Is Cryptocurrency Risky as An Investment Instrument? Analysis of Return and Risk with A Comparison of Sharia Stocks

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Abstract: Cryptocurrency instruments show an increase in the number of investors in Indonesia, the increase in cryptocurrency investors is even bigger than the number of stock investors in the Indonesian capital market, even though stock investors also increase. The increase in stock and cryptocurrency investors is an indication that the investment climate in Indonesia is starting to improve, this must be accompanied by increased financial literacy regarding the returns and risks of an investment instrument, this research is important considering that understanding the returns and risks of an investment instrument is crucial in the decision making. The test in this study uses a descriptive statistics and independent sample t-test, if the sample does not meet the requirements of the parametric statistical test, it will use the non-parametric statistical test Mann Whitney Test, which aims to determine whether there is a difference in return and risk of cryptocurrencies and sharia stock prices for the period January 2015 to October 2021. This study finds that there are significant differences in the returns and risk of cryptocurrencies and Sharia Stocks. Based on descriptive statistics, the standard deviation of cryptocurrency returns is greater than the standard deviation of Sharia stocks, indicating that cryptocurrency risks are higher than Sharia Stocks.

Keywords: investment; cryptocurrencies; stock markets; return and risk

INTRODUCTION

Cryptocurrency is a decentralized digital asset, which uses cryptography to transfer funds from one party to another without the influence of monetary authorities (Corbet et al., 2020). The Indonesian government through the Commodity Futures Trading Supervisory Agency (Bappebti) under the Ministry of Trade (Kemendag) officially provides legal certainty regarding cryptocurrency as an investment asset in Indonesia, which means that this instrument is legal to trade, regulations has been issued since December 17, 2020. This regulation regulates cryptocurrency as a tradable investment asset and not a means of payment.

The legal status of cryptocurrencies in an Islamic view is divided into several opinions, the Indonesian Ulama Council (MUI) in its fatwa forbids (haram)

cryptocurrencies as a medium of exchange, cryptocurrency as an investment instrument is haram if it does not have a clear underlying, and is permissible if it has clear underlying and benefits because it fulfils the requirements as a *sil'ah* (Khan, 2022; MUI, 2021; Wartoyo & Septian Haerisma, 2022). The Fatwa from the Muhammadiyah Central Committee *Tarjih* and *Tajdid* Council forbids all forms of using cryptocurrencies both as a medium of exchange and investment instruments (Ilham, 2022)

The financial literacy index in Indonesia is 38.03% and the financial inclusion index is 76.19% based on OJK survey data in 2019. It illustrates that people do not yet understand financial products, instruments, and services, while the level of public access to these products is very high. Of course, this can be a problem because people use products, instruments, or services that they do not fully understand. So, it is hoped that this research can provide an overview to the public, especially on the characteristics of investment instruments, in this case cryptocurrencies and sharia stocks.

Figure 1: Number of Crypto Asset Players in Indonesia (in millions)
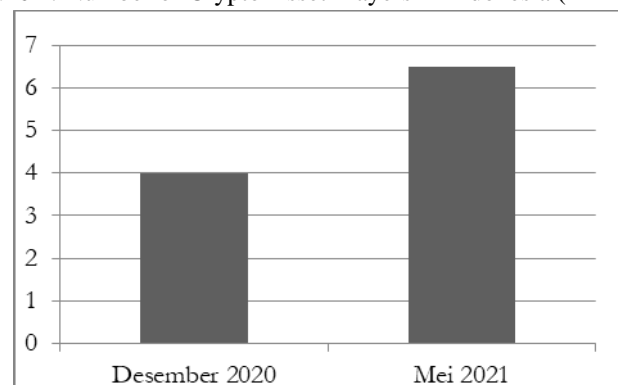

Source: (Ministry of Trade, 2021)

The legality of crypto money is important because cryptocurrency investment in Indonesia is growing so fast and people are easy to access these instruments, so many people are interested in investing in cryptocurrency instruments. Data from the Ministry of Trade (figure 1) shows the number of cryptocurrency players in Indonesia rose by 62.5% or 6.5 million people in May 2021 from the previous 4 million people at the end of 2020 (Dirgantara, 2021), this indicates an increase in cryptocurrency instrument transactions.

As of April 2021, the number of individuals involved in cryptocurrency trading has surpassed the number of investors registered in the capital market (as shown in Figure 2). Specifically, the total number of capital market investors reached 5,088,093 single investor identifications (SID), indicating a 31.11% increase from the year-end figure in 2020, which was 3,880,753 SID, the number of registered stock investors being 2,298,878 SID (KSEI, 2021). The trend of increasing stock investors in Indonesia does occur every year, but when compared with the total population of Indonesia, which is 271,349,889 people (BPS, 2020), it means that only 1.9% of the Indonesian population participates in the capital market.

Figures 2: Number of Indonesian Capital Market Players
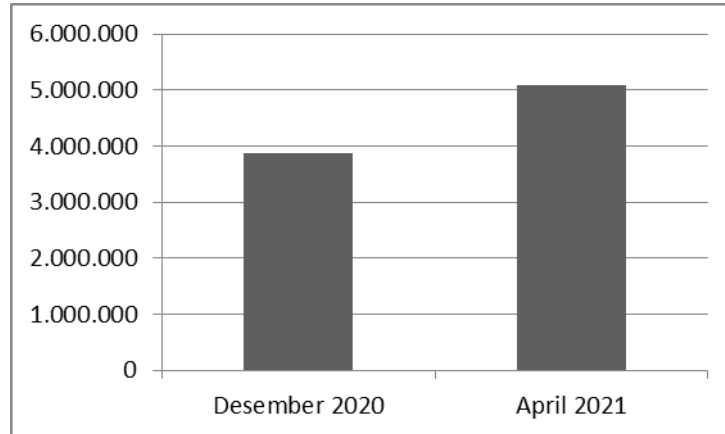
Source: (KSEI, 2021)

The increase in cryptocurrency and stock players is an indication that the investment climate in Indonesia is starting to improve, this must be accompanied by increased financial literacy regarding the potential returns and risks of an investment instrument, this research is important considering the understanding of the potential returns and risks of an investment instrument is very crucial in making investment decisions and as a benchmark for determining investment instruments that suit their risk preferences, because each investor has a different level of risk tolerance.

Figure 3: Cryptocurrency Prices (Bitcoin and Ethereum) in rupiah
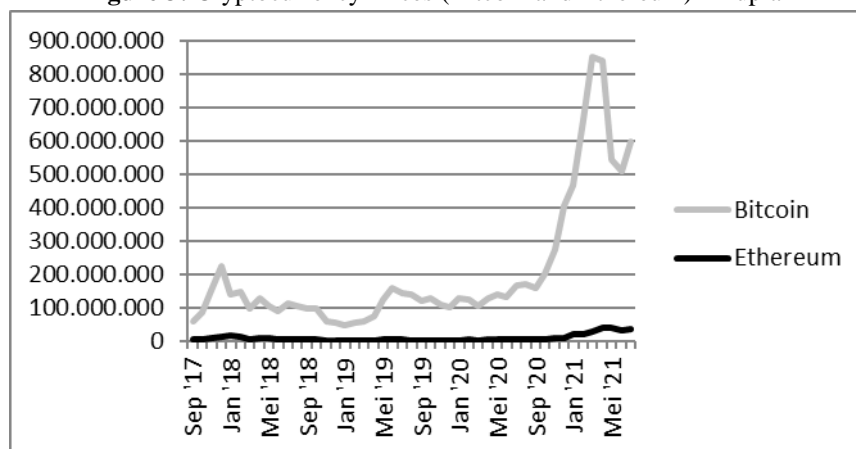
Source: (Investing.com, 2021)

Figure 3 explains that the price movement of crypto assets is very volatile, especially bitcoin, the increase and decrease occurred drastically in September 2020 the price of bitcoin in the range of 150 million then rose very high in early 2021 to 850 million rupiah and finally dropped back in June 2021 in the range of 500 million rupiah. This very high price fluctuation needs to be considered by investors, especially novice investors.

The explanation of the data above shows that there is a phenomenon of a very rapid increase in cryptocurrency investors when compared to capital market investors. From the data it is also known that the financial literacy of Indonesian people is still relatively low but financial inclusion is very high. It can be seen that Indonesia's financial literacy index

is low, so research that supports increasing financial literacy needs to be done. This research wants to contribute to increasing people's financial literacy, especially in cryptocurrencies and sharia stocks as investment instruments that focus on returns and risks.

There are still not many studies discussing cryptocurrencies in Indonesia because this instrument is relatively new, the research that has been done focuses on one investment instrument and only compares conventional investment instruments. Among them are focusing on cryptocurrency instruments that cryptocurrency promises high returns but the risk is also very high (Borri, 2019; Guo & Li, 2017; Xu et al., 2021; Zhang et al., 2021), contrary to research from (Ahmed, 2020) which explains there is no strong evidence of the existence of a positive risk-return trade-off in Bitcoin markets, meaning that high risk does not necessarily generate high returns. On the other hand, research on the stock market also focuses on one investment instrument, research from (Hersugondo et al., 2020; Suryadi et al., 2021) states that the volatility of the conventional stock market is higher compared to the sharia stock market, indicating higher risk on conventional stocks. In line with research (Abu-Alkheil et al., 2020) shows that sharia stocks are less sensitive to average market movements compared to conventional stocks.

This research attempts to compare cross investment instruments between cryptocurrencies and sharia stocks. For the government this research as a crucial resource for shaping its policies and strategies regarding the implementation of digital currency in the current era of rapid technological advancements. It is expected that the insights gained from this study will play a significant role in guiding the government's decision-making process. Furthermore, this research aims to demonstrate to investors the potential return and risk involved in the act of investing in cryptocurrency and sharia stock, so investors can wisely choose investment instruments that suit their risk preferences. This can prevent novice investors from making speculative and herding decisions, especially in cryptocurrency instruments, which are relatively new legalized in Indonesia. Before investing in financial instruments, investors need to understand about these investment instruments.

LITERATURE REVIEW
Cryptocurrency

Cryptocurrency is known in Indonesia as a crypto asset because regulations in Indonesia state that cryptocurrency is an investment asset, not a means of payment, meaning that its use as payment is an action that is not yet legal as long as regulations have not been updated. Cryptocurrency is a decentralized digital asset, which uses cryptography to transfer funds from one party to another without the influence of monetary authorities (Corbet et al., 2020).

According to (Inci & Lagasse, 2019) cryptocurrency is a digital asset that possesses value as long as its corresponding information and keys are kept secure and private. The individual who possesses this information is the owner of the cryptocurrency's value. Another definition of cryptocurrency according to (Aves, 2018) is a digital peer-to-peer exchange medium that uses cryptography to process and secure transactions. In contrast to digital money in general which is centralized and under the financial authority of a country,

crypto money has its own technology called blockchain which makes it decentralized. Blockchain is a database technology that organizes information into clusters referred to as blocks. These blocks are then interconnected in a sequential manner to create a continuous line, which is commonly known as a block-chain. Essentially, each block in the chain functions as a ledger or notebook page for the stored information (Danial, 2019).

Cryptocurrency has three core characteristics, namely decentralized, unregulated and anonymous (Inci & Lagasse, 2019). The decentralization of cryptocurrency comes from blockchain technology, which is a ledger that records every transaction that has ever taken place on the network, The operation is based on a peer-to-peer network, whereby data and information stored on the blockchain platform are accessible and distributed across thousands of computers globally. This ensures that every user within the network has access to the same information.

The definitions of cryptocurrency above can be compiled into a comprehensive understanding that cryptocurrency is a digital asset that uses cryptography to transfer, process, and secure transactions of funds from one party to another without the influence of monetary authorities because it is decentralized. Cryptocurrency uses a special technology called blockchain which can be likened to a database or ledger that records every transaction on the network in the form of interconnected blocks.

Shares

Shares are proof of receipt or securities that show ownership of part of the company. If viewed from the company's point of view shares are not like bank instruments, which provide short-term financing at a certain level that must be repaid, but shares are ownership of a part of the company. This means that if there are 100,000 shares issued by a company, investors who own 10,000 shares own one-tenth of the company's business (Becket, 2021). Shares are traded on the Capital Market; in Indonesia it is commonly called the Indonesia Stock Exchange.

According to (Becket, 2021) the benefits that can be obtained from investing in stocks is Dividends and Capital Gains. Capital Gain refers to the financial gain realized by an investor resulting from the variance between the selling price and the purchase price if the selling price is higher than the buying price. While dividends are distribution of company profits to investors in accordance with the number of shares owned once a year which are not mandatory. Dividend distribution depends on company policy, can be implemented or not.

The stock market has a Stock Index which is a statistical indicator that provides insight into the general price trends of a collection of stocks that have been selected based on specific criteria and methodologies. Example: Composite Stock Price Index (IHSG) reflects the prices of all shares in Indonesia stock market, Indonesian Sharia Stock Index (ISSI) reflects the prices of all sharia stocks listed on the IDX, and many other stock indices.

Returns and Risks

Return is simply a reward for bearing the risk associated with an investment, the greater the risk, the higher the expected return. Return is measured by how much the investor's money has grown during the investment period in the investment assets owned

(Karthikeyan, 2020). The basis for investment decisions based on (Tandelilin, 2010), is as follows:

a. Return

The primary motivation for people to invest their money is to generate profits. In the field of investment management, the profits earned from investments are commonly referred to as returns. Investors typically expect to receive a return on their investments as a form of compensation for the opportunity costs and risks involved in investing, such as the possibility of losing purchasing power due to inflation.

b. Risk

In general, the greater the risk, the greater the expected rate of return. The concept of risk in investment can be understood as the chance of an investor experiencing a return on their investment that is not in line with their expected return. And vice versa, investors who do not want to take risks that are too high, of course, will not be able to expect too high a rate of return. Risk and return have a linear relationship, meaning that the greater the risk, the greater the expected return and vice versa (Markowitz, 1952). For this reason, it is important for investors to understand returns and risks to adjust their level of tolerance for risk, because each investor has different risk preferences.

There are various studies that highlight the returns and risks in cryptocurrencies and sharia stocks, research from (Naeem et al., 2022) found extreme risks in cryptocurrencies, (Xu et al., 2021) added that there is a correlation between cryptocurrencies and bitcoin are the biggest systemic risk recipients. Cryptocurrencies are riskier than traditional fiat money (Fang et al., 2022). (Borri, 2019) found that the cryptocurrency market is very exposed to tail-risk even though it has an attractive return, this risk can be reduced by forming a cryptocurrency portfolio. In line with (Guo & Li, 2017) explains that a combination of conventional asset portfolios and bitcoin can increase the trade-off return and risk, meaning that even though the risk is high, it promises high risk. In contrast to (Ahmed, 2020) explaining that there is no strong evidence of the existence of a positive risk-return trade-off in Bitcoin markets, meaning that high risk does not necessarily generate high returns. Research on sharia stocks, the majority concluded that the performance of conventional stocks is better than sharia stocks (Abu-Alkheil et al., 2020; Hersugondo et al., 2020; Suryadi et al., 2021).

METHOD

The population in this study is all Cryptocurrency price data proxied by bitcoin prices and sharia stock prices proxied by the Indonesian Sharia Stock Index (ISSI). A purposive sampling technique was used and a monthly data sample of cryptocurrency prices and sharia stock prices from 2015 to 2021 was determined and obtained from the data provider website (www.investing.com). Cryptocurrency and sharia stock price data is processed to determine the return and risk using the measurement method described below (Jogiyanto, 2014). Return Comparison of price period t with price period t-1

$$\text{Return} = Rt = \frac{P_t - P_{t-1}}{P_{t-1}}$$

where:

Rt = the return at period t.

Rt-1 = the return at period t−1.

$$\text{Risk} = \sigma = \sqrt{\frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n-1}}$$

The results of the calculation of returns and risks from the prices of cryptocurrencies and sharia stocks were analysed using descriptive statistics in depth, the next step is to use the t-test data analysis method (independent sample t-test) with SPSS to find out whether there are differences returns and risks in investing in cryptocurrencies instruments and sharia stocks. In addition, to find out which investments have higher returns and lower risks. If the sample does not meet the requirements of the parametric statistical test (normal and homogeneous) it will use a non-parametric statistical test (Mann Whitney Test).

Before conducting the independent sample t test, the data needs to be tested for normality and homogeneity, normality test to find out whether the two groups of data have a normal distribution because this is a requirement that must be met, if the assumption of normality is not met then the independent sample t-test cannot be used and must use non-parametric statistics (Mann Whitney test). While the homogeneity test is to determine whether the two groups of samples are homogeneous, if the data is not homogeneous, the independent sample t-test analysis can still be carried out, but decision making is seen from the SPSS output in the "Equal variances not assumed" section.

RESULT

Descriptive Analysis

Descriptive statistics describe a data based on the average, minimum, maximum, and standard deviation values (Ghozali, 2011). The data input is from January 2015 to October 2021, the descriptive statistics results can be seen in table 2.

Table 2: Descriptive Statistics

		return_btc	return_issi	risk_btc	risk_issi
N	Valid	81	81	82	82
	missing	1	1	0	0
Means		.095267	.001846	.091991	.018268
Median		.074900	.003900	.081350	.014850
std. Deviation		.2278989	.0408103	.0582509	.0134187
Variances		052	002	003	.000
Range		1.0692	.2425	.2861	.0891
Minimum		-.3654	-.1452	.0126	.0017
Maximum		.7038	.0973	.2987	.0908

source: data processed 2022

Return Descriptive Analysis

The average return from cryptocurrency instruments is 0.095267 or 9.5% per month greater than the average sharia stock market return of 0.001846 or 0.2% per month. Indicates that cryptocurrency instruments generate higher profits compared to investments in the sharia stock market according to research (Setiawan, 2020). Even though cryptocurrency returns are higher than sharia stock returns, their movements are very volatile as illustrated in figure 4, in line with findings from (Saksonova & Kuzmina-Merlino, 2019).

Figure 4: Comparison of Returns

Source: data processed 2022

Risk Descriptive Analysis

According to (Jones, 2016), the risk calculation model that is most often used in the investment is the standard deviation. The standard deviation is a statistical measure utilized to evaluate the extent to which data is dispersed within a sample, as well as the proximity of individual data points to the mean. In the investment, the higher the standard deviation value, the higher the uncertainty or greater risk and vice versa.

Based on table 2, the standard deviation value for cryptocurrency is 0.2278989 or have a total risk of 22.8% during the 2015-2021 period with an average risk of 0.091991 or 9.2% per month, which is greater than the standard deviations of sharia stocks which only 0.0408103 or 4.1% with an average risk of 0.018268 or 1.8% per month, indicating that cryptocurrency risk is higher than sharia stocks. In line with research from (Cudd et al., 2018; Huda & Hambali, 2020; Rufino, 2019) which states that the risk of Cryptocurrency is very high compared to other investment instruments. So that risk-averse investors must be careful by limiting cryptocurrency instruments in their portfolios, because it can increase the possibility of loss (Bakry et al., 2021).

Figure 5: Risk Comparison
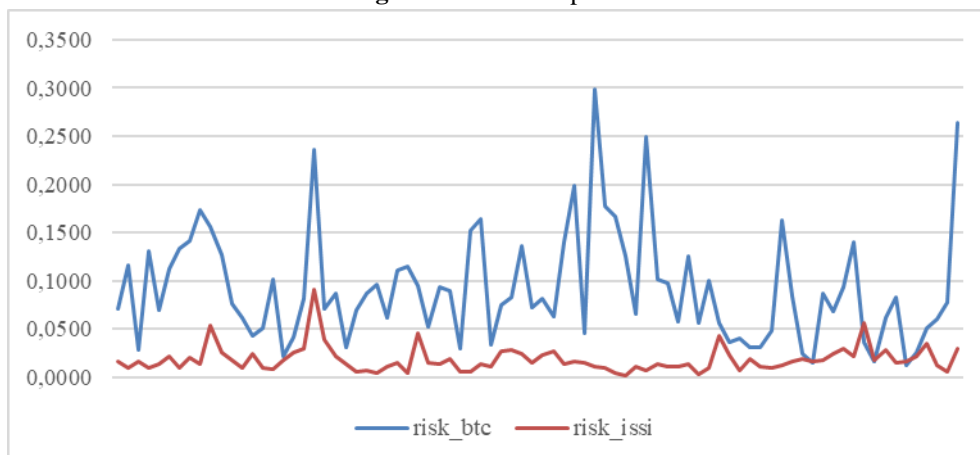
Source: data processed 2022

It can be seen that the movement of risks from cryptocurrency instruments is very volatile compared to risks in sharia stock instruments (figure 5), the highest risk is 0.2987 or 29.9% per month and the smallest is 0.0126 or 1.3% per month, this is very high when compared to the risk of sharia stocks, which are as high as only 0.0908 or 9% per month. The descriptive analysis of returns and risks explains that the higher the risk of an investment instrument, the higher the return (Pho et al., 2021).

Normality test

This test was conducted to see whether the two groups of data were normally distributed so that they could proceed to independent sample t-test analysis or had to use non-parametric statistics. Testing data normality can use various methods, this study uses the Kolmogoorov Smirnov test. The data is normally distributed if the sig. greater than 0.05 (Santoso, 2014).

Table 3: Normality Test
Return Cryptocurrency (btc) and Sharia Stock Market (issi)

Kolmogorov-Smirnov	return			risk		
	Statistics	df	Sig.	Statistics	df	Sig.
btc	.098	81	055	.130	82	002
issi	096	81	.064	.152	82	.000

source: data processed 2022

The normality test result of return variable can be seen in table 3 sig value from the two groups is greater than 0.05, the results of the normality test for the return variable in the cryptocurrency group are 0.055 and the Sharia stock group are 0.064. These results indicate that the data is classified as normally distributed, so the Independent Sample t test can be used for analysis of different tests on variable returns. The risk variable shows the sig values is smaller than 0.05 means that the two risk variable data are not normally distributed, so the different test must use non-parametric statistics (Mann Whitney test).

Homogeneity Test

This test is used to find out whether the variance of the two groups' data on the research variables is homogeneous or not, because homogeneous data variance is a requirement in the independent sample t test analysis, however, if the variance of the data is not homogeneous, the independent sample t test analysis can still be used but what is seen the output is in the Equal variances not assumed column which is different from the normality requirement which is an absolute requirement that must be fulfilled.

Table 4: Homogeneity Test
Return Cryptocurrency (btc) and Sharia Stock Market (issi)

Test of Homogeneity of Variances	Return (btc & issi)				Risk (btc & issi)			
	Levene Statistics	df1	df2	Sig.	Levene Statistics	df1	df2	Sig.
Based on Means	104,238	1	160	.000	65,061	1	162	.000
Based on Median	98,335	1	160	.000	53,231	1	162	.000
Based on Median and with adjusted df	98,335	1	86,417	.000	53,231	1	92,491	.000
Based on trimmed mean	102,836	1	160	.000	58,546	1	162	.000

source: data processed 2022

The homogeneity test of the return variable in table 4 shows sig. By 0.000, which is smaller than 0.05, it means that the variance of the data on the return variable in both the cryptocurrency and sharia stock groups is not homogeneous. While the risk variable shows the same value of sig. for the homogeneity test is 0.00 less than 0.05 so the data variance is not homogeneous

Return and Risk Difference Test

Return (return) is simply a reward for bearing the risk associated with the investment, the greater the risk the higher the expected return. Return is measured by how much investor money has grown during the period of investment in the investment assets owned (Karthikeyan, 2020). According to (Becket, 2021) the benefits that can be obtained from stock investments are generally Capital Gains and Dividends.

Based on the normality test of the return variable, the cryptocurrency and sharia stock groups have normal data distribution. For this reason, the different test is carried out using an independent sample t-test analysis, the results can be seen in table 5, column Sig. (2-tailed) section *Equal variances not assumed* because the data variances in the cryptocurrency and sharia stock groups are not homogeneous.

Table 5: Independent Sample t-test
Return Cryptocurrency (btc) and Sharia Stock Market (issi)

Independent Samples Test		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
returns	Equal variances assumed	104,238	.000	3,632	160	.000
	Equal variances not assumed			3,632	85,125	.000

source: data processed 2022

Value of Sig. (2-tailed) on the return variable is 0.000 smaller than 0.05 then H0 is rejected, and Ha is accepted, indicating a significant difference between returns in the cryptocurrency group and sharia stocks. The average difference between the two groups is 0.0934210 with a positive value, meaning that the cryptocurrency group has a higher mean

than the sharia stock group, this finding is in line with research from (Dasman, 2021; Liu & Tsyvinski, 2021; Troster et al., 2019).

Based on normality test, risk variables cannot use independent sample t test (parametric statistics) because the data are not normally distributed, risk variables use Mann Whitney analysis (non-parametric statistics).

Table 6: Independent Sample t-test
Return Cryptocurrency (btc) and Sharia Stock Market (issi)

Test Statistics [a]	
	risk
Mann-Whitney U	297,000
Wilcoxon W	3700,000
Z	-10,080
asymp. Sig. (2-tailed)	.000
a. Grouping Variable: market	

source: data processed 2022

Table 6 is the result of the different test for the risk variable, the Sig. (2-tailed) in the Mann Whitney test of 0.000 is smaller than 0.05 so that H0 is rejected and Ha is accepted, it means that there is a significant difference in the risk of cryptocurrencies and sharia stocks in line with research (Dasman, 2021; Jufridar et al., 2021; Liu & Tsyvinski, 2021).

This study provides an empirical explanation of cryptocurrencies risk compared to the sharia stock market as a consideration for investment decisions. From the results of the analysis, it is very clear that the returns and risks of cryptocurrencies assets are significantly different when compared to sharia stocks. High investment risk can be dangerous for beginners whose financial literacy is still low but invest in cryptocurrencies to get high returns without realizing that high returns must have high risks too.

DISCUSSIONS

Cryptocurrency is a financial asset that has a high return potential but is also known to have a fairly high risk. This was caused by several factors such as high volatility, unclear regulations, and limited liquidity. Cryptocurrency market is relatively new, and it is still uncertain how it will perform in the long term. Unlike stocks, there is no track record of performance to base investment decisions on. The market is also more vulnerable to manipulation, and the lack of regulation makes it more difficult to protect investors from fraud.

On the other hand, the sharia stock market has been around for quite some time and is relatively established and stable, providing investors with more information and data to make informed investment decisions. In conclusion, while the potential returns from investing in cryptocurrencies can be higher, the level of risk is also much higher. Sharia stocks, on the other hand, may provide a more stable and lower-risk investment opportunity, but with a lower potential return. It ultimately depends on an individual's risk tolerance and investment goals.

The implication of cryptocurrencies having a higher return and risk compared to sharia stocks is that investors who are willing to accept a higher level of risk may be attracted to the potential for higher returns from investing in cryptocurrencies. However, they must also be prepared for the potential for significant losses if the market does not

perform as expected. Investors who prioritize stability and lower risk may be more inclined to invest in sharia stocks. They may be willing to accept lower potential returns in exchange for a lower level of risk.

The concept of high risk - high return is a basic principle in modern portfolio theory, which was first introduced by Harry Markowitz (Markowitz, 1952). Markowitz's theory proposed that investors could construct an "efficient" portfolio of assets that maximizes returns for a given level of risk or minimizes risk for a given level of return. This theory is the foundation of modern portfolio theory. It is also important to note that different investors have different investment goals and risk tolerance levels. Some investors may be willing to accept higher risk in pursuit of higher returns, while others may prioritize preservation of capital and be more conservative in their investment choices.

CONCLUSION

Based on data analysis, both descriptive statistics and different tests on the return and risk variables of the two groups, cryptocurrencies proxied by Bitcoin (BTC) and sharia stocks proxied by the Indonesian Sharia Stock Index (ISSI) for the period January 2015 to October 2021, it can be concluded that there is a significant difference in the return and risk of cryptocurrencies and sharia stocks for the period January 2015 to October 2021.

Based on descriptive statistics, the standard deviation of cryptocurrency is greater than the standard deviation of sharia stocks per month, indicating that cryptocurrency risks are higher than sharia stocks. Meanwhile, the average return from cryptocurrencies is higher than the average return for sharia stocks per month.

Limitation

This research has contributed to increasing understanding of returns and also risks in cryptocurrencies and Sharia Stocks, so that it can be used as a consideration in investing that the higher the risk, the higher the expected profit. However, this study has limitations, first cryptocurrency in this study is only represented by Bitcoin, so it cannot fully describe the returns and risks in the cryptocurrency market where the growth of cryptocurrency continues to grow. Second, the Sharia Stock market is only represented by the Indonesia Sharia Stock Index (ISSI), further research can add stock markets from other countries, especially ASEAN or emerging stock market and developed stock market. Third, this research does not look at cryptocurrencies from the perspective of sharia law or Islamic law comprehensively, the research focuses on returns and risks, for that further research can add a comprehensive view of Cryptocurrency from an Islamic perspective.

REFERENCES

Abu-Alkheil, A., Khan, W. A., & Parikh, B. (2020). Risk-Reward Trade-Off and Volatility Performance of Islamic Versus Conventional Stock Indices: Global Evidence. *Https://Doi.Org/10.1142/S0219091520500022*, *23*(1). https://doi.org/10.1142/S0219091520500022

Ahmed, W. M. A. (2020). Is there a risk-return trade-off in cryptocurrency markets? The case of Bitcoin. *Journal of Economics and Business*, *108*, 105886. https://doi.org/10.1016/J.JECONBUS.2019.105886

Aves, A. (2018). *How to Get Started in Cryptocurrency*. Quoine Liquid.

Bakry, W., Rashid, A., Al-Mohamad, S., & El-Kanj, N. (2021). Bitcoin and Portfolio Diversification: A Portfolio Optimization Approach. *Journal of Risk and Financial Management*, *14*(7), 282. https://doi.org/10.3390/jrfm14070282

Becket, M. (2021). *How the Stock Market Works A beginner's guide to investment* (Seventh Ed). Kogan Page Limited.

Borri, N. (2019). Conditional tail-risk in cryptocurrency markets. *Journal of Empirical Finance*, *50*, 1–19. https://doi.org/10.1016/J.JEMPFIN.2018.11.002

Corbet, S., Urquhart, A., & Eds, L. Y. (2020). Cryptocurrency and Blockchain Technology. In *Cryptocurrency and Blockchain Technology*. Walter de Gruyter GmbH. https://doi.org/10.1515/9783110660807

Cudd, M., Ritterbush, K., Eduardo, M., Smith, C., Cudd, M., Ritterbush, K., Eduardo, M., & Smith, C. (2018). Cryptocurrency Returns. *Blockchain and Cryptocurrencies*. https://doi.org/10.5772/INTECHOPEN.80397

Danial, K. (2019). *Cryptocurrency Investing for Dummies*. John Wiley & Sons, Inc. https://www.dummies.com/personal-finance/investing/cryptocurrency-investing-for-dummies-cheat-sheet/

Dasman, S. (2021). Analysis of Return and Risk of Cryptocurrency Bitcoin Asset as Investment Instrument. *Accounting and Finance Innovations*. https://doi.org/10.5772/INTECHOPEN.99910

Dirgantara, H. (2021). *Mendag: Transaksi uang kripto di Indonesia tembus Rp 370 triliun*. https://investasi.kontan.co.id/news/mendag-tranasaksi-uang-kripto-di-indonesia-tembus-rp-370-triliun

Fang, F., Ventre, C., Basios, M., Kanthan, L., Martinez-Rego, D., Wu, F., & Li, L. (2022). Cryptocurrency trading: a comprehensive survey. *Financial Innovation*, *8*(1), 1–59. https://doi.org/10.1186/S40854-021-00321-6/TABLES/11

Ghozali, I. (2011). *Aplikasi Analisis Multivariate dengan Program SPSS*. Badan Penerbit Universitas Diponegoro.

Guo, L., & Li, X. J. (2017). *Risk Analysis of Cryptocurrency as an Alternative Asset Class*. 309–329. https://doi.org/10.1007/978-3-662-54486-0_16

Hersugondo, H., Sadiyah, C., Handriani, E., Subagyo, H., & Astuti, S. D. (2020). An Analysis of Sharia and Conventional Shares' System at Indonesia Stock Exchange. *Perisai : Islamic Banking and Finance Journal*, *4*(1), 1–1. https://doi.org/10.21070/PERISAI.V4I1.228

Huda, N., & Hambali, R. (2020). Risiko dan Tingkat Keuntungan Investasi Cryptocurrency. *Jurnal Manajemen Dan Bisnis (Performa)*, *17*(1), 72–84. https://doi.org/10.29313/performa.v17i1.7236

Ilham. (2022). *Pandangan Majelis Tarjih Terkait Mata Uang Kripto - Muhammadiyah*. https://muhammadiyah.or.id/pandangan-majelis-tarjih-terkait-mata-uang-kripto/

Inci, A. C., & Lagasse, R. (2019). Cryptocurrencies: applications and investment opportunities. *Journal of Capital Markets Studies*, *3*(2), 98–112. https://doi.org/10.1108/jcms-05-2019-0032

Jogiyanto. (2014). *Teori Portofolio dan Analisis Investasi*. BPFE-UGM.

Jones, C. P. (2016). *Investments Analysis and Management*. Wiley.

Jufridar, J., Nur Ilham, R., & Sinurat, M. (2021). Analisis Potensi dan Risiko Investasi pada

Instrumen Keuangan dan Aset Digital Cryptocurrency di Indonesia. *Jurnal EMT KITA*, *5*(1), 91–98. https://doi.org/10.35870/EMT.V5I1.425

Karthikeyan. (2020). *Introduction To Stock Market*. Independently Published.

Khan, S. N. (2022). The legality of cryptocurrency from an Islamic perspective: a research note. *Journal of Islamic Accounting and Business Research*, *ahead-of-print*(ahead-of-print). https://doi.org/10.1108/JIABR-02-2022-0041/FULL/XML

Liu, Y., & Tsyvinski, A. (2021). Risks and returns of cryptocurrency. *Review of Financial Studies*, *34*(6), 2689–2727. https://doi.org/10.1093/rfs/hhaa113

Markowitz, H. (1952). Portfolio Selection. *The Journal of Finance*, *7*(1), 77–91.

MUI. (2021). *Keputusan Fatwa Hukum Uang Kripto atau Cryptocurrency - Majelis Ulama Indonesia*. https://mui.or.id/berita/32209/keputusan-fatwa-hukum-uang-kripto-atau-cryptocurrency/

Naeem, M. A., Lucey, B. M., Karim, S., & Ghafoor, A. (2022). Do financial volatilities mitigate the risk of cryptocurrency indexes? *Finance Research Letters*, *50*, 103206. https://doi.org/10.1016/J.FRL.2022.103206

Pho, K. H., Ly, S., Lu, R., Hoang, T. H. Van, & Wong, W. K. (2021). Is Bitcoin a better portfolio diversifier than gold? A copula and sectoral analysis for China. *International Review of Financial Analysis*, *74*, 101674. https://doi.org/10.1016/J.IRFA.2021.101674

Rufino, C. (2019). *An analysis of the risk-return profile of the daily Bitcoin prices using different variants of the GARCH Model*. *July*, 9.

Saksonova, S., & Kuzmina-Merlino, I. (2019). Cryptocurrency as an investment instrument in a modern financial market. *Вестник Санкт-Петербургского Университета. Экономика*, *35*(2), 269–282. https://doi.org/10.21638/SPBU05.2019.205

Santoso, S. (2014). *Statistik Parametrik Edisi Revisi*. Elex Media Komputindo.

Setiawan, E. P. (2020). Analisis Potensi dan Risiko Investasi Cryptocurrency di Indonesia. *Jurnal Manajemen Teknologi*, *19*(2), 130–144. https://doi.org/10.12695/jmt.2020.19.2.2

Suryadi, S., ENDRI, E., & YASID, M. (2021). Risk and Return of Islamic and Conventional Indices on the Indonesia Stock Exchange. *The Journal of Asian Finance, Economics and Business*, *8*(3), 23–30. https://doi.org/10.13106/JAFEB.2021.VOL8.NO3.0023

Tandelilin, E. (2010). *Portofolio dan Investasi: Teori dan Aplikasi*. Kanisius.

Troster, V., Tiwari, A. K., Shahbaz, M., & Macedo, D. N. (2019). Bitcoin returns and risk: A general GARCH and GAS analysis. *Finance Research Letters*, *30*, 187–193. https://doi.org/10.1016/J.FRL.2018.09.014

Wartoyo, & Septian Haerisma, A. (2022). Cryptocurrency in The Perspective of Maqasid Al-Shariah. *Afkaruna: Indonesian Interdisciplinary Journal of Islamic Studies*, *18*(1), 110–139. https://doi.org/10.18196/AFKARUNA.V18I1.14164

Xu, Q., Zhang, Y., & Zhang, Z. (2021). Tail-risk spillovers in cryptocurrency markets. *Finance Research Letters*, *38*, 101453. https://doi.org/10.1016/J.FRL.2020.101453

Zhang, W., Li, Y., Xiong, X., & Wang, P. (2021). Downside risk and the cross-section of cryptocurrency returns. *Journal of Banking & Finance*, *133*, 106246. https://doi.org/10.1016/J.JBANKFIN.2021.106246