



Rational and Irrational Factors Influencing Bank Stock Prices: GMM Approach

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In the dynamic and volatile capital market, understanding the factors that influence stock prices is essential for making informed investment decisions. Stock price movements are influenced by rational, fundamental information, irrational investor behavior, and sentiment. This study aims to analyze the influence of rational and irrational factors on stock prices in the Indonesian banking sector during the 2020-2024 period. The rational variables include price-to-book value (PBV), financial literacy, technology adoption, and interest rates, while irrational influence is represented by investor sentiment or mood. Using a dynamic panel data approach with the Generalized Method of Moments (GMM), this study examines four major Indonesian banks: Bank Mandiri, BNI, BRI, and BCA. The results show that PBV, financial literacy, and technology adoption significantly affect stock prices, while interest rates have a significant negative effect. Additionally, investor sentiment has a considerable positive impact, indicating that emotional and psychological factors can drive stock price movements beyond fundamental valuation. This research presents a novel analytical model that integrates rational and irrational perspectives, offering a comprehensive understanding of stock price volatility in emerging markets. It suggests that investors, companies, and policymakers must consider both fundamental indicators and market sentiment simultaneously to make accurate, timely investment decisions.

INTRODUCTION

In the context of the financial system, a company's published stock price reflects an assessment of its prospects and performance that can attract investor interest. High stock prices indicate high company value and shareholder prosperity (Bintara, 2018). In the financial market, stock price movements are of concern to investors. The efficient market hypothesis theory states that stock prices comprehensively reflect all available information (Qurani, 2022). Stock price movements are not solely determined by rational factors, such as financial fundamentals, but are also influenced by irrational factors, including investor sentiment and behavioral bias (Mahirun, 2023). According to Hasmirati & Akuba (2020), stock price dynamics are influenced by several factors, including the company's financial performance and overall market perception. Therefore, investors need to understand these factors and perform financial analysis to support investment decision-making (Nufus *et al.*, 2020). The stock market presents opportunities for profit and risk for investors (Khan & Ullah Jan, 2022). The stock market is a complex, computerized financial system where price movements serve as a crucial reference for predictions by both individuals and institutions (Firmansyah *et al.*, 2024). Price volatility refers to the magnitude of price movements and the risk of sudden, significant price changes, which can escalate into broader social risks (Shubaita & Mar'i, 2022).

Rational factors, grounded in economic fundamentals and logical decision-making, play an essential role in shaping stock price fluctuations. Macroeconomic indicators, such as GDP growth, inflation, and unemployment rates, provide an overview of the economic environment and corporate prospects (Li *et al.*, 2022). Changes in macroeconomic variables and exchange rates significantly affect stock market volatility (Mahirun, 2023). Investors use these indicators as a basis for rational analysis in determining asset allocation and trading strategies that ultimately affect stock prices (Danarti *et al.*, 2020a). In addition, financial information such as company earnings reports, dividend announcements, and merger and acquisition news is essential for evaluating company performance and strategic direction. In this case, the efficient market hypothesis, which states that stock prices reflect all available information, becomes the theoretical basis for understanding how rational factors influence stock prices (Raza *et al.*, 2023). Data from the Indonesia Stock Exchange (IDX) and websites such as Yahoo Finance and Stock Analysis indicate that net profits at Bank Mandiri, Bank Negara Indonesia, Bank Rakyat Indonesia, and Bank BCA increased from 2020 to 2024. Increased net profits can strengthen investor confidence, which may drive stock prices and generate higher returns.

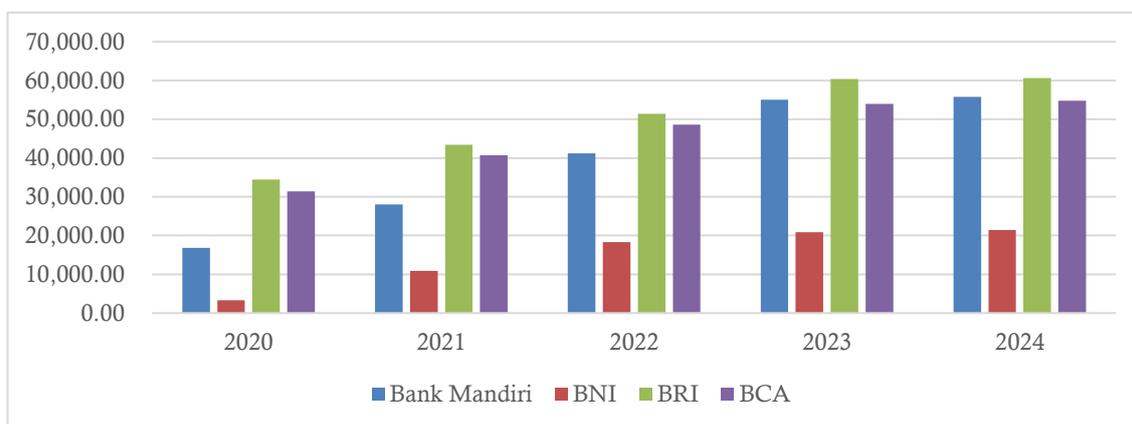


Figure 1. Net Profit of Bank Mandiri, BNI, BRI, and BCA in 2020-2024 (In Trillions of Rupiah)
Source: Indonesia Stock Exchange (2025)

Bank Mandiri, BNI, BRI, and BCA experienced a significant increase from 2021 to 2024, driven by their ability to adapt during the COVID-19 pandemic by maintaining asset quality and implementing structural improvements. However, in 2020, banks faced pressure from the COVID-19 pandemic. Sustainable profit growth occurred alongside the

recovery of the national economy and increasingly controlled internal efficiency. This increase in net profit is also directly proportional to stock price movements. Figure 2 shows that in 2020, the four banks experienced a price decline due to the COVID-19 pandemic. From 2021 to 2022, the market gradually recovered alongside the national economy. In 2023, stock prices

increased, supported by higher profits in the banking sector and an improving macroeconomic environment. In 2024, stock

prices continued to rise, although there was a significant correction, except for BNI and BRI.

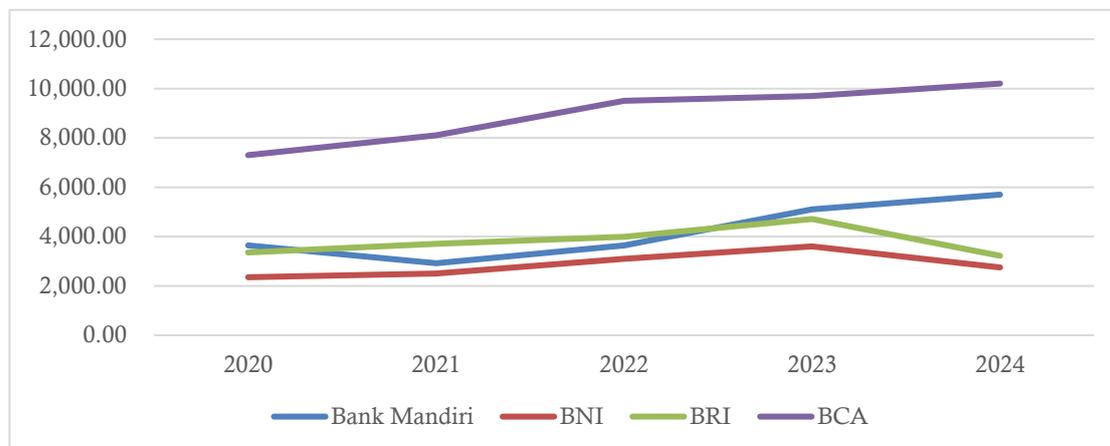


Figure 2. Stock Price Movements of Bank Mandiri, BNI, BRI, and BCA in 2020-2024
Source: Indonesia Stock Exchange (2025)

Although rational factors provide a strong basis for understanding stock price movements, irrational factors stemming from psychological biases, emotional responses, and herd behavior must also be considered. The behavioral finance approach provides an in-depth understanding of how these factors can cause market prices to deviate from their fundamental values. In practice, investors do not always act rationally. Psychological aspects and biases in the decision-making process significantly impact stock price movements (Moodley *et al.*, 2025). For example, cognitive biases, such as the anchoring effect, confirmation bias, and the availability heuristic, can distort investors' perceptions of risk and return, leading them to make suboptimal investment decisions. Emotional factors such as fear, greed, and overconfidence can increase volatility, as investors tend to be impulsive in response to certain news and events (Hassan *et al.*, 2023). Following the majority, or herd behavior, can create market dynamics that lead to price instability (Ghufran *et al.*, 2016). Meanwhile, overconfidence bias is closely related to excessive self-confidence, which drives speculative behavior and trading activity, thereby exacerbating market volatility (Urooj *et al.*, 2019). Therefore, investor sentiment is an essential factor to analyze, as investor perceptions of the stock market are often irrational and may not reflect objective

information, including expectations of future values.

The complex relationship between rational and irrational factors is important in determining stock price volatility, ultimately shaping financial market behavior and creating opportunities and challenges for investors and policymakers. Rational factors, including objectively measurable variables such as the price-to-book value ratio, financial literacy technology adoption, and interest rates, theoretically underpin investment decision-making (Ma *et al.*, 2017). PBV is a fundamental indicator used to assess whether a stock is undervalued or overvalued, thus affecting investor perceptions and trading activities (Assagaf & Kartikasari, 2019). Meanwhile, financial literacy refers to the ability to understand basic financial principles and concepts that help investors make informed decisions, assess risks objectively, and allocate capital efficiently, thereby affecting stock market prices (Obeng, 2019). On the other hand, technological advances in the financial sector, such as algorithmic trading and high-frequency transactions, accelerate the dissemination of information and increase trading efficiency. However, they can increase stock price volatility by triggering rapid market reactions and automated responses to various events (Danarti *et al.*, 2020). Interest rates, as a macroeconomic indicator, are important in determining the cost

of capital and investment direction. An increase in interest rates can weaken investment and lower stock valuations, while a reduction in interest rates can encourage lending and investment activity, thereby increasing stock prices (Li *et al.*, 2022). Furthermore, positive investor sentiment increases demand for stocks, while negative sentiment triggers sales and price declines. Market sentiment is related to mood sentiment, reflecting the emotional state and psychological attitude of investors toward the stock market (Laras & Tjahjono, 2021).

Although studies on stock price dynamics have developed rapidly, most previous studies tend to analyze rational factors, such as valuation ratios, macroeconomic indicators, and company fundamentals, and irrational factors, such as investor sentiment and behavioral biases, separately. Empirical research that integrates these two perspectives within a dynamic analytical framework remains relatively limited, particularly in the context of emerging markets such as Indonesia. Furthermore, many previous studies use estimation approaches that are less able to capture the persistence of stock prices over time and the potential endogeneity between market behavior and company characteristics. On the other hand, empirical measurements of irrational factors, such as investor sentiment and financial literacy, also have limitations and are not yet standardized in the literature. Based on these research gaps, this study uses an exploratory empirical approach by posing the following research questions: (1) How are rational factors, including price-to-book value, financial literacy, technology adoption, and interest rates, related to stock price dynamics in the banking sector in Indonesia? (2) How is investor sentiment, as an irrational factor, related to bank stock price movements in Indonesia? (3) To what extent do rational and irrational factors simultaneously shape stock price behavior when dynamic interactions and potential endogeneity are taken into account in the analysis?

RESEARCH METHODS

The research is a quantitative study using secondary data from 2020 to 2024. The samples in this study are Bank Mandiri (BMRI), Bank Negara Indonesia (BBNI), Bank Rakyat Indonesia (BBRI), and Bank Central Asia (BBCA) in Indonesia. Although the cross-sectional sample in this study is relatively small ($N = 4$), the selection focuses on the four banks with the largest market capitalization and dominant systemic roles in the Indonesian banking sector: Bank Mandiri, BNI, BRI, and BCA. These four banks consistently represent the majority of assets, profits, and stock trading volume in the banking sector, so their stock price dynamics reflect the core behavior of the national banking market. In this context, the objective of this research is not to generalize across sectors but rather to analyze stock price dynamics in depth over time. With a relatively longer time dimension than the cross-sectional dimension ($T > N$), a dynamic panel approach becomes relevant for capturing stock price persistence and its adjustment process over time. Data were obtained from the companies' annual and financial reports, the Otoritas Jasa Keuangan (OJK), and the Indonesia Stock Exchange (IDX) website. Data analysis uses the Generalized Method of Moments (GMM). The Generalized Method of Moments (GMM) estimation is used cautiously as a robustness-oriented approach, with an instrument restriction strategy to avoid instrument proliferation and ensure the validity of the estimates despite the limited number of cross-sectional units (Firmansyah *et al.*, 2025). The Generalized Method of Moments (GMM) in this study aims to capture stock price persistence and address potential endogeneity between variables, which cannot be adequately handled by estimation methods such as Fixed Effects, which can introduce bias.

To maintain robustness of estimation with small N , this study employs a parsimonious instrument strategy by limiting the number of instrument lags and avoiding instrument proliferation. The number of instruments is kept below the number of cross-sectional units.

Furthermore, only variables that are theoretically potentially endogenous are treated as endogenous, while other variables are assumed to be exogenous or predetermined. The validity and robustness of GMM estimates are evaluated using standard post-estimation diagnostics, including the Arellano–Bond autocorrelation test and the Sargan test to assess overidentification. Two models can be used to analyze dynamic panel data: First Difference GMM (FD-GMM) and System GMM (Sys-GMM). The GMM estimation model in this study is as follows:

$$SP_{it} = \alpha + \beta_1 PBV_{it} + \beta_2 FL_{it} + \beta_3 TECH_{it} + \beta_4 INTR_{it} + \beta_5 SENT_{it} + \varepsilon_{it} \dots\dots\dots (1)$$

Where SP_{it} denotes the Stock Price of the company i in year t , representing the market valuation of the firm. PBV stands for Price-to-Book Value, which measures a company’s fundamental performance by comparing its market price per share to its book value per share. FL_{it} indicates the Financial Literacy, which reflects an investor’s understanding and ability to make financial decisions. $TECH_{it}$ represents Technology Adoption, which measures the implementation of digital and technological innovations in financial and investment activities. $INTR_{it}$ stands for Interest Rate, which influences investor risk and portfolio allocation decisions across financial assets. $SENT_{it}$ stands for Sentiment Investor, which captures investors' optimistic or pessimistic attitudes toward market conditions, as reflected in stock trading behavior. α denotes the Constanta term, β_1, β_5 represent the estimated coefficient, and ε_{it} refers to the Error term. Sentiment is operationalized using market-based proxies that reflect aggregate investor optimism and pessimism, as reflected in trading behavior. Sentiment is measured using a composite index derived from observable market indicators, including trading volume growth, stock return volatility, and the market movement ratio. High index values indicate optimism, while lower values reflect pessimistic market conditions.

The GMM model utilizes several evaluation criteria, such as the Sargan and Arellano–Bond tests, to determine the most appropriate model specifications (Ginanjar *et al.*, 2020). In the

context of dynamic panel data, the estimator's consistency depends heavily on the validity of the instruments and the absence of second-order residual autocorrelation. The Arellano–Bond test is used to detect autocorrelation in the differenced residuals, whereas the Sargan test assesses the validity of the instruments used in the model. Both tests are important for evaluating the suitability of the GMM method, which addresses endogeneity through internal instrumentation. The advantage of the dynamic panel data approach lies in its ability to examine differences in characteristics across observation units and to exploit greater variation in the data. This helps reduce bias in cross-sectional regression models, resulting in more efficient estimates while minimizing multicollinearity (Shafiei *et al.*, 2023).

The rational factors examined in this study are price-to-book value (PBV), financial literacy, technology adoption, and interest rates. The price-to-book value (PBV) ratio is calculated by dividing the market price per share by the book value per share. This ratio can also be used to assess whether shares are overvalued or undervalued (Mahirun, 2023). The financial literacy variable can be measured using two approaches. The first is the macro approach, which uses the Otoritas Jasa Keuangan (OJK) financial literacy index to capture changes over time in market participants' financial knowledge and awareness. This indicator varies annually but is common to all firms within the same period. To introduce cross-sectoral variation, a firm-level financial literacy proxy was developed based on annual report data, including investor education programs, the availability of financial information to investors, and transparency-related initiatives (Devender *et al.*, 2025). The indicators used include the existence of investor education programs, the level of financial information transparency, and the company's involvement in financial literacy and inclusion activities. The financial literacy variable was obtained by averaging the components of the macro- and company-level indices, which were standardized using the z-score method so that each element had equal weight within the financial literacy construct.

The indicator for the technology adoption variable is the implementation of digital technologies in the company's operations, such as digital banking and online trading platforms. In addition, the number of digital service features available and the company's digital maturity index can serve as additional indicators and alternative measures. The interest rate variable can be measured using the BI 7-Day Reverse Repo Rate (BI-7DRR) as a macroeconomic indicator that affects stock valuation (González et al., 2016). Furthermore, the investor sentiment variable, as an irrational factor, is operationalized using market-based proxies indicated by observable trading behavior. The investor sentiment index is constructed from two indicators: stock trading volume growth, which reflects investor intensity and enthusiasm in transactions, and stock price volatility, which

reflects the level of uncertainty and the market's emotional reaction to information. These indicators reflect investor optimism or pessimism (Prasad et al., 2022). Each indicator is first calculated at the company and annual level and then standardized using the z-score method to eliminate scale differences. The investor sentiment index is computed as the simple average of the two standardized indicators, with each component given equal weight in the aggregate sentiment measure.

Meanwhile, the stock price variable is measured through the closing price of shares at the end of the year for each issuer (closing price). The average monthly price can also be used to track stock price fluctuations accurately. These data are obtained from the Indonesia Stock Exchange (IDX) or other capital market platforms (Qurani, 2022).

Table 1. Variable Definitions

Variable	Symbol	Indicator
Stock Price	SP	The closing price of shares at the end of the year for each issuer (closing price)
Price to Book Value	PBV	Comparing the market price per share to the book value per share obtained from the ratio between the closing share price and the equity value per share.
Financial Literacy	FL	The macro approach is through the financial literacy index, and the micro approach is through the company's involvement in providing financial education, transparency of financial information, and investor involvement in the stock market.
Technology Adoption	TECH	Implementation of the use of digital technology in the company's operations
Interest Rate	INTR	BI 7-Day Reverse Repo Rate (BI-7DRR) as a macroeconomic indicator
Investor Sentiment	SENT	Composite index based on standardized market indicators, including trading volume growth and stock price volatility, reflecting aggregate investor optimism or pessimism

Source: Data Processed (2025)

RESULTS AND DISCUSSION

The estimation results show that the variable coefficients lie between those of the Pooled Least Squares (PLS) and Fixed Effect (FE) models, so the Fixed Effect approach is chosen as the more appropriate model—fixed-effect estimation controls for specific company characteristics that do not change over time. However, fixed-effect estimation is less appropriate in this context because stock prices exhibit dynamic persistence, suggesting that past values influence current prices. Under these

conditions, FE estimation, which includes lagged dependent variables, may lead to dynamic panel bias, especially when the time dimension is relatively short.

FE estimation cannot adequately address simultaneity and reverse causality, leading to biased and inconsistent coefficient estimates. Although the Fixed Effect results provide a helpful baseline, the fixed effect model is used as a benchmark specification. In contrast, the GMM model serves as the main estimation framework for inference.

This study aims to determine the most suitable modeling approach while accounting for potential endogeneity-related bias. For example, an increasing price-to-book value (PBV) ratio in companies with weak fundamentals can yield an insignificant negative relationship with stock prices. Likewise, in unexpected situations such as economic expansion, a surge in speculative investor sentiment can drive up stock prices regardless of a company's fundamentals, making it difficult to determine the actual influence of

financial literacy or interest rate variables. In addition, companies' use of technology can be a response to market dynamics rather than the result of planned strategic decisions. The absence of relevant variables in the comprehensive measurement of psychological factors and market information can lead to estimation bias, suggesting endogeneity. This presents a challenge in observing and controlling the factors that influence stock prices.

Table 2. POLS and Fixed Effect Estimation Result

Variable	POLS		Fixed Effect	
	Coefficient	P-Value	Coefficient	P-Value
SP	0.33572*	0.061	0.31465*	0.053
PBV	2.59177**	0.048	3.08279**	0.017
FL	2.25201	0.227	1.27513**	0.026
TECH	1.76031**	0.039	1.81321***	0.001
INTR	-1.82147	0.105	-1.64052**	0.044
SENT	0.66421*	0.063	0.74931**	0.038
F-statistic	32.918		35.245	
Prob > F	0.000		0.000	
R ²	0.7342		0.85773	
Durbin-Wu Hausman Test				
F	6.34		5.26	
Prob > F	0.0072		0.0213	

Notes: *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively

Pooled Least Squares (POLS) and Fixed Effects (FE) analyses provide an initial overview of the relationship between independent variables and stock prices. In general, POLS results indicate that price-to-book value, technology adoption, and investor sentiment are positively associated with stock prices. In contrast, interest rates are negatively associated, although not all coefficients are statistically significant. This approach assumes homogeneity across firms and ignores unobserved specific characteristics, potentially resulting in biased estimates.

In the Fixed Effects estimation, several coefficients are more significant and stable than in the POLS results, indicating that differences in each bank's specific characteristics play an important role in explaining stock price variations. However, given the persistence of stock prices over time and the possibility of bidirectional relationships between stock prices and certain independent variables, FE results still warrant caution. FE estimates with lagged dependent variables are potentially subject to dynamic panel bias, making them inadequate as a basis for primary inference.

Although fixed-effects estimation can control for unobserved heterogeneity, it is inadequate in this study given stock price dynamics and potential endogeneity. Stock prices are influenced by their past values, so including lagged dependent variables in a fixed-effects model can lead to biased estimates (dynamic panel bias). Furthermore, variables such as investor sentiment, financial literacy, and technology adoption may be endogenous because they can be influenced simultaneously by stock price movements. Therefore, to obtain more consistent and reliable estimates, this study uses the Generalized Method of Moments (GMM) approach, which addresses dynamic dependence and endogeneity through internal instruments.

In selecting an analysis model with the Generalized Method of Moments (GMM) approach, two methods can be used: Difference GMM (FDGMM) and System GMM (SYSGMM). The selection of these methods aims to determine which approach provides the most optimal model.

Table 3. First Difference and System GMM Estimation Result

Variable	FD-GMM		SYS-GMM	
	Coefficient	P-Value	Coefficient	P-Value
PBV	1.04553*	0.057	2.85401**	0.031
FL	1.72866	0.318	1.16783**	0.027
TECH	2.15402**	0.029	1.79211***	0.004
INTR	1.83954	0.115	-1.6203**	0.043
SENT	0.87241**	0.046	0.72415**	0.015
Arellano-Bond Test		Z	P-value	
M1		-1.7582	0.0458	
M2		-1.1436	0.1334	
Sargan Test		Chi-square	15.983	
		P-value	0.266	

Source: Data Processed (2025)

The GMM analysis met the criteria for selecting the best model statistically by evaluating the consistency of the estimates, the validity of the instruments, and the absence of bias. In the Arellano–Bond test, the M1 statistic is -1.7582, with a p-value of 0.0458, indicating significance. Meanwhile, the statistical value of the M2 statistic is -1.1436 ($p = 0.1334$), so it is not statistically significant. In the Sargan test, the test statistic is 15.983 with a p-value of 0.266. These results indicate that there is no correlation between the residuals and the overidentifying restrictions, suggesting that the instruments are valid in the SYS-GMM estimation.

Within a dynamic panel framework, FD-GMM and SYS-GMM estimation are used to capture persistent stock price behavior and adaptation to new information over time. FD-GMM eliminates firm fixed effects by first differencing, thus focusing on interperiod stock price changes. This approach is effective in reducing bias due to unobserved heterogeneity but can lose level information, especially when variables are persistent.

In contrast, SYS-GMM combines equations in differences and levels, thereby utilizing additional information and improving estimation efficiency, especially when the number of cross-sectional units is limited and variables exhibit high persistence, as in the case of stock prices. In this study, SYS-GMM yields more stable and consistent coefficients than FD-GMM and is supported by the Arellano–Bond and Sargan diagnostic tests, which meet instrument validity criteria. Therefore, SYS-GMM was chosen as the

primary estimation framework to interpret the dynamics of the relationship among rational and irrational factors and stock prices.

The PBV coefficient value against the stock price is 2.85401. The estimated coefficient for PBV is positive and statistically significant ($0.031 < 0.05$), indicating that higher PBV levels are associated with higher stock prices. This result reflects an empirical linkage between market valuation and stock price dynamics. Research by Njoku & Lee (2025) explains that PBV is an assessment indicator that reflects how the market values a company's net assets, which can indicate whether the stock is undervalued or overvalued. The stock price-to-PBV ratio is a guideline for investors in assessing potential companies, as it reflects the market's view of a company's intrinsic value and future growth prospects. A high PBV ratio indicates that investors are willing to pay more for the company's assets, given the potential for promising growth, brand strength, and competitive advantages. Conversely, a low PBV ratio indicates a decline in the company's assessment, financial difficulties, and a loss of investor confidence in the company's potential to generate profits from its assets (Mahirun, 2023). The relationship between the PBV ratio and stock prices includes company profits, which affect stock price movements, and net asset value, the main component in calculating the PBV. Therefore, this ratio is highly relevant for making accurate investment decisions (Hidayat *et al.*, 2021).

However, PBV is sometimes compiled based on historical costs that may not fully reflect

current market values, particularly for intangible assets such as intellectual property and brand reputation. This discrepancy can distort the PBV ratio, reducing its predictive accuracy for future stock performance. In addition, external factors such as market sentiment, investor expectations, and macroeconomic conditions can significantly affect stock prices, even when the company's book value remains unchanged (Soetjanto & Thamrin, 2020).

The coefficient for financial literacy on stock prices is 1.16783, with a p-value of $0.027 < 0.05$. The estimation results indicate that financial literacy is positively associated with stock prices, even after controlling for other factors. These results are supported by research by Mehmood *et al.* (2019), which shows that individuals with high financial literacy can analyze financial information effectively and make sound investment choices, thereby affecting stock market prices. Analyzing financial reports, understanding market trends, and assessing company performance enable investors to identify overvalued or undervalued stocks and make wiser trading decisions (Muñoz-Céspedes *et al.*, 2024).

The influence of financial literacy on stock prices is also related to broader economic conditions enabled by greater access to financial information. Investors with strong financial literacy can sort and evaluate relevant information, enabling sound decision-making through fundamental analysis (Molina-García *et al.*, 2025). Individuals with low financial literacy tend to face obstacles in managing their finances and participating effectively in the stock market. Therefore, efforts to improve financial literacy must be made by providing education and resources more evenly to the community (Devender *et al.*, 2025). Financial literacy policies implemented by regulators, such as the Financial Services Authority (OJK), need to be directed not only at expanding reach but also at improving investors' understanding of risk and asset valuation.

The coefficient for technology adoption on stock price is 1.79211, with a p-value of $0.004 < 0.05$. The estimation results show that technology adoption is positively correlated with

stock price movements, indicating an empirical relationship between digital transformation and market perception. This association may reflect improved efficiency and investor perception, although causality cannot be conclusively established. Technology adoption is not merely an implementation within the company but a determining factor in forming competitive advantage and market response. This creates a fundamental restructuring of organizational processes, business models, and value propositions, which helps readjust investor perceptions and affect stock market valuations (Liu *et al.*, 2024). Conversely, companies unwilling to adopt technology in their operations may struggle to keep up with rapidly evolving technological changes. This can lead to decreased revenue, loss of market share, and ultimately reduced stock valuations (Razali & Razak, 2023).

Companies that implement new technologies experience increased productivity, lower costs, and improved customer relations, resulting in higher profitability and investor confidence, which, in turn, raise stock prices (Sharma *et al.*, 2020). Promising technological innovations affect stock prices, depending on their implementation, integration, and effective use in the company's operations. In addition to implementing technology-based infrastructure, companies also need to provide learning and training for employees in support of digital transformation, focusing on empowering them to maximize the potential of new technologies (Yatna *et al.*, 2025). Financial sector digitalization policies need to be accompanied by transparency standards and technology governance so that technology adoption not only increases efficiency but also maintains market stability.

The coefficient value of the interest rate on stock prices is -1.6203. The interest rate coefficient is negative and statistically significant ($p\text{-value} = 0.043 < 0.05$), indicating that higher interest rates are associated with lower stock prices. Interest rates, which serve as fundamental macroeconomic variables, significantly influence investment policies, funding, and corporate financial decisions, thereby affecting stock

valuations (González et al., 2016). When interest rates fall, stock prices rise, and vice versa. This phenomenon reflects an inverse relationship (Eldomiaty et al., 2020). Simultaneously, lower interest rates tend to reduce the attractiveness of bonds and other fixed-income instruments, encouraging investors to shift their portfolio allocations to the stock market, which in turn can strengthen stock price increases (Melcangi & Sterk, 2025). Conversely, higher interest rates can increase borrowing costs, potentially suppressing investment levels and lowering expectations of company earnings, thus weakening stock prices (Mahirun, 2023).

The relationship between interest rates and stock market performance is not always direct and can be influenced by many factors. This complexity arises because stock prices are influenced by various factors, and interest rates are only one of them. Anticipation of future interest rate changes can also significantly impact stock prices. Investors often respond to signals from central banks and economic indicators by adjusting their portfolios in anticipation of potential interest rate changes. Therefore, investors need to conduct careful stock market analysis to determine investment options that can potentially provide profits (Dixit & Gupta, 2020). In addition, the impact of interest rates can vary across sectors and industries. Changes in interest rates tend to have uneven effects, especially on sectors that are highly sensitive to interest rate fluctuations, such as banking and consumer spending on non-priority goods. Banks can benefit from interest rate increases by improving their net interest margins. On the other hand, higher interest rates can depress consumer spending, ultimately reducing demand for non-priority consumer goods and services (Chen et al., 2022).

The coefficient for investor sentiment on stock price is 0.72415 with a p-value of $0.015 < 0.05$. The estimation results show that investor sentiment is related to stock price dynamics, indicating that market psychological conditions play a role in shaping price fluctuations. Positive mood sentiment increases demand for stocks, while negative sentiment triggers sales and price

declines. Market sentiment is related to mood sentiment, which reflects investors' emotional condition and psychological attitude toward the stock market (Laras & Tjahjono, 2021). Mood sentiment can be influenced by news, economic events, and psychological factors (Qurani, 2022). Information published as an announcement signal to investors can be interpreted as good or bad (Mirayani et al., 2024). Behavioral finance theory suggests that psychological biases, such as peer group behavior and overconfidence, can amplify the impact of investor sentiment on stock prices (Spilioti, 2016).

Investor sentiment can cause asset prices to deviate from their expected values based on underlying fundamentals (Smales, 2017). The influence of sentiment is particularly pronounced in volatile markets or during periods of economic uncertainty, where fear and greed can drive irrational investment decisions. In such conditions, the assumption of market efficiency becomes less reliable so that investor emotions may have a significant impact on stock prices (Wang et al., 2020). Investors can optimize their investment strategies and manage risk by understanding the rational and irrational factors that influence stock prices, such as mood sentiment. The importance of market communication policies and timely information disclosure should be emphasized to dampen investor overreaction, especially during periods of economic uncertainty.

CONCLUSION

This study shows that both rational and irrational factors significantly affect stock prices, especially in the Indonesian banking sector during the 2020 to 2024 period. Rational factors, including Price-to-Book Value (PBV), financial literacy, technology adoption, and interest rates, significantly influence stock price movements. PBV provides an overview of stock valuation based on the value of the company's assets; financial literacy reflects investors' ability to make informed decisions; technology adoption indicates the company's readiness to face digital transformation; and interest rates play a role in determining investment and capital costs.

On the other hand, investor sentiment, as a reflection of irrational factors, has also been shown to significantly affect stock prices. Positive sentiment increases buying interest, while negative sentiment triggers selling actions that lower stock prices. This finding confirms that investor emotions, perceptions, and psychological expectations can create price volatility that does not always reflect the company's fundamental value.

This study's integrative approach to both rational and irrational aspects, using the Generalized Method of Moments (GMM) model, has provided a more comprehensive and realistic understanding of stock price dynamics in the Indonesian market. This also shows that to understand market behavior fully, it is not enough to focus solely on fundamental data; investor behavior and psychology must also be considered.

It is recommended that investors combine rational and irrational approaches in decision-making. In addition to analyzing fundamental indicators such as PBV and interest rates, investors need to consider market sentiment and psychological dynamics to anticipate price fluctuations. It is also crucial for companies to continue improving transparency, adopting digital technologies, and implementing financial literacy programs to strengthen investor confidence and sustainably increase market valuations. The results of this study support the need for educational policies that encourage increased public financial literacy and strengthen digital infrastructure in the financial sector. In addition, stabilizing interest rate policies are important for maintaining investor expectations.

Several limitations of this study should be acknowledged. First, the sample is relatively small ($N = 4$), as this analysis focuses on major banking institutions in Indonesia. This may limit the generalizability of the findings to other sectors or smaller financial institutions. Therefore, the GMM results are interpreted primarily as robustness-oriented estimates. Several key variables are measured using proxy indicators. Financial literacy and investor sentiment are latent constructs that cannot be

directly observed. Although the composite index used in this study was constructed using transparent, replicable procedures based on publicly available data, alternative proxy specifications or weighting schemes could yield different empirical results.

Furthermore, the study period (2020 to 2024) coincided with significant macroeconomic and financial shocks, including the COVID-19 pandemic and monetary policy adjustments. These shocks affected stock price dynamics and investor behavior in ways not fully captured by the model. Future research could extend the sample period or incorporate explicit shock-related controls to assess further the stability of the relationships identified in this study.

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