



# Fit and Forecasting Indonesia Banking Stock Price During Covid-19 Pandemic Based on Logistic Differential Equation System

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## CCS CONCEPTS

• **Mathematics of computing**; • **Mathematical analysis**; • **Numerical analysis**; • **Discretization**;

## KEYWORDS

Stock price fluctuation, logistic differential equation, fit and forecasting, MAPE

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Banks are financial service companies that play an important role in channeling finances to folks who want capital for micro, small and medium establishments. The increase in bankrupt companies and unemployment in many sectors due to the uncertain condition during the Covid-19 pandemic will affect bank performance which may change their stock price dynamics. This study analyzes the stock price fluctuation in banking companies using a logistic differential equation model since the fluctuation changes rapidly and has a nonlinear pattern. This model was finished by the fit and forecasting process; and completed by Mean Average Percentage Error (MAPE) value to see how well the model captures the stock price fluctuation. Furthermore, the closing stock price during the pandemic of the four banks with the largest number of assets in Indonesia's banking sectors is applied here to complete the fit and forecasting simulation. The results show that the MAPE average value of this model in the fit process is 6.331%. In other words, the logistic equation accurately represents banking stock price fluctuation. Next, the forecast process conducts to predict the stock price fluctuation for some periods. Thus, the fluctuation of stock prices

in Indonesian banking during the Covid-19 pandemic can analyze further.

## 1 INTRODUCTION

The Covid-19 pandemic has harmed our lives, not only in the health sector but also in the global economic sector [1-3]. Since Covid-19 viruses spread quickly, the World Health Organization (WHO) has adopted some policies to minimize this spreading, such as lockdowns, working from home, a school for home, etc. These situations have a significant effect on the socioeconomic character of the world, including Indonesia. International Monetary Fund (IMF) [4] shows that this pandemic causes many small and medium enterprises to go bankrupt. Furthermore, the International Labor Organization (ILO) [5] reports that these policies have increased unemployment following the global financial crisis. In Indonesia, [6-7] have similar report results about this situation. Many research have been conducted to analyze this pandemic situation's effect on global economic activities. These researchers aim to help and give more knowledge to the government and economic actors in making decisions in uncertain conditions.

Indonesia and China have had trade relations for more than 70 years. Nugroho Ari Pamungkas and Mutia Hariati Hussin [8] study the pandemic impact on this relationship since the first case of Covid-19 was released in Wuhan, China. The first theory of national interest and the international trade theory are applied as a basic hypothesis so that the relationship between China and Indonesia can be drawn. This study shows that trade relations between these countries decrease significantly, especially from December 2019 until March 2020. Furthermore, this relationship occurs not only in Indonesia and China but also in almost every country in the world. It causes a domino effect in global economic problems in other sectors, such as the transportation and tourism sector [9-12].

Based on ILO, four sectors have a high negative impact because of the pandemic: accommodation and food services related to transportation and tourism sectors; real estate and business; manufacturing; wholesale and retail trade. In real estate sectors, [13-15] analyze the pandemic impact in different approaches. Marina et al. [13] investigate the real estate demand in China, the USA, and Europe (England and Italy). They have the same behavior in decreasing real estate demand. In other ways, Rahadi et al. [14] study the relationship between demographic and residential preference during the pandemic in Indonesia. This study can help property investors to understand customer preferences to support economic

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