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The Effect of Increasing Daily Case COVID-19 as Moderating Variable on Coal Stock Price

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ABSTRACT

Stock investments in the time of the COVID-19 pandemic have a considerable risk. This happens because of the increasingly uncontrolled movement of stock prices. The potential for steep charts can occur at any time. Sentiment analysis of increasing daily cases of COVID-19 was analyzed to see how much effect it has on stock price movements. This research will analyze stock prices from coal commodities in Indonesia. Researchers choose to discuss coal commodities because, in April 2021, there was a significant increase and highest in November 2021. Because of the data, researchers want to see the influence of some coal companies using selling price data with moderating variables for estimating the stock price. There are 26 coal companies that are listed on Indonesia Stock Exchange. The analysis will be a check on five companies that have the largest investors. The analysis is also carried out on coal sales price movements. Furthermore, five different coal mining companies were analyzed based on the rate of price changes to new selling prices with variable moderation in Indonesia. Increasing daily cases of COVID-19 being variable moderation. The method used for finding the relationship is a linear regression with a moderating variable. According to the analysis, the increasing daily case of COVID-19 as a moderating variable is enough to affect the relationship between the selling price of coal and the stock price of HRUM.JK and PTBA.JK. In stock price HRUM.JK, there is an increasing adjusted R square from 0.5254 to 0.5451. The same conditions apply to PTBA.JK has increased by 0.4040 to 0.4444.

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1. INTRODUCTION

Investment is one of the strategies that people use to maximize their profits. The investment process can be carried out by planting models or purchasing assets that are expected to generate a capital gain in the future. The purchase of a company share is one type of investment. Investors will benefit in the form of capital gains and dividends.

Stocks are a certificate of proof of ownership of a company. This gives a shareholder has the right to the decision issued by the company. According to Tandelilin (2017), stocks can be defined as a sign of the participation of capital of a person or party (business entity) in a company or limited liability company.

The stock market is one of the places for the buying and selling of shares of companies that have high risk and high returns. This is due to price movements that are difficult to see in the direction. There are three factors that affect the direction of stock movements, namely technical factors, fundamental factors, and sentiment factors (Troiano et al., 2018).

Market sentiment shocks create demand shocks for risky assets and a systematic risk for assets (Liang, 2018). Market sentiment shocks are a systematic risk factor that provides investment opportunities (Liang, 2018).

COVID-19 began to circulate in Indonesia in early 2020, impacting many sectors, particularly finance. Stocks were also affected. The stock price can be analyzed from the sentiment analysis and the selling price of a

commodity. This research will be analyzed from coal mining because the selling price is a sentiment issue. In April 2021, there was a significant increase, and the highest price was in November 2021. According to the fundamental factors in selling coal, a variable moderation increasing daily case covid would be reviewed.

Debt to equity ratio significantly affects the stock price of coal mining companies at the level of 10%, and market capitalization significantly affects stock prices of coal mining at the level of 5%, and macroeconomic variables, such as oil prices, inflation, interest rates, exchange rates, and coal prices, have highly significant effects on stock prices of coal mining companies at the level of 1% (Sastralaga & Manurung, 2020).

Therefore, needs to be further analysis on how the effect of the selling price of a commodity by being influenced by increasing daily case covid-19 on the movement of the stock price of a commodity.

This research takes a case study on coal commodities. This is due to an increase in the net selling value of coal per metric ton. Based on data from Minerva Indonesia, the Benchmark Coal Price experienced a very sharp increase from June 2021 to January 2022. The sales price peaked in November when the daily case of covid-19 experienced very small in that month.

According to these statements, the relationship between the selling price of coal and the stock price of coal with the moderating variables increasing daily case covid-19 in Indonesia will be investigated. The multiple regression model with moderation variables will be used in the analysis process.

2. LITERATURE REVIEW

The COVID-19 pandemic has impacted the economy, including stock sales. A study examined the energy market efficiency two years before the outbreak of the epidemic. It investigated the movements in stock efficiency during the three peak periods of the epidemic for developed countries such as the United States. Overall, market efficiency dropped significantly following the outbreak of the epidemic, while risks increased. However, it differs due to the Fed's QE policy, the global energy supply and demand connection, and the US's energy views. It claimed that market efficiency has dropped significantly since the global outbreak of COVID-19, whether it is a single energy market or an interactive market. The epidemic has had a huge impact on the overall economy and energy market, and energy supply and demand are severely imbalanced (Wang et al., 2022).

Based on Jimenez et al. (2021), the effect of the health index as a variable indicator of response shows that countries with good health conditions will have less impact on the fall in the stock price index during the health crisis caused by COVID-19. Components affecting the charge of return should be considered by financial experts and potential monetary experts (Alexandri & Supriyanto, 2022).

In the US, the COVID-19 pandemic give impacted there is the relationship between WTI cred-oil dan coal market using the calculation MF-DCCA (Wang et al., 2022).

In Indonesia, Rahmayani and Oktavilia's (2020)

research using the Error Correction Model (ECM) with stock markets as an endogenous variable and exchange rate, inflation, interest rate, foreign stock markets, commodity price, and pandemic as exogenous variables suggests that the significantly increased accumulative cases of COVID-19 have become the cause of Indonesia's stock market weak spot in the long run. This research also reported that the short-term impact of the COVID-19 pandemic is not statistically significant (Rahmayani & Oktavilia, 2020).

In the previous study, 71 major listed food value chain companies from stock indices in the US, Japan, and Europe were to provide an initial assessment of the impact of COVID-19 on the volatility of stock prices and profits of the food supply chain companies. The findings indicate that the impact of COVID-19 is sector-specific, and more research should be conducted to examine the causes of these distinctions, such as the comparison of various levels of shock caused by lockdowns and social distancing (Höhler & Lansink, 2020).

Another study discovered that after Vietnam declared the COVID-19 epidemic in the entire territory, the share price of the Vietnam Oil and Gas industry responded positively, as evidenced by the cumulative abnormal return of $CAR(0; 3] = 3.8$ percent and statistically significant at 5 percent. This is the most damaging and significant event for oil and gas stock prices. The date Vietnam identified the first COVID-19 positive patient enhanced negative effects when Vietnam confirmed the COVID-19 epidemic in the entire area favors positive effects. However, abnormal returns change quickly from positive to negative after the announcement, and statistically significant reveals the transformation of investors' psychology (Phuong, 2021).

3. METHODOLOGY

3.1 Data

The purpose of this study is to examine the impact of a coal selling price on the stock price of companies in Indonesia with a moderating variable of increasing daily case covid against coal-stock price. There are 26 coal mining companies listed on the Indonesia Stock Exchange. In this research, we will analyze five coal companies that have the most significant number of investors. The daily stock movement price of five coal companies in Indonesia, namely PT Kapuas Prima Coal Tbk (ZINC), PT Adaro (ADRO.JK), PT Bukit Asam (PTBA.JK), PT Indo Tambang Raya Megah Tbk (ITMG.JK), and PT Harum Energy Tbk (HRUM.JK), will be examined.

From Figure 1, the monthly reference coal price (RCP) value obtained from the Directorate General of Mineral and Coal, Indonesian Ministry of Energy and Mineral Resources, is used to determine the selling price of coal. Starting in January 2021 and ending in January 2022, five stock prices were collected daily from Yahoo Finance. There was a significant increase in cases and cases hit during that time period. The impact of the movement on the stock prices of five coal companies will be examined.

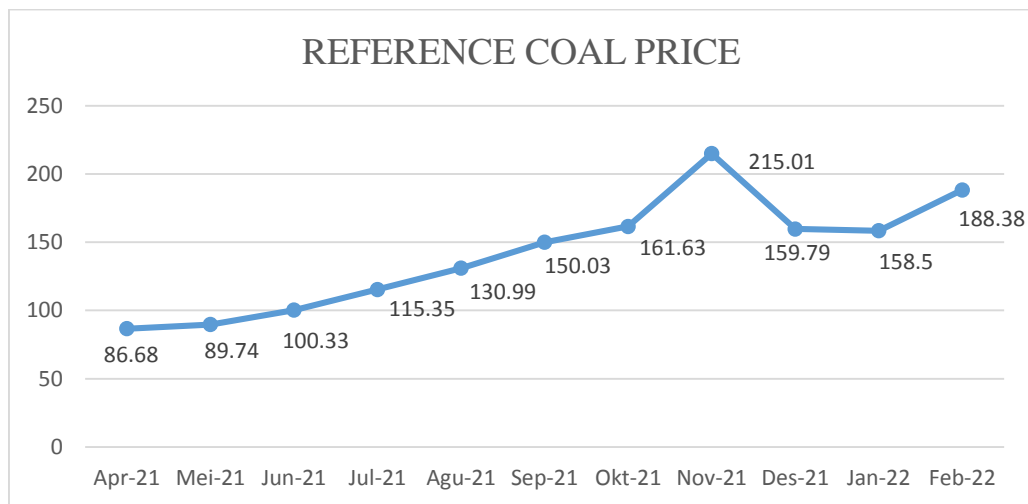


Figure 1. The Monthly Reference Coal Price (RCP) in Indonesia

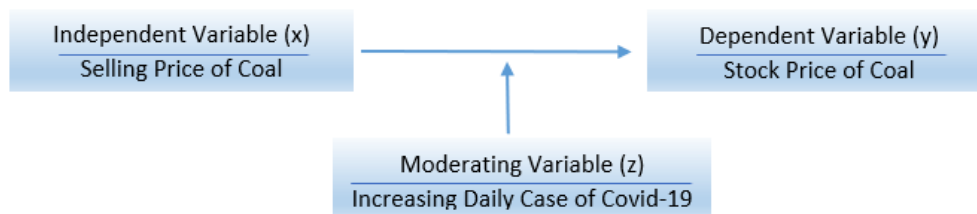


Figure 2. Relationship between variable x, variable y, and Variable z (Moderating Variable)

This analysis is intended to provide stock actors with a perspective on conducting stock purchase elections with coal commodities. The variable effect of moderation is expected to provide a view to stock actors in looking at the sentiment factors that can occur.

3.2 Moderating Variable

The Moderating Variables technique was used to measure whether the significance of the third variable moderated the relationship between two variables (x and y). This analysis is also known as Regression analysis with moderating variables. This analysis was called moderating analysis, which can be added one or more interaction terms in regression analysis using the concept of multiple linear regression modeling. For example, if z is the moderator for the relationship between x and y, then a regression model is obtained:

$$Y = b_0 + b_1x + b_2z + b_3xz + \varepsilon \quad (1)$$

According to equation (1), variable xz defines the interaction between variable x as a variable that affects the variable z as a moderating variable (z affects x).

The moderating variable, z, is the variable that modifies the strength of the relationship between x and y. In other words, the effect of x on y is determined by the moderating variable z. Simply stated, the moderating variable z is a variable that changes the direction and/or strength of the relationship between predictor x and outcome y. (Zhang & Wang, 2017).

A moderating variable exists when the impact of x on some variable y is moderated by z if somehow the size, sign, or strength of the effect depends on or can be

estimated by z. Variable z is indeed a moderator of x's effect on y in that case, or that z and x interact in their impact on y (Hayes, 2017). When incorporating this interaction into the hypothesis, researchers should be aware that implementing moderation analysis for attempting to make the model complicated and discovering the simplest workable solution without proper knowledge is analogous to a wreckage (Memon et al., 2019). Fundamental research is required to identify potential moderators, determine to use a moderating variable, hypothesize an interaction, and develop approaches for moderation analysis.

This relationship between variables in moderation analysis can occur under three conditions, namely:

1. Continuous dependent variables and continuous independent variables, modified by dichotomous moderating variables;
2. Continuous dependent variables and continuous independent variables, modified by polytomous moderating variables;
3. Continuous dependent and continuous independent variables are modified by continuous moderating variables.

The significance test in moderation analysis is similar to hypothesis testing in multiple regression analysis, notably F and t-tests. The essential difference from regression analysis is that the effect of moderation is tested using the t-test interactions of variables x and z. Suppose the p-value obtained from the t-test is less than the significance level. In that case, it is possible to conclude that the moderating variable influences the relationship between

Table 1. Result Analysis using Moderating Variable

y	x	z	Statistical test	Result
ZINC	The selling price of	Increasing daily cases	0.233800>0.05	Not significant
HRUM.JK	Coal	covid-19	0.000755<0.05	Significant
ITMG.JK			0.267000>0.05	Not significant
PTBA.JK			0.0000203<0.05	Significant
ADRO.JK			0.517000>0.05	Not significant

Table 2. Adjusted R Square using moderation and without moderation

Stock	Adjusted R squared	
	No Moderation	With Moderation
HRUM.JK	0.5254	0.5451
PTBA.JK	0.404	0.4444

variables x and y. As a result, variable z moderates the effect of variable x on variable y.

4. RESULTS AND DISCUSSIONS

Moderation analysis can be used in multiple regression analysis by including one or more interaction terms. The purpose of this study is to determine the effect of coal selling prices on coal stock prices moderated by increases in Covid 19 cases in Indonesia. As an outcome, this study employs a multiple regression model with the selling price of coal (x), the stock price of coal (y), the increase in Covid 19 Cases in Indonesia (z), and an interaction variable. If z modifies the relationship between x and y, the following regression model is obtained:

$$\hat{Y} = b_0 + b_1x + b_2z + b_3(xz) \quad (2)$$

As shown in the model, y is the data from the company's stock price, x is the variable daily coal selling price, and z is the variable of daily increasing positive number of covid-19 as moderation. Moderation analysis was performed in five cases in this study to determine which stock prices were affected by the selling price of coal moderated by the increase in covid 19 cases. The results of the t-test in coefficient regression on the variables that interact with each other (xz) can be used to assess the effect of moderating variables.

The results of the analysis obtained with the help of the R program are in Table 1.

The table above shows that for two of the five stocks analyzed, the regression coefficient for the term interaction xz is significant at a significance level of 5% occurring in HRUM.JK and PTBA.JK, then the effect of moderation is significant. In other words, the effect of the selling price of coal on the stock price of HRUM.JK and PTBA.JK significantly depends on the increase in covid 19 cases.

Analysis with classical regression without moderating variable to stock prices HRUM.JK and PTBA.JK produces adjusted R-squares of 0.5254 and 0.4040, respectively. In the analysis to see the effect of the selling price of coal on the stock price of HRUM. JK was moderated by the increase in Covid 19 cases in Indonesia, which increased the adjusted R-square. This indicates that additional interaction with the moderating variable correctly exerts an influence on the model created.

Analysis with classical regression without variable

moderation to stock prices HRUM.JK and PTBA.JK produces adjusted R-squares of 0.5254 and 0.4040, respectively. In the analysis to see the effect of the selling price of coal on the stock price of HRUM. JK was moderated by the increase in COVID-19 cases in Indonesia; there was an increase in adjusted R-square. This indicates that additional interaction with the moderating variable correctly exerts an influence on the model created.

In stock price HRUM.JK with moderating variable obtained Adjusted R-squared of 0.5451 means that the model obtained by the interaction between the selling price of coal and the increase in COVID-19 cases in Indonesia can explain the diversity of data by 54.51%, and other variables outside the model explain the rest. In the analysis of PTBA.JK stock price obtained Adjusted R-squared of 0.4444 indicates the variance of PTBA.JK share price can be explained by the variance of coal selling price and the increase in COVID-19 cases in Indonesia by 44.44%, while the rest is influenced by other variables that are not in the model. In addition, the results of the F test and the t-test on both stock prices showed a p-value <0.05, meaning the model obtained was significant, explained the diversity of data by 54.51%, and other variables outside the model explained the rest. Based on the result, it can be concluded that the increase in covid as a moderation variable is enough to affect the relationship between the selling price of coal and the stock price of HRUM.JK and PTBA.JK.

Regression coefficients for both stocks are as follows:

$$\widehat{HRUM.JK} = 2228 + 0.2098coal + 36.92covid + 0.002133coal_covid \quad (3)$$

$$\widehat{PTBA.JK} = 2302 + 0.03202coal + 2.06covid + 0.0003653coal_covid \quad (4)$$

According to the regression coefficients for both stocks, the selling price of coal and the increasing daily case COVID-19 positively affect daily stock movement price or constitute a significant proportion of the variance in the daily stock movement price. After that interaction term was added to the regression model, an exploration of the interaction revealed an enhancing effect. As the selling price of coal and the increasing daily case of COVID-19 increased, so did the daily stock movement price.

Furthermore, simple slopes test to find out the changes that occur in the data of covid 19 increase as moderator (z)

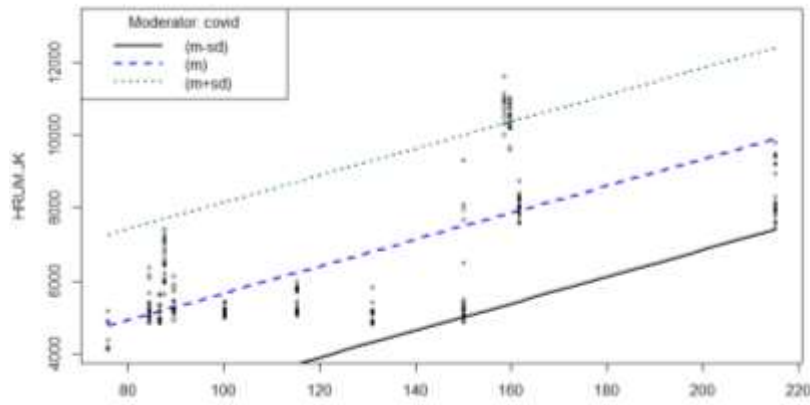


Figure 3. Moderation testing of increasing daily case COVID-19 in coal stocks and HRUM.JK stock

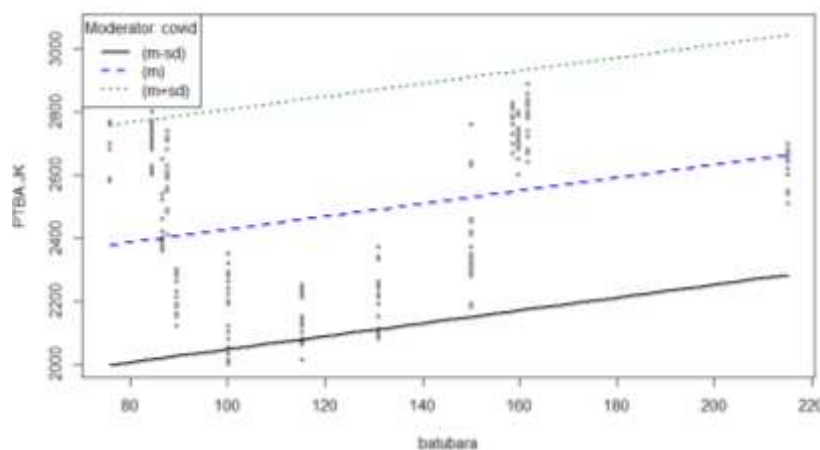


Figure 4. Moderation testing of increasing daily case COVID-19 in coal stocks and PTBA.JK stock

will give a variable effect of the coal selling price on the daily stock price. This analysis is done with the help of a "rock chalk" package on the R program. If the independent variables are continuous, then the model's influence is measured through the slope of the regression line. Moderation says that the slope of the regression line is different on each moderator value. A positive slope can become greater (or smaller) as moderators increase. Or it can also flip the sign from a positive slope at a low moderator value to a negative slope at a high value.

The graph above is the exterior of the plotSlopes() command that produces the graph as in The Picture. The three deepest lines in the picture. This order shows price changes with changes in coal and covid 19 selling price data. The other two lines describe mean-SD and mean+SD. The figure states that the lines formed are similar, and variable moderation is negated in looking at the effect of the selling price of coal on the stock price of HRUM.JK and PTBA.JK.

According to the result can be seen that stocks price from HRUM.JK and PTBA.JK is affected by the moderation variable, increasing daily cases of COVID-19. The practical benefit of this research can give investors insight when investing in stocks price coal companies.

5. CONCLUSION

Based on the five stocks observed, two have an increasing daily case effect on the movement of their share prices. After adding variable moderation increasing daily case covid-19, the adjusted R square increased from 0.5254 to 0.5451 on HRUM.JK. The same conditions apply to PTBA.JK has increased by 0.4040 to 0.4444 with the moderation of increasing daily cases.

These results indicate the stock price of two coal companies, PTBA.JK and HRUM.JK is affected by increasing daily cases of COVID-19.

More moderation variables can be added to the analysis to find more objective results in future research. Because of its random movements, Geometric Brownian Motion can be used to examine stock price movements

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