CHAPTER V
CONCLUSION AND SUGGESTION

5.1. Conclusion

Based on the results of research that has been conducted on gold price prediction using the Support Vector Regression (SVR) and Random Forest algorithms based on multivariate time series, the following conclusions can be drawn:

1. This study successfully developed a gold price prediction model using a multivariate time series-based machine learning approach, utilizing the domestic gold price, the global gold price in USD/oz, the USD/IDR exchange rate, the inflation rate, and the global oil price. Furthermore, this study applied temporal feature engineering in the form of lag features, moving averages, volatility, daily returns, and time indices to help the model recognize historical patterns and the dynamics of gold price movements.
2. The Support Vector Regression (SVR) and Random Forest algorithms can be used to build gold price prediction models based on historical data and supporting economic variables. Both algorithms have distinct characteristics: SVR uses a margin approach and kernel functions, while Random Forest uses a decision tree-based ensemble learning mechanism. These differences provide a relevant basis for comparing the ability of each model to predict gold prices.
3. Based on the evaluation results using the Mean Absolute Error (MAE), Root Mean Square Error (RMSE), and Mean Absolute Percentage Error (MAPE) metrics, the Support Vector Regression (SVR) model demonstrated the best performance compared to Random Forest and Naive Forecast. SVR produced the lowest prediction error rate, thus it can be concluded that in this research dataset, SVR is more suitable in modeling gold price movement patterns than Random Forest.
4. The Random Forest model performed inferiorly to the SVR on the test data. This indicates that the Random Forest model was less than optimal in tracking gold price trends during the test period.

   This is especially true when the data exhibits a strong upward trend. This can occur because decision tree-based models tend to be better at interpolating existing patterns in the training data, but are limited in extrapolating new trends

beyond the training data range.

5. The application of Bayesian Optimization to the SVR and Random Forest algorithms facilitates a more systematic search for hyperparameter combinations compared to manual or trial-and-error approaches. This optimization plays a role in improving model quality because the parameters used are not determined arbitrarily but are obtained through a search process based on model performance in a time-series data validation scheme.
6. The implementation of a prediction system using Streamlit successfully displayed prediction results and model evaluations interactively. The developed system can be used as an analytical prototype to aid in visualizing gold price predictions, comparing model performance, and presenting evaluation information more informatively. However, this system is still a prototype and is not yet intended as a direct investment recommendation tool.

Overall, this study shows that the integration of multivariate time series approaches, temporal feature engineering, Bayesian Optimization, and machine learning algorithms is able to produce a gold price prediction model that is accurate and relevant enough to support data-driven analysis.

5.2. Suggestion

Based on the results of the research that has been conducted, there are several suggestions that can be given for the development of further research, namely as follows:

1. Future research can compare other, more complex algorithms, such as Long Short-Term Memory (LSTM), Gated Recurrent Unit (GRU), XGBoost, and Transformer-based time series forecasting to determine the performance of deep learning models compared to traditional machine learning approaches.
2. Further research can apply more complex time series validation methods such as rolling window validation or walk-forward validation so that the model evaluation process becomes more realistic to actual prediction conditions.
3. This research still focuses on one-step forecasting, or one-day-ahead predictions. Future research could develop multi-step forecasting to predict gold prices in the medium and long term.

With this development, it is hoped that research on machine learning-based

gold price prediction can continue to develop and produce more accurate, adaptive, and useful models to support investment decision-making and data-based economic analysis.