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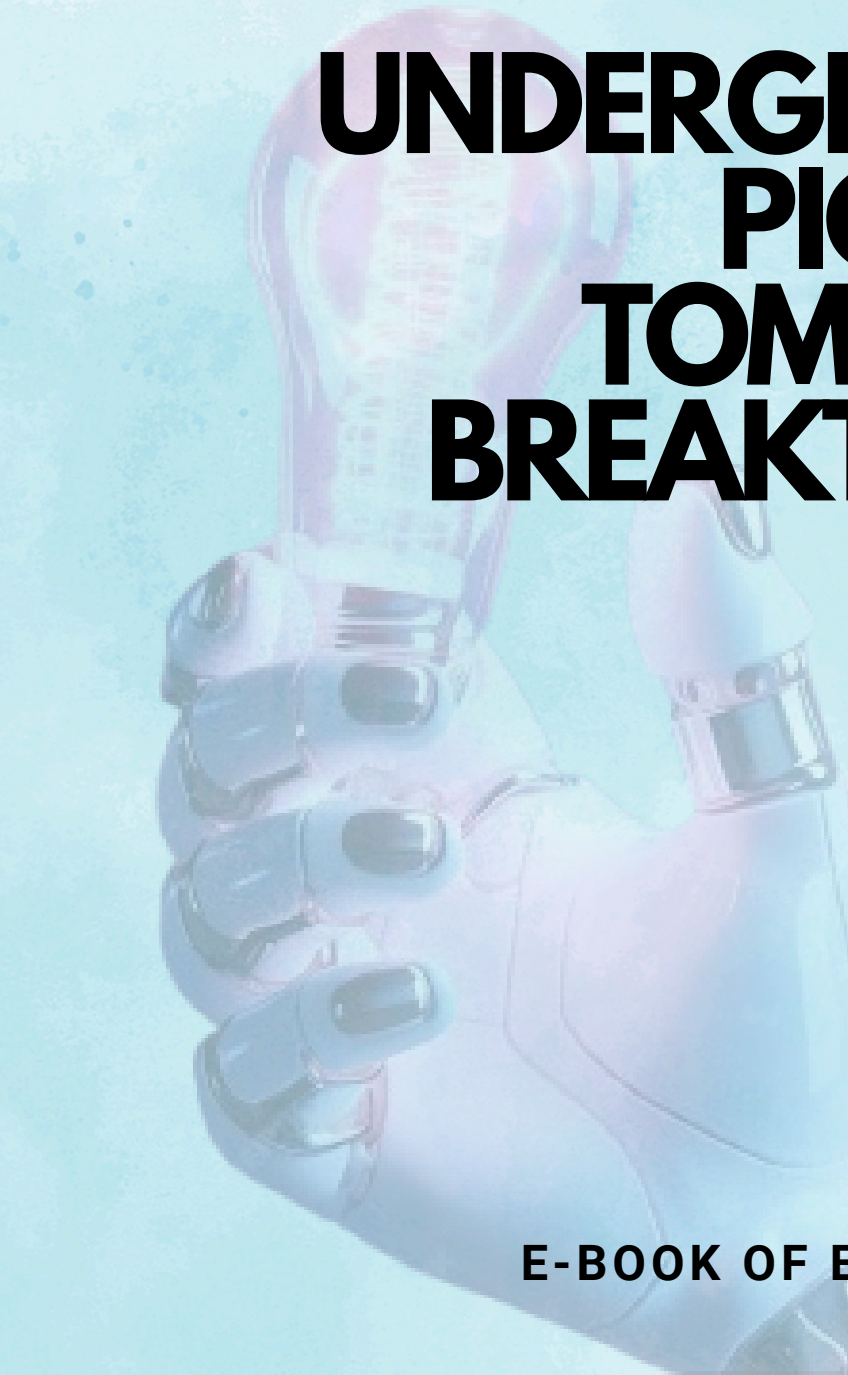

E-BOOK OF EXTENDED ABSTRACTS

AN INNOVATIVE WEB APPLICATION FOR FORECASTING MALAYSIA'S UNEMPLOYMENT RATE USING ARIMA AND EXPONENTIAL SMOOTHING TECHNIQUES

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ABSTRACT

Unemployment is one of the most significant socio-economic issues faced by many countries, as it reflects both economic stability and social well-being. Accurate forecasting of unemployment trends can help policymakers and stakeholders in making informed decisions to improve labour market conditions. This study aims to develop a forecasting model for unemployment rates using time series approaches and deploy it into an interactive Shiny web application. Data were obtained from publicly available unemployment statistics and analysed using ARIMA and ETS models. The forecasting results demonstrated that both models provide reliable projections, with ARIMA showing slightly higher accuracy based on error metrics such as RMSE and MAPE. The Shiny application enables users to visualise historical unemployment data, compare model performance, and generate forecasts interactively. The findings highlight the importance of integrating statistical forecasting with user-friendly technology platforms, providing accessible decision-making tools for researchers, policymakers, and the public.

Keywords: Forecasting, Shiny Application, Time Series Analysis, Unemployment

INTRODUCTION

Unemployment is a critical economic indicator that affects individual livelihoods, government policies, and overall economic growth. High unemployment rates often indicate instability in the job market, reduced productivity, and potential social challenges. Policymakers and economists rely on forecasting methods to anticipate future labor market conditions and plan effective strategies. Traditional statistical models such as ARIMA and ETS have proven to be effective in analysing economic time series data.

The motivation of this study is to create an interactive forecasting tool that combines statistical accuracy with accessibility. By deploying the model on a Shiny platform, the project provides an innovative solution that allows users to analyse unemployment trends dynamically. The objectives of this study are: (i) to analyse unemployment rate data using time series models, (ii) to compare the forecasting accuracy of ARIMA and ETS, and (iii) to develop a Shiny application that serves as a decision-support tool for policymakers, researchers, and the public.

RESULTS AND DISCUSSION

The developed web application features an interactive interface that allows users to select age ranges, choose forecasting methods (ARIMA or ETS), and adjust the forecast horizon to generate real-time unemployment predictions. The dashboard integrates descriptive statistics, dynamic time-series plots, and downloadable outputs, ensuring accessibility for both technical and non-technical audiences.

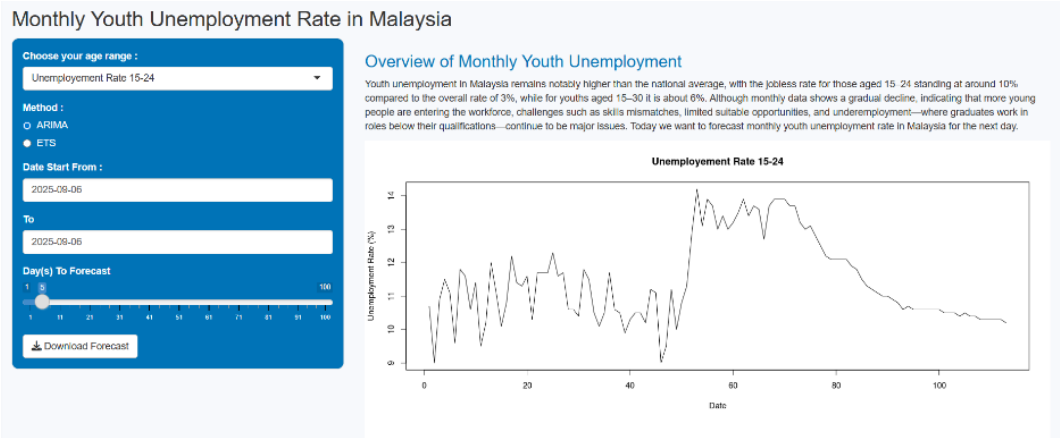

Figure 1: Image of Web Application of Unemployment Rate in Malaysia

The application offers practical benefits to users such as policymakers, researchers, and economists by providing fast, accurate, and interpretable unemployment forecasts without requiring advanced statistical skills. At a societal level, it supports evidence-based workforce planning and policy interventions to address youth unemployment. Beyond academic use, the tool holds commercialisation potential through a freemium model that is a basic feature for public access and advanced analytics for institutional clients. Its novelty lies in combining econometric forecasting with interactive visualisation and built-in accuracy diagnostics, providing a user-friendly yet rigorous platform that bridges advanced modelling with real-world usability. The discussion highlights that while statistical accuracy is important, the usability of forecasting tools also plays a crucial role. The Shiny web interface ensures that complex statistical outputs are translated into intuitive graphs and tables, making the results accessible to non-technical users. This innovation bridges the gap between data science and policy application.

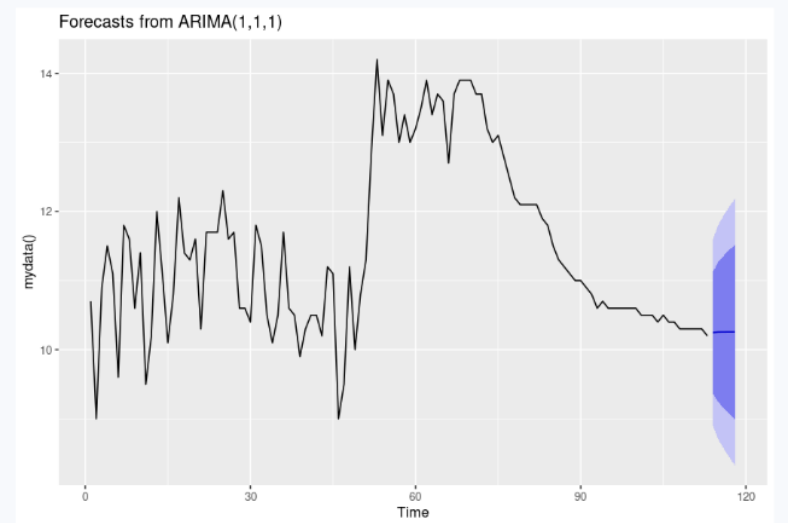

Figure 2: Forecast Unemployment Rate in Malaysia

A pilot study was conducted with 16 participants aged between 20 and 45 years, comprising both male and female individuals, using a convenience sampling method. Table 1 presents the descriptive statistics for the

key constructs measured in this study. The highest mean score was recorded for Overall Perception (X_6), with a mean of 6.29 and a standard deviation of 0.74, indicating a strong overall positive perception of the system. This was followed by Perceived Usefulness (X_1), which had a mean of 6.13 and a standard deviation of 0.75. The mean score of 6.13 suggests that participants generally agreed the system was useful, reflecting a strong positive sentiment. For Perceived Ease of Use (X_2), the mean score was 5.89 with a standard deviation of 0.94, suggesting that participants found the system relatively easy to use, with responses leaning toward agreement. In terms of Perceived Enjoyment or User Experience (X_3), the mean score was 5.90 and the standard deviation was 0.97, indicating that participants tended to agree that the system was enjoyable and provided a positive user experience. The construct related to Perceived Accuracy and Reliability (X_4) showed a mean of 5.98 and a standard deviation of 0.82, suggesting that participants perceived the system as accurate and dependable. The lowest mean score was observed for Intention to Use (X_5), with a mean of 4.61 and a standard deviation of 0.59. Although this was the lowest among all constructs, the score still exceeded the neutral point of the scale, indicating a moderately high intention to use the system. Overall, the construct measuring general perception of the web application demonstrated the highest mean, reinforcing the participants' strong positive perception of the system.

Table 1: Summary of constructs

Variable	Min	Max	Mean	Standard Deviation
Perceived Usefulness (X_1)	4.25	7.00	6.1250	0.75277
Perceived Ease of Use (X_2)	4.25	7.00	5.8906	0.94414
Perceived Enjoyment/User Experience (X_3)	4.00	7.00	5.8958	0.97159
Perceived Accuracy & Reliability (X_4)	4.33	7.00	5.9792	0.82074
Intention to Use (X_5)	3.00	5.25	4.6094	0.59139
Overall Perception (X_6)	5.00	7.00	6.2917	0.73912

A series of one-sample t-tests were conducted to compare the mean scores of each construct to the neutral value of 4 (see Table 2). The results indicated that all constructs were significantly higher than the neutral point ($p < .001$). This suggests that participants generally agreed or strongly agreed with positive statements regarding the system's usefulness, ease of use, enjoyment, accuracy, and reliability, as well as their intention to use it.

Table 2: Statistical Analysis of Constructs.

Variable	Mean	t	Degree of Freedom	p-value
Perceived Usefulness (X_1)	6.1250	11.29	15	< .001
Perceived Ease of Use (X_2)	5.8906	8.01	15	< .001
Perceived Enjoyment/User Experience (X_3)	5.8958	7.81	15	< .001
Perceived Accuracy & Reliability (X_4)	5.9792	9.64	15	< .001
Intention to Use (X_5)	4.6094	4.12	15	< .001
Overall Perception (X_6)	6.2917	12.40	15	< .001

CONCLUSION

This project successfully demonstrates the integration of time series forecasting methods with a Shiny web application to forecast unemployment rates. The results indicate that ARIMA provides slightly better accuracy compared to ETS, while both methods are effective in generating reliable forecasts. The interactive platform enhances accessibility, making it a practical tool for policymakers, researchers, and the community in monitoring and predicting unemployment trends. Future work may involve expanding the dataset, incorporating machine learning approaches, and enhancing the visualisation features for broader applications.

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