1 Data used (Canada)

1.1 Yield rates

Statistics Canada's socio-economic database CANSIM provides Bank of Canada Benchmark Bond Yields and Canadian treasury bill yields. These were given on a daily basis - the earliest reference data avaiable was 199501 and the latest reference data available was 201506. To be consistent with the inflation reference dates, only data until 201505 was used. The vectors used were **V39051, V39052, V39053, V39054, V39055, V39063, V39067**.

The following steps were taken to obtain monthly data.

1. All rows where the yield was `NA` or `0.00` were removed.
2. The average yield over a month was calculated using the daily data available (note that information for every day was not available in a given month).

For treasury bills (1 month, 1 year), let y represent the yield rate. The yield rate is quoted under simple interest. Therefore, the return on the treasury bill is yt where t is the length of the treasury bill, and the price is $1/(1+yt)$.

For government of Canada bonds (2 year, 3 year, 5 year, 7 year, 10 year), the yield rate is compounded semi-annually. Let $i^{(2)}$ represent the yield rate. The effective annual rate is $i = (1 + i^{(2)}/2)^2 - 1$ and the price is v^n where $v = 1/(1+i)^n$

Each yield rate was converted to a continuously compounded rate. For the treasury bills, let i represent the effective annual yield rate under compound interest. Then $i = (1+yt)^{(1/t)} - 1$ where y is the yield rate under simple interest. The force of interest is $\delta = \ln(1+i)$. For the government of Canada bonds, the force of interest is $\delta = \ln(1+i)$. We want the continuous rate over a monthly interval not over a yearly interval, so each of the force of interest terms were divided by 12.

1.2 Stock index

From yahoo finance, we can get the monthly stock prices for the index `S&P/TSX` which accounts for 95% of the Canadian equities market. To calculate the stock return over a monthly interval we take $\alpha_{1/12} = S_{1/12}/S_0$ then $\alpha_{2/12} = S_{2/12}/S_{1/12}$ and so on. Then the force of interest over a monthly interval is $\delta = \ln(1+\alpha_i)$.

The earliest reference date used was 199501 so that the dates lined up with the yield rates. Dividends were not modeled, only the stock index. However, reference dates are available into the 1970s.

1.3 Inflation

The Canadian consumer price index is also available from CANSIM. The vector used was **V41755375**, which provides the CPI from 198401 onwards until 201505. To be consistent with the yield rate reference dates only data from 199501 onwards was used.

The inflation rate over a month was calculated by dividing the CPI over the CPI of the previous month and subtracting 1. The continuously compounded inflation rate over the month was calculated by taking $\ln(1 + \pi)$ where π is the inflation rate over the month.

1.4 Salary

The seasonally adjusted annual salary rates are also available from CANSIM. The vector used was **V62468795**. However, the data frequency available is quarterly, so currently salary is not being included in the model. Monthly data is only available from 2001 onwards from the survey of employment, payrolls and hours (SEPH).