MATH 641   Project Regulations   Time Series Analysis I

Project work in this course is intended to stimulate creative thinking and to develop the skills of independent analysis of real data problems and building forecasts. It includes:

- Choosing two topics of interest to you and searching for two reliable datasets (one nonseasonal and other seasonal) on these topics

  I. Nonseasonal Time Series Data

  II. Seasonal Time Series Data

- Dealing with specific features of the data such as the length of the time series you are analysing, the presence of missing values and/or outliers, etc. in order to see the limitations of statistical methods.

- Choosing appropriate statistical techniques and providing evidence that the suggested methods are suitable for the chosen data.

- Applying the methods and delivering the forecasts.

- Providing conclusions on your analysis.

The cover page of your project report should contain the year, name of the course, topic of your project and name of the student. The project should explain and justify all steps of your analysis. Include necessary references, program code and outputs to facilitate the reproducing of your results. **You should limit your report to 20 pages.**
The details of the material which should be presented in your projects are as follows. You need to have an appropriate justification if you want to leave out one or more items below.

- **Motivation and introduction of the problem:** Start with the problem. Describe the general aspects of your project, and why it matters to do what you have done in your project.

- **Data:** Introduce your data, and where you have gotten it from, or how you have collected it (in the case that you have collected your own data). Perform some descriptive analysis on your data including, but not limited to, the plot of the data. You can provide tables, or graphs to familiarize the reader with your data. This is the place to discuss trends, seasonality, outliers, missing values and/or any problems existing in your data (e.g. missing values). Provide your solutions to these problems at this time.

- **Box-Jenkins models:** Use Box-Jenkins approach and propose some AR, MA, ARMA, ARIMA and/or SARIMA models for your data. You have to justify your proposed models. Similar to the regression modelling, you should fit your models and check the model assumptions. Then you can choose your "best" Box-Jenkins model from the candidates with respect to one of the criteria taught in class. You then use your final model to forecast the future. You can also combine approaches, like removing the trend via regression or other smoothing methods, and propose Box-Jenkins models for residuals.

- **Statistical Conclusions:** Compare your models, and pick the best candidate with respect to some criteria. This is where you provide your statistical conclusion on the models. You also should use your final model(s) to forecast the future.

- **Conclusions in the context of the problem:** Provide your findings in the context of the project. Fore example, highlight the implications/interpretations that you have come to during your modelling/forecasting process in the context of the project. You should avoid technical (mathematical/statistical) language as much as possible in this part of the project. This is the section in reports which is usually read carefully by managers, who may not have any statistical background.

Some On-line Data Sources

You can, but don't have to, check the following links for data.

- Globe and Mail, e.g., `http://www.theglobeandmail.com/globe-investor/markets/`

- Time Series Data Library `http://datamarket.com/data/list/?q=provider:tsdl`

- Permanent Service for Mean Sea Level `http://www.psmsl.org/data/`

- Environment Canada `http://www.ec.gc.ca/dccha-ahccd/default.asp?lang=En&n=B1F8423A-1`

- UW Weather Station `http://weather.uwaterloo.ca/data.html`

- Bank of Canada `http://www.bankofcanada.ca/rates/`

- U.S. Federal Reserve Bank `http://research.stlouisfed.org/fred2/` (and other national banks)

- World Bank `http://data.worldbank.org/`

- Global Financial Data `http://www.globalfinancialdata.com/index.html`

- Yahoo! Finance `http://ca.finance.yahoo.com/`

- Google Finance `http://www.google.com/finance`

- Gallup `http://www.gallup.com/poll/trends.aspx`

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