

ALAMAPI: DEVELOPMENT OF STOCK MARKET
PRICE TREND FORECASTING SYSTEM USING
DYNAMIC MODE DECOMPOSITION, ARNAUD LEGOUX
MOVING AVERAGE, AND LONG SHORT-TERM
MEMORY NEURAL NETWORK

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Chapter 1

Introduction

1.1 Background and Rationale

The stock market is a type of market that allows companies to raise capital by issuing shares of stock to investors. These shares represent a share of ownership in the company and entitle the holder to a share of the company's profits and voting rights. The stock market also provides a platform for investors to buy and sell these shares, allowing for the efficient trading of company ownership. By allowing companies to raise capital and investors to buy and sell shares, the stock market plays a crucial role in the growth and development of the economy (Chen, 2022; The Economic Times, n.d.).

Contrary to popular belief, the stock market is not a form of gambling. It involves a significant amount of analytical thinking and risk management, and the returns are based on the supply and demand for a given stock, rather than on false promises or assurances. In other words, the stock market is a legitimate platform for investing and generating returns, rather than a scam or gamble (Schwab-Pomerantz, 2021; Adams, 2022; Summers, 2022).

1.1.1 The Philippine Stock Exchange (PSE)

The Philippine Stock Exchange (PSE), Inc. is the official stock exchange market in the Philippines. It is a non-stock company that was incorporated in 1992 and manages and operates the stock market in the country. Registered individuals can participate in market exchanges on the PSE. (The Philippine Stock Exchange, Inc., n.d.-a).

Moreover, the main index of the Philippine Stock Exchange (PSE) is the Philippine Stock Exchange Index (PSEI). The PSEI is a market capitalization-weighted price index that is based on the 30 largest and most actively traded companies on the PSE. These companies are pre-determined based on strict criteria, such as liquidity and market capitalization. The PSEI is often used as a benchmark for the performance of the overall stock market in the Philippines. (Bangko Sentral ng Pilipinas, n.d.) The companies that make up the PSEI are often referred to as blue-chip companies, as they are typically large, well-established companies with a history of strong financial performance. As of October 2022, there are 286 companies listed on the PSE, providing a diverse range of investment opportunities for investors. (Fayed, 2022; The Philippine Stock Exchange, Inc., n.d.-b).

1.1.2 Economic Relevance and Benefits of Stock Market Investment

It is commonly accepted that the stock market plays a crucial role in economic growth, as it allocates and provides capital to businesses, which in turn drives economic activity and growth. This is evident from the fact that stock market performance is often correlated with a country's Gross Domestic Product (GDP) (Trade Brains, 2022; Hall, 2022; Bae & Kang, 2017) Additionally, historical trends in stock prices can provide insight into broader economic movements (Campbell, 2021).

Moreover, a study by Balaba (2017) found that the stock market has a positive effect on the economy of the Philippines. The data from the study showed that as the stock market grew, the country's unemployment rate declined. This is because the stock market's performance leads to job creation, which in turn drives economic growth. This relationship has been evident in the Philippines for the past 10 years.

1.1.3 Benefits of Investing for the Individual

The Philippine Stock Exchange allows individuals in the Philippines to trade shares of listed companies. Investing in the stock market can provide several benefits for an individual, such as:

- (a) Protecting the value of an individual's money from inflation: Inflation in the Philippines was at 6.9% as of September 2022 (Trading Economics, n.d.), while savings account deposit interest rates are only between 1-3% annually (Bureau of the Treasury Bangko Sentral ng Pilipinas, n.d.). This means

that savings in deposit banks may not keep pace with inflation, potentially reducing the purchasing power of an individual's money (Royal Bank of Canada Direct Investing Inc., n.d.; EdwardJones, n.d.).

- (b) (b) Providing opportunities for capital growth: Investing in the stock market can provide individuals with the potential for significant capital growth, without the need for direct involvement in business operations. This can be beneficial for individuals such as students or working professionals, who can grow their capital while focusing on their studies or careers (U.S. Securities and Exchange Commission, n.d.).

1.1.4 Utilization of Machine Learning in Stock Market Trading

In recent years, there has been a growing interest in applying machine learning techniques to predict the movement of the stock market, both in the short and long term. As a result, there have been numerous studies and practical applications that have explored the use of machine learning in this context. These efforts aim to improve the accuracy of stock market predictions and help investors make informed decisions about their investments. (Kumbure, Lohrmann, Luukka, & Porras, 2022; Strader, Rozycki, Root, & Huang, 2020; Soni, Tewari, & Krishnan, 2022; Rea, 2020; Guo, 2022). Wherein, one of the common techniques used in machine learning for stock market prediction is Long Short-Term Memory (LSTM). A study by Budiharto (2021) found that LSTM was effective in predicting the Indonesian stock market by 95% using short-term data. This indicates that LSTM can be a valuable tool for making short-term stock market predictions.

Recently, the use of Dynamic Mode Decomposition (DMD) for predicting stock market price trends has gained momentum in the financial and scientific communities. DMD is a mathematical method that can be used to identify patterns and trends in complex data sets, such as stock market data. By applying DMD to stock market data, it is possible to make more accurate predictions about future stock price movements. This can help investors make informed decisions about their investments and potentially generate better returns. In connection to this, a study by Lu and Tartakovsky (2020) found that DMD can be a faster predictor than Proper Orthogonal Decomposition (POD), but it is less accurate.

Furthermore, other studies have shown that DMD can be effectively applied to the Turkish and Indian stock markets to predict market price trends (Savas, 2017; Kuttichira, Gopalakrishnan, Menon, & Soman, 2017). These studies indicate that DMD is easy to implement and can be a useful tool for making stock market predictions.

1.2 Statement of the Problem

1.3 Significance of the Study

1.4 Objectives

1.5 Scope and Limitations

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