The Effect of Inflation, Exchange Rate and Gold on the Indonesian JCI: Non-Linear Approach

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ABSTRACT

Predicting the stock market is very difficult to do, because the stock market has a high complexity, but predicting the stock market is a necessity because it directly relates to the profits of the actors involved in the stock market. This study tries to examine the determinant factors that can affect stock market conditions. By using the level of Inflation, Exchange, and Gold as predictors of the stock market in Indonesia. Using data from January 2005 – December 2020, the researcher then analyzed the data using the Warppls 7.0 application in order to be able to analyze it non-linearly, because the complexity of the stock market makes it very possible that the analysis carried out must be in a non-linear form in order to gain broader insight into the factors that affect the market. Our finding are that gold and exchange rate are signicant, whereas the inflation is not toward Indonesian JCI level.

Keywords: *Stock market; Inflation; Exchange rate; Gold*

INTRODUCTION

The Indonesian stock market is growing rapidly from time to time. These developments are influenced by various factors, both internal factors and external market factors, this is because the stock market has a high complexity to understand. Even though the stock market is simply a place where people buy and sell shares of stock, to make investment decisions, it takes the right data and experience to make profitable decisions in the future. Hasanuddin (2021) explained that in making these decisions, those who are experienced can use instinct before buying or selling shares, or investors in general will make rational decisions by considering various aspects before making a decision to sell or buy shares. Many factors affect the Indonesian stock market, these factors can be the economic conditions of a country such as inflation and fluctuations in the value of a country's currency, where when that happens many people will try to divert their capital to different investment instruments to maintain the value of their wealth, or external factors such as world gold prices. Syahri & Robiyanto (2020) explained that gold can be a diversified investment

because gold is a relatively safe asset even in conditions of uncertainty. Understanding the factors that affect the stock market is of course very important, because the timing of when we invest determines our future profits. Finding the best time and predicting the influencing factors have the most important role for investment decisions.

The reason investors invest in addition to getting a profit margin, is to maintain the value of their wealth from macroeconomic factors such as exchange rates volatility and inflation. The exchange rate volatility is also one of the factors that affect the stock market, the volatility of the exchange rate has the effect of foreign investors being reluctant to enter the stock market (Kennedy & Nourizad, 2016). This can be interpreted as fewer players in the market, then the market will move more passively and are more likely to weakening the movement of industry, especially for multinational companies because they are at risk of experiencing losses from foreign exchange differences.

Inflation, which is an increase in product prices for a certain time unit. The increase in the price of goods will affect people's purchasing power so that this has an impact on the company's income decline. Bad company performance can lead the stock price decrease. When inflation starts to increase, many investors will withdraw from the market, which causes the Jakarta Capital Index (JCI) level to decline. However, Fitriani et al. (2020) and Herlina & Widjaja (2018) found that inflation had no significant effect on the value of the JCI.

Similar research has been done before, such as Nugroho & Ramli (2016), Tanusdjaja & Nariman (2019), Artha & Paramita (2021), and Primavistanti & Sutanto (2020). In addition to the results of their research not finding consistent results, the majority of the studies tested their data with multiple linear regression, which this method is not appropriate to use because the stock market does not always move linearly and to predict it requires the right method. But if we use a non-linear approach with a partial least square we can get an idea of how the price has moved in the past, and we can find out what factors can support our decision, because the stock market is almost certainly the same from time to time, the situation when countries is in a crisis or when it experiences growth, the same pattern will repeat itself, because human nature that runs the stock market will not change (Chandan, 2020). Because actually what moves the stock market is the financial decisions of stock market participants, which means that if we can understand human behavior, we can understand the stock market itself. So a non-linear approach can be used to predict human nature and behavior when faced with certain financial conditions which affect the stock market.

LITERATURE REVIEW

Inflation

Inflation can be interpreted as a condition in which the price of goods increases and is sustainable and very broad, which causes a decrease in the value of a country's currency. Generally, inflation is measured by the Consumer Price Index (CPI) (Herlina & Widjaja, 2018). Inflation is also associated with an increase in currency circulation in a country, which causes an increase in economic liquidity. This understanding emerged after an incident caused by an increase in the circulation of money in the community, which was followed by an increase in the price of certain commodities (Ahmad, 2021).

Inflation is closely related to the decline in the purchasing power of the public or companies (Sartika, 2017). In the short-term inflation can improve the economy but in the long term it will destroy the economy.

Exchange rate

According to David & Widjaja (2021) Exchange rate is the ratio of a country's currency to another currency. The comparison is used in appropriate international trade transactions, of course the currency used is officially recorded at the country's Central Bank. Exchange rate fluctuations are very important because if the domestic currency weakens, automatically products that need to be imported will experience price increases (Main & Puryandani, 2020).

Gold

Tully & Lucey (2007) said that gold is a metal that becomes a commodity and has a monetary function. Gold has been proven in history to be used as a means of storing assets or wealth and tested as a commodity that can be exchanged in general in the world (Robiyanto, 2018). In its development, besides being a medium of exchange, gold is now used in electronic devices, this is because gold is the best conductor compared to silver which is also one of the precious metals traded throughout the world. The use of gold in the monetary and financial fields is generally because gold can be used as a tool for asset diversification to reduce the effects of a country's inflation (Tully & Lucey, 2007). The form of the use of gold as an investment commodity is generally in the form of gold bars, but there are also futures contracts. Fluctuations from gold often affect a country's economy, therefore gold is often get the attention of analysts, traders, investors, and policymakers (Syahri & Robiyanto, 2020).

Composite Stock Price Index

The stock price index is a reference to see the performance of the stock market. In general, the stock market will be judged by the fluctuation of trading volume and the price of the stock price index and its price changes from time to time. These stock price movements determine whether investors gain or lose from differences in stock index prices (Kananda et al., 2020). Primavistanti & Sutanto (2020) opine that the JCI is a series of historical information regarding the price movements of the combined stock with a certain time unit, generally information about the JCI price from daily, weekly and monthly. The composite stock price index is a reflection of the performance measurement of a joint stock on the stock exchange (Hidayat, Maulana, & Arief, 2021).

Hypothesis Development

Herlina & Widjaja (2018) said that an increase in inflation is a negative signal for investors in the stock market. The reason is that rising prices will result in the market not being able to absorb the products that have been produced by companies indexed in the stock market, this causes the decline in most of the company's stock prices. In previous studies such as Herlina & Widjaja, (2018), Prayoga & Khairunnisa (2019), Primavistanti & Sutanto, (2020); and Yuniawati & Lestari (2021) found results that are not clear because their results find that inflation does not have a significant effect on the Indonesian stock market, which results indicate that fluctuations in the price of goods do not have a direct effect on the stock market. Whereas Anggriana & Paramita, (2020) and Pratama & Kurniawati (2018) find clearer results their research results have a negative effect, it explains that the higher the inflation, the more likely it will hit the stock

market of a country. In this study, the researcher argues that it is in line with Anggriana & Paramita, (2020) and Pratama & Kurniawati (2018)Therefore the researcher draws the hypothesis:

H_1: Inflation has a negative effect on the Indonesian stock market

The currency of a country has an important role in the stock market in Indonesia, its fluctuations in addition to indirectly affecting companies or industries that list their shares on the JCI, fluctuations can also invite foreign investors to invest in Indonesia, but there is a certain level at which investors will attend and the level where investors will flee from the Indonesian stock market. This is confirmed by previous studies such as Anggriana & Paramita (2020) and Listriono & Nuraina (2015) where the results found indicate that exchange rate fluctuations will negatively affect the JCI, while Kananda et al. (2020 and Sartika (2017) found that the effect of exchange rate conditions can have a positive effect on the JCI, in the context of this study the researcher argues that the exchange rate can positively affect the stock market because when the currency begins to weaken, many people turn their money into other investment instruments to protect their assets. Therefore, the researcher proposes a hypothesis:

H_2: Exchange rate has a positive effect on the Indonesian stock market

Previous studies that have examined the relationship between gold and the JCI show a positive effect on the JCI as shown in Nugroho & Ramli, (2016) and Zifi & Arfan (2021)even gold also has a positive influence on stocks in Indonesia as in the research Suryani & Robiyanto, (2021) and Syahri & Robiyanto, (2020), this shows that the gold price is one of the most important and decisive factors in predicting the performance of the JCI in the future, this is the reason the researcher proposes the following hypothesis:

H_3: Gold has a positive effect on the Indonesian stock market.

RESEARCH METHODOLOGY

This research belongs to the type of empirical quantitative research with secondary data. The Indonesian inflation rate obtained from www.bi.go.id. Data on the IDR/USDollar exchange rate, gold price and JCI level are obtained from www.investing.com. The dependent variable in this study is the stock market as a proxy for the JCI level. The independent variable in this study is monthly inflation data, IDR/USDollar exchange rate, gold price from January 2005 to December 2020. In this study inflation, IDR/USDollar exchange rate, gold price is t-1. T-1 is used with the assumption that the value of t-1 will predict the JCI level in the next month.

The research will be carried out using structural equation modeling (SEM) partial least squares (PLS) with the help of the WarpPLS 7.0 application with the Warp 3 inner model analysis algorithm and resampling method with bootstrapping. The JCI price will be an indicator and be realized formatively as the JCI performance and will be symbolized by the JCI. The analyzed data will be tested. Model fit and quality indices, and the inner model by taking into account the measurement of the formative model (Hidayat, Maulana, & Andriani, 2021; Solimun et al., 2017)

statistics, quality assurance, and survey methodology, sampling is the selection of a subset (a statistical sample) of individuals from within a statistical population to estimate characteristics of the whole population. Two advantages of sampling are that the cost is lower and data collection is faster than measuring the entire population.

FINDINGS

Figures, Diagrams and Pictures

Table 1 Descriptive statistics

Descriptive Statistics					
	N	Minimum	Maximum	mean	Std. Deviation
Inflation	191	1.32	18.38	5.9614	3.5359
Exchange rate	191	8495	16347	11315	2192.9
Gold	191	416.3	2017.1	1208.7	378.34
JCI	191	1029.6	6605.6	3906.9	1692.7
Valid N (listwise)	191				

Source: Data processed by researchers (2022)

The distribution of data presented from January 2005 to December 2020 provides a very diverse picture of the development of the stock market and Indonesia's macro conditions. Inflation data captured in this study ranged from 1.32% to18.38% which means from stable economic conditions to very bad economic conditions. The IDR/USD exchange rate has a maximum value of IDR 16,347 to a minimum value of IDR 8,495. Then the gold price from a minimum value of 416.3 to a maximum of 2017,1. Then the condition of the JCI was the minimum at 1029.6 and the maximum at 6605.6.

Table 1 Model fit and quality indices

Model fit and quality indices		
Average path coefficient (APC)	Ideal if P value < 0.05	0.367, P<0.001
Average R-squared (ARS)	Ideal if P value < 0.05	0.893, P<0.001
Average adjusted R-squared (AARS)	Ideal if P value < 0.05	0.892, P<0.001
Average block VIF (AVIF)	Accepted if ← 5, Ideal if ← 3.3	1.74
Average full collinearity VIF (AFVIF)	Accepted if ← 5, Ideal if ← 3.3	3.313
Tenenhaus GoF (GoF)	small >= 0.1, medium >= 0.25, large >= 0.36	0.945
Sympson's paradox ratio (SPR)	Accepted if >= 0.7, ideally = 1	1
R-squared contribution ratio (RSCR)	Accepted if >= 0.9, ideally = 1	1
Statistical suppression ratio (SSR)	Accepted if >= 0.7	1
Nonlinear bivariate causality direction ratio (NLBCDR)	Accepted if >= 0.7	1

Source: Data processed by researchers (2022)

Testing Model fit and quality indices are used to test the feasibility of the model used in regression testing using Warppls. APC, ARS and AARS are estimated with if the P value < 0.05 then it will be considered feasible, AVIF and AFVIF are considered suitable for use if < 3.3 or if the value above 3.3 is still acceptable if it is below 5. GoF is the ability of the independent variable to explain the dependent variable with method from Michael Tehnaus, then in this study the independent variable has a great ability to explain the dependent variable because it has a value of 0.945. Then the last value SPR, RSCR, SSR and NLBCDR have a value of 1 which meets the criteria for assessing model fit and quality indices (Kock, 2020).

Table 3 Coefficient of Effect size (f2)

Effect Size Coefficient (f2)	
Inflation → JCI	0.024
Exchange Rate→ JCI	0.379
Gold→ JCI	0.490

Source: Data processing by researchers (2022)

Effect size is the absolute value of the individual contribution of the predictor latent variable corresponding to the R-square coefficient of the criterion latent variable in each block of latent variables (Kock, 2020). The effect size values used to assess the contribution of the predictor variables are 0.02 for weak, 0.15 moderate, and 0.35 large, if the effect size value is below 0.02 it can be said that it is too weak to have a practical value. The effect size value of the effect of inflation on the JCI is0.024, it can be said to be weak. Exchange rate and Gold have effect sizes of 0.379 and 0.490, so it can be said that they have a big influence in predicting the JCI.

Table 4 Hypothesis Testing

Test	**Coefficient**	**P Value**	**Decision**
Inflation → JCI	-0.036	0.164	Rejected
Exchange Rate → JCI	0.482	<0.001***	Received
Gold → JCI	0.58	<0.001***	Received

Note: * = <0.10, weak significance, ** = <0.05, significant, * = 0.01 very significant**

Source: Test results from research (2022)

In this study, the researchers found that inflation did not have a significant effect on the JCI, with a path coefficient of-0.036 and a P value of 0.164 which is greater than 0.05, so from these results it shows that H_1 which states "Inflation has a negative effect on the Indonesian stock market", rejected. H_2 which states "The exchange rate has a positive effect on the Indonesian stock market" is accepted, this is because the P value of the effect of the exchange rate on the stock market is equal to<0.001, much smaller than 0.01 and the path coefficient is 0.482, it can be concluded that the effect of the exchange rate on the stock market is very significant. Then lastly, H_3 which states that "Gold" positive effect on the Indonesian stock market" is accepted, the P value of the influence of gold on the Indonesian stock market is<0.001 is smaller than 0.01 and has a path coefficient of 0.580, which means that gold has a very significant influence on the Indonesian stock market.

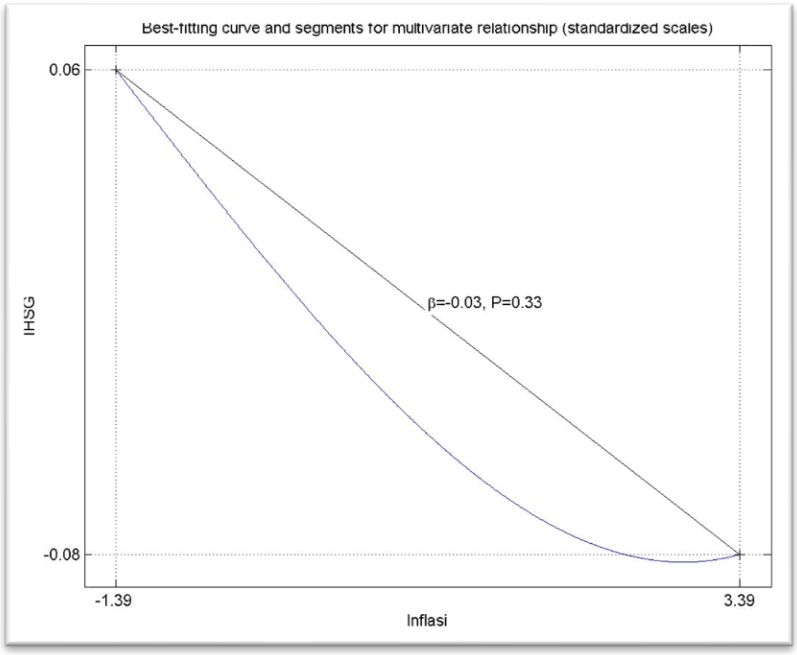

Fig 1 Inflation effect curve on the JCI

In Figure 1, this study shows that the influence of inflation on the stock market forms a line that tends to decline then begins to slope when it approaches the value of 3.39, meaning that the higher the inflation rate, the more negative the JCI development will be. Even so, we do not get significant results in this test and the path coefficient of this test is-0.036.

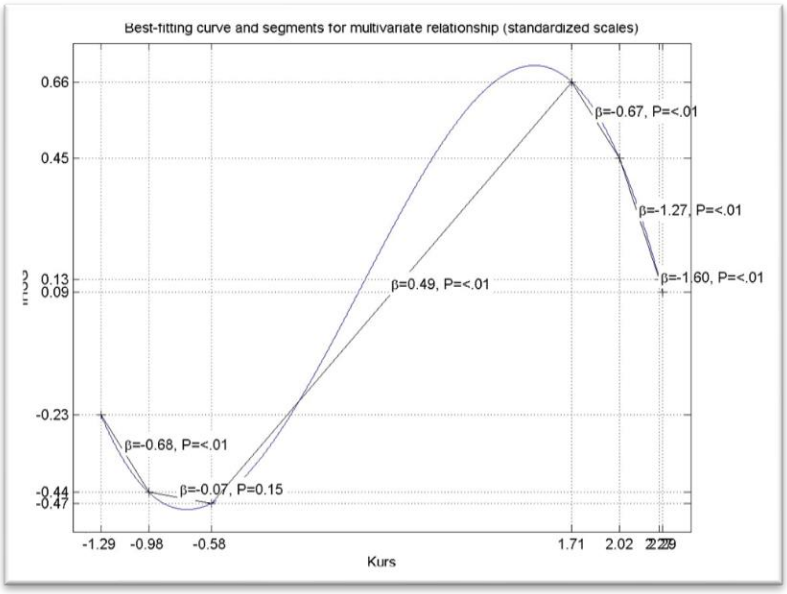

Fig 2 Curve of the effect of the exchange rate on the JCI

The effect of the exchange rate on the stock market has an interesting finding where the curve tends to form mirrored N with a path coefficient0.482. From this result, we can see that the stock market shows its best performance when it is at -0.58 to 1.71, then we find that the effect of the exchange rate is not always positive, because when it reaches a value of 1.71, an inverted U is formed, which in the end, the performance of the stock market decreases significantly from the weakening of the Rupiah.

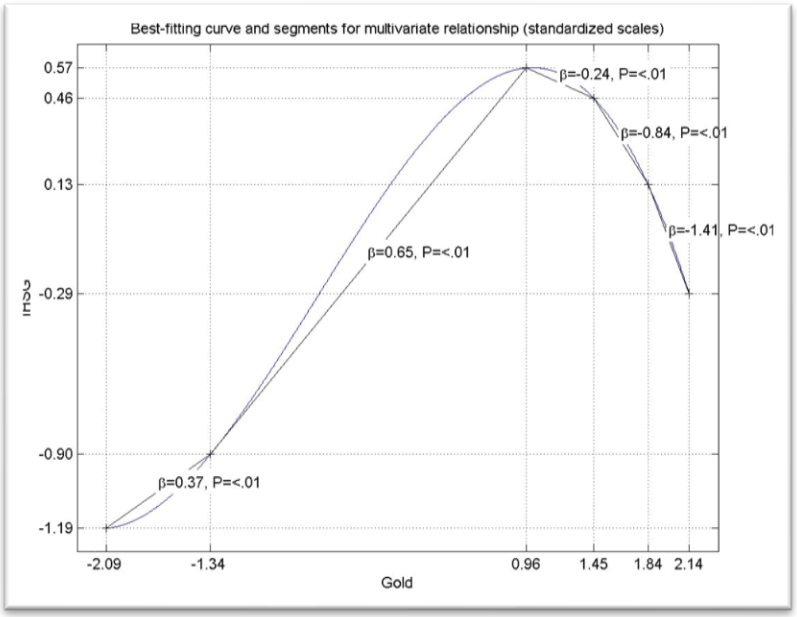

Fig 3 Gold's influence curve on the JCI

Then the effect of gold on the Indonesian stock market with a coefficient of 0.58, has an interesting relationship where -2.09 to 0.96 shows a positive influence but more than 0.96 the influence changes, this is a phenomenon that researchers see as a phenomenon when gold prices are getting more expensive, many investors leave the stock market and switch to gold instruments as their investment, it causes a decline in stock market performance.

DISCUSSION

The Effect of Inflation on the Indonesian Stock Market

In this study, inflation does not show a significant effect in a non-linear approach. Macroeconomic conditions do not have a significant effect, although theoretically, when prices rise, inflation will hit various industries that list their companies on the Indonesian stock exchange. But here, the empirical facts show something different. An insignificant negative effect is possible because investment activity in the Indonesian stock market continues and grows, so even though there is high inflation, the stock market can still maintain its value. The results of this study are in line with Herlina & Widjaja, (2018), Prayoga & Khairunnisa (2019), Primavistanti & Sutanto, (2020) and Yuniawati & Lestari (2021) which the results obtained are not significant in their research on the effect of inflation on the JCI or the stock market.

The Effect of Exchange Rates on the Indonesian Stock Market

The researcher found that the IDR/USDollar exchange rate had a positive effect on the stock market. in the same direction as Kananda et al. (2020 and Sartika (2017)who also found positive results in their study. This empirical result confirms that when the rupiah exchange rate weakens, the stock market will increase. Researchers believe this is because investors are starting to transfer their wealth into stocks in an effort to protect the value of their wealth. This encourages the growth of the stock market in Indonesia.

However, what is interesting here, is that when the rupiah weakens to the segment (0.66 – 1.71) the exchange rate actually has a negative effect, where the weakening of the rupiah may affect many multinational companies that are affected by the weakening of the rupiah. Then the stock market which is quite sensitive to these kinds of changes will leave the stock market. As we know, when the value of a currency becomes too weak, both companies and even the economy of a country can collapse.

The Effect of Gold on the Indonesian Stock Market

We find gold as one of the globally accepted financial instruments to have a positive influence on the Indonesian stock market. The price of gold can predict well the direction of the development of the stock market. This study confirms the results of the majority of researchers Nugroho & Ramli, (2016), Zifi & Arfan (2021), Suryani & Robiyanto (2021) and Syahri & Robiyanto (2020) who found that gold was very good at predicting stock market performance. However, it should be noted that when the gold price is too high, it tends to have a negative effect, as shown in Figure 3. This is because stock market participants see the development of higher gold prices, causing many to diversify their assets into gold and leave stocks.

CONCLUSION

From this research, there are at least three things that need to be underlined, firstly, inflation does not have a significant effect on the stock market, the exchange rate has a significant positive effect on the stock market, and gold has a positive and significant effect on the stock market. The results of this study indicate the predictive ability of the three t-1 variables, which means that the results of this study will answer whether the values of these three variables can predict the stock market conditions well next month. Different from previous studies which argue that gold and volatility of exchange rate linearly influence JCI, Our finding show that the influence of gold and volatility of exchange rate to JCI price is work nonlinearly, there is a point where the increase in the value of gold and the exchange rate can worsen the performance of Indonesian JCI.

For an investor, this research becomes a reference when they want to invest in the stock market, they need to pay attention to trends in gold and currency exchange rates, whether they are strengthening or weak before making decisions so that they can make profitable decisions.

Suggestions for future research are to examine more deeply how gold actually affects the stock market, as we see that the effect size value is 0.49 which is classified as large according to (Hair et al., 2019; Kock, 2020).

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