-05	0,001139	0,011886	0,9804	-3,740994	1820,382
	AR(1)	-0,05373	0,042672	-1,259127	0,4020		
	AR(2)	0,09063	0,036761	2,465404	0,0324		
	$\alpha 0$	0,000115	1,41E-05	8,167723	0,0000		
	$\alpha 1$	0,222682	0,028482	7,818413	0,0000		
	$\lambda 1$	0,761281	0,025331	30,05373	0,0000		
GARCH (1,2)	C	6,63E-06	0,001249	0,00202	0,9984	-3,739416	1820,617
	AR(1)	-0,04963	0,043417	-1,100918	0,2709		
	AR(2)	0,095285	0,042545	2,279054	0,0227		
	$\alpha 0$	0,000111	2,20E-05	5,912146	0,0000		
	$\alpha 1$	0,244358	0,048373	5,28279	0,0000		
	$\lambda 1$	-0,027949	0,16715	3,546101	0,0004		
	$\lambda 2$	0,768592	0,132771	1,020088	0,3077		
GARCH (2,1)	C	6,63E-06	0,001294	0,005126	0,9959	-3,739096	1820,461
	AR(1)	-0,04963	0,045727	-1,085355	0,2778		
	AR(2)	0,095285	0,042939	2,21908	0,0265		
	$\alpha 0$	0,000111	1,51E-05	7,391633	0,0000		
	$\alpha 1$	0,244358	0,041879	5,835674	0,0000		
	$\alpha 2$	-0,027949	0,038058	-0,734389	0,4627		
	$\lambda 1$	0,768592	0,028225	27,23129	0,0000		
GARCH (2,2)	C	-7,63E-06	0,001301	-0,005867	0,9953	-3,737413	1820,645
	AR(1)	-0,045033	0,046973	-0,958692	0,3377		
	AR(2)	0,099381	0,042196	2,357849	0,0185		
	$\alpha 0$	0,000125	5,50E-05	2,267398	0,0234		
	$\alpha 1$	0,268045	0,049747	5,378977	0,0000		
	$\alpha 2$	-0,021847	0,10588	-0,206341	0,5645		
	$\lambda 1$	0,624925	0,447719	1,395326	0,1628		
	$\lambda 2$	0,113842	0,333314	0,341547	0,7327		

Source: Data Process (2022)

The table above shows the result of GARCH model of Bitcoin, based on the result of GARCH model of bitcoin the best model is GARCH (1,1).

Table 2. Garch Model on Etherium

Model		Coefficient	Std.Error	z-Statistic	Prob	AIC	Log Likelihood
GARCH (1,1)	C	-7,85E-05	0,002051	-0,038268	0,9575	-3,277782	1597,447
	AR(1)	-0,482817	0,176607	-2,733846	0,0063		
	AR(2)	-0,367314	0,163559	-2,245762	0,0247		
	AR(3)	0,623119	0,165872	3,756625	0,0002		
	AR(4)	0,144057	0,042497	3,389794	0,0007		
	MA(1)	0,453346	0,187508	2,417742	0,0156		
	MA(2)	0,489546	0,183209	2,67207	0,0075		
	MA(3)	-0,521162	0,187655	-2,777234	0,0055		
	$\alpha 0$	0,000152	2,26E-05	6,75468	0,0000		
	$\alpha 1$	0,114366	0,012523	9,132589	0,0000		
	$\lambda 1$	0,833878	0,016399	50,84854	0,0000		
GARCH (1,2)	C	-2,27E-04	0,002016	-0,112784	0,9102	-3,290399	1604,553
	AR(1)	-0,505124	0,184851	-2,732609	0,0063		
	AR(2)	-0,383208	0,171602	-2,233123	0,0255		
	AR(3)	0,606752	1,74E-01	3,482262	0,0005		
	AR(4)	0,150376	0,040994	3,668292	0,0002		
	MA(1)	0,476229	0,190824	2,495644	0,0126		
	MA(2)	0,511705	0,186377	2,745542	0,0060		
	MA(3)	-0,49829	0,190897	-2,610257	0,0090		
	$\alpha 0$	0,000124	1,55E-05	8,027538	0,0000		
	$\alpha 1$	0,063272	0,00775	8,164606	0,0000		
	$\lambda 1$	1,537027	0,041584	36,96239	0,0000		
	$\lambda 2$	-0,645486	0,031718	-20,35083	0,0000		
GARCH (2,1)	C	-2,45E-04	0,002119	-0,115827	0,9078	-3,276854	1597,997
	AR(1)	-0,437682	0,16515	-2,650212	0,0080		
	AR(2)	-0,327954	0,14836	-2,210523	0,0271		
	AR(3)	0,663315	0,150566	4,405491	0,0000		
	AR(4)	0,139909	0,046272	3,02362	0,0025		
	MA(1)	0,412606	0,17394	2,372116	0,0177		
	MA(2)	0,450002	0,169975	2,647458	0,0081		
	MA(3)	-0,561834	1,74E-01	-3,226937	0,0344		
	$\alpha 0$	0,000175	2,75E-05	6,348162	0,0000		
	$\alpha 1$	0,076437	0,025498	2,997717	0,0027		
	$\alpha 2$	0,050329	0,026285	1,914744	0,0555		
	$\lambda 1$	0,812987	0,019585	41,51118	0,0000		
GARCH (2,2)	C	-5,68E-04	0,002052	-0,276668	0,7820	-3,291597	1606,133
	AR(1)	-0,431761	0,160638	-2,687787	0,0072		
	AR(2)	-0,315779	0,145878	-2,164687	0,0304		
	AR(3)	0,675632	1,48E-01	4,561195	0,0000		
	AR(4)	0,147178	0,042628	3,452546	0,0065		
	MA(1)	0,401946	0,165323	2,43128	0,0150		
	MA(2)	0,439586	0,161411	2,723391	0,0065		
	MA(3)	-0,572359	0,165355	-3,461402	0,0005		

$\alpha 0$	0,00014	1,91E-05	7,320369	0,0000
$\alpha 1$	0,021691	0,016653	1,302634	0,1927
$\alpha 2$	0,051903	0,019658	2,640264	0,0083
$\lambda 1$	1,511533	0,042046	35,94942	0,0000
$\lambda 2$	-0,634974	0,030886	-20,55849	0,0000

Source: Data Process (2022)

The table above shows the result of GARCH model of Bitcoin, based on the result of GARCH model of bitcoin the best model is GARCH (2,2).

Table 3. Garch Model on Dollar

Model		Coefficient	Std.Error	z-Statistic	Prob	AIC	Log Likelihood
GARCH (1,1)	C	-2,50E-03	0,001652	-1,514779	0,1298	-3,228395	1575,157
	AR(1)	-0,070917	0,338251	-0,209658	0,8345		
	AR(2)	-0,189982	0,325597	-0,583488	0,5546		
	AR(3)	0,600114	0,243127	2,468321	0,0136		
	MA(1)	0,047674	0,342735	0,139098	0,8894		
	MA(2)	0,236982	0,331019	0,715917	0,4740		
	MA(3)	-0,581441	0,248106	-2,343521	0,0191		
	MA(4)	0,048774	0,046703	1,04436	0,2963		
	$\alpha 0$	7,53E-05	8,68E-06	8,678966	0,9854		
	$\alpha 1$	0,124358	0,010656	11,66977	0,0000		
	$\lambda 1$	0,867266	0,008231	105,3684	0,0000		
GARCH (1,2)	C	-3,08E-03	0,001663	-1,853595	0,0638	-3,251776	1587,485
	AR(1)	0,459519	0,207822	2,211111	0,0270		
	AR(2)	-0,819003	0,051312	-15,96111	0,0000		
	AR(3)	0,703854	2,07E-01	3,407389	0,0007		
	MA(1)	-0,486904	0,225565	-2,158599	0,0309		
	MA(2)	0,869964	0,060084	14,47922	0,0000		
	MA(3)	-0,725827	0,222196	-3,266609	0,0011		
	MA(4)	6,38E-02	0,038853	1,642613	0,1005		
	$\alpha 0$	4,68E-05	6,80E-06	6,871572	0,0000		
	$\alpha 1$	0,25535	0,035706	7,151467	0,0000		
	$\lambda 1$	-0,156747	0,033678	-4,654239	0,0000		
	$\lambda 2$	0,899515	0,008694	103,4655	0,0000		
GARCH (2,1)	C	-2,45E-04	0,002119	-0,115827	0,9078	-3,276854	1597,997
	AR(1)	-0,437682	0,16515	-2,650212	0,0080		
	AR(2)	-0,327954	0,14836	-2,210523	0,0271		
	AR(3)	0,663315	0,150566	4,405491	0,0000		
	AR(4)	0,139909	0,046272	3,02362	0,0025		
	MA(1)	0,412606	0,17394	2,372116	0,0177		
	MA(2)	0,450002	0,169975	2,647458	0,0081		
	MA(3)	-0,561834	1,74E-01	-3,226937	0,0013		
	$\alpha 0$	0,000175	2,75E-05	6,348162	0,0000		
	$\alpha 1$	0,076437	0,025498	2,997717	0,0027		
	$\alpha 2$	0,050329	0,026285	1,914744	0,0555		
	$\lambda 1$	0,812987	0,019585	41,51118	0,0000		
GARCH	C	-3,11E-03	0,001503	-2,066721	0,0388	-3,25656	1590,803

(2,2)	AR(1)	0,442682	0,173424	2,552594	0,0107
	AR(2)	-0,737956	0,055533	-13,28866	0,0000
	AR(3)	0,740008	1,69E-01	4,384613	0,0000
	AR(4)	-0,477701	0,191613	-2,493055	0,0127
	MA(1)	0,789853	0,057616	13,70892	0,0000
	MA(2)	-0,788512	0,185212	-4,257338	0,0000
	MA(3)	0,060461	0,042828	1,411726	0,1580
	$\alpha 0$	3,39E-05	6,81E-06	4,984044	0,0000
	$\alpha 1$	0,352109	0,05237	6,723467	0,0000
	$\alpha 2$	-0,255536	0,047542	-5,374952	0,0000
	$\lambda 1$	0,983216	0,064044	15,35219	0,0000
	$\lambda 2$	-0,073382	0,055798	-1,315133	0,1885

Source: Data Process (2022)

The table above shows the result of GARCH model of Dollar, based on the result of GARCH model of bitcoin the best model is GARCH (1,2).

Table 4. Garch Model on Composite Stock Price Index (JCI).

Model		Koefisien	Std.Error	z-Statistic	Prob	AIC	Log Likelihood
GARCH (1,1)	C	-2,50E-03	0,001652	-1,514779	0,3248	-3,228395	1575,157
	AR(1)	-0,070917	0,338251	-0,204368	0,8539		
	AR(2)	-0,189982	0,325597	-0,584368	0,5326		
	AR(3)	0,600114	0,243127	2,468343	0,0136		
	MA(1)	0,047674	0,342735	0,139098	0,3254		
	MA(2)	0,236982	0,331019	0,715917	0,4230		
	MA(3)	-0,581441	0,248106	-2,343251	0,0461		
	MA(4)	0,043574	0,046703	1,04436	0,2642		
	$\alpha 0$	7,53E-05	8,68E-06	8,678966	0,0000		
	$\alpha 1$	0,124358	0,010656	11,64366	0,0000		
	$\lambda 1$	0,867266	0,008231	105,3684	0,0000		
GARCH (1,2)	C	-2,27E-04	0,002016	-0,112784	0,9142	-3,290399	1604,553
	AR(1)	-0,505124	0,184851	-2,732609	0,0063		
	AR(2)	-0,383208	0,171602	-2,233123	0,0255		
	AR(3)	0,606732	1,74E-01	3,482236	0,0005		
	AR(4)	0,150546	0,040994	3,668292	0,0002		
	MA(1)	0,476229	0,190824	2,495325	0,0134		
	MA(2)	0,511455	0,186377	2,745542	0,0060		
	MA(3)	-0,49829	0,190897	-2,610257	0,0090		
	$\alpha 0$	0,000124	1,55E-05	8,027438	0,0000		
	$\alpha 1$	0,063272	0,00775	8,164606	0,0000		
	$\lambda 1$	1,537027	0,041584	36,96579	0,0000		
	$\lambda 2$	-0,645486	0,031718	-20,3556	0,0000		
GARCH (2,1)	C	-2,45E-04	0,002119	-0,115827	0,9078	-3,276854	1597,997
	AR(1)	-0,437682	0,16515	-2,650212	0,0080		
	AR(2)	-0,327954	0,14836	-2,210523	0,0271		
	AR(3)	0,663315	0,150566	4,405491	0,0000		
	AR(4)	0,139909	0,046272	3,02362	0,0025		
	MA(1)	0,412606	0,17394	2,372116	0,0177		
	MA(2)	0,450002	0,169975	2,647458	0,0081		

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	MA(3)	-0,561834	1,74E-01	-3,226937	0,0013		
	$\alpha 0$	0,000175	2,75E-05	6,348162	0,0000		
	$\alpha 1$	0,076437	0,025498	2,997717	0,0027		
	$\alpha 2$	0,050329	0,026285	1,914744	0,0555		
	$\lambda 1$	0,812987	0,019585	41,51118	0,0000		
	C	-7,63E-06	0,001301	-0,005867	0,9953		
	AR(1)	-0,045033	0,046973	-0,958692	0,3377		
	AR(2)	0,099381	0,042196	2,355227	0,0185		
GARCH (2,2)	$\alpha 0$	0,000125	5,50E-05	2,267398	0,0234	-3,737413	1820,645
	$\alpha 1$	0,268045	0,049747	5,388141	0,0000		
	$\alpha 2$	-0,021847	0,10588	-0,206341	0,8365		
	$\lambda 1$	0,624925	0,447719	1,395796	0,1628		
	$\lambda 2$	0,113842	0,333314	0,341547	0,7327		

Source: Data Process (2022)

The table above shows the result of GARCH model of Composite Stock Price Index (JCI), based on the result of GARCH model of bitcoin the best model is GARCH (1,2).

3.2 ***Value at Risk*** **(VaR) Analysis**

After obtaining forecasts on the conditional variance (ARCH/GARCH), it is possible to estimate the value at risk (VaR) for the data period (in-sample forecasting) and for the future period (out-of-sample forecasting) by holding a period of one day and a 95% confidence level ($Z\alpha$=1,645). However, based on the results of the study, shows that the three cryptocurrencies in the form of Bitcoin, Ethereum, Dollar, and JCI in the calculation of returns are not normally distributed. So the value = 1.645 at the 95% confidence level must be corrected again and replaced with a value as in the previous Cornish-Fisher Expansion calculation in the normality test. The VaR estimation results on Bitcoin, Ethereum, Dollar, and JCI return data for the one-day period ahead t = 973 (1st September 2022) respectively are as follows:

On Bitcoin with the GARCH (1,1) model it will be calculated Y_{973} and σ_{9732}:

Y_t $=0,0000135-0.053730Y_{t-1}+0.090630Y_{t-2}$

Y_{973} $=0,0000135-0,053730_{Y972}+0,090630_{Y971}$

Y_{973} $=0,0000135-0,05373(-0,00499145252817882) + 0,09063(0,00231920829232547)$

Y_{973} $=0,0004918806$

σ_{t2} $=0.000115+0.222682e^{2}{}_{t-1}+0.761281\sigma_{t-12}$

σ_{9732} $=0.000115+0.222682e9722+0.761281\sigma_{9722}$

σ_{9732} $=0,0005647525$

So, the value of the 973rd variant is σ^{9732}=0.0005647525 so the volatility value is σt $=\sqrt{0.0005647525}=0.0237645219$. By using equation (2.73) and the value = 0.8505056787, the VaR for Bitcoin return is:

$VaR(\alpha)$ $= Yt+Zcf(\sigma t\times\sqrt{\sqrt{h}})$

$VaR(\alpha)$ $= 0,0004918806+0,8505056787(0,0237645219\times\sqrt{\sqrt{1}})$

$VaR(\alpha)$ $= 0,0207032814$

If an investor will make an investment in Bitcoin of IDR 100,000,000.00, then the value of $VaR(\alpha)$= 0,0207032814 there is a possibility that investors will suffer a maximum loss of: $VaR(\alpha)$= 0,0207032814×IDR 100.000.000= IDR 2.070.328,14

On Ethereum with the GARCH (2,2) model it will be calculated Y_{973} and σ_{9732}:

$Y_t=-0.000568-0.431761_{Yt-1}-0.315779_{Yt-2}+0.675632_{Yt-3}+0.147178_{Yt-4}+0.401946_{et-1}+0.439586_{et-2}-0._{572359et-3}$

$Y_{973}=-0.000568-0.431761_{Y972}-0.315779_{Y971}+0.675632_{Y970}+0.147178_{Y969}+0.401946_{e972}+0.439586_{e971}-0.572359_{e970}$

Y_{973} $=0,0019055336$

σ_{t2} $=0.000140+0.021691_{et-12}+0.051903_{et-22}+1.511533_{\sigma t-12}-0.634974_{\sigma t-22}$

σ_{9732} $=0.000140+0.021691_{e9722}+0.051903_{e9712}+1.511533_{\sigma 9722}-0.634974_{\sigma 9712}$

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σ_{9732} =0,0013492625
So, the value of the 973rd variant is σ^{9732}=0,0013492625 so the volatility value is σ_t =√0,0013492625=0,0367323087. By using equation (2.73) and the value of Zcf=0,8020817375, the VaR for Etherium return is:

$VaR(\alpha)$ = $Yt+Zcf(\sigma t\times\sqrt{\sqrt{h}})$
$VaR(\alpha)$ = 0,0019055336+0,8020817375 (0,0367323087×$\sqrt{\sqrt{1}}$)
$VaR(\alpha)$ = 0,0313678477
If an investor will make an investment in Ethereum of IDR 100,000,000.00, then the value of $VaR(\alpha)$= 0,0313678477 there is a possibility that investors will suffer a maximum loss of: $VaR(\alpha)$= 0,0313678477×IDR 100.000.000= IDR 3.136.784,77

On Dollar with the GARCH (2,2) model it will be calculated Y_{973} and σ_{9732}:
Yt =
$-0.002709-0.394160Y_{t-1}+0.031677_{Yt-2}+0.831758Y_{t-3}+0.379270_{et-1}-0.003108_{et-2}-0.812792_{et-3}+0.021087e_{t-4}$
$Y973$ =
$-0.002709-0.394160_{Y972}+0.031677_{Y971}+0.831758_{Y970}+0.379270_{e972}-0.003108_{e971}-0.812792_{e970}+0.021087_{e969}$
$Y973$ =0,0061145052
σ_{t2} $=0,0000929+0.205799e_{t-12}+0.484710_{\sigma t-12}+0.308660_{\sigma t-22}$
σ_{9732} $=0,0000929+0.205799_{e9722}+0.484710_{\sigma 9722}+0.308660_{\sigma 9712}$
σ_{9732} =0,0005514476
So, the value of the 973rd variant is σ^{9732}=0,0013492625 so the volatility value is σ_t =√0,0013492625=0,0367323087. By using equation (2.73) and the value of Zcf=0,8020817375, the VaR for Dollar return is:

$VaR(\alpha)$ = $Yt+Zcf(\sigma t\times\sqrt{\sqrt{h}})$
$VaR(\alpha)$ = 0,0019055336+0,8020817375 (0,0367323087×$\sqrt{\sqrt{1}}$)
$VaR(\alpha)$ = 0,0415679477
If an investor will make an investment in Ethereum of IDR 100,000,000.00, then the value of $VaR(\alpha)$= 0,0415679477 there is a possibility that investors will suffer a maximum loss of: $VaR(\alpha)$= 0,0415679477×IDR 100.000.000= IDR 4.156.794,77

On JCI with the GARCH (1,2) model it will be calculated Y_{973} and σ_{9732}:
Yt =
$-0.002709-0.394160Y_{t-1}+0.031677_{Yt-2}+0.831758Y_{t-3}+0.379270_{et-1}-0.003108_{et-2}-0.812792_{et-3}+0.021087e_{t-4}$ $Y973$ =
$-0.002709-0.394160_{Y972}+0.031677_{Y971}+0.831758_{Y970}+0.379270_{e972}-0.003108_{e971}-0.812792_{e970}+0.021087_{e969}$
$Y973$ =0,0061145052
σ_{t2} $=0,0000929+0.205799e_{t-12}+0.484710_{\sigma t-12}+0.308660_{\sigma t-22}$
σ_{9732} $=0,0000929+0.205799_{e9722}+0.484710_{\sigma 9722}+0.308660_{\sigma 9712}$
σ_{9732} =0,0005514476
So, the value of the 973rd variant is σ^{9732}=0,0013492625 so the volatility value is σ_t =√0,0013492625=0,0367323087. By using equation (2.73) and the value of Zcf=0,8020817375, the VaR for JCI return is:

$VaR(\alpha)$ = $Yt+Zcf(\sigma t\times\sqrt{\sqrt{h}})$
$VaR(\alpha)$ = 0,0019055336+0,8020817375 (0,0367323087×$\sqrt{\sqrt{1}}$)
$VaR(\alpha)$ = 0,0313678477
If an investor will make an investment in JCI of IDR 100,000,000.00, then the value of $VaR(\alpha)$= 0,0409826573 there is a possibility that investors will suffer a maximum loss of: $VaR(\alpha)$= 0,0409826573 ×IDR 100.000.000= IDR 4.098.265,73

Discussion

From the result above, the result shown that The prize of Cryptocurrencies (Bitcon and Etherium) influence by the past prize, but, it's don't have impact from other Variabel (Dollar and JCI). This result in line with the research by [11], The results of the average equation show that the price of Bitcoin is influenced by the past price of Bitcoin and gold, while other variables do not affect the price of Bitcoin. Ethereum price is only influenced by the past price of other Ethereum variables does not affect. In addition, the results of the variance equation show that Bitcoin volatility is only influenced by the past price of Bitcoin itself and is not influenced by other variables. The same result is obtained in Ethereum volatility which is influenced by the past price of Ethereum and is not affected by other variables. So that in investing in cryptocurrencies, especially Bitcoin and Ethereum, investors can analyze previous prices [11].

4. CONLUSION

Estimation of value at risk (VaR) using the GARCH model only works well on the Dollar. This is from the validity and more value it can be seen that the VaR estimate is lower and closer to the actual loss compared to Bitcoin and Ethereum. This situation has that Bitcoin and Ethereum are unstable and high risk compared to the Dollar. In addition, the results of the variance equation show that Bitcoin volatility is only influenced by the past price of Bitcoin itself and is not influenced by other variables. The same result is obtained in Ethereum volatility which is influenced by the past price of Ethereum and is not affected by other variables. So that in investing in cryptocurrencies, especially Bitcoin and Ethereum, investors can analyze previous prices, to mesure the Value of Risk.

This research has several limitations, namely, this research only leads to Ethereum and Bitcoin so that in the future it can analyze other instruments besides Bitcoin and Ethereum.

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