

CHAPTER I

INTRODUCTION

1.1 Research Background

The rapid advancement of information technology has transformed numerous sectors, including the financial investment industry. In Indonesia, the stock market has demonstrated significant growth in recent years. According to data from the Indonesia Stock Exchange, the total number of capital market investors grew from 3.88 million in 2020 to 14.87 million by the end of 2024, representing a Compound Annual Growth Rate (CAGR) of 30.82% (Endang Muchtar, 2025). This growth has been driven by the increasing accessibility of digital-based trading applications and growing financial literacy, particularly among younger generations. However, the dynamics of the stock market are also accompanied by high levels of volatility, making stock price prediction a critical yet challenging aspect of investment decision-making.

One sector that has attracted considerable investor attention is the banking sector. BBRI, BMRI, and BBCA are recognized as blue-chip stocks with large market capitalizations and high liquidity, consistently ranking among the highest-traded stocks on the Indonesia Stock Exchange on a daily basis. These three issuers represent the largest equities in the Indonesian banking industry and are frequently the primary choice for both retail and institutional investors, owing to their strong fundamentals and dominant market positions (Sudipa et al., 2023). Nevertheless, despite their robust fundamentals, banking stocks remain vulnerable to volatility driven by fluctuations in interest rates, fiscal policy, and global market sentiment, making accurate price prediction a persistent challenge.

Forecasting stock prices is far from straightforward. Price movements are influenced by a multitude of simultaneous factors, ranging from corporate financial performance and macroeconomic conditions to rapidly shifting market sentiment. The failure to select an appropriate prediction model can lead to substantial estimation errors, ultimately causing harm to investors in their decision-making processes. To address this challenge, various approaches based on historical data analysis have been developed, one of which is the Seasonal Autoregressive Integrated Moving Average (SARIMA) model. This model has long been recognized in statistical science as one of the most capable forecasting methods for capturing recurring patterns in data, such as weekly, monthly, or annual patterns that frequently appear in stock price data (Schaffer et al., 2021). The application of SARIMA to Indonesian stock data has also been demonstrated in several studies, most notably by (Ferdinand et al., 2023) who showed that SARIMA outperformed other models in predicting stock prices of Indonesian companies.

As the demand for more complex data analysis has grown, new forecasting models offering alternative approaches have emerged. One such model is Prophet, a forecasting model developed by Facebook (Meta) research team. Prophet employs an additive decomposition approach that automatically separates trend, seasonal, and holiday components, making it easier to configure even when faced with data exhibiting irregular patterns. Prophet's ability to handle multiple seasonality and national holiday effects directly makes it a strong candidate for comparison with SARIMA (Taylor & Letham, 2018). Several studies have demonstrated that Prophet is capable of producing accurate stock price predictions, even achieving lower

MAPE values compared to classical methods such as ARIMA (Hery, 2024; Y. Kumar & Sikari, 2025).

Through this research, it is hoped that a practical contribution can be made to investors in Indonesia in determining the most suitable predictive approach. Furthermore, this study is expected to enrich academic discourse in the field of information systems and serve as a foundation for the development of more accurate, adaptive, and context-appropriate stock price prediction systems in the future.

1.2 Problem Identification

1. The stock price data of major Indonesian banking companies, specifically BBRI, BMRI, and BBKA, is highly volatile, and there is limited research that forecasts this data using a comparative approach between the SARIMA and Prophet models.
2. No evaluation using MAPE, MSE and Dstat metrics has been conducted to determine the best predictive model for this domain.

1.3 Research Questions

Based on the background described above, the research questions formulated in this study are as follows:

1. What are the results of the performance comparison between the SARIMA and Prophet models for forecasting the Close and Open prices of major Indonesian banking stocks namely: BBRI, BMRI, and BBKA, as measured by the Mean Absolute Percentage Error (MAPE), Mean Square Error (MSE) and Directional Statistic (Dstat) evaluation metrics?

2. How can a web-based system be developed for forecasting major Indonesian banking stock prices using the SARIMA and Prophet models?

1.4 Research Objectives

The objectives of this research are as follows:

1. To determine the results of the performance comparison between the SARIMA and Prophet models in forecasting the Close and Open prices of major Indonesian banking stocks (BBRI, BMRI, and BBCA) using MAPE, MSE and Dstat evaluation metrics, in order to identify the superior model in producing accurate predictions.
2. To produce a web-based system that utilizes the SARIMA and Prophet models as a tool for forecasting major Indonesian banking stock prices.

1.5 Research Limitations

To ensure that this research remains focused and structured, the following scope limitations have been established:

1. This study will only compare two forecasting models: SARIMA and Prophet.
2. The data used consists of daily Close prices from three major banking companies listed on the Indonesia Stock Exchange, namely: PT Bank Rakyat Indonesia (Persero) Tbk (BBRI), PT Bank Mandiri (Persero) Tbk (BMRI), and PT Bank Central Asia Tbk (BBCA). Data was retrieved through the yfinance library (Yahoo Finance) for three observation periods: January 1, 2020 to March 31, 2026 (± 4.8 years) as the primary dataset, and two additional shorter periods, July 1, 2025 to June 30, 2026 (1 year) and January 1, 2026 to June 30, 2026 (6 months)

3. SARIMA and Prophet are applied as two independent forecasting models, meaning that they are not interrelated and are not combined into a hybrid model, but are implemented separately on the same dataset for comparison purposes.
4. Model performance will be evaluated based on three metrics: Mean Absolute Percentage Error (MAPE), Mean Square Error (MSE) and Directional Statistic (Dstat).

1.6 Research Significances

This research is expected to provide the following benefits:

1. For the Author: This study provides an opportunity to apply knowledge acquired during the course of study, particularly in the areas of time series forecasting and web-based information system development.
2. For Academics and Future Researchers: This research offers insights into the characteristics, strengths, and limitations of the SARIMA and Prophet models in the context of stock price forecasting, and can serve as a reference for subsequent research aimed at developing predictive models in the financial domain or other fields.
3. For Investors: The web-based system produced by this research can be utilized directly as a practical tool for monitoring and predicting the Close price movements of major Indonesian banking stocks, thereby supporting more objective and data-driven investment decision-making.