

Comparative analysis of the performance of investment instruments in the fourth industrial revolution (a comparative study of risk and return between stocks, gold, and cryptocurrency)

Angga Okitesvara Pratama*
Fitra Dharma
Liza Alvia

Accounting Department, University of Lampung, Lampung, Indonesia

ABSTRACT

This research is done to determine the best-performing investment instruments in the Fourth Industrial Revolution by analyzing the performance of stocks, gold, and cryptocurrencies. In this era of information, investing is a well-known strategy used to allocate wealth. However, the knowledge of investment still needs to be improved. Thus, this research is done to provide comprehensive information about investment instruments performances. The sample used in this research is the monthly closing price of IDX30 stocks, gold, and cryptocurrency from January 2018 – December 2021. The analytical method used in this research is a comparative method which is done by using secondary data. Microsoft Excel was used to calculate the formula of each variable. Afterward, the data obtained were processed using the IBM SPSS application, the Kruskal-Wallis's test. Our research indicates no significant difference between IDX30 stocks, gold, and cryptocurrency when measured from return. However, our research finds significant differences between IDX30 stocks, gold, and cryptocurrency when measured from risk. Therefore, in conclusion, it is advised for investors to be wary of the risks presented by each investment instrument and invest according to each investor's risk tolerance. This research has several limitations, such as the short research period, namely from January 2018 – December 2022. For future research, it would be advised to widen the period of data that is going to be researched, and a wider variety of investment instruments would also be a welcome improvement as they can provide research results that would be more beneficial and extensive.

KEYWORDS

Investment; Stocks; Gold;
Cryptocurrency; Performance;
Return; Risk

Received: 10 January 2023
Accepted: 18 February 2023
Published: 28 February 2023

Introduction

Financial independence or financial freedom is a state in which an individual or household has sufficient assets or wealth to live happily without having to depend on the salary of being employed or dependent on others. Individuals or household certainly wants to achieve financial freedom. However, this state of financial freedom could be challenging to achieve, especially in today's macroeconomic conditions and the increasing cost of living.

One way that can be used to achieve financial freedom is by investing. The purpose of investment is to create sustainability in investment, get maximum profit, and create prosperity for investors (Fahmi, 2015). Investing in the fourth industrial era is very different from the era before, in which back then, investors would have to call a broker in order to make a buy or sell order for a stock. Nowadays, technology has progressed so far that in order for investors to buy or sell shares, all they need to do is create an investing account using their chosen stock exchange app. Now the process of buying or selling shares is done with the simple tap of a button.

Another difference in the fourth industrial era is the ease of access to financial information such as corporate income statements. However, with the ease of access to information also comes the downside of having the rampant spread of misinformation that could give investors terrible financial information.

In the fourth industrial era, there were various investment instruments such as stocks, gold, and, most recently and perhaps also the most infamous, which is cryptocurrency. This research focused on comparing the return and risk of stocks, gold, and cryptocurrency to find the best-performing investment instrument. According to Nurcahya (2019), Bitcoin and stocks have a higher risk and return rate compared to futures instruments such as gold and forex.

Analyzing the performance of stocks, gold, and cryptocurrency by their return and risk will have a practical contribution for investors, thus making it easier for them to choose the right investment instrument according to their risk tolerance.

Literature review

Investment Theory

Investment is a commitment fund for one or more assets that will be held for several periods in the future, this is the theory of investment put forward by Jones & Jensen (2019). In every form of investment there is a risk of uncertainty, so a compensation is needed for this risk. According to Hartono (2019) which states that return and risk are two inseparable things because the consideration of investment is a trade-off of these two factors. Return and risk have a positive relationship, the greater the risk that must be borne, the greater the return that must be compensated.

Return

According to Fahmi (2015), return is the profit expected by investors in the future for funds that have been invested. Investments made by investors are indeed expected to produce results. The results expected by investors are in the form of returns or rewards from investment. This return can be in the form of dividends given by shares or rewards obtained when staking cryptocurrency. Another form is capital gains which are obtained when an investment value rises and is sold at a profit. With that explanation, the hypothesis in this research is:

H1: Is there a difference between the rates of return from stocks, gold, and cryptocurrency in the 4.0 era?

Risk

There will always be risks when investing. Investment risks cannot be eradicated but can be minimized, according to Aven & Renn (2010), risk means the uncertainty and weight of the consequences of an activity related to something valued by humans. According to Van Horne & Wachowicz (2010), risk is the variability of returns against expected returns. According to Tandelilin (2010), Types of investment risk can be divided into two types: systematic risk and unsystematic risk. With that explanation, the hypothesis in this research is:

H2: Is there a difference between stocks, gold, and cryptocurrency risk levels in the 4.0 era?

Stocks

According to Rusdin (2008), stocks are certificates that show proof of ownership of a company, and shareholders have claim rights to the income and assets of the company. Publicly traded shares are shares that have been listed on the capital market. Every major country has its own stock exchange, for example, in the United States, there is the New York Stock Exchange (NYSE), and in Indonesia itself there is also its own stock exchange, namely, the Indonesia Stock Exchange (Bursa Efek Indonesia) or commonly abbreviated BEI or (IDX). IDX has its own stock index, namely the Composite Stock Price Index (IHSG).

According to Darmadji & Fakhruddin (2011), there are two types of stocks, and it is as follows:

1. Common Stock
This type of stock gives its shareholders a claim to corporate assets if it gets liquidated and the right to receive dividends if the corporation is profitable. This type of stock gives its shareholders proportional rights in the election of directors and other decisions determined at the General Meeting of Shareholders (GMS).
2. Preferred Stock
Stocks categorized as preferred stock entitle the shareholders to a fixed dividend, which takes priority over common stock dividends.

Gold

Gold is known as a valuable metal that has a high value throughout the world, especially in the form of jewelry. Gold played a central role in the international monetary system in past centuries when currency rates were linked to the price of gold. The fixed currency system ended in 1973, diminishing gold's role (IMF, 2022). Gold is a financial standard determined by various forms of state and as a medium of exchange that is relatively never obsolete and accepted in all countries worldwide. For many years strengthened gold prices in combination with US dollar (USD) depreciation have attracted the attention of investors, risk managers, and the financial media. The fact that when the USD goes down as gold goes up suggests the possibility of using gold as a hedge against currency movements and as a safe-haven asset against extreme currency movements (Reboredo, 2013)

Gold supplies diminish over time while its demand seldom decreases. Another factor supporting the great demand for gold in the world is that gold is considered a medium of exchange that can increase in value if macroeconomic events happen, such as inflation, a global economic crisis, or the increasing price of commodities. These factors bring confidence to investors that it will survive many macroeconomic incidents that could happen.

Cryptocurrency

Cryptocurrency is a digital asset in which ownership data and transfer of ownership are guaranteed not by banks or third parties but by cryptographic technology (Giudici et al., 2020). Cryptocurrency can be considered a financial asset because it has its own value for cryptocurrency holders. Cryptocurrency gained its fame through the global economic crisis in 2008, in which the level of public confidence in the conventional banking system began to decline. This decrease in public confidence happened precisely when the economic turmoil began to emerge on March 16, 2008, when large banks such as Bear Stearns and Lehman Brothers, which were considered too big to fail went

bankrupt (Wilson, 2019). First, cryptocurrency was started by Nakamoto (2008) which is explained further in his whitepaper which represents the beginning of cryptocurrency and has become a foundation for understanding cryptocurrencies as well as blockchain technology.

Another cryptocurrency or more precisely, a decentralized blockchain platform for applications built within it that is also well-known is Ethereum, which was created and described by Vitalik Buterin in a whitepaper in 2013. Ethereum differs from bitcoin in its uses, bitcoin is designed specifically as a currency and a store of value. Meanwhile ethereum's intended uses are for complex smart contracts and decentralized applications (Reiff, 2022). Ethereum does this by building what is essentially the ultimate abstract foundational layer: a blockchain with a built-in Turing-complete programming language, allowing anyone to write smart contracts and decentralized applications where they can create their own arbitrary rules for ownership, transaction formats, and state transition functions (Buterin, 2014).

While cryptocurrency is a controversial investment choice, its popularity is undoubtedly growing exponentially, especially among young investors. The frequent marketings of cryptocurrency by influencers are also one of the biggest reasons cryptocurrency popularities was skyrocketing.

However, many risk-averse investors would avoid cryptocurrency, not only due to its volatility but also due to its many drawbacks, one of the biggest hurdles in the spread of cryptocurrencies is the lack of governance in peer-to-peer networking transactions. Users are at risk of being victims of fraud and cyberattacks. In addition, cryptocurrencies are underpinned by blockchain technology, which could enable malicious actors to operate without oversight (Rejeb et al., 2021). Such instances of events that spotlighted cryptocurrencies downsides are Luna and FTX collapse which triggered market crashes in cryptocurrency, with its main founders unable to return the money lost due to the crash. These events showed the public that freedom in cryptocurrency is a double-edged sword in which the cryptocurrencies lack governance and laws to protect their users, unlike other investments like stock or gold.

There is a positive side to cryptocurrency infamy however, as lawmakers across the world are currently trying to make laws to protect and legalize cryptocurrencies, one such example is the use of Bitcoin as a legal tender in El Salvador. However, according to Weber (2015), Its future as money looks less promising outside a scenario where Bitcoin survives as the only replacement after the official money system collapses due to internal problems.

Methods

Data Collection Technique

This study used a quantitative method. Quantitative research is an approach for testing objective theories by examining the relationship among variables. These variables, in turn, can be measured, typically on instruments, so that numbered data can be analyzed using statistical procedures (Creswell, 2016). The research itself is independent of the researcher. As a result, data is used to measure reality objectively. Quantitative research creates meaning through objectivity uncovered in the collected data (Williams, 2007).

This research takes a population of the monthly closing price of the IDX30 index, Gold, and Ethereum from January 2018 to December 2021. The sample selection in this study was made through purposive sampling, in which there were 144 research samples. This research was done using secondary data.

Variables of the research

IDX30 (X1)

IDX30 is an index that measures the price performance of 30 stocks with a high level of liquidity and is accompanied by good company fundamentals.

Gold (X2)

Gold is a means of storing wealth which is often used as a long-term investment tool to fight inflation.

Ethereum (X3)

Cryptocurrency is a virtual currency that is transacted through a decentralized computer network, which means it does not depend on banks or the government. Ethereum is a cryptocurrency with the second largest market cap with a smart contract function. Ethereum is used as a variable in this research due to its rising popularity, which many have speculated will overtake bitcoin as it has exponential growth while bitcoin is stationary.

Return (Y1)

Return is the rate of return or yields from investing in stocks, gold, or cryptocurrency, for the method of calculation, the following formula was used:

$$R_t = \frac{p_t - p_{t-1}}{p_{t-1}}$$

Risk (Y2)

Risk is the deviation from expected returns from investing in stocks, gold, and cryptocurrencies. In order to calculate risk, the standard deviation formula was used, the formula is as follows:

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

Results

This study obtained results of the tests that have been carried out which are as follows:

Descriptive Statistical Analysis

Table 1. Monthly Return Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
IDX30	48	-20.27%	11.68%	-0.22%	5.36%
Gold	48	-6.98%	10.37%	0.78%	3.99%
Ethereum	48	-54.00%	78.00%	7.88%	31.82%
Valid N (listwise)	48				

Based on the results of the analysis, IDX30 earned -20.27% as its lowest monthly return, with 11.68% as its highest monthly return with an average monthly return of -0.22%, while Gold earned -6.98% as its lowest monthly return with 10,37% as its highest monthly return with an average monthly return of 0.78%. Meanwhile, Ethereum earned -54.00% as its lowest monthly return, with 78.00% as its highest monthly return with an average monthly return of 7.88%.

Based on all the results earned by the analysis above, it would imply that Ethereum has the highest average monthly return and maximum return, however it also has the lowest monthly return, with -54.00% which differs substantially from its maximum monthly return, 78.00%. This large margin of difference in minimum and maximum monthly return would imply ethereum investors have to bear the risk of their investment plummeting. On the other hand, IDX30 and Gold both have a maximum and minimum level of monthly return that does not deviate from its counterpart, which would imply IDX30, and gold price stability is better than Ethereum.

Table 2. Monthly Risk Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
IDX30	48	0.000050	0.029248	0.00575905	0.005220848
Gold	48	0.000208	0.013992	0.00464008	0.003450672
Ethereum	48	0.000029	0.102680	0.03743238	0.026811217
Valid N (listwise)	48				

Based on the results of the analysis, IDX30 has 0.000050 as its lowest monthly risk, with 0.029248 as its highest monthly risk with an average monthly risk of 0.00575905, while Gold has 0.000208 as its lowest monthly risk with 0.013992 as its highest monthly risk with an average monthly risk of 0.00464008. Meanwhile, Ethereum has 0.000029 as its lowest monthly risk, with 0.102680 as its highest monthly risk with an average monthly risk of 0.03743238.

Ethereum provides the highest monthly average risk, this is in accordance to its high return as stated in table 1. IDX30 and Gold both have an average monthly risk that is similar to each other, which explains why their ratio of monthly return do not have a significant difference from one another. This would imply that Ethereum brings a high return but with the drawback of having the highest risk out of all the investment instrument presented in this research, thus expressing caution would be wise for investors willing to allocate their assets here.

Normality Test

Table 3. Kolmogorov-Smirnov Test

Indicator	Research Variables		
	IDX30 (X1)	Gold (X2)	ETH (X3)
	Sig.	Sig.	Sig.
Return	,200 ^d	,200 ^d	,200 ^d
Risk	0,025	0,030	,200 ^d

Based on table 3, the Kolmogorov-Smirnov test results indicated that the return indicator's significance for IDX30, Gold, and Ethereum are all higher than the 0.05 significance level. Meanwhile, the significance of the risk indicator for IDX30 is $0.025 < 0.05$, with Gold having $0.030 < 0.05$ significance level and Ethereum having $0.000 > 0.05$ significance level, thus it can be concluded that both return and risk indicators have abnormal data distribution.

Homogeneity Test

Table 4. Homogeneity Test

ANOVA		
Indicator	F	Sig.
Return	2.734	0.000
Risk	66.195	0.000

Based on the results of the homogeneity test in table 4, all the significance levels of the return and risk indicators are all < 0.05 , which means that the variances for the return and risk indicators are not homogeneous.

Kruskall-Wallis Test

Due to the results of the normality test which stated that the data distribution has abnormal distribution, and the homogeneity test which stated that the variances between return and risk indicators are not homogeneous, this study does not meet the assumptions of the One-Way ANOVA test. Henceforth, this research will use a non-parametric statistical test, namely the Kruskal-Wallis test.

Table 5. Kruskal-Wallis Ranking Test

Investment Instrument		N	Mean Rank
Investment	IDX 30	48	67.69
	Gold	48	71.75
	ETH	48	78.06
Total		144	
Risk	IDX 30	48	57.04
	Gold	48	51.24
	ETH	48	109.22
Total		144	

Based on Table 5 above, the results of the Kruskal-Wallis ranking test can be summarized as follows:

1. Ethereum has the highest average return value compared to gold and stock investment instruments, which is 78.06, the investment instrument with the second highest average return is gold which earned 71.75, with IDX30 earning the lowest average return of 67.69.
2. Ethereum has the highest average risk value compared to gold and stock investment instruments, which is 109.22, the investment instrument with the second highest average risk is IDX30 at 57.04, with gold investment having the lowest average risk, which is 51.24.

Table 6. Kruskal-Wallis Hypothesis Test

	Investment Return	Investment Risk
Kruskal-Wallis H	1.508	56.471
df	2	2
Asymp. Sig.	0.470	0.000
Conclusion	Not Supported	Supported

Based on Table 6 above, the results of the Kruskal-Wallis hypothesis test can be summarized as follows:

1. The return indicator produces a significance level of 0.470 which is greater than 0.05 (> 0.05) thus making the H1 which stated that there is a difference between the returns on stocks, gold, and cryptocurrencies in the Fourth Industrial Era not supported, which means that there is no significant difference between the returns on stocks, gold, and cryptocurrencies in the Fourth Industrial Era.
2. The risk indicator produces a significance level of 0.000 which is lower than 0.05 (< 0.05) thus making the H2 which stated that there is a difference between the risk levels of stocks, gold, and cryptocurrencies in the Fourth Industrial Era are accepted, which means that there is a significant difference between the risks on stocks, gold, and cryptocurrencies in the Fourth Industrial Era.

Discussion

Comparison of IDX30, Gold, and Ethereum Return

Based on the results obtained from this research between the three investment instruments, namely stocks (IDX30), gold, and cryptocurrency (Ethereum), there is no significant difference in return values. This statement is obtained because the significance value is $0.470 > 0.050$ or greater than 0.050. Nonetheless, the Kruskal-Wallis ranking test results show that Ethereum provides the highest average return with an average return value of 78.06, while the return from average stocks is 67.69, and gold provides the lowest average return with 71.75.

The implication of this result is that Ethereum on average grants investors higher return than stocks and gold, however by looking at this graph below it can be noticed that while Ethereum does give higher return, it does not come without risk.

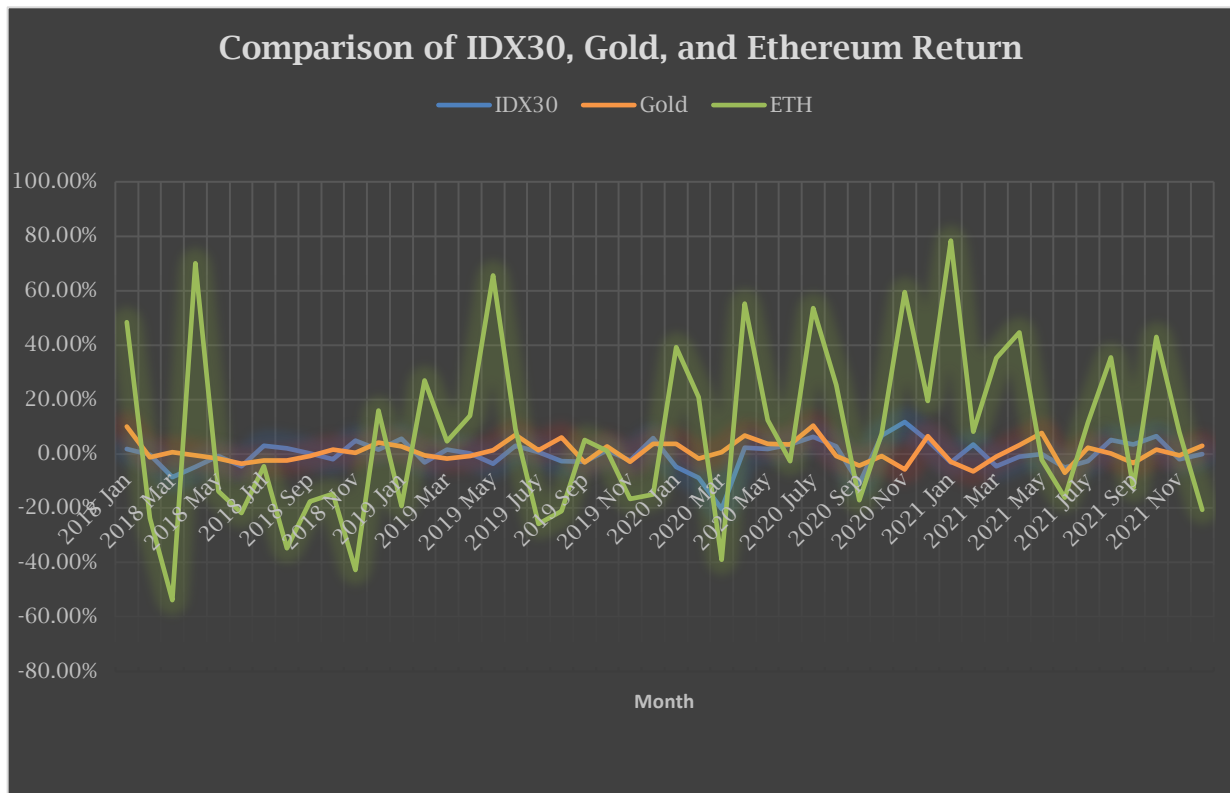


Figure 1. Graph of Comparison between IDX30, Gold, and Ethereum Return

By looking at the evidence proven by figure 1, both IDX30 and Gold provide similar return and they are fairly stagnant, even during crisis in 2020 March during which the pandemic COVID-19 started making economic crashes, making the implication that their stability is proven during crisis, however the same could not be said about Ethereum, while it is true that Ethereum gives a very high return in some months, it fluctuates constantly swinging between sharp uptrends and sharp downtrends.

To put it simply, the returns given by Ethereum might be very high indeed, but on the other hand, it is a genuine possibility that instead of gains, losses would be met by investors as the graph above has proven that Ethereum does not precisely show any pattern except for slightly following the movement of other investment such as Gold and IDX30 as shown above Ethereum price rises substantially when IDX30 is uptrend, however it also experienced severe crashes during downtrend, thus it can be concluded that Ethereum does not follow any real pattern except following macroeconomic conditions and other investment instrument.

This is contradicted by the research of Warsito & Robiyanto (2020) which stated that Ethereum does not follow any variables such as IHSI and Dollar index, and its volatility is only caused by its past prices, which means investors can make an analysis based on past prices.

Gold is known as a safe-haven during crisis such as the COVID-19 pandemic, and it shows as it experienced price increase during the pandemic, specifically during March until July, this is an inverse of IDX30 which experienced a total loss of 20% during March. This is further supported by the research of Yousef & Shehadeh (2020) which stated that there was a significantly positive price impact towards gold during COVID-19, however during a pandemic, the volatility of gold also increases, thus raising its risk.

The reasoning behind the results obtained from this research which stated that there is no significant difference in return values could be caused by macroeconomic events such as the COVID-19 pandemic that occurred in 2020 caused a supply and demand shock that caused stocks, gold, and cryptocurrencies to experience similar market movements. The researcher suspects that the above factors caused the similar returns from stocks, gold, and

cryptocurrencies to have no significant difference so that H1, namely that there is a difference between the return levels of stocks, gold, and cryptocurrencies in the fourth industrial era is not supported.

The results of this study are in line with the results of research by Mahessara & Kartawinata (2018) and the results of research by Adiyono et al. (2021), which stated that there was no significant difference in returns between Bitcoin, stocks, and gold. However, the result of this study is contradicted by the results of research obtained by Liu & Tsyvinski (2021) and Meiyura & Azib (2020), who found that there was a significant difference in return between cryptocurrencies (bitcoin, ripple, and ethereum), stocks, and gold. Similar results were also found by Nurcahya (2019) which also stated that there was a significant difference between Bitcoin and stocks.

Kruskal-Wallis ranking test results indicate that the highest average return is obtained by ethereum, with the trade-off that the highest average risk is also obtained by ethereum, and the lowest return is obtained by stocks, with the lowest risk obtained by gold. The results provided by the Kruskal-Wallis rating test are also in line with the results of research obtained by Lumbantobing & Sadalia (2021), who obtained the result that cryptocurrency (bitcoin) is in the highest position in providing returns compared to stocks and gold.

The results of this discussion have implications for investors, which may cause investors to reconsider the choice of investment instruments to which they wish to allocate their funds, because the returns provided by stocks, gold, and cryptocurrencies, while different, do not generate significant returns.

Comparison of IDX30, Gold, and Ethereum Risk

Based on the results obtained from this research between three investment instruments, namely stocks (IDX30), gold, and cryptocurrency (Ethereum), have significant differences in risk values, this statement can be obtained due to the significance value that is $0.000 < 0.050$ or lower than 0.050. The research results provided by the Kruskal-Wallis ranking test, Ethereum provides the highest risk compared to other investment instruments, namely with an average risk indicator value of 109.22, compared to gold which has an average risk indicator value of 51.24 which is lower compared to IDX30 index which get an average risk indicator value of 57.04.

The implication of the result earned is that Ethereum has significantly higher risk ratio than IDX30 and Gold, this is in line with the results earned in figure 1, which shows Ethereum having a very high return with also high risk of losses due to its volatility. More details are going to be explained with the addition of a graph below in order to further explain the implication of risks of the investment instruments.

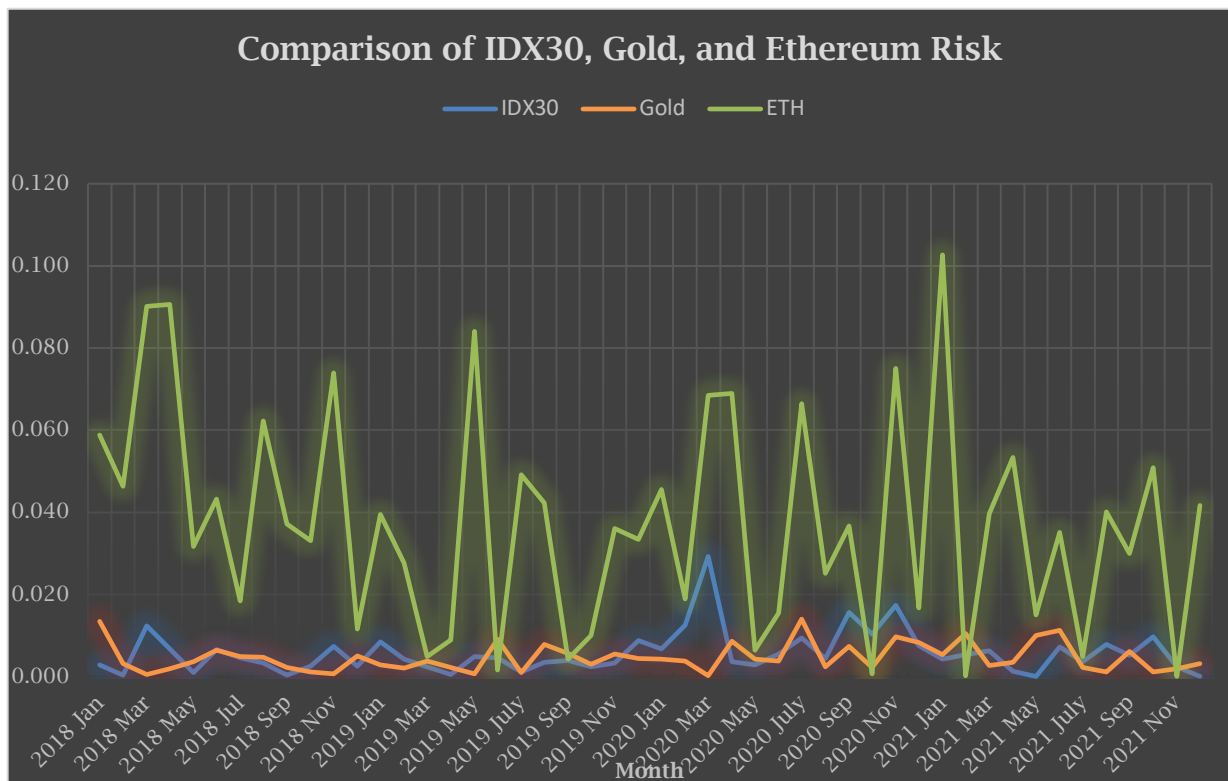


Figure 2. Graph of Comparison between IDX30, Gold, and Ethereum Risk

As shown by the graph above, the fluctuations in Ethereum risk is apparent in contrast to both IDX30 and Gold risk, which constantly stay below Ethereum, which implies that IDX30 and Gold is a safer investment instrument as they do not possess as many risks as Ethereum, this is in line with the conclusion of research done by Abdul Hamid & Talib (2019), which stated that Bitcoin is highly speculative and therefore should have remained as a virtual currency rather than replacing fiat money. An analysis of the economic value shows that risk-averse investors will be willing to pay a high performance fee to switch from a portfolio with gold to a portfolio with bitcoin (Henriques & Sadorsky, 2018).

On the other hand, Gold stability in maintaining low risks even during crisis such as 2020 March COVID-19 economic crash, it still maintains a lower risk than IDX30 and Ethereum, this is contradicted by the research of Cheema et al. (2020) which concluded that Gold had become risky in some settings, especially in Asian countries, especially China which could indicate that Gold might lose its stability during a pandemic.

The implications of these results might indicate that while Gold might be a safe-haven during economic crisis there are still risks looming over it losing its safe-haven status. Investors with high tolerance for risks on the other hand, might find that Ethereum volatility during crisis to be enticing as it provides a great buying opportunity on short term, however extreme caution must be exercised as there has been no evidence that support cryptocurrency surviving macroeconomic conditions that economist have warned would happen in the future, such as recession.

According to a research by Mariana et al. (2021), during COVID-19 pandemic, while Ethereum and Bitcoin both exhibit high volatilities, Ethereum is possibly a safer investment during the crisis than Bitcoin, as it correlates negatively with S&P500 return.

This study's results indicate significant differences in investment risks between stocks, gold, and cryptocurrencies. This is in line with the risk-return trade-off theory, which stated that there is a positive correlation that exists between return and risk, thus a high return will have a trade-off in the form of high risk or uncertainty. In this case, Ethereum gets the highest return while also having the highest risk. Therefore, this study is in accordance with H2, namely that there is a difference between the risk levels of stocks, gold, and cryptocurrencies in the fourth industrial era.

This study's results align with the results of research conducted by Mahessara & Kartawinata (2018) and Lumbantobing & Sadalia (2021), which state that there is a significant difference between the risks posed by bitcoin, stocks, and gold. This is also in line with the results of research conducted by Liu & Tsyvinski (2021), who found that the risks posed by cryptocurrencies (bitcoin, ripple, and ethereum), stocks, and gold are different.

Conclusion

This research has obtained results of comparison on stocks, gold, and cryptocurrencies performance, specifically their rates of return and risks. The results have shown that while there is no significant difference between the return values of stocks, gold, and ethereum, there is a significant difference in risk between stocks, gold, and ethereum that can lead to a consequence, namely investors prefer investment instruments with low risk such as gold and stocks over cryptocurrencies because in general investors will avoid risks as it is only rational to avoid uncertainty within an investment.

Even so, investors with high-risk tolerance are likely to choose cryptocurrencies over stocks, and gold due to the high level of risk in theory will generate high returns. On the other hand, risk-averse investors are likely to choose stocks or gold instead of cryptocurrencies such as ethereum due to the low risk those investment instruments provide. For investors and potential investors. It would be a wise choice to measure one's risk tolerance and risk management, thus it is better to consider the trade-off between return and risk in the three investment instruments, namely stocks, gold, and ethereum. For investors with a high-risk tolerance level, it might be suitable to invest in Ethereum, nonetheless extreme vigilance is a must for investors interested in allocating their assets in cryptocurrency as cryptocurrency never experienced severe economic crash, and thus it is unknown if cryptocurrency such as Bitcoin and Ethereum would be capable of surviving macroeconomic conditions such as the looming recession that economists have warned as a global economic crisis.

Acknowledgements

The researchers would like to thank all of the parties involved in supporting the researchers in carrying out this research.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

References

- Abdul Hamid, A. F., & Talib, A. A. (2019). A Note On Bitcoin's Price Volatility. *Jurnal Keuangan Dan Perbankan*, 23(3), 376-384. <https://doi.org/10.26905/jkdp.v23i3.3103>
- Adiyono, M., Suryaputri, R. V., Efan, E., & Kumala, H. (2021). Analisis Alternatif Pilihan Investasi Pada Era Digitalisasi. *Jurnal Akuntansi Trisakti*, 8(2), 227-248. <https://doi.org/10.25105/jat.v8i2.9678>
- Aven, T., & Renn, O. (2010). Risk Management And Governance: Concepts, Guidelines And Applications. In *Risk Governance And Society* (1st Ed., Vol. 16, Issue 2007). Springer-Verlag Berlin. <https://doi.org/10.1007/978-3-642-13926-0>
- Buterin, V. V. (2014). Ethereum: A Next-Generation Smart Contract And Decentralized Application Platform. *Whitepaper, January*, 1-36.
- Cheema, M. A., Faff, R. W., & Szulczuk, K. (2020). The 2008 Global Financial Crisis And Covid-19 Pandemic: How Safe Are The Safe Haven Assets? *Ssrn Electronic Journal*, 1-35. <https://doi.org/10.2139/ssrn.3642945>
- Creswell, J. W. (2016). *Research Design : Pendekatan Metode Kualitatif, Kuantitatif Dan Campuran* (4th Ed.). Pustaka Pelajar.
- Darmadji, T., & Fakhruddin, H. M. (2011). *Pasar Modal Di Indonesia* (3rd Ed.). Salemba Empat.
- Fahmi, I. (2015). *Manajemen Investasi Teori Dan Soal Jawab* (2nd Ed.). Salemba Empat.

- Giudici, G., Milne, A., & Vinogradov, D. (2020). Cryptocurrencies: Market Analysis And Perspectives. *Journal Of Industrial And Business Economics*, 47(1), 1-18. <https://doi.org/10.1007/s40812-019-00138-6>
- Hartono, J. (2019). *Teori Portofolio Dan Analisis Investasi* (11th Ed., Issue 3). Bpfe-Yogyakarta.
- Henriques, I., & Sadorsky, P. (2018). Can Bitcoin Replace Gold In An Investment Portfolio? *Journal Of Risk And Financial Management*, 11(3), 48. <https://doi.org/10.3390/jrfm11030048>
- Imf. (2022). *Gold And The Imf*. <https://www.imf.org/en/about/factsheets/sheets/2022/gold-in-the-imf>
- Jones, C. P., & Jensen, G. R. (2019). *Investments: Analysis And Management* (14th Ed.). Wiley.
- 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>
- Lumbantobing, C., & Sadalia, I. (2021). Analisis Perbandingan Kinerja Cryptocurrency Bitcoin, Saham, Dan Emas Sebagai Alternatif Investasi. *Studi Ilmu Manajemen Dan Organisasi*, 2(1), 33-45. <https://doi.org/10.35912/simo.v2i1.393>
- Mahessara, R. D., & Kartawinata, B. R. (2018). Comparative Analysis Of Cryptocurrency In Forms Of Bitcoin, Stock, And Gold As Alternative Investment Portfolio In 2014 - 2017. *Journal Of Secretary And Business Administration*, 2(2), 38. <https://doi.org/10.31104/jsab.v2i2.58>
- Mariana, C. D., Ekaputra, I. A., & Husodo, Z. A. (2021). Are Bitcoin And Ethereum Safe-Havens For Stocks During The Covid-19 Pandemic? *Finance Research Letters*, 38(May 2020). <https://doi.org/10.1016/j.frl.2020.101798>
- Meiyura, A. P., & Azib. (2020). Analisis Perbandingan Return Dan Risk Investasi Antara Emas Dan Bitcoin Periode Juli 2016 - Juni 2019. *Prosiding Manajemen*, 299-303.
- Nakamoto, S. (2008). *Bitcoin: A Peer-To-Peer Electronic Cash System*. <https://bitcoin.org/bitcoin.pdf>
- Nurchaya, E. (2019). *Perbandingan Tingkat Risiko Dan Keuntungan Dari Investasi Foreign Exchange Dan Emas Pada Pt. Valbury Asia Futures Terhadap Investasi Saham Dan Bitcoin* [[Tugas Akhir Thesis, Universitas Teknologi Yogyakarta]. Universitas Teknologi Yogyakarta Repository]. <http://eprints.uty.ac.id/2483/>
- Reboredo, J. C. (2013). Is Gold A Safe Haven Or A Hedge For The Us Dollar? Implications For Risk Management. *Journal Of Banking And Finance*, 37(8), 2665-2676. <https://doi.org/10.1016/j.jbankfin.2013.03.020>
- Reiff, N. (2022). *Bitcoin Vs. Ethereum: What's The Difference?* Investopedia. <https://www.investopedia.com/articles/investing/031416/bitcoin-vs-ethereum-driven-different-purposes.asp>
- Rejeb, A., Rejeb, K., & G. Keogh, J. (2021). Cryptocurrencies In Modern Finance: A Literature Review. *Etikonomi*, 20(1), 93-118. <https://doi.org/10.15408/etk.v20i1.16911>
- Rusdin. (2008). *Pasar Modal: Teori, Masalah, Dan Kebijakan Dalam Praktik* (1st Ed.). Alfabeta.
- Tandelilin, E. (2010). *Portofolio Dan Investasi: Teori Dan Aplikasi* (1st Ed.). Kanisius.
- Van Horne, J. C., & Wachowicz, J. M. (2010). *Fundamentals Of Financial Management*. Pearson Education.
- Warsito, O. L. D., & Robiyanto, R. (2020). Analisis Volatilitas Cryptocurrency, Emas, Dollar, Dan Indeks Harga Saham (Ihsg). *International Journal Of Social Science And Business*, 4(1), 40-46. <https://doi.org/10.23887/ijssb.v4i1.23887>
- Weber, B. (2015). Bitcoin And The Legitimacy Crisis Of Money. *Cambridge Journal Of Economics*, 40(1), 17-41. <https://doi.org/10.1093/cje/beu067>
- Williams, C. (2007). Research Methods. *Journal Of Business & Economics Research (Jber)*, 5(3). <https://doi.org/https://doi.org/10.19030/jber.v5i3.2532>
- Wilson, C. (2019). *Cryptocurrencies: The Future Of Finance?* 359-394. https://doi.org/10.1007/978-981-13-6462-4_16
- Yousef, I., & Shehadeh, E. (2020). The Impact Of Covid-19 On Gold Price Volatility. *International Journal Of Economics And Business Administration*, 8(4), 353-364. <https://doi.org/10.35808/ijeba/592>