

Time Series (MATH5845)

Group Project Description

June 2025 - Version 3

Project Overview

The group project for MATH5845 is a significant component of your final grade, accounting for 15%. This project is designed to provide you with an opportunity to collaborate with your peers and apply the theoretical knowledge gained in class to a practical dataset.

Group Formation

At the beginning of the term, you will be organized into groups of three or four students. You are free to choose one of the datasets from the Monash Time Series Forecasting Repository¹. Please note that most of these datasets are multivariate, but this course focuses on univariate time series. Therefore, you will need to select a single variable and may need to write some code to extract the relevant data. Alternatively, you may choose your own dataset, subject to approval by the course convenor.

What dataset to choose?

In time series analysis, we require the dataset to:

- have a clear and consistent time-stamp.
- preferably be at regular intervals such as annually, quarterly, monthly, or daily. If your dataset is recorded at higher frequencies (e.g., hourly or minute-level), more advanced methods may be needed. These are beyond the scope of this course.
- be sufficiently long—typically more than 100 observations—to allow for reliable modelling and inference.
- have equally spaced time intervals (i.e., observations are recorded at regular and consistent time steps).
- contain minimal missing values, or have appropriate methods applied to handle them.

¹ <https://forecastingdata.org/>

Project Objectives

- Apply the methods discussed in class to analyse the dataset.
- Develop skills in data analysis, interpretation, and teamwork.
- Gain hands-on experience with real-world data analysis.
- Enhance problem-solving skills through practical application.

Project Timeline

- **Weeks 1-9:** During tutorials and independent study, you will apply various methods discussed each week to your dataset. Keep a record of your results and the steps taken.
 - **Friday 5 PM on Week 2:** Submit **Form 1** along with your dataset (as a .csv, .xls, or .dat file). This form is **MANDATORY** and provides us with general information about the dataset you will be working on throughout the term. You will receive a confirmation email upon submission.
 - **Friday, 5 PM in Week 5:** Submit **Form 2** if you wish. This form is **OPTIONAL**. It helps us provide brief feedback before you begin analysing the time series in the frequency domain.
 - **Thursday, 5 PM in Week 9:** Submit **Form 3** if you wish. This form is **OPTIONAL**. It helps us provide brief feedback based on your analysis of the data in the frequency domain before you submit your final report.
- **Week 10:** Submit a comprehensive report summarizing your findings. The report should be **no more than 10 pages** and should describe the steps taken and the final model you consider the best fit for the data.

Report Requirements

- **Introduction:** Briefly describe the dataset and the objectives of your analysis.
- **Methods:** Detail the methods applied each week, including any preprocessing steps, models used, and rationale for their selection.
- **Results:** Present the results obtained from each method. Include visualizations and statistical summaries where appropriate.
- **Discussion:** Discuss the performance of the models, any challenges faced, and insights gained from the analysis.
- **Conclusion:** Summarize your findings and reflect on the overall learning experience.

Assessment Criteria

- **Data Analysis:** Accuracy and appropriateness of the methods applied.
- **Interpretation:** Clarity and depth of the interpretation of results.
- **Teamwork:** Evidence of collaboration and equal contribution from all group members.
- **Report Quality:** Organization, clarity, and professionalism of the final report.



Submission

- The final report is due by the end of **Thursday, 5 PM, in Week 10**². Submit your report through the provided link on the Moodle page of the course.
- Submit a **PDF file of your report**, along with your **code** and **dataset**. Ensure that the code can be run smoothly and without errors so that the markers can recreate the results.
- **Marks will be deducted if the code does not run correctly.**

Feedback

You will receive feedback in the form of marks and comments from the academic staff. This feedback will help you understand your strengths and areas for improvement.

Note

The primary goal of this project is to implement and understand various methods and models in time series analysis. The final model you fit to the data might not be the best model, but the process of applying and refining these methods is crucial for your learning.

² Due dates are set at Australian Eastern Standard/Daylight Time (AEST/AEDT). If you are located in a different time-zone, you should use the time and date converter.



Suggested Sections for the Report

1. Title Page

- Project Title
- Group Members' Names and Student IDs
- Course Name and Code (MATH5845)
- Date of Submission

2. Abstract (150-200 words)

A brief summary of the project, including the objectives, methods, key findings, and conclusions.

3. Introduction (300-400 words)

- Background information on the dataset and the problem being addressed.
- Objectives of the project.
- Overview of the report structure.

4. Data Description (300-400 words)

Detailed description of the dataset, including the source, variables, and any preprocessing steps taken.

5. Methodology (800-1000 words)

- Explanation of the methods and models applied each week.
- Justification for the choice of methods.
- Description of any preprocessing, transformations, or feature engineering performed.

6. Results (800-1000 words)

- Presentation of the results obtained from each method.
- Use of visualizations (graphs, charts) and statistical summaries to illustrate findings.
- Comparison of different models and their performance metrics.

7. Discussion (500-700 words)

- Interpretation of the results.
- Discussion of the performance of the models.
- Challenges faced during the analysis and how they were addressed.
- Insights gained from the analysis.



8. Conclusion (300-400 words)

- Summary of the key findings.
- Reflection on the overall learning experience.
- Suggestions for future work or improvements.

9. References

List of all sources and references used in the report, formatted according to a standard citation style (e.g., APA, IEEE).

10. Appendices (if applicable)

Additional material such as code snippets, detailed tables, or supplementary figures that support the main text but are too lengthy to include in the main sections. This section will not be counted towards the 10-page limit of the report.

