STAT 447C Final Project - Project Proposal

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Due Date: March 8th 2024

Key Details

- **Project Idea:** Bayesian Time Series Analysis of US Unemployment Rates
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- **Professor:** Alexandre Bouchard-Côté
- **Course:** STAT 447C - Bayesian Statistics
- **Project Proposal Submittion Date:** March 15th 2024

Project Theme and Overview

The aim of this project is to apply Bayesian forecasting techniques to model and predict unemployment rates in the United States (US), utlizing a real-world dataset that has documented the monthly unemployment rate (from 01/1948 to 02/2024) in the US. Through the lens of Bayesian time series analysis, this project aims to reveal seasonal patterns/fluctuations in the data, providing a detailed look at how the unemployment rate has evolved over time, with a goal of providing probabilistic forecasts of future trends. Furthermore, this project also aims to quantify the uncertainty surrounding these forcasts, which is an important consideration to make when considering the inherent variability over the years in the US labor market.

This approach will enable a detailed assessment of the historical behavior of unemployment rates, offering insights into the potential future state of the US labor market, solely based on its past trends. This analysis would hold significant value in understanding US economic cycles, the planning of any governmental interventions, and for preparing for future market conditions, while also showcasing how Bayesian methods can be applied in economic time series forecasting.

Data Sources

The two real-world candidate datasets that have been identified are:

Federal Reserve Economic Data (FRED): This dataset offer historical data on monthly US unemployment rates (from 1948 to 2024) and their associated economic indicators.

URL: https://fred.stlouisfed.org/series/UNRATE

```
# The dataset was downloaded and saved locally and on the GitHub repository

FRED_dataset <- read_csv("UNRATE.csv")
head(FRED_dataset)
```

```
## # A tibble: 6 x 2
##   DATE       UNRATE
##   <date>      <dbl>
## 1 1948-01-01    3.4
## 2 1948-02-01    3.8
## 3 1948-03-01    4
## 4 1948-04-01    3.9
## 5 1948-05-01    3.5
## 6 1948-06-01    3.6
```

US Bureau of Labor Statistics (BLS): Just like the dataset from the US Federal Reserve, his dataset offer historical data on monthly US unemployment rates (from 1948 to 2024) and their associated economic indicators.

URL: https://data.bls.gov/pdq/SurveyOutputServlet

Please note that the original dataset downloaded from the above URL contains title information, and so I have removed them when reading in the data in the console. However, I have saved the original dataset under the file name `BLS.xlsx`.

```
# The dataset was downloaded and saved locally and on the GitHub repository

BLS_dataset <- read_excel("BLS_edited.xlsx")
head(BLS_dataset)
```

```
## # A tibble: 6 x 13
##    Year   Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec
##   <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1  1948   3.4   3.8   4     3.9   3.5   3.6   3.6   3.9   3.8   3.7   3.8   4
## 2  1949   4.3   4.7   5     5.3   6.1   6.2   6.7   6.8   6.6   7.9   6.4   6.6
## 3  1950   6.5   6.4   6.3   5.8   5.5   5.4   5     4.5   4.4   4.2   4.2   4.3
## 4  1951   3.7   3.4   3.4   3.1   3     3.2   3.1   3.1   3.3   3.5   3.5   3.1
## 5  1952   3.2   3.1   2.9   2.9   3     3     3.2   3.4   3.1   3     2.8   2.7
## 6  1953   2.9   2.6   2.6   2.7   2.5   2.5   2.6   2.7   2.9   3.1   3.5   4.5
```

These two datasets can be used well to tackle the selected project theme.

GitHub Repository Link

The following link takes you to the public GitHub repository where the project files are located.

URL: https://github.com/RohanUBC/STAT-447C-Final-Project

The repository includes the following files:

- Project Proposal
- Project Report (scaffold)
- The Federal Resereve Economic Data (FRED) Dataset
- The US Burean of Labour Statistics (BLS) Dataset
- A README File