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Investment in bond, stock, gold, real estate and bitcoin as a hedge against inflation in Indonesia

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ABSTRACT

Constant changes in the prices of goods and services cause inflation. This inflation can cause a decrease in the value of money owned by the community, so it is important for investors to be able to hedge so that the value of wealth is maintained. This study aims to analyze whether there is a cointegration relationship between inflation and bonds, stock markets, gold, real estate and bitcoin in the market in Indonesia. This research was conducted quantitatively using the Johansen's Cointegration Test method analysis technique. The data used in this study are in the form of monthly from 2011 to 2023. The results of the study show that bonds, stock markets, gold and real estate have a cointegration relationship with inflation. However, bitcoin does not have a cointegration relationship with inflation.

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INTRODUCTION

The prices of goods and services circulating in society always change all the time, these changes occur because of an imbalance between demand and supply, especially when there are competitive factors (Li, 2019). An increase in prices is referred to as inflation. To see price changes that occur, the government generally uses changes in the Consumer Price Index (CPI) or commonly called the consumer price index (CPI) as a benchmark for inflation. In its measurement, the CPI is measured based on 7 commodity groups, namely (1) foodstuffs, (2) prepared foods, cigarettes and tobacco, (3) housing, (4) clothing, (5) health, (6) education, recreation and sports, and (7) transportation, communication and financial services (Nafisah & Respatiwulan, 2019). When these 7 groups experience price changes, there will be a change in the consumer price index.

An increase in the Consumer Price Index will cause inflation, which means an increase in the prices of products and services (Salsabila et al., 2022). This has a negative impact because people's purchasing power will of course decrease, especially if it is not accompanied by a sufficient increase in income (Nworah et al., 2023). Indirectly, this condition makes people 'poorer' because the value of money decreases which results in a decrease in purchasing power even though in

terms of value, the amount of money that people have is the same (Duong, 2023). A similar thing was stated by Paul & Sharma (2018) who said that people could become poorer due to inflation in a country.

The negative impact of inflation needs to be handled by the government and society itself (Hawariyuni & Andrasari, 2022). People need to avoid excessive saving activities because the money saved will experience a decrease in value, therefore investment activities are needed to be able to counter the decrease in the value of money that occurs due to inflation. There are various investment instruments that can be used to fight inflation, such as bonds (Chen et al., 2023)..

Bonds are medium- or long-term debt instruments that include a commitment by the issuing entity, such a government or business, to reimburse the bond buyer with principle at a prearranged time and provide compensation in the form of interest over a certain period (Yusuf & Prasetyo, 2019). Therefore, investors who buy bonds will gain profits in the form of monthly interest payments or what is usually called yield and also profits from selling the bonds. Investments made in bonds are often used to fight inflation (Li, 2019). Wolski (2022) in his research shows that bonds have a significant and negative cointegration relationship with inflation. Investing in the stock market is also an alternative for investors when they want to fight inflation (Eldomiaty et al., 2020). The stock market is a place where investors can invest by buying shares in the companies they want in the hope of getting appropriate returns. If you look at the data provided by the Indonesian Stock Exchange, in the last 10 years (2013-2023) IHSG obtained a return of +-85% so that the average annual return is around 8.5%, this value is quite high when compared to inflation in Indonesia which has an average of 4% per year (Widianto, 2023). Research conducted by Wolski (2022) shows that the stock market has a significant and negative cointegration relationship with inflation.

One instrument that is also used as a hedging asset is gold (Duong, 2023). Gold is a type of metal that has been used as a transaction tool since BC, until now gold is considered the best barrier to control inflation (Rahmansyah & Rani, 2021). In his research, Wolski (2022) shows that the price of gold has a significant and negative cointegration relationship with inflation, as well as research conducted by Wicaksono (2016) which shows that the price of gold has a negative relationship with inflation. Property has now been used by investors as an investment instrument because property prices tend to increase over time. Some assets such as property are better suited to hedging against inflation than others, depending on the country, sector or time period (Anastasia & Hidayat, 2019). Property is often considered an asset that can provide an adequate inflation hedge due to its two mechanisms: (1) Rental payments (property rental) and (2) Land value and building costs usually increase with inflation (Muckenhaupt et al., 2023). Research conducted by Wolski (2022) shows that the property price index has a significant and positive cointegration relationship with inflation.

Cryptocurrency is currently a digital asset that has been used by quite a number of investors as an alternative investment (Kusumastuty et al., 2019). Since fluctuations in the price of Bitcoin typically result in variations in the anticipated rate of inflation, it might be utilized as a hedge against inflation (Blau et al., 2021) Financial investments may be impacted by inflation through a trade-off between risk and return. Investors always choose financial assets that are protected from inflationary pressure since inflation reduces the buying power of fiat currency (Sarker & Wang, 2022). Investors may purchase financial assets like Bitcoin when they anticipate an increase in inflation. This will raise demand for Bitcoin and drive up its price.

The rate of return on bonds can be influenced by several factors, one of which is inflation. When inflation increases, consumer products at that time are experiencing an overall increase so that industry players will experience uncertainty in running their businesses, therefore investors will avoid investing in the bond market because it is considered to have a risk of default (Listiawati & Paramita, 2018). In addition, when inflation occurs, people's purchasing power will also decrease

and then it will have an impact on the lack of interest in investing, especially in the bond market (Alshubiri, 2021). The central bank tends to raise interest rates when high inflation occurs, and when interest rates are high enough to approach the bond return rate, it can cause bonds to become less attractive to investors. This will encourage bond prices to fall to increase the yields obtained so that they can match the current interest rate. Research conducted by Wolski (2022) shows that bonds have a significant and negative cointegration relationship with inflation. Similar research conducted by Chen et al. (2023) and Ślusarczyk et al. (2020) also shows that inflation and bonds have a significant relationship.

One of the factors that can cause changes in the IHSG is inflation (Nurjanah et al., 2023). When inflation occurs, the price of goods and services is increasing which will have an impact on the decline in people's purchasing power. The declining purchasing power can encourage a lack of consumer interest in investing. Research conducted by Wolski (2022) shows that the stock market has a significant and negative cointegration relationship with inflation. Similar research conducted by Eldomiaty et al. (2020) also shows that inflation has a close relationship with stock prices. This shows that investing in the stock market is not the right thing to do to fight inflation because the higher the inflation, the more the stock market tends to decline.

Wicaksono (2016) shows that inflation has a positive effect on gold prices, but research conducted by Duong (2023) shows that high inflation tends to lower the price of gold. High inflation can trigger a decline in the price of gold because high inflation can encourage the government to raise interest rates. But on the other hand, when inflation is high, it means that the price of goods will also be more expensive, which then encourages people not to store assets in the form of money that can lose value. Research conducted by Wolski (2022) shows that gold prices have a significant and negative cointegration relationship with inflation. Wicaksono (2016) in his research also showed that the price of gold has a negative relationship with inflation. This shows that investing in gold products is not the right thing to do to combat inflation because the higher the inflation, the price of gold tends to decrease. However, in a study conducted by Duong (2023), the relationship between gold prices and inflation is positive.

Property is often used by investors as an investment instrument because property prices tend to increase over time. It is common that inflation has an impact on property because inflation tends to affect the value of income and total returns in real terms (Nworah et al., 2023). From an investor's perspective, inflation is bad on the surface because it erodes the present value of future income returns on investments that provide a return on assets that are able to hedge against inflation. In other words, assets that provide a substantial hedge against inflation will be very attractive to prudent and rational investors. Research conducted by Wolski (2022) shows that the property price index has a significant and positive cointegration relationship with inflation. This shows that property investment can be a hedge when inflation occurs. Similar research conducted by Lee (2013) and Christou et al. (2018) also shows that there is a cointegration relationship between real estate and inflation.

Cryptocurrency is currently a digital asset that has been used by quite a number of investors as an alternative investment (Kusumastuty et al., 2019). Since fluctuations in the price of Bitcoin typically result in variations in the anticipated rate of inflation, it might be utilized as a hedge against inflation (Blau et al., 2021) inancial investments may be impacted by inflation through a trade-off between risk and return. Investors always choose financial assets that are protected from inflationary pressure since inflation reduces the buying power of fiat currency (Sarker & Wang, 2022). Investors may purchase financial assets like Bitcoin when they anticipate an increase in inflation. This will raise demand for Bitcoin and drive up its price. According to research by Kusumastuty et al. (2019) there is a large and positive cointegration link between the price of bitcoin and inflation. Likewise with the research conducted by Sarker & Wang (2022) shows that there is a cointegration relationship between bitcoin prices and inflation.

RESEARCH METHOD

This research was conducted by analyzing whether there is a cointegration relationship between inflation and bond returns, the stock market, gold prices, property and bitcoin which can be used as a hedge in Indonesia. This research was conducted with the analysis of distributions, stationarity of returns and correlation of successive investments ending with cointegration analysis using the Johansen test. The Johansen test may be less powerful than the trace test for the same values if there are more than one cointegration relationship, but in this study only one cointegration relationship was found so that the shortcomings of the Johansen test did not occur. The analysis is carried out on data from the first monthly for the period 2011 to the end 2023, the period was chosen due to the availability of Bitcoin price data, where bitcoin was first released in 2009, but the price of bitcoin when it was first released was very volatile, reaching hundreds of percent in a short period, so the analysis was carried out starting from 2011. Inflation data will use the growth of the consumer price index, bond data will use the composite bond index, gold price data will use the percentage growth in the price of gold, stock market data will use price index growth data composite stock (IHSG), real estate data will use property stock index rate of return and bitcoin data will use bitcoin price growth.

RESULTS AND DISCUSSION

Table 1. Descriptive Statistics

Variable	Mean	Median	Maximum	Minimum	Std. Dev.	Obs
Inflation	4.44	4.47	4.66	4.16	0.15	156
Bonds	8.76	8.78	9.18	8.39	0.18	156
Gold	13.45	13.35	13.94	13.04	0.25	156
Stock	8.58	8.59	8.89	8.13	0.19	156
Real_Estate	5.94	6.00	6.36	5.20	0.29	156
Bitcoin	7.12	7.90	11.02	-0.69	3.00	156

Non-stationary data will cause spurious regression, resulting in inaccurate estimates. To be able to estimate a model using the data, the first step that must be taken is the data stationarity test or known as the unit root test. Additionally, OLS regression can be employed provided the data is steady; if not, the degree of integration test must be used to check for stationarity. Moreover, a cointegration test is required since non-stationary data at the level level may be cointegrated. The Augmented Dickey Fuller (ADF) test was used to test for data stationarity in this investigation. The findings of this study's data stationarity test are as follows:

Table 2. Augmented Dickey Fuller Test

Variable	Obs	Including	ADF t-test	p-value
Inflation	156	1st lag	-13.030	0.000
Real Estate	156	1st lag	-11.892	0.000
Gold	156	1st lag	-13.367	0.000
Stock	156	1st lag	-11.170	0.000
Bonds	156	1st lag	-12.484	0.000

Table 2 shows that the Inflation, gold, stock, real estate and bond variables use 1st difference because testing at 0 level of stationarity shows a p value of more than 0.05 so that it requires data transformation into 1st difference. In cointegration testing, there are several stages of testing that need to be done, namely determining the optimal lag, looking at the cointegration relationship and continuing with the VECM test if there is cointegration, but if there is no cointegration, it is continued with the VAR test. Lag examination is used to determine the optimal lag length to be

used in further analysis and will determine the parameter estimates for the PVAR model. This is because the estimation of the causality relationship and PVAR is very sensitive to the length of the lag. The optimal lag is the number of lags that have a significant influence so it is necessary to look at the data and then determine the accuracy of the lag length. It is believed that the model's overall dynamics won't be explained if the ideal lag entered is too short. An excessively lengthy optimum latency, however, can lower the degree of freedom and provide an ineffective estimate (particularly models with few data). Prior to determining the VECM, the ideal lag must be known.

Table 3. Lag Optimum Test

Lag	LogL	LR	FPE	AIC	SC	HQ
0	367.589	NA	0.000	-4.727	-4.608	-4.678
1	1623.332	2396.582	0.000	-20.671	-19.83913*	-20.33309*
2	1660.492	68.005	4.19e-17*	-20.68617*	-19.141	-20.059
3	1692.375	55.84653*	0.000	-20.632	-18.374	-19.715

LR is Sequential modified LR test statistic. Final Prediction Error (FPE). Akaike information criterion (AIC). Schwarz information (SC) Hannan-Quinn information standard (HC) Table 3 shows that the asterisk is at Lag 2 with the lowest (minimum) AIC value criteria. This means that the optimal Lag length in this study is Lag 2. There is a resemblance in movement and stability of the link between the variables in this research, according to the findings of the lag length test, which serves as the foundation for the cointegration test to ascertain whether or not there will be long-term equilibrium. The Johansen's Cointegration Test technique was used to conduct the cointegration test in this investigation. The findings of this study's cointegration test are as follows.

Table 4. Cointegration Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	Critical Value	Prob.** <0.05
None *	0.2316	96.6174	95.7537	0.0435
At most 1	0.1844	56.3032	69.8189	0.3659
At most 2	0.0667	25.1227	47.8561	0.9154
At most 3	0.0570	14.5588	29.7971	0.8078
At most 4	0.0340	5.5850	15.4947	0.7439
At most 5	0.0019	0.2921	3.8415	0.5889

Table 4 shows that the vector has a probability value smaller than 0.05 so that it can be said that all variables, namely gold, real estate, bonds and stocks have a long-term relationship or are cointegrated with the inflation variable. The VECM panel is a test to see the variables used in a study with two parameter estimates, namely the long-term equilibrium relationship parameter and the short-term relationship parameter. In this study, the VECM test using lag 2 based on the determination of the optimal lag that has been done previously. The VECM test is carried out by looking at the t-statistic value and comparing it with the t table 1.975 obtained from a probability of 0.05 and a degree of freedom of 150 (156 data - 6 variables). The following are the results of the VECM test in this study.

Table 5. VECM *Test*

Cointegrating Eq:	Coefficient	Standar Error	t-Stats	Decision
Cointeq1	-0.039	0.013	[-3.029]	
Bonds(-1)	-0.089	0.038	[-2.336]	Significant
Gold(-1)	-0.388	0.067	[-5.828]	Significant
Stock(-1)	0.406	0.067	[-6.076]	Significant
Real_Estate(-1)	-0.142	0.032	[-4.472]	Significant

Bitcoin(-1)	0.115	0.006	[1.809]	Not significant

It can be seen in table 5 that the coefficient value is -0.039 which can be concluded that the magnitude of the influence is 3.9%, the magnitude of the influence means that only 3.9% of inflation approaches the equilibrium position, so it takes a long time to reach the equilibrium position. The variables of bonds, stock market, gold and real estate have coefficient values that are also negative, which means that the 5 variables move in the same direction in the long term.

Hypothesis 1 in this study tests whether bonds have a long-term cointegration relationship with inflation, the results of the study show that the t statistic value of 2.336 is higher than the t table of 1.975, which means that hypothesis 1 is accepted. Based on the coefficient value, it is known that inflation and bonds tend to move together. Generally, high inflation can trigger an increase in interest rates, where when interest rates increase, bond prices will decrease, however, this study shows that bonds can move with inflation. This study is in line with that conducted by Chen et al. (2023) and Ślusarczyk et al. (2020) which shows that inflation and bonds have a significant relationship. Likewise with the research conducted by Wolski (2022) shows that bonds have a significant and negative cointegration relationship with inflation..

Hypothesis 2 in this study tests whether the stock market has a long-term cointegration relationship with inflation, the results of the study show that the t statistic value of 5.828 is higher than the t table of 1.975, which means that hypothesis 2 is accepted. The negative coefficient indicates that inflation and the stock market tend to move together. This can happen because the inflation value that increases constantly and regularly means that the value of money will also increase which will also increase the income of the community because wage increases generally always increase above the inflation value. So that the money invested by the community in the stock market will also increase. However, inflation that increases very high up to 2 digits is likely to weaken the stock market due to the decline in the purchasing power of the community. The results of this study are different from those conducted by Wolski (2022) which shows that the stock market has a significant and negative cointegration relationship with inflation. However, the results of this study are in line with those conducted by Eldomiaty et al. (2020) also shows that inflation has a close positive relationship with stock prices.

Hypothesis 3 in this study tests whether gold prices have a long-term cointegration relationship with inflation, the results of the study show that the t statistic value of 6.071 is higher than the t table of 1,975, which means that hypothesis 3 is accepted. The negative coefficient indicates that inflation tends to move with gold prices. This can happen because people prefer to store their assets in the form of gold because it is considered more stable and safer when inflation occurs compared to money that easily loses its value. The results of this study are not in line with those conducted by Wolski (2022) which shows that gold prices have a significant and negative cointegration relationship with inflation and Wicaksono (2016) which in his research also showed that the price of gold has a negative relationship with inflation. However, the results of this study are in line with those conducted by Duong (2023) which shows that the relationship between gold prices and inflation is positive.

Hypothesis 4 in this study tests whether the property stock exchange index has a long-term cointegration relationship with inflation, the results of the study show that the t statistic value of 4.472 is higher than the t table of 1.975, which means that hypothesis 4 is accepted. The negative coefficient indicates that inflation tends to move with the property stock exchange index. This can happen because the inflation that occurs means that the price of goods and services increases, this will certainly also increase the price of property because it is considered as goods. The results of this study are in line with those conducted by Wolski (2022) which shows that the property price index has a significant and positive cointegration relationship with inflation. Likewise with the research conducted by Lee (2013) and Christou et al. (2018) also shows that there is a cointegration relationship between real estate and inflation.

Hypothesis 5 in this study tests whether bitcoin does not have long-term cointegration relationship with inflation, the results of the study show that the t statistic value of 1.809 is lower than the t table of 1.975, which means that hypothesis 5 is rejected. This can happen because Bitcoin moves globally and is not only influenced by inflation in one country. The results of this study are in line with those conducted by Kusumastuty et al. (2019) which shows that the price of bitcoin does not have significant cointegration with inflation. Likewise with the research conducted by Sarker & Wang (2022) shows that there is a cointegration relationship between bitcoin prices and inflation.

To see whether a variable has a two-way or one-way relationship, a causality test is carried out. This study uses the Grangrer's Causality / Block Exogenity Wald Test method. If the significance value is below alpha 0.05, there is a causal relationship, while if the significance value is above 0.05, there is no causal relationship. The result show that Grangrer's Causality probability is 0.0013 which means that overall the variables bonds, stock market, gold, real estate and bitcoin have a two-way relationship with inflation.

CONCLUSION

Based on the results of the tests conducted, it is known that there is a long-term relationship between inflation and property stock exchange, gold prices and stock prices in Indonesia with the nature of the movement in the same direction. This means that the higher the inflation, the property price, gold price and stock price in Indonesia will also increase. So in terms of investors can invest in the property sector, gold and the stock market as a strategy to hedge assets, because it is proven that property prices will also increase along with the increase in inflation. Investors can also invest in the property sector, gold and stocks as a strategy to hedge assets. In addition, it is expected that investors can also wait and see when they are going to start investing in gold, property and the stock market when high inflation is occurring, and when inflation returns to normal, you can re-enter the investment market, however, this can also be utilized by investors, where the inflation that occurs seems to provide an opportunity to start investing because high inflation can suppress gold prices, property and the stock market. In addition, it is also known that there is no long-term relationship between inflation and bonds in Indonesia. This research is limited to analyzing inflation and property stock exchange, gold prices and stock prices. It is hoped that further research can analyze other investment instruments such as cryptocurrencies which are currently popular, and also analyze similar models in several other countries.

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