

Comparative Evaluation of Portfolio Performance: A Study of Cryptocurrency, Stock, and Foreign Exchange Investments

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ABSTRACT

This study aims to provide information about the level of risk, return, and investment performance of cryptocurrency and also compare it with traditional investment instruments such as stocks and dollars. The population in this study is the monthly closing price of Bitcoin, JCI, and Dollar. The sample in this study is the monthly closing price of Bitcoin, JCI, and Dollar in the period January 2020 to December 2022, each of which is 36 data so the number of observations made is 108 data. The analysis technique used in this research is a comparative analysis using the Kruskal Wallis test method using the SPSS 25 analysis tool. The results of this study found that there were significant differences between the performance of Bitcoin, JCI, and Dollar stocks using the Sharpe, Treynor, and Jensen methods.

Keywords : **Cryptocurrency; Portfolio Performance; Finance; Risk Measurement; Sharpe, Treynor, and Jensen Methods**

ABSTRAK

Penelitian ini bertujuan menyediakan informasi mengenai tingkat risiko, return, dan kinerja investasi cryptocurrency dan juga membandingkannya dengan instrument investasi tradisional seperti saham dan dollar. Populasi pada penelitian ini adalah harga penutupan bulanan (monthly closing price) Bitcoin, IHSG dan Dollar. Sampel pada penelitian ini adalah harga penutupan bulanan (monthly closing price) Bitcoin, IHSG dan Dollar pada periode Januari 2020 hingga Desember 2022, masing-masing sebanyak 36 data sehingga jumlah observasi yang dilakukan adalah sebanyak 108 data. Teknik analisis yang digunakan dalam penelitian ini adalah analisis komparatif dengan metode uji Kruskal Wallis menggunakan tool analisis SPSS 25. Hasil penelitian ini menemukan terdapat perbedaan signifikan antara kinerja Bitcoin, Saham IHSG dan Dollar menggunakan metode Sharpe, Treynor dan Jensen. Cryptocurrency tidak hanya merupakan mata uang digital, tetapi dapat menjadi pilihan investasi yang sangat menguntungkan, namun karena risiko yang mungkin dihasilkan juga fluktuatif, maka calon investor harus memiliki pengetahuan yang baik mengenai instrument ini.

Kata Kunci : **Kriptokurensi; Kinerja Portofolio; Keuangan; Pengukuran Risiko; Metode Sharpe, Treynor, dan Jensen**

INTRODUCTION

This research aims to examine the Sharpe, Treynor, and Jensen methods for cryptocurrencies compared to stocks and foreign currencies from 2020 to 2022 in Indonesia. Since the introduction of Bitcoin in 2008, the cryptocurrency market has continuously grown, as evidenced by the increasing use of crypto currencies as an investment tool or medium of exchange (Nikolova et al., 2020). Cryptocurrency, also known as crypto currency, is a digital currency created and controlled through cryptographic techniques.

In general, cryptocurrency accounting is decentralized (Almeida et al., 2022). With increased computing capacity, the value of cryptocurrency tends to rise. One distinctive characteristic of cryptocurrency is its high exchange rate volatility, which, in turn, results in high risk associated with its use (Nikolova et al., 2020). Active trading in the cryptocurrency market only began in 2013. Cryptocurrencies such as Bitcoin and Ethereum have become increasingly popular assets in recent years.

In Indonesia, cryptocurrencies began to garner attention a few years ago, especially when the Commodity Futures Trading Regulatory Agency (Bappebti) of the Ministry of Trade officially recognized cryptocurrency trading companies such as Bitcoin, Binance, Ethereum, and Dogecoin. In 2019, Indonesia emerged as the country with the highest digital adoption (Indonesian Blockchain Association, 2021). The cryptocurrency market in Indonesia continues to show growth. According to data from Bappebti, there were approximately 4 million cryptocurrency users at the beginning of 2020, which increased to 11.4 million by the end of 2021, a rise of over 150% from the previous year. In 2022, the number of crypto investors in Indonesia increased to 14.1 million. This data can be observed in Figure 1.



Source: *Potential Growth of Crypto Adoption in Southeast Asia, Coinvestment, n.d., 2023*

Figure 1. Number of Crypto Investors in Indonesia 2020-2023

Figure 1 showcases the number of cryptocurrency investors in Indonesia from 2020 to 2023. The graph illustrates a significant surge in cryptocurrency adoption in the country, particularly after the official recognition of cryptocurrency trading companies by Bappebti in 2019. The number of crypto investors continued to grow over the years, indicating the increasing popularity of cryptocurrencies as an investment option and means of financial transaction. However, it's noteworthy that the graph displays a declining trend starting in early 2023, suggesting a potential shift in the cryptocurrency market landscape. This trend may be influenced by various factors, including market dynamics, regulatory changes, and investor sentiment.

Based on Figure 2, a significant price increase in Bitcoin can be observed at the beginning of 2021. This increase continued into the following periods but showed a

declining trend in early 2023. Figure 2 presents the Price Movement Chart of Bitcoin for the years 2018-2023.



Source: Yahoo Finance – Stock Market Live, Quotes, Business & Finance News, n.d., 2023

Figure 2. Bitcoin Price Movement Chart 2018-2023

Figure 2 provides a visual representation of the price movements of Bitcoin from 2018 to 2023. The chart demonstrates a substantial price increase in Bitcoin, particularly at the start of 2021, followed by a prolonged period of bullish market sentiment. However, as we approach early 2023, the chart displays a declining trend in Bitcoin's price. Several factors could contribute to this shift in the cryptocurrency's price dynamics, including market sentiment, regulatory changes, and macroeconomic conditions. It's essential to monitor these price movements closely, as they can have significant implications for investors and the cryptocurrency market as a whole.

The exchange rate of the Indonesian Rupiah against the US Dollar, as depicted in Figure 3, displays a fluctuating trend starting from mid-2019. It saw a decrease of 500 points, followed by a sharp increase at the beginning of 2020, rising from Rp 13,000 to Rp 16,000. Subsequently, it declined to Rp 14,000 in the following year. In 2022, the exchange rate shows a consistently increasing trend. This trend contrasts with the one observed for cryptocurrencies, where at the onset of the pandemic, there was a significant increase, but it exhibited a declining trend in early 2023.



Source: Yahoo Finance – Stock Market Live, Quotes, Business & Finance News, n.d., 2023

Figure 3. Exchange Rate Movement Chart of the US Dollar Against the Rupiah 2019-2023

Figure 3 offers a graphical representation of the movement in the exchange rate between the Indonesian Rupiah and the US Dollar from 2019 to 2023. The chart unveils the Rupiah's fluctuations against the Dollar, marking a significant depreciation in mid-2019, a sharp appreciation at the onset of 2020, and subsequent depreciation in 2021. In contrast, 2022 showcases a sustained appreciation of the Rupiah against the Dollar. This intricate interplay between exchange rates and the global economic environment underscores the importance of monitoring currency fluctuations in international trade and investment.

As depicted in Figure 4, the stock prices of the IHSG do not exhibit a highly volatile trend. The stock prices experienced a sharp decline at the beginning and mid-2020 when the initial outbreak of the Covid-19 pandemic occurred. However, the IHSG stock prices did not remain in a prolonged slump. In 2021, it is evident that the IHSG stocks swiftly rebounded and began to steadily ascend, resembling the years preceding the pandemic.



Source: Yahoo Finance – Stock Market Live, Quotes, Business & Finance News, n.d., 2023

Figure 4. Stock Price Movement Chart of IHSG 2018-2023

Figure 4 provides a graphical overview of the movement in IHSG (Indonesian Composite Index) stock prices from 2018 to 2023. It illustrates that the stock prices of IHSG have not displayed pronounced fluctuations. While there was a sharp decline in early to mid-2020 coinciding with the initial phase of the Covid-19 pandemic, the IHSG stock prices exhibited a relatively rapid rebound, and in 2021, they began a steady ascent akin to the pre-pandemic years. This chart underscores the robustness and adaptability of the Indonesian stock market.

Referring to the diagram illustrating the price movement of Bitcoin (Figure 2), it is evident that Bitcoin experienced a significant increase in value at the onset of the Covid-19 pandemic. In contrast, the stock prices of IHSG and the Dollar (Figures 3 and 4) displayed a substantial decline. This fact provides an explanation for the increase in the number of investors that occurred from early 2020 to 2022 (Figure 1). The substantial increase in the price of Bitcoin served as a catalyst for attracting many individuals to invest in Bitcoin, which was considered more profitable than investing in stocks or holding US Dollars. This trend emerged due to the economic issues and declining purchasing power faced by the public as a result of the pandemic, which impacted the prices of stocks and the Dollar.

Although cryptocurrency witnessed a significant price surge during the Covid-19 pandemic, investors and traders need to be mindful of the associated risks. The cryptocurrency market is relatively new and still volatile, which can result in sudden price fluctuations and high levels of volatility (Setiawan, n.d.), potentially leading to substantial

losses for investors. In the short term, the value of investments can rise or fall significantly. Therefore, it is crucial for the public to have a thorough understanding of the benefits, potential, and risks of cryptocurrency trading. This necessitates investors and traders to conduct comprehensive risk analysis before deciding to invest in cryptocurrencies.

Before the widespread popularity of cryptocurrency investments, the general public was more familiar with investing in real estate, gold, stocks, and other investment instruments. Consequently, they relatively had a better understanding of the risks, returns, and performance of these instruments. In contrast, cryptocurrency, which has gained popularity in the last decade, requires a deeper exploration of its characteristics, risks, and investment performance.

The rapidly growing investment trend in the cryptocurrency market over the past decade has drawn the attention of numerous researchers. Some researchers, such as Botte & Nigro (2021), have concluded that there is a significant relationship between various crypto assets, indicating that a diversified portfolio of different coins may not provide significant diversification benefits. Studies conducted by Firdhy, n.d.; Ichsan & Pamungkas (2022), specifically analyzed the comparison of risk and return of Bitcoin with other financial assets using risk measurement methods such as Sharpe, Treynor, and Jensen. Additionally, Almeida et al., (2022) found that during the pandemic crisis, uncertainty levels increased while risk decreased, indicating that the considered assets may have safe haven characteristics.

Despite promising high returns, as previously mentioned, cryptocurrencies are characterized by very high volatility. Therefore, numerous research studies have explored cryptocurrency performance. Some of these studies, like Mahessara & Kartawinata (2018a); Maldhini & Patrisia (2022); P & Yuliari (2023); Chandra (2023), examined the performance of cryptocurrency portfolios compared to stocks and gold using the Treynor, Sharpe, and Jensen methods. Several of these studies found that Bitcoin is a superior investment instrument, exhibiting better performance and returns compared to stocks and gold. Previous research studies primarily focused on cryptocurrencies as investment instruments, thus only comparing their performance with other investment instruments.

In contrast, this study is distinctive from previous research because it compares cryptocurrencies as a digital currency, analyzing their performance against foreign currencies and stocks as investment instruments during the early phase of the Covid-19 pandemic using the Sharpe, Treynor, and Jensen methods. These methods are widely used as they offer different perspectives in evaluating investment portfolio performance. Moreover, these methods are relatively straightforward to calculate and can assist investors in comparing their portfolio performance with market indices or other portfolios. Consequently, this research aims to compare the performance of cryptocurrencies, stocks, and foreign currencies using the Sharpe, Treynor, and Jensen methods.

Investment, originating from the Latin word "investire," means to 'invest capital' or 'allocate funds.' According to the Kamus Besar Bahasa Indonesia (Big Indonesian Dictionary), investment is defined as the allocation of capital or resources in a company or project with the expectation of making a profit. Investment can be interpreted as a commitment to allocate funds or other resources in the present with the expectation of gaining profits in the future (Mahessara & Kartawinata, 2018a; Tandelilin, 2010).

Moreover, risk, as per Adnyana (2020), can be defined as the probability of failing to achieve investment objectives due to uncertainty over time. Risk can be categorized into two types: systematic risk (market risk) and unsystematic risk (company policy risk). There is a linear relationship between Return and Risk, implying that higher returns potentially entail greater risk, a concept commonly known as 'high risk, high return.' In

this context, Return or yield, as defined by Trisnawati (2013), is interpreted as the earnings obtained as a percentage (%) of the capital invested or investment instruments.

Cryptocurrency refers to a digital currency protected by cryptography. The term 'cryptocurrency' is a combination of two words: 'cryptography,' meaning secret code, and 'currency,' referring to money. Cryptocurrency is a form of digital currency that employs blockchain technology as a decentralized ledger to secure transactions and control the creation of new currency units, often referred to as coins. It operates independently, without central authority supervision (Firdhy, n.d.; Liang et al., 2019). Cryptocurrency is considered an alternative form of currency and digital money.

In recent years, investment in cryptocurrencies has become a prominent issue. Cryptocurrencies like Bitcoin, Ethereum, and Litecoin have attracted the interest of a considerable number of global investors. However, before deciding to invest in cryptocurrencies, it is crucial to consider the risks, returns, and investment performance of cryptocurrencies compared to other conventional investment instruments. Some research studies have found that the cryptocurrency market is susceptible to speculative bubbles (Almeida et al., 2022).

According to Jones (2016), portfolio investment performance is a crucial aspect for investors engaging in investments. When evaluating performance, factors such as risk and return of the portfolio are considered. Investment portfolio performance is a significant aspect that investors need to pay attention to when starting their investments or allocating their capital (Adiyono, 2021).

Hypotheses

A key characteristic of cryptocurrency investment is its extreme level of volatility. Cryptocurrency prices can fluctuate dramatically in a very short period, often within hours or even minutes. This characteristic sets it apart from traditional investment instruments like stocks or bonds, which typically exhibit more stable price changes. Given its high volatility, cryptocurrency investments tend to be riskier compared to other traditional investment instruments. However, this aspect can also be an advantage for investors willing to bear the risk.

According to studies conducted by Firdhy, n.d.; Vejačka (2014), there is a significant difference in the returns of Bitcoin, stocks, and gold. With rapid price changes, cryptocurrency investments also have the potential for significant short-term gains, making it an attractive investment option for speculators. However, as per Ichsani & Pamungkas (2022), their research findings indicate a significant difference in risk variables, the Sharpe Ratio, and the Jensen Index. While there is no significant difference between returns and the Treynor Index, cryptocurrencies have the highest risk level. According to Jones (2016), risk refers to the potential loss due to the actual return not matching the expected return.

Based on research conducted by Liang et al. (2019), the behavior of the cryptocurrency market shows similarities with the stock market in terms of central node diversity and the correlation between minimum risk and the ratio of average/long normalized tree length in portfolio risk. Furthermore, a study carried out by Lumbantobing & Sadalia (2021) found that the returns generated by the cryptocurrency, specifically Bitcoin, are higher compared to other investment sectors like stocks and gold. However, this is also accompanied by greater risk compared to investing in other financial instruments like stocks and gold. The research findings of Sakina Ichsani and Adithya Pamungkas (2022) show that the highest returns are provided by Ethereum, followed by Bitcoin, gold, IHSG (Indonesian Composite Index), and lastly, Ripple Coin.

Meanwhile, Ripple Coin generates the highest risk, followed by Ethereum, Bitcoin, IHSG, and Gold. These findings align with the study conducted by P & Yuliari (2023), which found that the investment performance in Bitcoin and stocks is quite significant, with Bitcoin showing good return during the research period. In fact, the return generated by Bitcoin is directly proportional to its risk, as is the case between stocks and Bitcoin, indicating that Bitcoin also carries a relatively high level of risk.

Another study conducted by Ilham et al. (2022) reveals that in Indonesia, the turnover rate of crypto digital assets has a positive impact and can enhance investment returns when economic growth is stable and export commodity prices increase. However, when inflation rises and the exchange rate of the rupiah weakens against foreign currencies, this will impact the slowing growth rate of the Indonesian economy. In this study, the author aims to test whether there are differences in the return, risk, Sharpe, Treynor, and Jensen performance measures between Bitcoin, IHSG stocks, and the Dollar using the Kruskal-Wallis test.

Based on the results of several previous studies mentioned earlier, the author proposes the following hypotheses: H_1 suggests that there is a difference in returns between Bitcoin, IHSG stocks, and the Dollar, and the Kruskal-Wallis test is employed to investigate the potential significant differences in the returns generated by these assets. H_2 postulates that there is a difference in risk among Bitcoin, IHSG stocks, and the Dollar, and the Kruskal-Wallis test is used to explore the significant differences in the associated risks.

H_3 posits that there is a difference in Sharpe performance between Bitcoin, IHSG stocks, and the Dollar, and the Kruskal-Wallis test aims to identify any significant distinctions in the Sharpe performance of these assets. H_4 proposes that there is a difference in Treynor performance between Bitcoin, IHSG stocks, and the Dollar, with the Kruskal-Wallis test serving to uncover any significant variations in the Treynor performance. Finally, H_5 suggests that there is a difference in Jensen performance among Bitcoin, IHSG stocks, and the Dollar, and the Kruskal-Wallis test is used to investigate the potential significant differences in the Jensen performance of these assets.

RESEARCH METHOD

The purpose of this research is to analyze whether there is a significant difference in the return, risk, and portfolio performance using the Sharpe, Treynor, and Jensen methods among cryptocurrencies, stocks, and foreign currencies. To achieve this goal, a data analysis method utilized is a comparative analysis or difference test. The researcher employed monthly closing price data from Bitcoin, IHSG, and the Dollar.

The data source for this research is secondary data obtained from historical prices from Yahoo Finance - Stock Market Live, Quotes, Business & Finance News (n.d.) and downloaded on May 31, 2023. The research timeframe encompasses monthly closing data from January 2020 to December 2022. This quantitative study aims to evaluate whether there are significant differences between Bitcoin, IHSG, and the Dollar. A comparative study is a research type that compares the existence of one or more variables in two or more different samples (Sugiyono, 2012).

In this study, data analysis techniques were carried out using SPSS 25 software. Several tests were performed, including Standard Deviation, Return, and performance measurements using the Treynor, Sharpe, and Jensen methods. Hypothesis testing was conducted using non-parametric statistical tests in the form of the Kruskal-Wallis test. The Kruskal-Wallis test is a statistical method used to test significant differences among three or more groups in non-normally distributed dependent variables. This test uses ranked

data and does not require the assumption of a normal distribution, making it suitable when the assumption of normal distribution is not met (Puspaningtyas, 2016).

Thus, through this descriptive comparative research, the researcher can test the validity of the previously formulated hypotheses, which state that the rate of return, risk, and portfolio performance of Bitcoin, IHSG, and the Dollar analyzed using the Sharpe, Treynor, and Jensen methods. The population in this research includes the prices of Bitcoin, IHSG stocks, and the Dollar for the period 2020-2023. The sampling technique in this study is saturated sampling, which means this research involves all monthly closing data of Bitcoin, IHSG, and the Dollar from January 1, 2020, to December 31, 2022, comprising 36 data points for each instrument, resulting in a total of 108 data points. Further summary of this method can be found in the Table 1.

Table 1. Research Sample

Research Object	Number of Data
Bitcoin	36
IHSG	36
Dollar	36
Total Observations	108

Source: Data processed by the Author from Yahoo! Finance on May 31, 2023

Based on Table 1, the research sample consists of three main objects of study: Bitcoin, IHSG, and the Dollar. Each object has 36 data points, resulting in a total of 108 observations in this study. The data for this research were collected from the monthly closing prices of these financial instruments over the period from January 2020 to December 2022. The table provides a clear summary of the number of data points available for each object in the study.

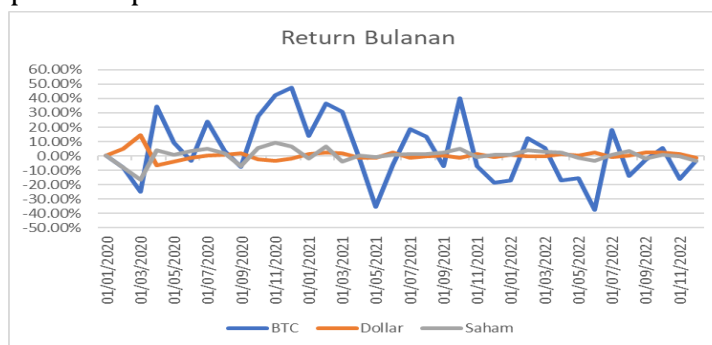
This table indicates that the study has a total of 108 data points, with an equal distribution of 36 data points for each of the three objects—Bitcoin, IHSG, and the Dollar. These data are essential for conducting the comparative analysis and hypothesis testing as discussed in the research methodology.

RESULTS AND DISCUSSION

Descriptive Analysis

Returns of Bitcoin, Dollar, and IHSG Stocks

Before presenting the chart, it is important to note that the chart is a visual representation of the monthly returns for Bitcoin, the Dollar, and IHSG stocks over the research period from January 2020 to December 2022. As shown in Figure 5, this chart illustrates the comparative performance of these three investment instruments.



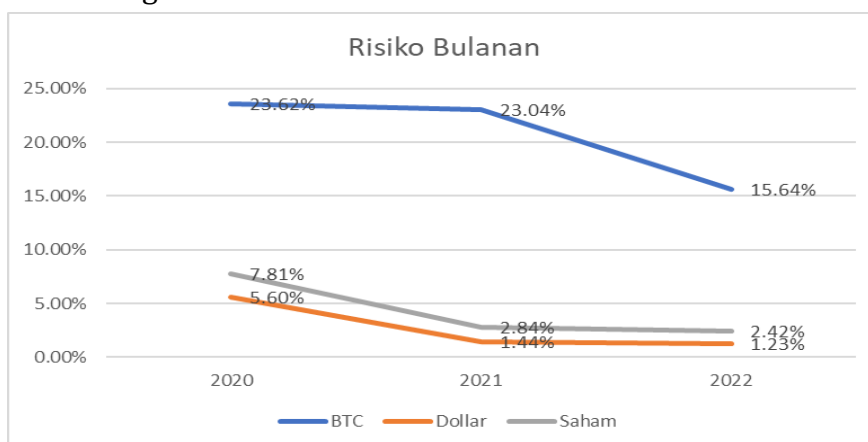
Source: Data Analysis, 2023

Figure 5. Monthly Return Comparison Chart for Bitcoin, Dollar, and IHSG Stocks

Based on Figure 5, monthly returns for Bitcoin display highly fluctuating data, unlike the returns for the Dollar and IHSG stocks, which tend to be more stable. The average return for Bitcoin during the research period from January 2020 to December 2022 is 3.94%. The highest return occurred in December 2020 at 47.77%, while the lowest return was in June 2022 at -37.77%. Furthermore, the average return for the Dollar during the same period is 0.41%. The highest return happened in March 2020 at 14.22%, and the lowest return was in April 2020 at -6.80%. As for IHSG stock, the average return for the research period from January 2020 to December 2022 is 0.52%. The highest return occurred in November 2020 at 9.44%, while the lowest return was in March 2020 at -16.76%. Among these three investment instruments, Bitcoin has the highest average return during the period from January 2020 to December 2022.

Monthly Risk of Bitcoin, Dollar, and IHSG Stocks

As presented in Figure 6, the chart titled "Monthly Risk Comparison Chart for Bitcoin, Dollar, and IHSG Stocks" illustrates the monthly risk for Bitcoin, the Dollar, and IHSG stocks. This risk assessment is based on the standard deviation calculated from the return data over 12 months within a year. The figure provides a visual comparison of the risk levels associated with these different investment instruments over the course of the research period from January 2020 to December 2022. It allows for an at-a-glance understanding of how risk fluctuated over time, highlighting the average risk values as well as the highest and lowest risk points for each of the analyzed instruments. The figure serves as a valuable reference for assessing the relative risk profiles of Bitcoin, the Dollar, and IHSG stocks in the given timeframe.



Source: Data Analysis, 2023

Figure 6. Monthly Risk Comparison Chart for Bitcoin, Dollar, and IHSG Stocks

The monthly risk for Bitcoin, the Dollar, and IHSG stocks is calculated based on the standard deviation taken from the return data over 12 months in a year. As shown in Figure 6, based on the processed data, it can be observed that the average risk value for Bitcoin during the research period from January 2020 to December 2022 is 20.76%. The highest risk occurred in the year 2020 at 23.62% and continued to decrease every year, reaching 15.64% in 2022. In contrast, the average risk value for the Dollar during the same period is 2.76%.

The highest risk happened in the year 2020 at 5.60%, gradually decreasing each year to 1.23% in 2022. The average risk value for IHSG stocks during the research period from January 2020 to December 2022 is 4.36%. The highest risk was in the year 2020 at 7.81%, decreasing each year to 2.42% in 2022. From the processed data, it is evident that

Bitcoin consistently had the highest risk value each year, while the lowest risk was associated with the Dollar.

Performance Evaluation of Bitcoin, Dollar, and IHSG Stocks Using the Sharpe Method

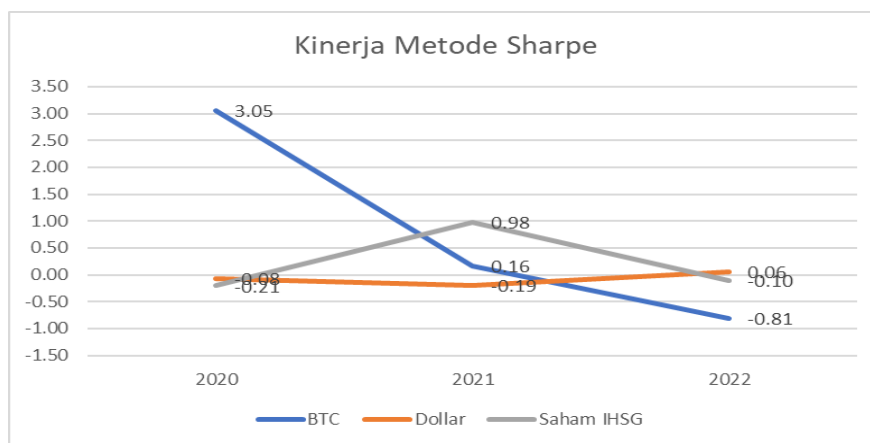
The Sharpe ratio, as presented in Equation 1, was formulated by William F. Sharpe in 1966. Sharpe compares the value between returns and the dispersion of returns. The higher the Sharpe ratio, the better the performance concerning the associated risk. The Sharpe ratio is commonly used to assist investors in understanding the return on investment compared to its risk. The ratio used is the average rate of return obtained over the risk-free rate per unit of volatility or total risk (Firdhy, n.d.).

$$S = \frac{\bar{R}_{pi} - \bar{R}_f}{\sigma_{pi}} \quad (1)$$

Based on Equation 1, the Sharpe ratio (S) is calculated as follows: S represents the Sharpe ratio, which is a measure of an investment's risk-adjusted return. It takes into account three key components for assessing investment performance. \bar{R}_{pi} denotes the average portfolio return, providing insight into the investment's overall profitability. \bar{R}_f stands for the risk-free rate of return, offering a baseline for risk assessment, and σ_{pi} signifies the portfolio's standard deviation, quantifying the investment's volatility or risk. This formula allows investors to evaluate how efficiently they utilize their capital, as a higher Sharpe ratio indicates a better return for the risk taken in the investment.

The Sharpe ratio allows investors to assess the risk-adjusted performance of a portfolio or investment, making it a valuable tool in evaluating the effectiveness of various investment options. The higher the Sharpe ratio, the better the return for the risk taken, indicating a more efficient use of capital.

Investment performance is calculated based on annual data, resulting in three data points for the period from January 2020 to December 2022, as presented in Figure 7.



Source: Data Analysis, 2023

Figure 7. Investment Performance Comparison Using the Sharpe Method

Based on Figure 7, it can be observed that Bitcoin investments experienced a decline in performance from 2020 to 2022, with Sharpe ratios of 3.05, 0.16, and -0.81, respectively. Dollar investments also saw a decrease in 2021, going from -0.08 to -0.19, and then experienced an increase in 2022 with a Sharpe ratio of 0.06. In the case of IHSG stock investments, the performance was -0.21 in 2020, then it increased to 0.98 in 2021, and experienced a decline to -0.10 in 2022.

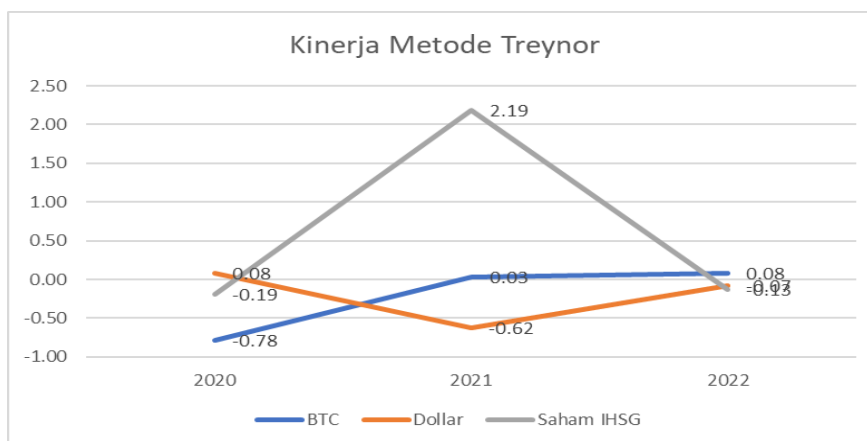
Treynor Performance Evaluation of Bitcoin, Dollar, and IHSG Stocks

The Treynor formula was first introduced by Jack L. Treynor. The Treynor measurement method is also known as the Reward to Volatility Ratio (RVOL). The calculation method of Treynor involves comparing return with risk (Jones, 2016) using the formula presented in Equation 2.

$$T = \frac{\bar{R}_{pi} - \bar{R}_f}{\beta_{pi}} \quad (2)$$

The Treynor formula, initially developed by Jack L. Treynor, is a measurement method known as the Reward to Volatility Ratio (RVOL). This method assesses investment performance by comparing the return to the level of risk associated with the investment (Jones, 2016). As per Equation 2, the Treynor formula is used to calculate this ratio. Where: $[T]$ Treynor ratio; $[\bar{R}_{pi}]$ Average portfolio return; $[\bar{R}_f]$ Risk-free rate of return; $[\beta_{pi}]$ Portfolio beta, representing the sensitivity of portfolio returns to market returns.

Investment performance, evaluated using the Treynor method, is calculated based on annual data, resulting in three data points for the period from January 2020 to December 2022, as presented in Figure 8.



Source: Data Analysis, 2023

Figure 8. Comparison of Investment Performance Using the Treynor Method

Based on Figure 8, we can glean information regarding investment performance. In the case of Bitcoin, performance improved from -0.78 in 2020 to 0.03 in 2021 and further increased to 0.08 in 2022. For Dollar investments, performance was 0.08 in 2020, decreased to -0.62 in 2021, and rebounded to -0.07 in 2022. Meanwhile, IHSG stock investments had performance values of -0.19 in 2020, rose to 2.19 in 2021, and then experienced a performance decline in 2022 to -0.13.

Evaluation of Investment Performance Using the Jensen Method

The Jensen index represents the excess above or below the security market line. It is interpreted as a measure of how much a portfolio can outperform the market (Firdhy, n.d.). Jensen takes into account the Capital Asset Pricing Model (CAPM) value, known as Jensen Alpha. The Jensen formula, discovered in 1967 by Michael C. Jensen, is presented in Equation 3.

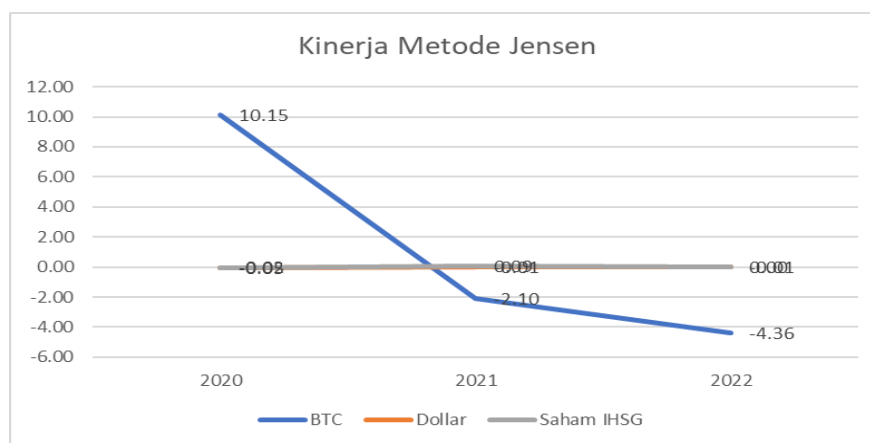
$$J = (\bar{R}_{pi} - \bar{R}_f) - (\bar{R}_m - \bar{R}_f)\beta_{pi} \quad (3)$$

The Jensen formula, as shown in Equation 3, calculates the Jensen Alpha, which is an indicator of how much a portfolio's actual returns deviate from the expected returns

predicted by the Capital Asset Pricing Model (CAPM). Jensen Alpha measures whether the portfolio outperforms or underperforms the market, considering the specific risk associated with the portfolio. It quantifies the portfolio manager's ability to generate excess returns beyond what would be expected based on the level of systematic risk in the portfolio. Therefore, the Jensen Alpha is a valuable metric for assessing the skill of an investment manager in achieving superior returns. The formula is as follows, where: J (Jensen Alpha) represents the risk-adjusted excess return. \bar{R}_{pi} is the portfolio's actual return. \bar{R}_f is the risk-free rate of return. β_{pi} (Beta) is the portfolio's beta, which measures its systematic risk. \bar{R}_m is the market return.

This equation helps evaluate the portfolio's performance based on the CAPM framework, as indicated by Equation 3.

The graph, presented in Figure 9, provides valuable insights into the investment performance of Bitcoin, the Dollar, and IHSG stocks. The figures reveal distinct trends in the performance of these investment instruments over the years, thus offering important information for analysis.



Source: Data Analysis, 2023

Figure 9. Comparison of Investment Performance using Jensen Alpha Method

Based on Figure 9 above, we can gather information regarding the performance of Bitcoin investments. It consistently experienced a decline, starting at 10.15 in 2020, decreasing to -2.10 in 2021, and further declining to -4.36 in 2022. In the case of Dollar investments, the performance continued to improve, although not significantly. In 2020, the Dollar's performance was -0.02, which then increased to -0.01 in 2021 and further rose to 0.004 in 2022. Meanwhile, IHSG stock investments exhibited a performance of -0.05 in 2020, followed by an increase to 0.09 in 2021, but subsequently decreased to -0.01 in 2022.

Kruskall-Wallis Rank Test

After conducting tests for normality and homogeneity, it was evident that the data for each variable did not meet the assumptions of a normal distribution and homogeneity. Consequently, a non-parametric statistical test was employed. The Kruskal-Wallis test was utilized by the author to address the hypotheses in this study. The Kruskal-Wallis test is a non-parametric rank-based test designed to determine whether there is a statistically significant difference among two or more groups of independent variables involving numeric data (interval or ratio) and ordinal scale. The differences observed in the investment performance analyses through the conducted calculations needed to be statistically tested for overall and statistical differences. Testing through the Kruskal-

Wallis H analysis plays a crucial role in proving these hypotheses, measuring statistically whether there are differences in average ranks or not, as presented in Table 2.

Table 2. Kruskal-Wallis Rank Test

	Instrumen	N	Mean Rank
Return	Bitcoin	3	6.00
	Dollar	3	4.33
	IHSG Stocks	3	4.67
	Total	9	
Risk	Bitcoin	3	8.00
	Dollar	3	2.67
	IHSG Stocks	3	4.33
	Total	9	
Sharpe	Bitcoin	3	5.67
	Dollar	3	4.67
	IHSG Stocks	3	4.67
	Total	9	
Treynor	Bitcoin	3	4.67
	Dollar	3	5.00
	IHSG Stocks	3	5.33
	Total	9	
Jensen	Bitcoin	3	4.00
	Dollar	3	5.67
	IHSG Stocks	3	5.33
	Total	9	

Source: Data Analysis, 2023

Based on the data analysis presented in Table 2, it can be inferred that in terms of returns, Bitcoin holds the highest rank with a value of 6.00. The second rank is held by IHSG stock with a value of 4.67, followed by the third rank held by the Dollar with a value of 4.33. Subsequently, the Kruskal-Wallis test for risk indicates that Bitcoin holds the highest rank with a value of 8.00, followed by the second rank held by IHSG stock with a value of 4.33, and the third rank held by the Dollar with a value of 2.67. In terms of the Sharpe method's performance, Bitcoin has the best performance or first rank with a value of 5.67, followed by the Dollar and IHSG stock with the same performance value of 4.67.

In terms of the Treynor method's performance, the best performance or first rank is held by IHSG stock with a value of 5.33, followed by the second rank with a value of 5.00 held by the Dollar, and the third rank is held by Bitcoin with a value of 4.67. Lastly, in terms of the Jensen method's performance, the highest rank is held by the Dollar with a value of 5.67, followed by IHSG stock in the second rank with a value of 5.33, and the third rank held by Bitcoin with a value of 4.00.

Kruskall-Wallis Test

The data presented in Table 3 were subjected to statistical analysis to determine whether there are significant differences in various financial performance indicators (Return, Risk, Sharpe Performance, Treynor Performance, and Jensen Performance) among the three assets: Bitcoin, the Dollar, and IHSG stocks.

Table 3. Kruskal-Wallis Test

	Return	Risk	Sharpe	Treynor	Jensen
Kruskall Wallis	7.622	6.956	7.267	6.089	7.622
df	2	2	2	2	2
Asymp Sig.	0.000	0.001	0.000	0.007	0.000

Source: Data Analysis, 2023

Based on the data presented in Table 3, it was found that the Return variable has a significance value of 0.000, which is less than 0.05. Therefore, the hypothesis is accepted, indicating that there is a significant difference in returns between Bitcoin, the Dollar, and IHSG stocks. The Risk variable has a significance value of 0.001, which is also less than 0.05, so the hypothesis is accepted, indicating a significant difference in risk between Bitcoin, the Dollar, and IHSG stocks.

The Sharpe Performance variable has a significance value of 0.000, which is less than 0.05, so the hypothesis is accepted, indicating a significant difference in Sharpe performance between Bitcoin, the Dollar, and IHSG stocks. The Treynor Performance variable has a significance value of 0.007, which is less than 0.05, so the hypothesis is accepted, indicating a significant difference in Treynor Performance between Bitcoin, the Dollar, and IHSG stocks. Lastly, the Jensen Performance variable has a significance value of 0.000, which is less than 0.05, so the hypothesis is accepted, indicating a significant difference in Jensen Performance between Bitcoin, the Dollar, and IHSG stocks.

To understand whether there are differences in return, risk, and portfolio performance between Bitcoin, IHSG stocks, and the Dollar, five hypotheses were tested using comparative analysis. Based on the analysis results, all hypotheses were accepted.

The first hypothesis states that there is a difference in returns generated by Bitcoin, IHSG stocks, and the Dollar. This hypothesis was accepted, indicating a significant difference in returns among these assets. This can be observed from the significance value of 0.000, which is less than 0.05. In other words, there is a significant difference in returns among Bitcoin, stocks, and the Dollar. Based on the average ranks, Bitcoin produces the highest return, at 3.94%, followed by IHSG stocks at 0.52%, and the Dollar at 0.41%. The Kruskal-Wallis test ranks Bitcoin at the top for returns. This aligns with the findings of previous studies, such as Firdhy, Meiyura & Azib, and Meiryani, which also found differences in returns and risk between Bitcoin and other assets.

The second hypothesis states that there is a difference in the risk generated by Bitcoin, IHSG stocks, and the Dollar. This hypothesis was accepted, indicating a significant difference in risk among these assets. The significance value is 0.001, which is less than 0.05. This means that there is a significant difference in risk between Bitcoin, stocks, and the Dollar. In terms of average ranks, Bitcoin has the highest risk at 20.76%, followed by stocks at 4.36%, and the Dollar at 2.76%. This aligns with the research conducted by Maldhini & Patrisia, which also found significant differences in risk among Bitcoin, LQ45 stocks, and gold. It implies that investing in Bitcoin carries a higher risk compared to stocks and the Dollar. On the other hand, investing in the Dollar represents the lowest average risk among the instruments, making it a safer investment choice compared to Bitcoin and stocks.

The third hypothesis states that there is a difference in Sharpe performance generated by Bitcoin, IHSG stocks, and the Dollar. This hypothesis was accepted, indicating a significant difference in Sharpe performance among these assets, as reflected in the significance value of 0.000, which is less than 0.05. In terms of average ranks, Bitcoin has the highest Sharpe ratio at 5.67, while the Sharpe ratio for the Dollar and IHSG stocks is both 4.67. This finding is consistent with research showing that Bitcoin outperforms other investment instruments.

The fourth hypothesis states that there is a difference in Treynor Performance generated by Bitcoin, IHSG stocks, and the Dollar. This hypothesis was accepted, indicating a significant difference in Treynor Performance among these assets, with a significance value of 0.007, which is less than 0.05. In terms of average ranks, IHSG stocks have the highest Treynor ratio at 5.33, followed by the Dollar at 5.00, and Bitcoin ranks last at 4.67.

This means that Bitcoin does not provide the maximum return compared to the market volatility it faces, as IHSG stocks and the Dollar offer better risk-adjusted returns.

The fifth hypothesis states that there is a difference in Jensen Performance generated by Bitcoin, IHSG stocks, and the Dollar. This hypothesis was accepted, indicating a significant difference in Jensen Performance among these assets, with a significance value of 0.000, which is less than 0.05. In terms of average ranks, the Dollar has the highest Jensen value at 5.67, followed by IHSG stocks at 5.33, and Bitcoin at 4.00. Jensen Performance measures the difference between an investment's return and the market return. If the Jensen value is positive, the instrument is considered to perform well; otherwise, it is considered poor. This result aligns with the research conducted by Ichسانی & Pamungkas, indicating significant differences in performance between Bitcoin, stocks, and gold when measured with the Jensen method.

In summary, the analysis revealed significant differences in returns, risk, Sharpe performance, Treynor performance, and Jensen performance between Bitcoin, the Dollar, and IHSG stocks. These findings provide valuable insights for investment and financial decision-making.

CONCLUSION

This research was designed to compare the investment portfolio performance between Bitcoin, IHSG stocks, and the Dollar from January 2020 to December 2022 using the Sharpe, Treynor, and Jensen methods. Based on the analysis results, the researcher has drawn the conclusion that there are significant differences in returns and risks generated by Bitcoin, IHSG stocks, and the Dollar. This is attributed to the high volatility in Bitcoin returns, which can potentially carry high and fluctuating risks but also offer the potential for high returns.

In contrast, returns from IHSG stocks and the Dollar are typically smaller but more stable, resulting in lower and less fluctuating risks for investors. Based on these findings, it can be concluded that investing in Bitcoin is a high-risk investment and requires in-depth analysis before deciding to invest in this financial instrument. Investors and prospective investors should consider the potential returns and risks they may face, whether they align with their risk profile, in order to make investment decisions that suit their financial capacity.

Based on the performance analysis using the Sharpe, Treynor, and Jensen methods, there are significant differences in the performance of Bitcoin, IHSG stocks, and the Dollar. Bitcoin achieves the highest performance only with the Sharpe method, mainly due to the significant returns it generates. When compared to its average return, it results in a high Sharpe ratio. However, in terms of performance measured with the Treynor method, IHSG stocks produce the highest values because the return they offer is proportionate to the risk taken.

In this context, IHSG stocks provide returns that are not as high as Bitcoin but with more stable risk and relatively lower market volatility. Meanwhile, when measured using the Jensen method, the best investment performance is achieved by the Dollar. This means that the Dollar provides returns greater than its expected return, which is a positive outcome as it indicates that the Dollar investment portfolio offers relatively higher returns for its systematic risk level.

Investing in cryptocurrency offers the potential for high returns but is accompanied by equally high and fluctuating risks and volatility. Therefore, investors need to exercise caution before deciding to invest in this type of financial instrument. Education about cryptocurrency investment in Indonesia is essential to prevent potential investors

and beginners from being lured by high profits without understanding the associated risks.

Additionally, clearer and structured regulations are needed to protect investors from various local cryptocurrencies that may not have legal entities and could potentially harm investors. Investing in stocks and the Dollar has well-established fundamentals that prospective investors can learn about because they have clear legal foundations and are supported by legal financial entities that can monitor the buying and selling of these investment instruments. Unlike decentralized cryptocurrencies, the legal status and theoretical foundations are less mature, adding additional risks for potential investors.

RECOMMENDATION

Like most research studies, this research also has limitations. These limitations can serve as considerations for future research efforts to obtain better results. The limitations in this study include the relatively short data collection period, which was limited to 36 months. This short period was due to the data being collected during the early stages of the COVID-19 pandemic in Indonesia.

Therefore, it may not provide a comprehensive long-term perspective on the investment instruments studied. Additionally, cryptocurrency investment instruments have only gained popularity in recent years, so historical data for a longer timeframe is not yet available. Another limitation is that this research took only one sample for each investment instrument, which does not provide a comprehensive overview of an investment instrument.

For future research, it is recommended to take more samples for each type of investment instrument to obtain a more comprehensive picture. Furthermore, in future research related to relevant variables, it is necessary to use a longer period, including data from both before and after the COVID-19 pandemic, to examine the long-term trends of each investment instrument. This will help determine whether the high volatility observed during the pandemic is a temporary phenomenon or a characteristic of specific investment variables.

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