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# Factors Determining the Price of Banking Stocks: The Role of Sentiment, Volatility, Trading Volume, and Exchange Rate

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**Abstract**

This study analyzes the influence of investor sentiment, trading volume, volatility, and exchange rate on banking stock prices in Indonesia. Using a mixed qualitative and quantitative approach, this study analyzed 1,245 comments of mobile banking application users through text mining using the Naïve Bayes algorithm, combined with secondary data from the IDX and BI for the 2020-2024 period. The results of multiple linear regression showed that simultaneously all variables had a significant effect (F test, p=0.000), but only partially volatility (0.099, p<0.05), trading volume (0.215, p<0.05), and exchange rate (1.004, p<0.05) were significant, while positive and negative sentiment were insignificant. This model is able to explain the 25.59% variation in stock price ($R^2$=0.2559), indicating the presence of other factors that are more dominant. These findings are consistent with the literature that in emerging markets such as Indonesia, fundamental and macroeconomic factors are more influential than investor sentiment in determining the price of banking stocks. This research provides important implications for investors and regulators in investment decision-making and market stabilization policy formulation.

**Keywords:** stock price; investor sentiment; trading volume; volatility; exchange rate

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## Introduction

The world of the stock market is still an interesting and challenging study for some experts in certain fields. The stock market is volatile due to its dynamic stock prices and continues to change (Maqbool et al., 2023). The market is influenced by several things, such as: economy, policy, people, and *psychological* factors (Pang et al., 2020). Therefore, external and internal factors such as information or finance must be considered. In the controversial study, *the Efficient Market Hypothesis* (EMH) assumes that all relevant information describes the price in the market (Neifar & Gharbi, 2022; Peón et al., 2019; Fama, 1970), and new information with random patterns can also affect the stock market value (Shilpa & Shambhavi, 2021).

The current dissemination of information is carried out digitally and instantly to stock market participants. Based on the Digital 2022 October Global Statshot Report, social media is a forum for disseminating information, with the number of world users reaching 4.74 billion people in October 2022. This information can be used as a signal for investors to make decisions (Fedorova et al., 2022). However, many individual investors are not yet able to determine the fundamental value of information they are considered to be inclined to overreact in a bull or bearish market related to stock market liquidity and market participants' expectations (Liu et al., 2023 ; Kim et al., 2022 ; Shah & Albaity, 2022; Fernandes et al., 2016). And it is claimed that they do not have a high level of individualism and

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tolerance for the uncertainty of information so that they are susceptible to sentiment (Liu et al., 2023) Therefore, estimating the accuracy of positive and negative sentiments from information is important in portfolio management and investment decisions (Sapkota, 2022)

In addition to investor sentiment, there are other indicators that need to be considered, namely volume, volatility and exchange rates. In (Souza & Martins, 2022 ; Nasseri & Ali, 2018; Behrendt & Schmidt, 2018) stating that a high sentiment value will have an impact on the volume of trade. Widespread investor sentiment will have an impact on stock price volatility. Major issues will cause panic and show extreme volatility (Gong et al., 2022 ; Da et al., 2015). Stock market volatility is basically related to several applications in financial markets such as asset pricing, hedging strategies and financial risk management (Song et al., 2023). In addition, according to (Abdelhedi & Abbes, 2020) investor sentiment related to fear, panic, and optimism depends on stock prices, especially during times of high volatility. The rupiah exchange rate is one of the macroeconomic factors that can affect the condition of a country's stock market. In addition, currency exchange rates can also affect the Company's performance, especially companies that have exposure to foreign currencies, so exchange rate fluctuations will affect fluctuations in the stock price of a Company (Aditya et al., 2024)

Indonesia is known as an irrational market and has a high panic of sentiment that often leads to significant stock price volatility. Some sentiment also affects the movement of stocks in Indonesia. Based on historical data on JCI movements in 2018-2024, they are 6,194, 6,299, 5,979, 6,581, 6,850, 7,272, 7,360. Issues related to the 2019 presidential election made the JCI strengthen compared to the previous year. Then in 2020 the Covid-19 pandemic became the main issue, causing a significant decline in the JCI and affecting almost all sectors. In 2021, the Covid-19 vaccination program is one of the efforts to handle the spread of the Covid-19 virus and increase the number of investors. In 2024, the JCI will touch an all-time high. Departing from this phenomenon, it is important to understand how certain sentiments affect stock prices as well as the factors that strengthen or dampen the impact of that sentiment. In addition, this study will also explore the role of retail investors in increasing stock prices and the effectiveness of policies implemented in mitigating the impact of negative sentiment.

The researcher also identified the importance of sentiment analysis on stock prices in the banking sector for further analysis. Considering that the financial sector can increase economic growth through financial services that are needed in the future (Shah & Albaity, 2022) In addition, there is a very strong relationship with financial growth with the consensus that if a country has good development in its financial sector, it contributes to economic growth (Ibrahim & Alagidede, 2018) While (Baker & Wurgler, 2007) states that future cash flows and investment risks are influenced by investor sentiment. In the study (Di et al., 2021) stated that investor sentiment affects the stock price of the dual-banking industry in several Islamic countries.

Financial sentiment analysis is related to informed decision-making including through unstructured data such as comments, social media, blogs, news, emails, and others (Kejriwal et al., 2022) Therefore, we take advantage of technological developments, namely Machine Learning (ML) through the Text Mining stage to extract real time information. Therefore, analyzing the relationship between user review sentiment, volatility, trading volume, and exchange rates to the price of banking stocks is the main focus of this article.

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**Literature Review**

Basically, sentiment analysis is used in the discovery of information contained in text and has positive, negative, and neutral values. The Naïve Bayes algorithm can classify sentiments into a form of feelings such as belief, fear, criticism, suggestions, and so on. So this can affect the psychology of investors in the stock market. Previous literature studies have discussed how investor sentiment influences asset prices (Ljungqvist et al., 2018 ; Lemmon & Portniaguina, 2006), stock returns (Neal & Wheatley, 1998) stock market returns (Brown & Cliff, 2004 ; Fisher & Statman, 2000), stock market liquidity (Liu, 2015) Previous literature studies have highlighted that financial news sentiment and stock prices have a very significant relationship (Maqbool et al., 2023 ; Liu et al., 2022). Stuart (Jena & Majhi, 2023 ; Chen & Chen, 2022). Finding sentiment on Twitter affects the stock prices of several sectors and the high percentage of Twitter usage in the US. Sentiment analysis can also be used in predicting stock price movements (Derakhshan & Beigy, 2019)

Furthermore (Teti et al., 2019) in their findings show that social media, especially Twitter, has a strong statistical relationship with stock prices, and prediction markets can collect decentralized information more effectively than alternative sources. Then the study (Ho et al., 2017) used a sample from Yahoo! Finance to prove the relationship between media sentiment at a time and market returns had the same performance as Fama-French factor and momentum (Nguyen et al., 2015) using 18 companies in one year highlighted that social media sentiment has a performance of 2.07% better than historical prices. It is more interesting when the model is used on stocks that are difficult to predict, to have an accuracy of 9.83%, which is better than the historical price method and better than the human sentiment method. In addition, the study (Liu et al., 2022) also contributes to sentiment in the form of external anxiety that can significantly affect the synergy of stock prices and investor sentiment. However, in a certain period, sentiment and stock prices become positive, neutral, or even negative in the combined effect of positive and negative signals.

According to (Ghosh et al., 2021) overall market sentiment affects a company's stock price and describes the economic, social, and political environment. In addition, the relationship between market sentiment and the sectoral outlook will be stronger in the long run. Sentiment analysis from online surveys can also be used to analyze stock price behavior and support predictions of company performance (Wojarnik, 2021). The article (Maqsood et al., 2020) makes stock prediction an important aspect in the form of global and local events of the investment plan. The study used 11.42 million tweets as sentiment analysis for each event in the US, Hong Kong, Turkey, and Pakistan. The result is that not all major events have a serious effect on the exchange's predictions, while local events of an important nature have an effect on the prediction algorithm. In this study, the US election has an influence on the stock market in several countries. The research (Eliacik & Erdogan, 2018) stated that the sentiment analysis method was effective in finding the polarity of community sentiment among Turkish stock market bloggers. In addition, according to (Souza & Martins, 2022) the volume of daily tweets with negative timing has a positive relationship with trading volume in the market. (Mao et al., 2012) in their research stated that the number of daily tweets in the financial sector has a strong relationship with daily trading volume.

In addition, volatility is also one of the factors that can affect stock price movements. This indicates an increase or decrease in prices in the short term. (Robiyanto, 2018). Stock price volatility is also a standard for assessing investment performance (Safrani & Kusumawati, 2022) If there is an increase in

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stock price volatility, then the stock price will also experience large fluctuations. In this case, high volatility highlights unusual demand and supply characteristics. This volatility is caused by the existence of new information that enters the stock market or stock market. As a result, market participants reassess the assets they trade. In efficient market conditions, market prices will adjust quickly so that this reflect information (Wati & Puspitaningtyas, 2023).

The performance of a stock can also be measured by its trading volume. The more often the stock is traded, stating that it is active and in demand by investors. Stock trading volume is also used as one of the measuring tools for stock performance. The higher the frequency of stock trading, the more it reflects that the stock is active and has an attraction for investors. Trading volume is also often used as an indicator to analyze information and assess the impact of various events that occur. This is also closely related to the acquisition of profits, which motivates a person to invest in stocks. Fluctuations in stock trading volumes also reflect changes in investor expectations, and these dynamics also reflect investment activity on the exchange. In addition, trading volume is also used as a reference to examine information and its impact from various market conditions (Wati & Puspitaningtyas, 2023).

The uncertainty of economic growth due to Covid-19 has also caused sharp fluctuations and even a decline in stock prices, mainly triggered by the weakening of the exchange rate as a result of the lockdown policy that has hampered export activities. In a situation full of uncertainty, investors will tend to be held back, regional closures, policy restrictions, and quarantines have also disrupted the smooth flow of the supply chain. Although the adverse impact of the pandemic may have subsided, the potential threat may reappear in the event of a surge in new cases (Thorbecke, 2021). The depreciation of the local currency is expected to have a negative impact on domestic prices and import costs. The Company's competitiveness is highly dependent on its exposure to exchange rate fluctuations that affect the Company's input and output prices. When there is an appreciation of the value of the currency, the competitiveness of exporters decreases in the global market, which has an impact on a decrease in sales or profits, and also affects a decrease in the Company's share price (Tampubolon & Abbas, 2002).

## Methods

This research uses a mixed approach, namely qualitative and quantitative. At the qualitative stage, the analysis was carried out using *content analysis* techniques on comments from BCA, BRI, and BNI mobile banking application users on the Google Play Store, to identify emerging sentiments. Investor sentiment, according to (Long et al., 1990) is an opinion or belief that is influenced by emotions related to cash flow and future investment risks, which can be optimistic or pessimistic.

Generally, sentiment analysis is done automatically using methods such as *Support Vector Machine*, *Naïve Bayes*, or *Lexalytics* (Sari et al., 2023) to understand the meaning in comments more accurately. The results of *the content analysis* are then converted into numerical data to be analyzed quantitatively using multiple linear regression, to test the relationship between sentiment and stock movements.

The unit of analysis includes stock prices, trading volume, stock volatility, USD/IDR exchange rates, as well as user comments during the period January 2020 to December 2024. The data used is secondary data obtained from the Indonesia Stock Exchange and Bank Indonesia. The population of this study is banks that have mobile banking applications, and sampling is carried out purposively based on the availability of complete financial data. The analysis was carried out by performing multiple linear

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regression tests. Multiple linear regression models are used to test the relationships between variables, according to the approach used by (Gujarati & Porter, 2013)

The regression equations in this study are as follows:

**Y = a+b1X1positive + b1X1negative +b2X2 +b3X3 +b4X4 +ei**

Information:

| | |
|---|---|
| Y | = Stock Price |
| a | = konstanta |
| b1-b4 | = Regression Line Coefficient |
| ei | = Standard Error |
| X1positif | = Sentiment positive |
| X1negatif | = Sentiment negative |
| X2 | = Volatility |
| X3 | = Trading Volume |
| X4 | = Exchange Rate |

A stock price is the value or price of a share that is traded on the capital market at a certain time. The price of these stocks is greatly influenced by the demand and supply in the market, which in turn is influenced by various external and internal factors such as economic conditions, company performance, government policy decisions, and market sentiment. Data related to stock prices can be accessed via the web (www.idx.co.id).

Sentiment Analysis is done using the Naïve Bayes Algorithm on Python as a research technique. This study has data taken using the Web Scrapping method on the BCA Mobile, BRI Mobile and BNI mobile pages on the Google Play Store from January 2020 to December 2024. Review data with ratings or scores of 1 and 2 will be labeled Negative, while review data with ratings 4 and 5 will be labeled Positive.

Stock price volatility is the upward or downward movement of stock prices on the Indonesia Stock Exchange. Stock price volatility is obtained from the company's share price obtained on the official website of the Indonesia Stock Exchange (www.idx.co.id) which is calculated using the Parkinson's extreme value method. The volatility of the stock price is expressed in the form of a percentage. The volatility of stock prices is calculated using the extreme value method, the calculation formula is as follows (Tandelilin, 2010)

PV = Hit − Lit (Hit+Lit)/2

Information:

PV = Price Volatility

Hit = Highest share price for a company i in the period t

Lit = Lowest share price for a company i in the period t

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Stock trading volume refers to the number of shares traded in a given period of time in the capital market, both bought and sold. These volumes are often used as an indicator of market liquidity and can provide important information regarding market sentiment, investor activity, or potential changes in stock prices. Data related to stock trading volume can be accessed via the web (www.idx.co.id).

The exchange rate is the price of one currency against another, which indicates how much one unit of foreign currency can be exchanged for a domestic currency. Exchange rate data in this study was obtained from the official website of Bank Indonesia (www.bi.go.id), which provides daily reference rates based on interbank foreign exchange market transactions. The exchange rate used is expressed in United States Dollar (USD) against Rupiah (IDR) currency units. The calculation of the central exchange rate refers to the method used by Bank Indonesia, namely:

$$mid - rate = \frac{selling\ rate + bid\ rate}{2}$$

## Results and Discussion

### Fixed Effects Regression Results

Table 1: Fixed Effects Regression Results

| Variable | Coefficient | Std. Error | t-Statistic | P-Value | [95% Confidence Interval] |
|---|---|---|---|---|---|
| X1positive | -0.000898 | 0.002478 | -0.36 | 0.717 | [-0.00579, 0.003994] |
| X1negative | -0.001798 | 0.002443 | -0.74 | 0.463 | [-0.00662, 0.003025] |
| VolatilityX2 | 0.0988518 | 0.0282 | 3.51 | 0.001 | [0.0431891, 0.1545145] |
| VolumeX3 | 0.2151126 | 0.0631047 | 3.41 | 0.001 | [0.0905533, 0.3396719] |
| KursX4 | 1.037347 | 0.1452046 | 7.14 | 0.000 | [0.7507347, 1.32396] |
| Constant | -6.637973 | 1.407708 | -4.72 | 0.000 | [-9.41658, -3.859366] |

model summary:
- Number of Observations : 180
- Number of Groups : 3
- Observations per Group: Min = 60, Max = 60, Avg = 60
- R-squared (Within) : 0.5137
- R-squared (Between) : 0.1119
- R-squared (Overall) : 0.2559
- Corr(u_i, Xb) : 0.0425
- F(5, 172) = 36.33, Prob > F = 0.0000

Variance components:
- sigma_u = 0.15778979
- sigma_e = 0.07480894
- rho = 0.8164761 (fraction of variance due to u_i)

F test (u_i = 0):
- F(2, 172) = 196.05, Prob > F = 0.0000

From the regression results, the following equations were obtained:

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Stock price = -6,637973 - 0,0000898X1positive - 0,001798X1negative + 0,0988518X2 + 0,2151126X3 + 1,0037347X4 + ei

The results of the F Test show a probability value of 0.000 (< 0.05), which means that all independent variables (positive sentiment, negative sentiment, volatility, trading volume, and exchange rate) together (simultaneously) have a significant effect on the stock price. This is in line with several previous research (Maqbool et al., 2023) and Pang et al., 2020) stating that the stock market is influenced by the interaction of various factors, including market psychology (sentiment), liquidity (volume), risk (volatility), and macroeconomic conditions (exchange rates).

Found that in emerging markets like Indonesia (Shah & Albaity, 2022), external factors (such as exchange rates) and internal factors (such as trading volume) often have a strong combined influence on stock prices (Fama, 1970). The Efficient Market Hypothesis (EMH) explains that although new information (including sentiment) affects the market, the impact often depends on supporting factors such as volume and volatility.

The R-Square value of 25.59% indicates that the independent variables in this model are able to explain 25.59% of the stock price variation, while the remaining 74.41% is influenced by other factors not included in the model. (Ghosh et al., 2021) states that non-quantitative factors (such as government policies, geopolitics, or unmeasured media sentiment) also play a big role in stock movements. (Peón et al., 2019) in the Efficient Market Hypothesis (EMH) study explained that stock prices are influenced by many random variables that are difficult to predict completely. (Wojarnik, 2021) found that textual analysis (such as sentiment) explains only a small part of stock movements, while fundamental factors are more dominant.

Positive sentiment has a negative but not significant effect on the stock price (-0.0000898; p=0.717). These findings are in line with several previous studies that have stated that investor sentiment does not always have a direct impact on stock prices, especially if the market has anticipated positive information (Liu et al., 2023; Maqbool et al., 2023) In addition, (Neifar & Gharbi, 2022) and (Fama, 1970) within the framework *of the Efficient Market Hypothesis (EMH)* explain that positive information may have been discounted in stock prices before it became widespread, so that market reactions became insignificant. (Sapkota, 2022) also emphasized that the accuracy of sentiment in predicting stock prices depends on the market context and time, so insignificant results can occur when sentiment is not followed by fundamental changes.

Negative sentiment also showed a negative but insignificant effect (-0.001798; p=0.463). These results are consistent with research (Shah & Albaity, 2022), which found that investors in emerging markets like Indonesia tend to overreact to negative sentiment, but the effects are not always long-lasting. (Da et al., 2015) and (Gong et al., 2022) state that negative sentiment (such as panic) often creates short-term volatility, but does not always structurally change stock price trends. Additionally, (Kim et al., 2022) argue that investors with a high risk tolerance may ignore negative sentiment if they are deemed irrelevant to the company's fundamental prospects.

Volatility has a positive and significant effect on the stock price (0.0988518; p<0.05). This result is in line with (Robiyanto, 2018), which states that volatility reflects market dynamics, where price fluctuations can attract short-term traders. (Song et al., 2023) added that volatility is related to asset pricing and risk management, so the market may value stocks with high volatility as arbitrage opportunities. However, (Abdelhedi & Abbes, 2020) warn that extreme volatility can be an indicator of uncertainty, even if in the short term it actually increases trading activity.

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Trading volume has a positive and significant influence on the stock price (0.2151126; p<0.05). These findings are supported by (Souza & Martins, 2022) and (Nasseri & Ali, 2018), which state that high volumes reflect liquidity and investor interest, thus driving price increases. (Mao et al., 2012) also found a strong correlation between social media activity (as a proxy for sentiment) and trading volume, where an increase in volume is often followed by stock price appreciation. In addition, (Wati & Puspitaningtyas, 2023) explained that high trading volume indicates positive investor expectations for stock performance.

The exchange rate (exchange rate) has a positive and very significant influence on the stock price (1.0037347; p<0.05). These findings are consistent with (Aditya et al., 2024), which states that the depreciation of the rupiah against the US dollar increases the share price of companies with export exposure. (Thorbecke, 2021) Also found that exchange rate uncertainty during the COVID-19 pandemic significantly affected stock prices. In addition, (Tampubolon & Abbas, 2002) explained that foreign currency appreciation can increase the competitiveness of companies, thus having a positive impact on stock prices.

## Conclusions

Based on an empirical analysis of the factors that determine the price of banking stocks in Indonesia, this study concludes several crucial findings. First, the results of multiple linear regression analysis revealed that the variables of volatility, trading volume, and exchange rate statistically showed a significant influence on the price of banking stocks, with a significance level below 0.05. These findings are consistent with efficient market theory which states that fundamental and macroeconomic factors play a dominant role in determining stock prices. Second, contrary to initial hypotheses, both positive and negative investor sentiment variables do not show significant influence, a phenomenon that can be explained through the lens of behavioral finance where the market may have anticipated and accommodated sentiment information before it became widespread. Third, the value of the determination coefficient ($R^2$) of 0.2559 indicates that this research model is able to explain about 25.59% of stock price variations, while the remaining 74.41% is explained by factors other than the model. These findings have significant practical implications for stakeholders. For investors, the results of the study confirm the importance of considering macroeconomic indicators and trading volumes in investment decision-making. For regulators, these findings can be a reference in formulating more effective market stabilization policies.

The statistically significant effects of volatility, trading volume, and exchange rates provide a foundation for investors, analysts, and policymakers to develop a more comprehensive understanding in the context of informed decision-making. Interestingly, the absence of a significant effect from investor sentiment, regardless of its polarity, raises questions that may be explored further, possibly stemming from measurement constraints, market response delays, or other systemic influences.

The limitations of this study lie in the scope of variables that have not included micro factors such as the company's financial performance and external factors such as global geopolitical conditions. Therefore, further research is recommended to expand the scope of variables and use more comprehensive analytical approaches, such as VAR analysis or machine learning, to gain a more holistic understanding of the dynamics of banking stock prices in Indonesia.

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