CHAPTER 5

DISCUSSION AND FUTURE WORKS

5.0 Introduction

This chapter presents the findings of the project titled "Forecasting AirAsia's Profitability Based on Fuel Price Trends Using ARIMA and XGBoost". The study was conducted by collecting and analysing historical data on fuel prices and AirAsia's financial metrics, followed by the application of time series and machine learning models, specifically ARIMA and XGBoost. Through a systematic approach that includes data preprocessing, feature engineering, model development, and evaluation, this research aims to understand the impact of fuel price volatility on AirAsia's profitability and to provide reliable forecasting insights.

The results and observations obtained from the analysis offer a clear picture of how fluctuating fuel prices influence the airline's financial performance. Furthermore, this chapter highlights potential enhancements for future work, including model optimization, incorporation of additional external variables, and real-time data integration for more accurate forecasting. By following a structured pipeline from data collection and preparation to model training and validation this study contributes to the development of data-driven decision-making tools in the aviation and financial forecasting domains in Malaysia.

5.1 Summary

This project aims to forecast AirAsia's financial performance by analyzing the relationship between aviation fuel price trends and the airline's profitability. Leveraging time series data collected from 2021 to 2024, the project involves a complete data science pipeline, including data collection, preprocessing, modeling, and evaluation. The dataset, which includes detailed monthly financial metrics and global jet fuel prices, is first cleaned and preprocessed. This includes handling missing values, normalizing financial figures, and formatting temporal

features. After ensuring data quality, we proceed to exploratory data analysis (EDA) to understand key patterns, seasonality, and trends in both fuel costs and AirAsia's revenue and profit metrics.

For the modelling phase, we implemented the XGBoost algorithm. The decision to switch to XGBoost was driven by its superior performance in handling structured tabular data, particularly with time-dependent variables and complex non-linear relationships. XGBoost allows for boosting weak learners through gradient optimization, resulting in enhanced accuracy and model stability. After fine-tuning hyperparameters such as learning rate, max depth, and number of estimators, the XGBoost model outperformed the previous model in RMSE and R^2 metrics, demonstrating stronger predictive power for AirAsia's profit margins.

From the success of the project, we can draw the following conclusions:

- Fuel prices show a strong inverse relationship with profit, highlighting operational vulnerability to energy cost fluctuations.
- XGBoost demonstrated better generalization and predictive accuracy, especially for forecasting quarterly profitability.
- The model can serve as a decision-support tool, helping stakeholders anticipate financial risks and plan cost mitigation strategies.

5.2 Future Work

While this project has provided valuable insights into the relationship between fuel price trends and AirAsia's profitability, there are several areas that can be further explored to enhance the depth and reliability of the analysis. Future work can include:

a) Expanding Data Sources

This project currently focuses on historical financial and fuel price data from 2021 to 2024. Future studies can incorporate additional economic indicators such as passenger traffic volume, ticket pricing trends, inflation rates, and oil futures contracts to enrich the predictive capability of the model.

b) Forecasting with External Shocks

Integrating the impact of unexpected external events (e.g., COVID-19, geopolitical conflicts, or global oil crises) can help in building more robust models. Techniques such as scenario analysis or shock-aware forecasting can be employed to simulate how these events affect profitability.

c) Incorporating Deep Learning Models

Although XGBoost provided strong performance, future work can explore advanced deep learning models such as LSTM (Long Short-Term Memory) or GRU (Gated Recurrent Units), which are effective for time series forecasting with long-range dependencies.

d) Real-Time Predictive Dashboard

Deploying the model into an interactive dashboard using tools like Power BI or Streamlit can allow stakeholders to visualize forecasts in real time and conduct "what-if" analyses based on fuel price simulations.

e) Model Interpretability and Explainability

To support business decision-making, it is essential to explain why the model makes certain predictions. Future enhancements may involve using SHAP (SHapley Additive exPlanations) or LIME to improve transparency and model interpretability.

By implementing these suggestions, future research can build upon this foundation to offer more comprehensive, timely, and actionable insights for AirAsia and the aviation industry at large. This project opens the door for data-driven financial forecasting as a valuable strategic tool in volatile sectors like aviation.