Project Proposal

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2025-03-12

1. Team members

This is an individual project. Only Jessie Liang (student number: 52819596) is involved in doing it.

2. Project theme

This project will address the theme called `time series and state-space models`.

3. GitHub repo link

https://github.com/jessie-liang/447-project.git

4. Two real-world datasets

4.1 Monthly consumer price index (CPI) aggregated for all items in Canada (2000 - 2024)

URL: https://www150.statcan.gc.ca/t1/tbl1/en/cv.action?pid=1810000401

(Source: Statistics Canada)

```
##   year month  cpi
## 1 2000     1 93.5
## 2 2000     2 94.1
## 3 2000     3 94.8
```

```
##     year month   cpi
## 298 2024    10 161.8
## 299 2024    11 161.8
## 300 2024    12 161.2
```

4.2 Vancouver daily average temperature (June 15,2022 - March 10, 2025)

URL: https://vancouver.weatherstats.ca/download.html

(Source: Weather Dashboard for Vancouver)

```
##         date avg_temperature
## 1 2022-06-15            13.8
## 2 2022-06-16            15.0
## 3 2022-06-17            14.2
```

```
##            date avg_temperature
## 998  2025-03-08            8.10
## 999  2025-03-09            7.20
## 1000 2025-03-10            5.15
```

5. Summary of potentail approach

My main goal is prediction, specifically using past data to forecast future values. For this, the main steps are:

(1) Split the data set into a training set (relatively large) and a testing set (relatively small).

(2) Use MCMC (ideally Stan) to fit a model on the training set, setting observations in the testing set as latent variables.

(3) Obtain the posterior mean of these latent variables as point forecasts.

(4) Compute RMSE using the point forecasts and real data in the testing set to assess prediction performance.