

CHAPTER I

INTRODUCTION

1.1 Background

The stock market is among the most popular investment vehicles worldwide, including in Indonesia. This is due to the potential profits that can be obtained through capital gains and dividends, as well as the ease of access offered by information technology. The Indonesian Composite Index (IHSG) serves as a platform for investors to trade shares of companies listed on the capital market. By early 2025, the number of investors in Indonesia's capital market approached 15 million, reflecting the growing public interest in stocks as a long-term investment instrument [1].

A common benchmark for assessing the general state and performance of Indonesia's capital market is the Indonesian Composite Index (IHSG). As a very comprehensive indicator, the IHSG accumulates the value of all shares listed on the IDX, thus playing an important role in helping investors make investment decisions and also reflecting the health of the national economy. Throughout 2025, the IHSG recorded its highest value at 7,543.503 at the close of trading on July 25, 2025. This increase reflects the positive performance of the Indonesian stock market amid global economic challenges. The JCI experienced a weekly increase of 3.17% compared to the previous week. This reflects rising positive sentiment and stronger investor confidence in Indonesia's capital market [2].

The movement of the IHSG often exhibits significant fluctuations, both in the form of increases and sharp declines, which are generally influenced by various factors such as economic conditions, political dynamics, and continuously evolving market sentiment [3], [4]. The presence of these fluctuations increases the complexity of stock price prediction, particularly for investors who strive to base their decisions on rational analysis and data. The level of accuracy in predicting stock prices not only provides opportunities for profit, but also plays a role in reducing potential losses caused by market dynamics.

Research conducted by Adi & Ismawati., (2023). demonstrates how the Dow Jones Industrial Average (DJIA) Index and worldwide gold prices affect the evolution of the IHSG pricing. More specifically, global gold prices and the DJIA Index had a partial effect on the IHSG during the 2017-2021 periode studied [5]. In the meantime, Purwaningsih & Sriyono (2023) carried out another study. According to the analysis,

the only economic element that significantly affects the IHSG is the rupiah exchange rate, GDP and inflation have no discernible impact [6].

Research conducted by Yusuf, (2021). used the LSTM algorithm to predict The Indonesian Composite Index price movements. This study used 1,212 daily data form the periode February 16, 2017, to February 14, 2020, divided into 970 training data and 242 testing data. Using a batch size parameter of 25 and epoch variation, the best results were obtained at epoch 50, which produced an RMSE value of 6.2335, with and the IHSG prediction value of 6765.5130, which was close to the actual value of 6807.50. These results show that LSTM is capable of providing good model performance in capturing the IHSG time series pattern [7].

Another study conducted by Rahmadeyan & Mustakim, (2024). used Long Short-Term Memory and Gated Reccurent Unit algorithms to predict the share price of Bank Rakyat Indonesia from January 1, 2018, to December 30, 2022. The model underwent testing across multiple scenarios that examined the effects of timesteps, optimizer choice, batch size, and learning rate on its performance. The best GRU model was obatined in the Timesteps 30, Optimizer RMSDrop, Batch Size 32, and Learning Rate 0.0001 testing scenario. The results of the study show that GRU model is the best model compared to LSTM, with the lowes MSE value of 4958.9168, RMSE of 70.4195, and MAPE of 1.1699% [8]. According to the experimental findings, the GRU model outperforms the LSTM model in terms of stock price prediction accuracy.

Another study was conducted by Saud & Shakya, (2020). They used LSTM and GRU algorithms to predict the Nepal Investment Bank Limited (NIB) dan Nabil Bank Limited (NABIL). The study used sample data from August 8, 2007, to November 5, 2018. They used MAPE to measure the evaluation value. The model was analyzed using a loop-back testing scenario. The LSTM model was the model when using loopbacks 2 and 5, with a MAPE value of around 1,9%-2,5% for NABIL shares, while NIB shares had a MAPE value of around 4%-5%. The GRU model was the best model when using loopbacks of 10 to 30, obtaining a MAPE value of around 4%-5,9% for NABIL shares, while NIB shares obtained a MAPE value of around 4%-5% [9]. These results explain that the GRU model is good when used for large loopbacks.

This study aims to implemenent and evaluate a prediction model for IHSG value by considering the exchange rate of the rupiah and the DJIA Index, using the Gated Reccurent Unit (GRU) algorithm. This research focuses on examining the effectiveness of the algorithm in forecasting IHSG price movements by considering

data configuration (data split and variable combinations), along with model architecture and hyperparameter settings. It is envisaged that this study's findings would significantly aid researchers and investors in obtaining more precise IHSG price forecasts, promoting a more insightful and data-driven method of stock market analysis.

1.2 Problem Statement

In light of the background presented above, this study formulates the following research questions:

1. How is the Gated Recurrent Unit (GRU) model applied in predicting the Indonesian Composite Index (IHSG)?
2. How do variations in data split, number of hidden layers and GRU units, learning rate, dropout rate, and stock variable combinations affect the performance of the GRU model in predicting the IHSG?
3. How can the GRU model provide accurate predictions of IHSG movements based on the Rupiah exchange rate and the DJIA index?

1.3 Research Objectives

The following formulation of the study's objectives is in line with the previously mentioned problem formulation:

1. Apply the Gated Recurrent Unit (GRU) model to predict the Indonesian Composite Index (IHSG).
2. Examine how the amount of hidden layers and GRU units, learning rate, dropout rate, and combinations of stock variables affect the GRU model's ability to predict the IHSG.
3. To evaluate the accuracy level IHSG predictions using the GRU model based on the Rupiah exchange rate and the DJIA index.

1.4 Benefits of Research

Referring to the previously stated research objectives, the benefits of this study can be described as follows:

1. For the Author: This research is expected to improve the author's understanding and skills in applying the Gated Recurrent Unit (GRU) algorithm to time series data analysis, particularly in predicting IHSG price movements. The author also hopes to gain deeper experience in the scientific

research cycle, from problem formulation to systematic report writing, as well as IHSg the use of predictive models in the context of the stock market.

2. **For Readers:** This research can be a useful reference for similar research in stock price or market index prediction in the field of economics. Readers will gain insight into the application of the GRU model in predicting the IHSg by considering external variables such as the Rupiah exchange rate and the DJIA index. In addition, this research will provide an overview of how variations in data configuration and model architecture can affect prediction accuracy, which can be used as a reference for further research within the domain of financial forecasting.
3. **For the Government and Related Institutions:** It is expected that the results of this study will provide an alternative machine learning-based approach that can produce more accurate and adaptive predictions of the Indonesian Composite Index in response to global economic dynamics. The GRU model developed in this study can support relevant agencies in conducting data-based economic trend analysis and projections. Thus, this study has the potential to make a real contribution in supporting more responsive, predictive, and technology-based economic IHSg.

1.5 Problem Scope

To ensure that this study is more focused and targeted, several limitations have been set as follows:

1. **Dataset:** The data used in this study is time series data covering the Indonesian Composite Index (IHSg), the Rupiah exchange rate against the Dollar, and the Dow Jones Industrial Average (DJIA) Index. All data was retrieved from Yahoo Finance as the primary data source, which provides historical data related to stock market movements and exchange rates.
2. **Metode:** The method used in this study is the Recurrent Neural Network (RNN) model with a Gated Recurrent Unit (GRU) architecture, which is applied to predict IHSg movements.
3. **Metrik Evaluasi:** The evaluation of the model's performance in this study was carried out using several measurement metrics, namely Mean Squared Error (MSE), Root Mean Squared Error (RMSE), and Mean Absolute Percentage Error (MAPE) to evaluate the model.