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Mengungkap Hubungan Tersembunyi Antara Harga Kripto dan Saham Pertambangan: Bukti dari ANTM dan TINS

Uncovering the Hidden Relationship Between Crypto Prices and Mining Stocks: Evidence from ANTM and TINS

Diky Paramitha[1]*, Etik Ipda Riyani[2], Kan Wen Huey[3]
paramithadiky@gmail.com, etik@ecampus.ut.ac.id, whkan@wou.edu.my
Accounting Department, Faculty of Economic and Business, Universitas Terbuka, Jakarta, Indonesia[1,2]
School of Business and Administration, Wawasan Open University, Malaysia[3]

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Abstract

The high volatility of the crypto market has raised questions about its potential impact on other financial instruments, including shares of mining sector issuers. This study aims to reveal the relationship between the price of crypto assets, especially Bitcoin, and the stock price movements of two major mining issuers in Indonesia, namely Antam (ANTM) and Tin (TINS). The analysis was carried out with a quantitative approach with a simple linear regression analysis method, to test the influence of the price of bitcoin on each stock. The results of the analysis show the direction of a positive and significant relationship between the price of Bitcoin and ANTM shares with a regression coefficient of 0.008776. This value indicates that any increase in the price of Bitcoin is potentially followed by an increase in the price of ANTM's shares, with a contribution of variation of 45% (R^2 = 0.45). Meanwhile, the influence on TINS shares was also positive but weaker, with a regression coefficient of 0.004999 and a contribution of variation of 28% (R^2 = 0.28). These findings indicate that the crypto market could be one of the external factors influencing the dynamics of real sector stocks, especially those related to metal commodities. The conclusion of this study confirms the importance of including crypto variables in the risk analysis and investment strategies of mining sector stocks due to the adoption of blockchain technology that requires such commodities.
Keywords: bitcoin, crypto, stock

Abstrak

Volatilitas pasar kripto yang tinggi telah menimbulkan pertanyaan mengenai potensi pengaruhnya terhadap instrumen keuangan lain, termasuk saham emiten sektor pertambangan. Penelitian ini bertujuan untuk mengungkap hubungan antara harga aset kripto, khususnya Bitcoin, dengan pergerakan harga saham dua emiten pertambangan utama di Indonesia, yaitu Antam (ANTM) dan Timah (TINS). Analisis dilakukan dengan pendekatan kuantitatif dengan metode analisis regresi linier sederhana, untuk menguji pengaruh harga bitcoin terhadap masing-masing saham. Hasil analisis menunjukkan arah hubungan positif dan signifikan antara harga Bitcoin dan saham ANTM dengan koefisien regresi sebesar 0,008776. Nilai ini mengindikasikan bahwa setiap kenaikan harga Bitcoin berpotensi diikuti kenaikan harga saham ANTM, dengan kontribusi variasi sebesar 45% (R^2 = 0,45). Sementara itu, pengaruh terhadap saham TINS juga positif namun lebih lemah, dengan koefisien regresi 0,004999 dan kontribusi variasi sebesar 28% (R^2 = 0,28). Temuan ini mengindikasikan bahwa pasar kripto dapat menjadi salah satu faktor eksternal yang memengaruhi dinamika saham sektor riil, terutama yang terkait dengan komoditas logam. Kesimpulan dari penelitian ini menegaskan pentingnya memasukkan variabel kripto dalam analisis risiko dan strategi investasi saham sektor pertambangan karena adopsi teknologi blockchain yang memerlukan komoditas tersebut.
Kata kunci: bitcoin, crypto, saham

*Corresponding author: **Diky Paramitha**, paramithadiky@gmail.com

INTRODUCTION

The global financial market has undergone a significant transformation since the advent of cryptocurrencies, specifically Bitcoin, which has become one of the most in-demand digital assets in the

last decade. The rapid development of cryptocurrencies, particularly Bitcoin, has attracted the attention of academics and financial practitioners globally. As the widespread adoption of crypto by institutions and individuals increases, the relationship between the cryptocurrency market and the traditional capital market is beginning to gain academic attention. Although initially seen as a speculative asset, Bitcoin is now a financial instrument that is increasingly integrated with global capital and commodity markets (Brière et al., 2015)(Bouri et al., 2021). A review of the literature shows that the correlation between Bitcoin and global stock indices increases during market turmoil, such as the COVID-19 pandemic, which indicates a dynamic relationship across assets (Wątorek et al., 2023)(Corbet et al., 2018). Regional studies have also found a positive relationship between cryptocurrency prices and stock indices in developing countries. Previous research has resulted in crypto returns and volumes having a significant influence on Indonesian, Singapore, and Thai stock indices during 2018–2021 (Utami, 2023).

In Indonesia, the phenomenon of cryptocurrency development has also attracted the attention of market participants and researchers. Although authorities such as the OJK and Bappebti strictly regulate crypto assets, Bitcoin's popularity among retail investors has soared sharply. However, the relationship between the price of Bitcoin and the stock prices of domestic companies, especially those engaged in the mining sector, is still rarely used as an object of empirical study. In fact, the mining sector has an important role in supporting crypto mining infrastructure, both directly and indirectly. In addition, research on crypto mining companies whose commodities come from the conventional mining sector shows that crypto miner stocks have a strong positive correlation with Bitcoin. Nonetheless, the characteristics of such correlations tend to be influenced by market volatility and the type of commodity involved (Wan et al., 2023). In Indonesia, mining companies such as ANTM (nickel, gold) and TINS (tin) play an important role in the global supply of raw materials, including for blockchain infrastructure and crypto mining hardware. Mining companies such as PT Aneka Tambang Tbk (ANTM) and PT Timah Tbk (TINS) are two strategic SOE issuers that produce important commodities such as nickel and tin. These two metals are used in computer hardware components and high-tech infrastructure, including in the manufacture of chips and crypto mining devices. Therefore, there is an assumption that the price of Bitcoin, as an indicator of sentiment towards crypto activity, could potentially affect the stock movements of these companies.

Several international studies have traced the relationship between the price of cryptocurrencies and the stock prices of technology or crypto mining companies. Mining company stocks have a positive correlation with the price of Bitcoin, especially in the short term and when the market is under pressure (Bouri et al., 2017). The asymmetric and non-linear relationship between the stock price of a mining company and the price of cryptocurrencies, depending on market conditions and the type of metal produced (Wan et al., 2023).

Therefore, research on the relationship between the price of Bitcoin and the shares of these two issuers is a relevant topic to understand the dynamics of market sentiment as well as the potential impact across industries. In line with previous literature, the relationship between the price of Bitcoin and the stock price of mining issuers in Indonesia is still very rarely studied empirically. most previous studies used the period before 2020 or only covered the early phases of the pandemic, when crypto adoption was still limited and volatility had not yet been systemically integrated into the real asset market. This research uses the 2020–2024 range, which includes the phase of crypto asset expansion, the Bitcoin halving cycle, increased institutional participation, and market consolidation. Thus, this study provides a more up-to-date understanding of how digital asset dynamics affect mining sector stocks in developing countries that have strategic mineral reserves. The focus of this study is to explore the correlation and impact of the price of Bitcoin on the fluctuations of ANTM and TINS stocks using a quantitative approach through simple linear regression analysis, this study wants to find out if there is a significant relationship and the direction of its influence between the two variables. The findings of this study are expected to contribute to the academic literature and become a strategic reference for investors and policy makers. By comparing the

results for two different issuers, this study is expected to contribute to understanding cross-asset market dynamics in the context of the Indonesian capital market.
Additionally, the comparison between the two issuers will help answer the question of whether certain mining commodities are more sensitive to Bitcoin's price movements. This is important considering that ANTM is more engaged in the nickel and gold sectors, while TINS is more focused on tin production. The difference in the characteristics of the commodity and its exposure to crypto mining technology can be a factor influencing the relationship. With technological developments and cross-industry linkages, the Indonesian capital market is increasingly showing complexity and openness to global sentiment, including from the crypto market. Therefore, the study linking Bitcoin and mining stocks is not only academically relevant, but also practically important for portfolio risk management and investment decision-making.

METHOD

This study uses a quantitative approach with a simple linear regression analysis method to determine the influence of Bitcoin price on the stock price of mining issuers, namely PT Aneka Tambang Tbk (ANTM) and PT Timah Tbk (TINS). This approach was chosen because it can measure the causal relationship between two variables and analyze the strength and direction of influence between variables (Sugiyono, 2019). The type of data used in this study is secondary data in the form of time series data. Bitcoin's daily closing price data, as well as the closing prices of ANTM and TINS shares with a data collection period starting from January 2020 to December 2024. The use of daily data aims to obtain high precision in the measurement of the dynamics of relationships between variables (Wątorek et al., 2023). Data processing is carried out with the help of Microsoft Excel software for initial data collection, and EViews 10 for regression and classical assumption tests. This device was chosen because of its flexibility and ability to process financial statistical data (Gujarati & Porter, 2009).

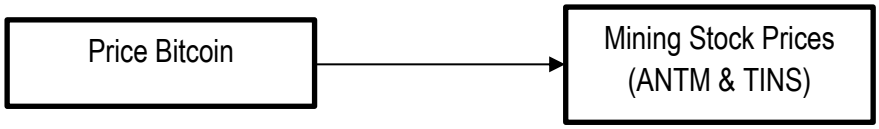

Figure 1. Framework

The frame of thought in figure 1 shows the relationship between the price of Bitcoin and the stock price of mining companies, namely ANTM (Miscellaneous Mines) and TINS (Tin). In this framework, the price of Bitcoin is placed as an independent variable that is suspected to have an influence on the dependent variable, namely the stock price of the mining sector. This thinking is based on the assumption that the price movements of digital assets such as Bitcoin can affect the dynamics of financial markets, including stocks in the commodity sector.

Theoretically, the increase in Bitcoin's price could reflect investors' high interest in risky assets, which could then encourage a shift or diversification of investments into mining stocks as alternative assets. Conversely, significant fluctuations in Bitcoin can also have a psychological effect on investors, which in turn has an impact on stock price movements in the capital market, including ANTM and TINS shares.

This frame of thought constructs a causal relationship in which the price movement of Bitcoin is assumed to be one of the factors that can affect the change in the price of mining stocks. This relationship is important to be further analyzed to find out the extent to which crypto assets such as Bitcoin are related to conventional financial instruments, especially stocks in Indonesia's mining sector.
The framework of this research is built on the basis that changes in Bitcoin prices as a representation of the high-risk digital asset market can provide signals to mining sector stocks, both through investor psychology and expectations regarding commodity demand.

RESULT

In this study, the independent variable (X) is the price of Bitcoin, which is the daily closing value of the Bitcoin crypto asset which represents the turmoil of the global crypto market. Bitcoin was chosen because it is a crypto asset with the largest market cap, the highest adoption rate, and is often used as an indicator of digital market sentiment. Bitcoin's price changes are assumed to have the potential to affect other asset markets through spillover mechanisms or sentiment-driven trading.

Meanwhile, the dependent variable (Y) is the share price of the mining issuer that is the object of analysis, namely ANTM (PT Aneka Tambang Tbk) or TINS (PT Timah Tbk). The two stocks represent real sector companies that produce strategic metal commodities such as gold, nickel, and tin, which are linked to the needs of the technology industry, including blockchain and crypto mining hardware. Thus, stock price changes are seen as a market response to the dynamics of crypto assets. The price movement of bitcoin, antam and tin stocks is shown in figure 2.

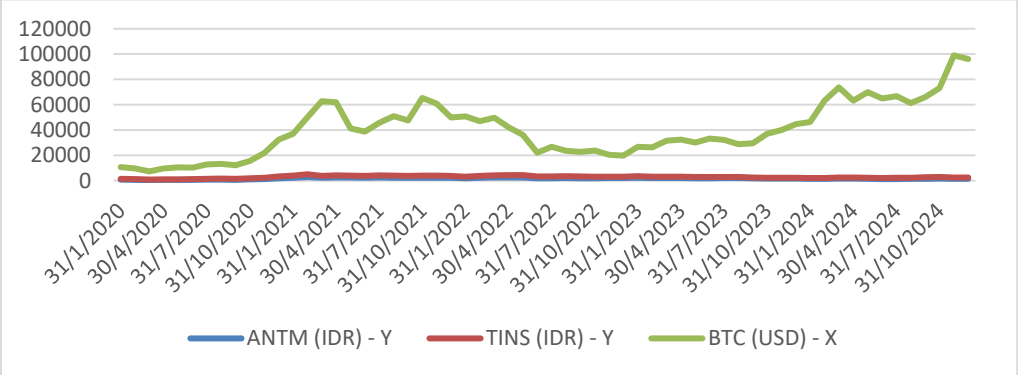

Figure 2. Chart of Bitcoin, Antam Shares and Tin Shares Price Movement in 2020-2024

The chart shows the stock price movements of ANTM (Aneka Tambang), TINS (Tin) in Rupiah (IDR), and Bitcoin (BTC) prices in US Dollar (USD) from January 2020 to October 2024. From the chart, it is clear that Bitcoin's movement is much more volatile and dominant than ANTM and TINS, with its value increasing significantly especially after 2023. This shows the large difference in scale and volatility between crypto assets and mining commodity stocks in Indonesia.

Meanwhile, the ANTM and TINS lines look to be stable near the zero axis when compared to Bitcoin. This does not mean that the stock price does not move, but rather because of the huge scale difference with Bitcoin, so the movement appears flat on the chart. However, if observed in detail, ANTM shares show a slightly more dynamic trend than TINS, with fluctuations reflecting the response to global commodity market conditions as well as domestic factors.

Overall, this chart illustrates that Bitcoin has a very significant growth in value with high volatility compared to mining commodity stocks. ANTM and TINS are more stable, reflecting the characteristics of real sector stocks that move in line with the demand and supply of minerals in the world market. This comparison confirms the fundamental difference between crypto assets that are high-risk but have the potential for large returns, and mining sector stocks that are more stable but have limited growth.
Therefore, further statistical analysis is needed to determine whether changes in the price of Bitcoin affect the stock price of ANTM and TINS.

Multicollinearity Test

Table 1. Variance Inflation Factors

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
TINS	0.109037	16.22602	1.042531
C	215777.6	22.13860	NA
BTC	1.49E-05	4.200441	1.042531

Source : data processing

Both the TINS and BTC variables have a VIF value of around 1.04, which is very low. This means that there is no strong correlation between independent variables, so the model is free from multicollinearity problems. Based on Centered VIF, the model does not experience multicollinearity. TINS and BTC are independent of each other, so regression estimation can be considered stable and not disturbed by correlations between variables.

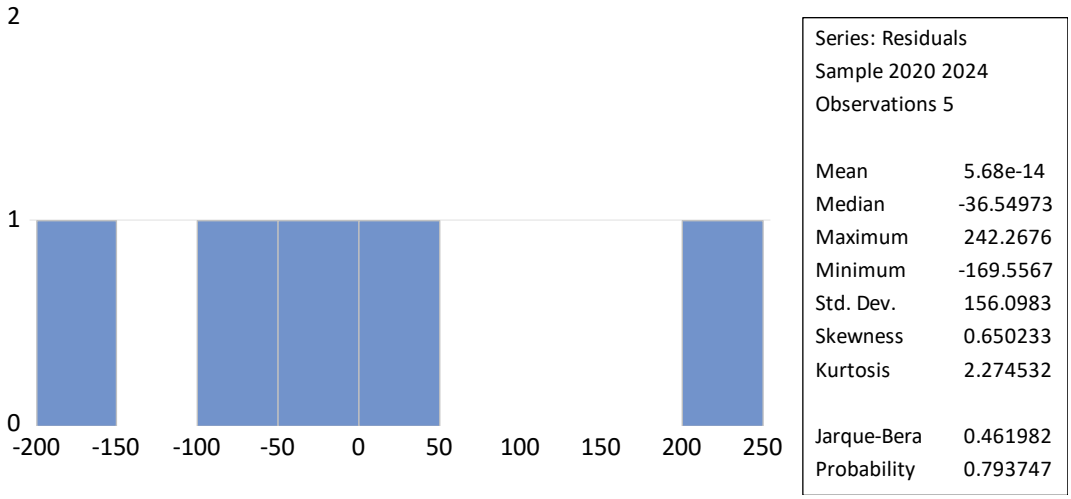

Figure 3. Normality Test (*Source: data processing)*

Based on the results of the normality test using the Jarque-Bera method, a probability value of 0.79 was obtained. This value is well above the significance limit of 0.05, so it can be concluded that the residuals in the regression model are normally distributed. Thus, the assumption of normality is met and the model is feasible to use for further statistical analysis.

Table 2. Equation

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1414.999	150.7516	9.386300	0.0000
X	0.008776	0.003524	2.490275	0.0157
R-squared	0.096594	Mean dependent var		1740.750
Adjusted R-squared	0.081018	S.D. dependent var		605.4770
S.E. of regression	580.4318	Akaike info criterion		15.59819
Sum squared resid	19540260	Schwarz criterion		15.66800

Log likelihood	-465.9456	Hannan-Quinn criter.	15.62549
F-statistic	6.201468	Durbin-Watson stat	0.171399
Prob(F-statistic)	0.015651		

Source : data processing

The relationship with Bitcoin's marginal significance to Antam Shares

The results of the regression test show that the value of the regression coefficient for the Bitcoin variable is positive of 0.008776. This means that every one unit increase in the price of Bitcoin will be followed by an increase in ANTM's share price of 0.008776 units, assuming other factors remain. This positive relationship indicates that Bitcoin's price movements have an impact on shaping investor perceptions of stocks related to mining commodities, such as ANTM which is engaged in the nickel sector, one of the important raw materials in the crypto mining industry. This finding can be explained theoretically through a behavioral finance approach, where retail investors in the Indonesian capital market show sensitivity to the movement of digital assets which is considered a leading indicator of high-risk market sentiment. On the other hand, ANTM shares, which focus on nickel and tin commodities, are linked to the crypto mining ecosystem, thus increasing investors' positive perception of the issuer's prospects when crypto prices strengthen. These findings are reinforced by research which suggests that the rise in the price of Bitcoin could affect market sentiment towards commodity-related companies such as nickel and rare earth metals, which are used in the blockchain and crypto mining industries (Wan et al., 2023)

Statistical Significance of Bitcoin Variables

The probability value (p-value) for the independent variable of 0.0157 which is below the significance threshold of 5% (α = 0.05) indicates that Bitcoin's influence on ANTM's stock price is statistically significant. In addition, the t-statistic value of 2.490275 is also greater than the critical value of t at a certain degree of freedom, which reinforces the evidence that Bitcoin partially has an influence on the price movement of ANTM shares. These results support the hypothesis that there is a real influence between the movement of crypto assets and stock prices, although these influences are not dominant.
This significance suggests that investors may consider crypto market sentiment as one of the signals in stock investment decision-making in the mining sector. These results are in line with previous studies that have shown the linkage between the crypto market and the capital market, especially in the context of emerging markets, where the market structure is not yet fully efficient opening up space for cross-asset sentiment.

The Role of Constants in Regression Models

The constant value (intercept) of 1414,999 in the regression equation indicates that if Bitcoin's value is at zero point (although practically impossible), then the stock price is expected to be at the level of 1414,999. This suggests the existence of another factor that keeps the stock price at a certain level, regardless of Bitcoin's value. Mathematically, this constant value is useful for forming regression lines and providing a baseline for stock values
The regression model formed can be written as follows:

$$y = 1.415 + 0{,}008776\mathrm{X} + \varepsilon$$

where:
Y is the ANTM stock price
X is the price of Bitcoin
ε is an error term

Strength of the Regression Model: R-Square Value

The value of R Square (R^2) of 0.096594 or around 9.66% indicates that the contribution of Bitcoin price in explaining the variation in the stock price of mining issuers is only around 9.66%. In other words, around 90.34% of stock price variations are explained by other variables outside of this model, such as nickel and tin commodity prices, national capital market sentiment, rupiah exchange rates against dollars, interest rates, inflation, as well as issuer fundamental factors such as financial performance and production volume. This relatively low R^2 value does not diminish the significance of the relationship, but it does emphasize that Bitcoin is not the only factor influencing the mining stock price. Previous studies have stated that although there is a relationship between crypto and the capital market, its strength tends to be low in the Indonesian context, so Bitcoin is more of an additional sentiment in investment decision-making.

DISCUSSION

Implications of the findings research

These findings are relevant in the context of increasing attention to crypto as an alternative investment instrument and external factors influencing real sectors. For investors, the existence of a significant albeit weak relationship between the price of Bitcoin and mining stocks can be considered in developing a portfolio strategy that is responsive to the development of digital assets. Statistically, the model shows a significant relationship. However, econometrically, the low R-Square value indicates that the predictability of the model is still limited and not strong enough to be used as a single forecasting tool. That the relationship between Bitcoin and mining stocks is non-linear and volatile, and stronger in the short term than in the long term, especially when there is a surge in crypto prices (Peng et al., 2024)
From an academic perspective, these results contribute to the literature on cross-asset linkages in the digital economy era, and open up opportunities for further research that includes more variables, crypto crisis periods (Misal, 2024), as well as advanced analysis techniques such as panel regression, VAR/VECM or time series cointegration.

The relationship with Bitcoin's marginal significance to Tin Stocks

Table 3. Equation

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	959.2278	107.9865	8.882847	0.0000
X	0.004999	0.002524	1.980466	0.0524
R-squared	0.063341	Mean dependent var		1144.800
Adjusted R-squared	0.047192	S.D. dependent var		425.9477
S.E. of regression	415.7755	Akaike info criterion		14.93093
Sum squared resid	10026418	Schwarz criterion		15.00074
Log likelihood	-445.9280	Hannan-Quinn criter.		14.95824
F-statistic	3.922245	Durbin-Watson stat		0.170722
Prob(F-statistic)	0.052401			

Source : data processing

Table 3 shows the results of a simple linear regression analysis that illustrates the relationship between independent variables (X) and dependent variables (Y). The value of constant (C) of 959.2278

indicates that when X is zero, Y is estimated to be worth 959.23. The X coefficient of 0.004999 indicates that every increase of one unit on variable X will increase Y by 0.004999 assuming the other factors remain.

From the results of the significance test, the constant variable (C) is statistically significant at the level of 1% because the probability value is 0.0000, while the variable X has a probability value of 0.0524. This shows that X is almost significant at a significance level of 5%, but can be said to be significant at a level of 10%. Thus, the variable X has a positive influence on Y, although the influence is relatively weak.

The quality of the model indicated by the R-squared value of 0.0633 indicates that only 6.33% of the Y variation can be explained by X, while the remaining 93.67% is influenced by other factors outside the model. The F-statistical value of 3.922 with a probability of 0.0524 also shows that the model as a whole is almost significant at the 5% level, but significant at the 10% level. However, a very low Durbin-Watson value (0.1707) indicates a fairly strong positive autocorrelation in the residue. Overall, the model shows a positive relationship between X and Y, but with a low level of strengths and weaknesses in terms of the quality of the model's explanation.

The regression results show a positive regression coefficient of 0.004999, which indicates that the rise in the price of Bitcoin is likely to be followed by an increase in the price of TINS. The t-statistic value is 1.980466 and the probability is 0.0524 close to the 5% significance limit. Although not entirely statistically significant ($\alpha = 0.05$), this value is close to the significant threshold, so it can be interpreted as a marginally significant relationship.

These results are in line with the finding that the stocks of companies related to metal commodities can be affected by crypto dynamics due to market perceptions of the interconnectedness between metals such as tin and nickel and blockchain infrastructure, especially in the context of mining hardware (Bouri et al., 2017).

Constant Values and Model Interceptions

The regression constant of 959.2278 implies that when the price of Bitcoin is zero, the TINS share price remains at a level of around Rp959. This illustrates the underlying influence or other factors that are not directly related to Bitcoin's movement.

Explanatory Power of Model R^2

The R Square value of 0.063341 indicates that the approximately 6.33% variation in the price of TINS stock can be explained by the variation in the price of Bitcoin. This indicates that the relationship between Bitcoin and TINS exists, but is weak, and implies the existence of other variables that are much more dominant such as global metal prices, exchange rates, interest rates, and the issuer's fundamental factors. The relationship between the price of Bitcoin and mining stocks is volatile and non-linear, and is stronger during a crypto market surge, such as during a bull run, but tends to be weak in general (Peng et al., 2024).

Implications of the Findings Research

There is a positive relationship between the price of Bitcoin and the TINS share price, although its significance is marginal ($p = 0.0524$). This shows that there is market sentiment that links crypto movements with mining sector stocks, especially those related to industrial metals. The strength of the relationship is still weak, indicated by the R^2 which is only 6.33%. This reinforces the assertion that mining stock prices are more influenced by industrial and commodity fundamentals than by the price of Bitcoin alone. This research provides the initial basis for the development of an intermarket analysis between crypto assets and real sector stocks that are indirectly affected, such as mining.

Comparative results of the ANTM and TINS effects of Bitcoin

This study examines the relationship between the price of Bitcoin (X) against two Indonesian mining stocks, namely ANTM (PT Aneka Tambang Tbk) and TINS (PT Timah Tbk), using a simple linear regression model. The results of data processing show an interesting difference between the two issuers:

Table 3. Comparative Effects

The Relationship of Bitcoin and ANTM Shares	The Relationship of Bitcoin and TINS Shares
A positive regression coefficient of 0.008776 indicates that any increase in the price of Bitcoin is likely to be followed by an increase in the price of ANTM stock	The regression coefficient is also positive, but smaller, at 0.004999.
T-statistic = 2.490275 and Prob. = 0.0157 indicates that Bitcoin's influence on ANTM stock is statistically significant at a 95% confidence level	T-statistic = 1.980466 and Prob. = 0.0524, indicating Bitcoin's influence on TINS marginally significant (almost significant at α = 0.05)
R^2 = 0.096594, meaning that about 9.66% of the variation in the price of ANTM stock is explained by the variation in the price of Bitcoin	R^2 = 0.063341, indicating only 6.33% of the variation in TINS shares explained by the Bitcoin price

Source : data processing

CONCLUSION

This study aims to analyze the influence of Bitcoin price on the stock price of mining companies in Indonesia, especially ANTM and TINS, and test the hypothesis that the increase in the price of Bitcoin is positively related to the movement of mining stock prices. Based on the results of empirical analysis, it was found that the price of Bitcoin has a positive relationship with the two stocks. However, the influence was shown to be stronger and more significant in ANTM compared to TINS.

The difference in the strength of these relationships can economically be explained by the fundamental characteristics of each company. ANTM has greater exposure to strategic commodities such as nickel and gold, which are relevant to the blockchain technology ecosystem and crypto mining activities. In contrast, TINS that are more focused on tin production show a lower sensitivity to cryptocurrency market dynamics.

These empirical findings support the hypothesis that Bitcoin's price fluctuations could affect the performance of the mining stock market, especially companies related to strategic metals used in digital technologies. This aligns with previous studies (Bouri et al., 2017)(Corbet et al., 2019) that emphasized the interconnection between crypto market sentiment and the performance of certain metal mining stocks. Overall, the evidence highlights the importance for investors and policymakers to recognize the potential role of cryptocurrency trends in influencing the stock performance of mining companies, particularly those producing strategic metals that are essential for the development of digital and blockchain technologies. Overall, the study confirms that trends in the cryptocurrency market, particularly Bitcoin's price movements, have the potential to have an impact on traditional financial markets. This implication is important for investors and policymakers to consider the development of crypto assets as one of the external factors that can affect the stock valuation of mining companies in Indonesia.

SUGGESTION

Based on the results of the research, there are several suggestions that can be given. For investors, it is important to pay attention to the relationship between the price of Bitcoin and the performance of mining stocks, especially ANTM, so that the movement of Bitcoin can be used as an additional indicator in investment decision-making. For mining companies, ANTM and TINS need to be

aware of the potential indirect impact of crypto market dynamics on their stock prices, where ANTM can leverage its exposure to strategic metals relevant to blockchain technology, while TINS can consider diversifying commodities. For regulators, more attention is needed to the increasing interconnectedness between the crypto market and the traditional stock market, so that appropriate policies and oversight can minimize the risk of volatility. In addition, further research is suggested to expand the object of study to other companies and commodities and use more complex econometric models so that the results obtained are more comprehensive and robust.

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