

Analysis of Financial Ratios and Data Visualization of Share Prices in Coal Mining Company

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ABSTRAK

Banyak investor pemula yang tidak melakukan analisis rasio keuangan sehingga mengalami banyak kerugian. Menganalisis fundamental rasio keuangan yang dapat memaksimalkan keuntungan investasi, dan melihat informasi keuntungan dan kesehatan perusahaan saat ini dan yang akan datang. Selain keuntungan juga terdapat resiko dari investasi saham. Untuk mengurangi resiko dibutuhkan analisa untuk prediksi harga saham. Data yang digunakan laporan tahunan perusahaan dengan metode koefisien korelasi dengan tools Tableau sehingga dapat mencari korelasi antara rasio keuangan terhadap harga saham perusahaan dan dilakukan visualisasi data. Hasil penelitian menunjukkan bahwa ada hubungan yang positif kuat antara harga pada saham perusahaan dengan rasio keuangan sehingga analisis ini bisa untuk melakukan prediksi harga saham dan investor dalam mengambil keputusan investasi saham.

ABSTRACT

Many novice investors do not analyze financial ratios and thus suffer many losses. Analyzing the fundamentals of financial ratios that can maximize investment returns, and see information on the current and future profits and health of the company. In addition to profits, there are also risks from stock investment. To reduce risk, analysis is needed to predict stock prices. The data used is the company's annual report with the correlation coefficient method with Tableau tools so that it can find the correlation between financial ratios and the company's stock price and visualize the data. The results showed that there is a strong positive relationship between the price of the company's shares and financial ratios so that this analysis can be used to predict stock prices and investors in making stock investment decisions.

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INTRODUCTION

A way of investing capital, where capital grows and gains profit in the future can be done by investing. By investing someone can increase their wealth and have additional income. Investment can also be interpreted as a form of capital allocation, where the capital is used to invest

in real projects or financial fields in the hope that it can increase the value of money in the future and generate profits (Yurico, 2023). Before investing, an investor must pay close attention to the choice of investment assets: capital markets (stocks, mutual funds, bonds), gold, time deposits, and property. In addition, every investor must know their respective risk profiles. If an investor has a risk profile and can take risks, then these investors can also invest in investment assets such as stocks (Moh'd et al., 2021). Stocks are investment assets in the form of securities in the form of proof of ownership of a company. In addition, stocks have the highest returns compared to other investment assets such as mutual funds, gold, time deposits, property, and bonds (Octovian, 2019). With high yields, they are followed by high-risk returns. Many investors from the younger generation who enter the market without being equipped with qualified analysis have made many fatal mistakes in investing in the capital market, where the mistake is not analyzing the stocks they want to invest in (Perusahaan et al., 2021). As a result of these mistakes, many novice investors experience stock losses. Investors can reduce the risk due to stock investment losses by using fundamental analysis (Tarmidi et al., 2020).

Fundamental analysis is an analysis that uses financial statements and financial and economic ratios to see the condition of a company (Wilson & Kurniasari, 2018). In this study, fundamental analysis focuses on financial ratios using fundamental analysis on financial ratios because financial ratios positively correlate with stock prices. The ratios used in this study include Return on Equity (ROE), Return on Assets (ROA), Return on Investment (ROI), and Earning Per Share (EPS) (Pangestu & Wijayanto, 2020). In addition to using fundamental analysis in analyzing financial ratios, this study also uses the correlation coefficient method and data visualization to visualize financial ratio data and look for the strength of the correlation between stock prices and financial ratios (Nurhidayati & Septiana, 2022).

The correlation coefficient is a relationship method that relates two variables to each other. In addition, the relationship between the two variables can produce connotations, namely positive correlation and negative correlation, based on the number of variables, namely one. The use of the correlation coefficient is based on the fact that it can be used to find the strength of the correlation that exists for two variables. (Jiao et al., 2023). In displaying the results of the correlation coefficient of financial ratios on stock prices in graphical form, Tableau software is used to visualize data in graphical form. Tableau is a useful software for performing data visualization and analysis activities on any data that has been processed and then displayed on a dashboard. It is known to be easy and efficient because it only uses drag and drop during the data visualization (Aryanti & Setiawan, 2019).

The research object under study is the shares of companies engaged in the coal mining industry. The substantial reason for this research using shares of coal companies is that Indonesia has abundant coal reserves of 143 billion tons, so coal is Indonesia's mainstay export commodity. Besides that, world coal prices rose to 160-170 US\$/ton, which was also the basis for this research using coal mining company shares as a research object. The coal mining companies studied have low valuations based on the Price Earning Ratio (PER). With the background of the problems described, this study will visualize data on financial ratios ROI, ROE, ROA, and EPS and then use the coefficient correlation method for each stock price in coal companies.

RESEARCH METHOD

Research Stage

Figure 1 explains the steps in the data visualization method, starting from data collection, data cleansing, filtering, data verification, and presenting and analyzing the visualization (Tasriq & Kunang, 2023) namely:



Figure 1. Data Visualization Method Research Phase

Data Collection

Raw data of coal mining companies that have been collected by extracting them through the annual reports of coal companies that go public. The raw data collected from these financial reports include ROI, ROE, EPS, and ROA. After obtaining financial ratio data from each company's annual report, the financial ratio data is processed in Microsoft Excel. With output, it produces the required financial ratios.

Data Cleansing and Filtering

The data that has been collected will be checked for formatting errors, typing errors, formula errors, inaccuracies, and so on. The following process is data filtering, where when a data filtering process occurs, financial ratio data is analyzed and visualized and will be filtered first so that data analysis is easier and more accurate. The data cleansing and filtering processes' results are performed in tabular form, with the output of producing the correct financial ratio data.

Data Verification

How to correct/verify data so that the data looks correct and has zero mistakes before entering the data visualization stage. In carrying out data verification, the data to be visualized is verified repeatedly to avoid errors such as typos or error numbers. The output results from processing in charts, graphs, and numbers.

Present and Analyze the Visualization

The process of analyzing and presenting financial ratios consists of ROI, ROE, EPS, and ROA in coal mining companies in 2014-2020. At this stage, re-visualize the data but in the form of a correlation coefficient. With the correlation coefficient, it is possible to find the correlation between the company's stock price and financial ratios with the output of processing results in the form of graphs, and numbers.

Coefficient Correlation

A coefficient correlation is a statistic that connects two variables. In addition, the association of these two variables can result in positive and negative correlations based on the number of variables, which is one. Using correlation coefficient analysis, it can be seen whether there is a correlation so that the cause and effect of an event can be known (Indrawati et al., 2023).

Table 1. Correlation Coefficient With Power

Size of Correlation	Interpretation
0.90 to 1.00 (- 0.90 to -1.00)	Very high positive (negative) correlation
0.70 to 0.90 (-0.70 to - 0.90)	High positive (negative) correlation
0.50 to 0.70 (- 0.50 to - 0.70)	Moderate positive (negative) correlation
0.30 to 0.50 (- 0.30 to - 0.50)	Low positive (negative) correlation
00 to 0.30 (00 to - 0.30)	Negligible correlation

Table 1 shows the correlation strength where +1 indicates positive correlation, and also -1, negative correlation. In addition, a correlation coefficient number of +1 indicates perfect, a coefficient of 0.50 to +1 indicates a strong correlation, a coefficient value of 0.30 to 0.49 means moderate correlation strength, and finally, if the correlation coefficient number is below 0.29 indicates that the strength of the correlation is neither solid nor weak.

In calculating the correlation coefficient, use the formula, namely:

$$r = \frac{N \sum xy - (\sum x)(\sum y)}{\sqrt{\{N \sum x^2 - (\sum x)^2\} \{N \sum y^2 - (\sum y)^2\}}} \quad (1)$$

Where:

- r : Pearson product moment correlation coefficient
- N : Number of pairs of values or scores
- $\sum xy$: Sum of the products of x and y
- $\sum x$: Sum of the x values (or x scores)
- $\sum y$: Sum of the y values (or y scores)
- $\sum x^2$: Sum of squares of x values (or x scores)
- $\sum y^2$: Sum of squares of y values (or y scores)
- $(\sum x)^2$: Square of the sum of x values (or x scores)
- $(\sum y)^2$: Square of the sum of y values (or y scores)

Return on Equity (ROE)

It is a financial ratio that shows management's performance/key performance indicator (KPI) in managing the company's capital for shareholders. In addition, investors also use ROE to calculate the company's abilities to produce profit for shareholders (Mohamed & Mohamed Gamal Elden, 2023). The formula for calculating, namely:

$$ROE = \frac{\text{Net Income}}{\text{Shareholder's Equity}} \times 100 \quad (2)$$

Return On Asset (ROA)

Return On Assets (ROA) is a financial ratio that shows the performance or critical performance indicators of a company's management on the return on company assets. Investors and company management use this ratio to measure the performance of company assets invested to generate profits for the company itself (Sari et al., 2022). The formula for calculating, namely:

$$ROA = \frac{\text{Net Income}}{\text{Average Total Assets}} \times 100 \quad (3)$$

Return On Investment (ROI)

A financial ratio that represents the return on investment of the organization's capital. This ratio shows how efficiently a company uses capital to generate investment returns. By looking at the ROI ratio, investors can find out what profit percentage they get when investing their money (Alex et al., 2022). The formula for calculating ROI, namely:

$$ROI = \frac{\text{Profit}}{\text{Cost of Investment}} \times 100 \quad (4)$$

Earning Per Share (EPS)

A financial ratio used to calculate a company's earnings per share. With Earning Per Share, investors can find out how much profit they get from a company's shares that they buy (Humaerah et al., 2022). The formula for calculating EPS, namely:

$$EPS = \frac{\text{Net Income}}{\text{Number of Shares Outstanding}} \quad (5)$$

RESULTS AND DISCUSSION

Data Collection

They are collecting data on the company's financial ratios originating from the annual/financial reports of coal mining companies. These financial ratio data are then processed using Microsoft Excel. In the financial statements, the equity section lists how much capital or equity the company owns in a certain period. The company's capital is used to strengthen the company's foundation and also as a cash reserve.

Data Cleansing and Filtering

Raw data on financial ratios and share prices of coal mining companies, namely:

Table 2. Financial Ratios and Share Prices of Coal Company

Year	Stock Prices	ROE	ROA	EPS	ROI
2014	1.060	6.00%	2.78%	69.3	23.17%
2015	515	5.00%	2.56%	65.7	15.76%
2016	1.655	9.00%	5.13%	140.6	23.57%
2017	1.890	13.11%	7.09%	204.7	35.09%
2018	1.215	11.10%	5.92%	189.1	37.26%
2019	1.580	10.92%	5.60%	175.7	23.75%
2020	1.490	4.00%	2.30%	64.8	13.39%

Table 2 shows the ratio of raw data in the form of numbers to the ratio of ROI, ROE, EPS, and ROA), which consists of 2014-2020 in a coal mining company. The process of filtering financial ratios is done by calculating manual formulas in financial reports so that they can produce finished figures in each table. Financial ratio figures are obtained using formulas ready to be processed into graphs.

Data Verification

At this stage, the data processed through the filtering and cleansing process will be rechecked for errors or errors in the data so that the displayed data does not experience errors during the visualization process and the visualization results can be perfect. This verification did not find any errors in the data in Table 2.

Present and Analyze the Visualization Return on Equity (ROE)

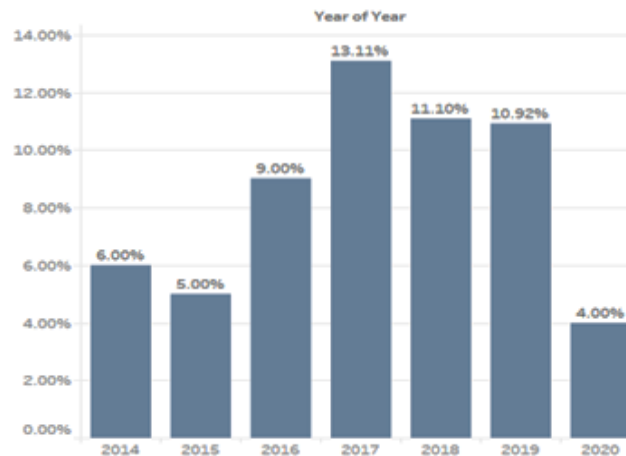


Figure 2. Return on Equity (ROE) in Coal Mining Company

Figure 2 shows that the company had a Return On Equity (ROE) of 13.11% in 2017. This shows that if the company invests 1 billion Rupiah in a coal mining project, the profit earned from the project is 13.11 million Rupiah in 2017. In addition, ROE also shows key performance indicators (KPI) of company management. The higher the ROE, the better the profit and performance generated from project investment and KPI management. With such results, investors will happily choose the stocks with the highest ROE in the market.

Return On Asset (ROA)

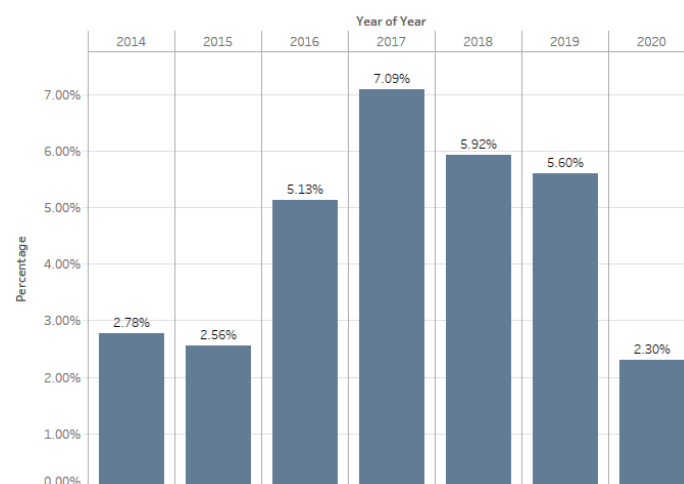


Figure 3. Return on Assets (ROA) in Coal Mining Company

Figure 3 shows companies had the highest Return on Assets (ROA) in 2017. Companies with high ROA show that companies manage company assets such as machinery, buildings, and vehicles effectively and efficiently. The highest ROA performance shows the highest value in 2017, namely 7.09%. In addition, high ROA performance also makes investors see that company management is innovative in managing company assets to generate profits for shareholders.

Earning Per Share (EPS)

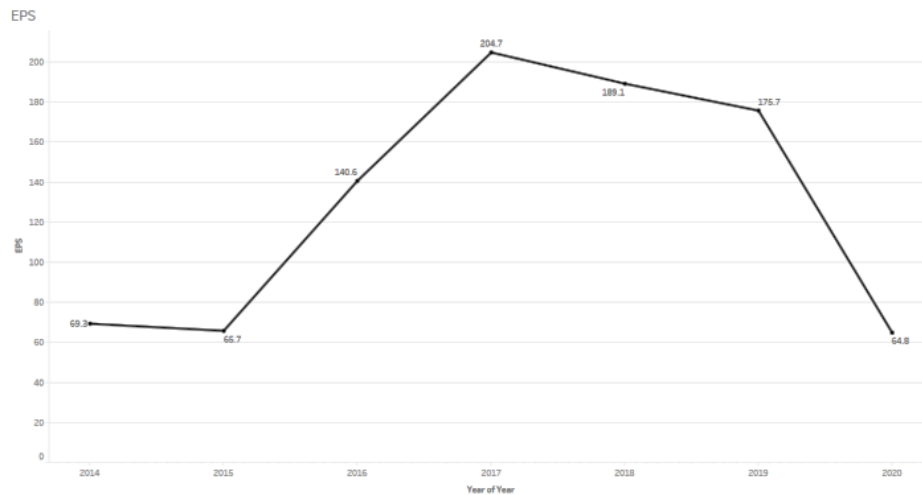


Figure 4. Earning Per Share (EPS) in Coal Mining Company

In Figure 4, it is used as a profit analysis for coal mining companies which shows a value of 69.3, 2015 65.7, 2016 140.6, 2017 204.7, 2018 189.1, 2019 175.7, and 2020 64.8. The highest EPS is aimed at 2017, with the number 204.7, and the lowest EPS in 2020 at 64.8.

Return On Investment (ROI)

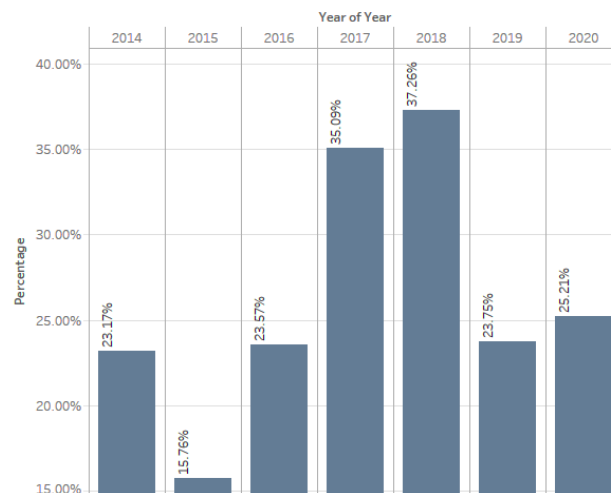


Figure 5. Return On Investment (ROI) in Coal Mining Company

In Figure 5, the results of the visualization of ROI data for coal companies show that the company had the highest ROI (Return on Investment) in 2017-2018. This indicates that company investors got the highest profits in 2017-2018. The highest ROI occurred in 2018, with a percentage of 37.26%, meaning that if an investor invests 100 million Rupiah, the investor will get a profit of 137 million Rupiah within one year.

Correlation coefficient

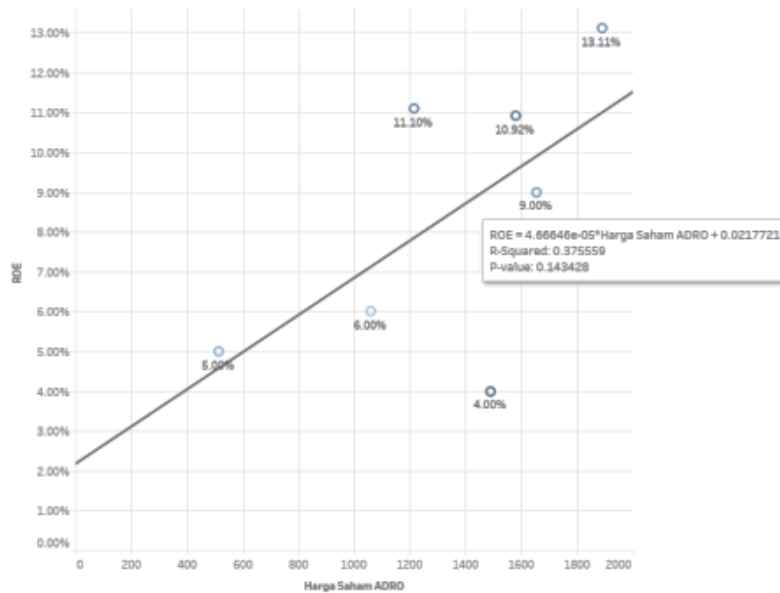


Figure 6. Correlation of Return on Equity (ROE) and stock prices in Coal Mining Company

Figure 6 explains that the correlation coefficient on the company's stock price yields several 0.61, which means a positive relationship and a moderate strength between the company's stock price and the ROE ratio. The correlation number of 0.61 is obtained using the correlation coefficient formula from 0.37559. The number 0.37559 is R Squared on the ROE ratio of company, where the R squared value represents the value of both variables, namely the company's stock price and ROE financial ratio. The positive correlation in the ROE ratio means that ROE has a moderate positive influence on the company's stock price.

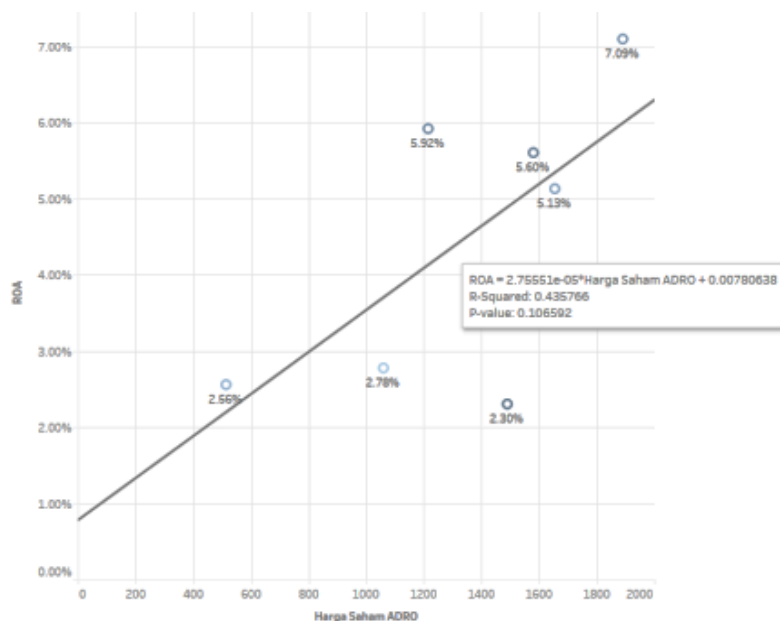


Figure 7. Correlation of Return on Assets (ROA) and stock prices in Coal Mining Company

Figure 7 explains that the correlation coefficient on the company's stock price yields a strength of 0.66, which means a moderate positive relationship exists between the company's stock price and the ROA ratio. The correlation figure of 0.66 is obtained using the correlation coefficient formula derived from R squared, which is 0.435766. 0.435766 is the R squared on the ROA ratio,

where the R squared represents the value of the two variables, namely the company's stock price and the ROA financial ratio. The positive correlation on the ROA ratio means that the ROA ratio has a fairly positive influence on the company's share price.

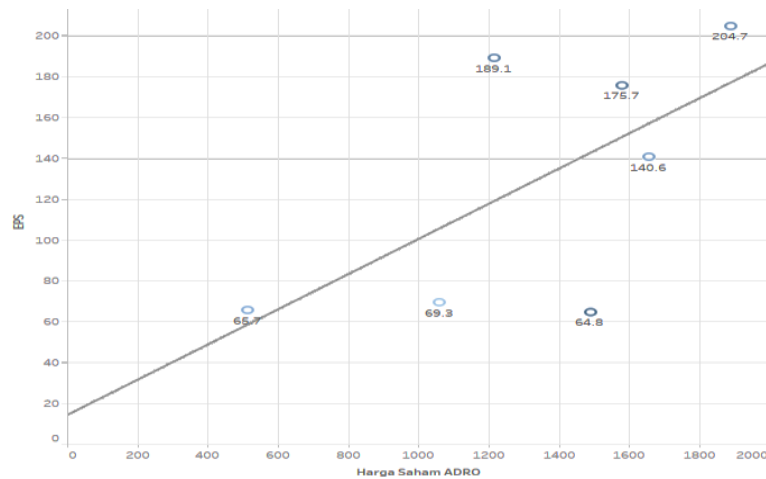


Figure 8. Correlation of Earning Per Share (EPS) and stock prices in Coal Mining Company

Figure 8 explains that the correlation coefficient on the company's stock price produces a figure of 0.63, indicating a moderate positive correlation between the company's stock price and the EPS ratio. So that the ups and downs of the company's share price correlate with the EPS ratio, aka company profits. The correlation figure of 0.63 is obtained using the correlation coefficient formula 0.399388. The number 0.399388 is the R Squared on the EPS ratio, where the R squared value represents the value of the two variables, namely the company's stock price and the EPS financial ratio. The significant positive correlation in the EPS ratio means that EPS has a positive and moderate influence on the company's share price.

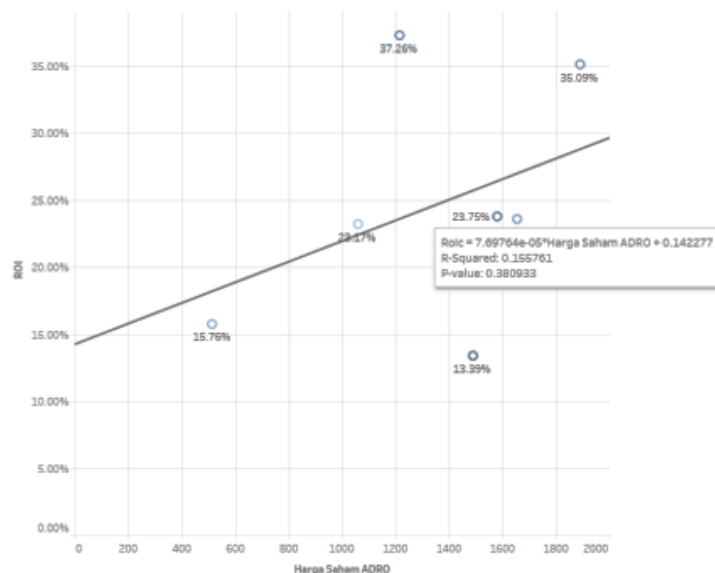


Figure 9. Correlation of Return on Investment (ROI) and stock prices in Coal Mining Company

Figure 9 explains that the correlation coefficient on the company's stock price yields several 0.39, which means a positive but weak relationship exists between the company's stock price and the ROI ratio. The correlation figure 0.39 is obtained using the coefficient formula of 0.155761. The number 0.155761 is R Squared in the ROI ratio, where the R Squared value represents the value of the two variables, namely the company's stock price and financial ratios Return on Investment (ROI). With a positive correlation in the ROI ratio, it means that ROI has a low positive power on the company's stock price.

Table 3. Correlation Coefficient Analysis Results

Financial Ratios	Correlation Coefficient R	Description	Strength
ROE	0.61	Positif	Moderate
ROI	0.39	Positif	Low
ROA	0.66	Positif	Moderate
EPS	0.66	Positif	Moderate

In Table 3, companies with financial ratios ROE, ROI, ROA, and EPS positively correlate with stock prices. However, the most substantial financial ratio correlation to the company's stock price is shown by a ROA of 0.66, EPS of 0.66, and ROE of 0.61.

CONCLUSION AND RECOMMENDATION

Conclusion

The results of testing visualization data with the correlation coefficient on stock prices and financial ratios of coal mining companies show a positive association between the stock price and financial ratios. The correlation coefficient of financial ratios in the company is ROE 0.61, ROA 0.66, EPS 0.63, and ROI 0.39. However, the strength of each financial ratio is different, where ROE, ROA, and EPS have moderate correlation strength to the company's stock price. At the same time, ROI has a low correlation with the company's stock price. Investors who wish to buy company shares can look at the financial ratios, namely ROE, ROA, and EPS, because these financial ratios have a moderate positive correlation compared to the ratio of ROI to the company's stock price.

Recommendation

Future research can add broader financial ratios besides Return On Investment (ROI), Return On Equity (ROE), Return On Assets (ROA), and Earning Per Share (EPS) to add information on the correlation of world coal prices with stock prices.

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