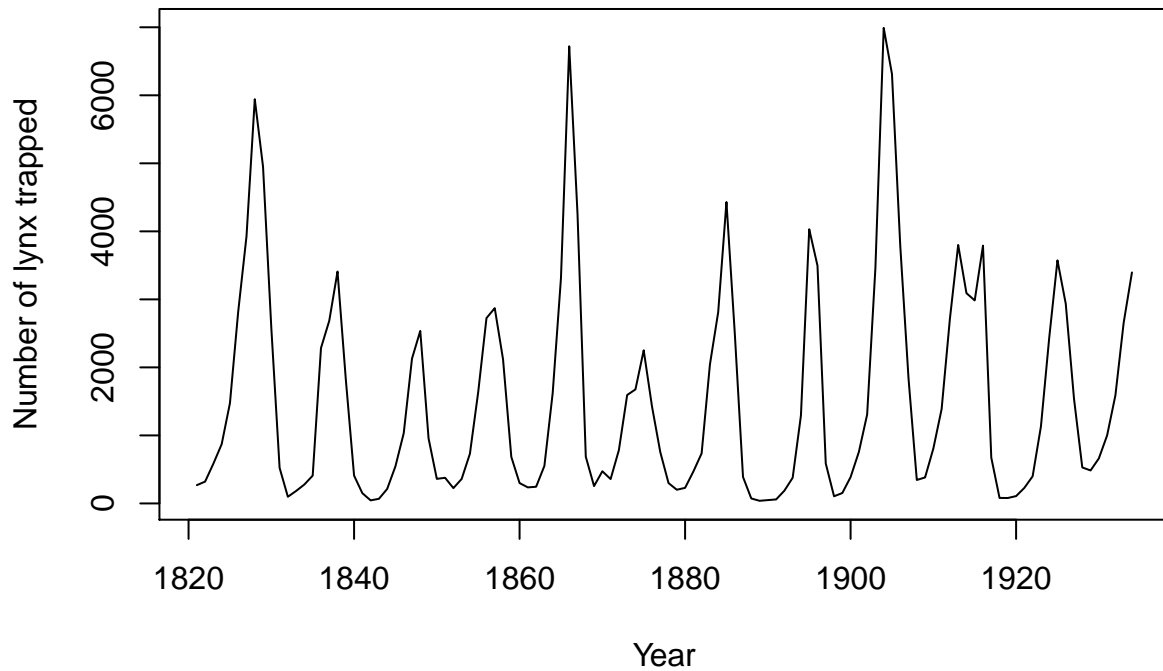# STATS 326 A1

Zoe Zhou

Question 1. Find a Time Series that exhibites cycles.

Number of lynx trapped each year in Canada (1821–1934)
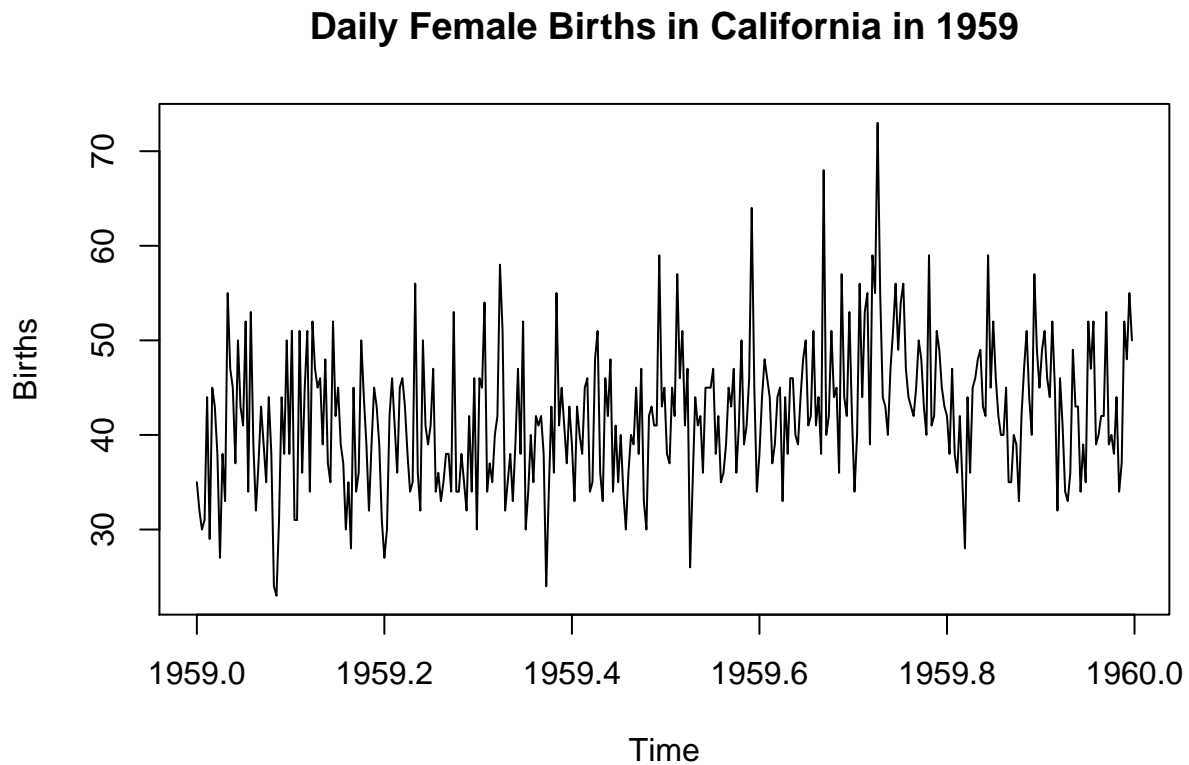

Comment

The time series is the number of lynx trapped each year in the McKenzie river district of northwest Canada (1821-1934). Found in https://robjhyndman.com/hyndsight/cyclicts/.

The number of lynx trapped each year seemed to have irregular cycle patterns. The length or amplitude of these cycles are not fixed or predictable.

Question 2. Find a Stationary Time Series.

## Daily Female Births in California in 1959

Comment

This time series describes the number of daily female births in California in year 1959. The units are a count and there are 365 observations. The source of the dataset is credited to Newton (1988) https://machinelearningmastery.com/time-series-datasets-for-machine-learning/.

The daily female births seemed to have a constant mean and constant variance through time. There is no trend or cycle or seasonal pattern in the plot. We can say it is stationary.

Question 3. Find a Time Series that has a seasonal component but no trend or cycle.

Minimum Daily Temperatures (1981–1990) in Melbourne
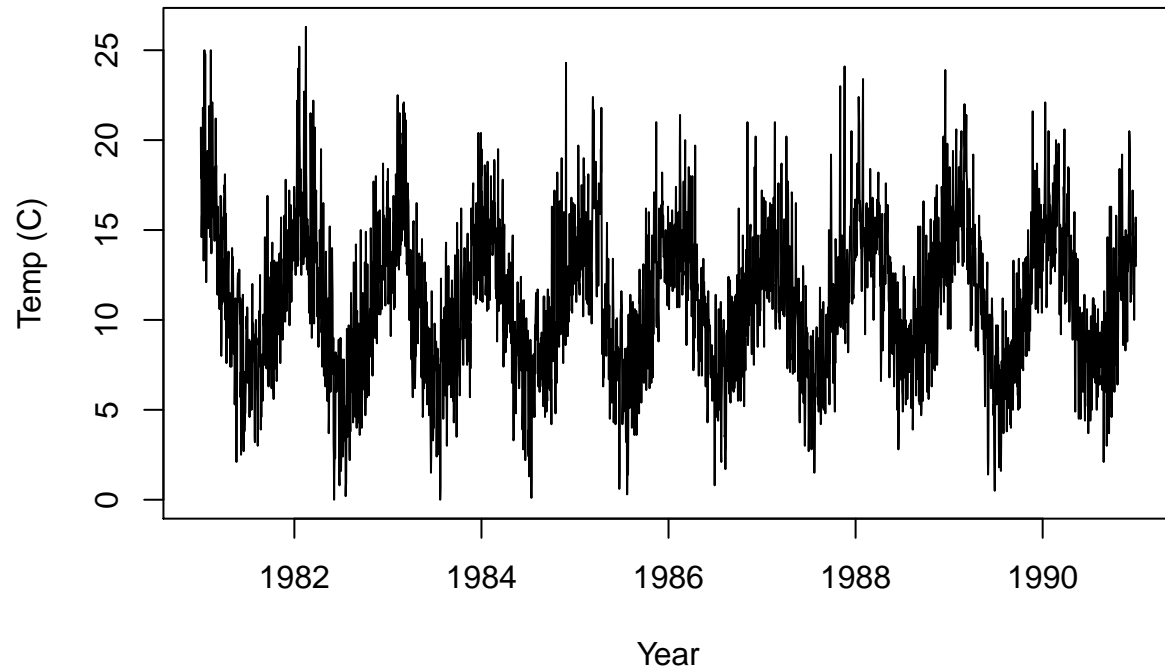
Comment

This time series describes the minimum daily temperatures over 10 years (1981-1990) in Melbourne, Australia. The units are in degrees Celsius and there are 3650 observations. The source of the data is credited as the Australian Bureau of Meteorology. Found on website https://machinelearningmastery.com/time-series-datasets-for-machine-learning/.

The minimum daily temperature showed a strong seasonality component. We can see peaks approximately at the beginning of each year (summer) and valleys in the middle of the year (winter). There is no trend or cycle.

Question 4. **Find a Time Series that has a reasonably linear trend and a seasonal component.**

Monthly Souvenir Sale (1987–1993) in Queensland
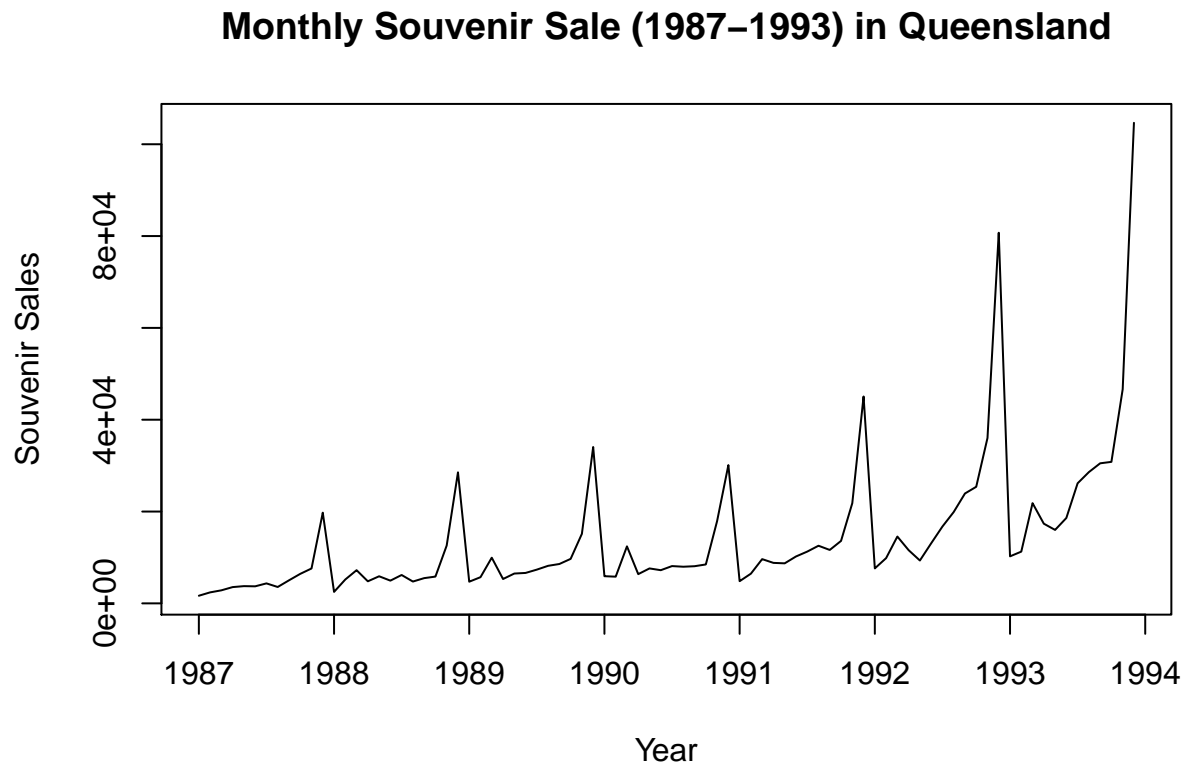
Comment

We are using data that is monthly sales for a souvenir shop at a beach resort town in Queensland, Australia, for January 1987 - December 1993 (original data from Wheelwright and Hyndman, 1998). Found http: //robjhyndman.com/tsdldata/data/fancy.dat.

We can see the time series clearly has a strong seasonal component around the end of each year. The peaks occurred probably in summer, the tourism season. We can see the sales was increasing drastically each year showing a positive linear trend.
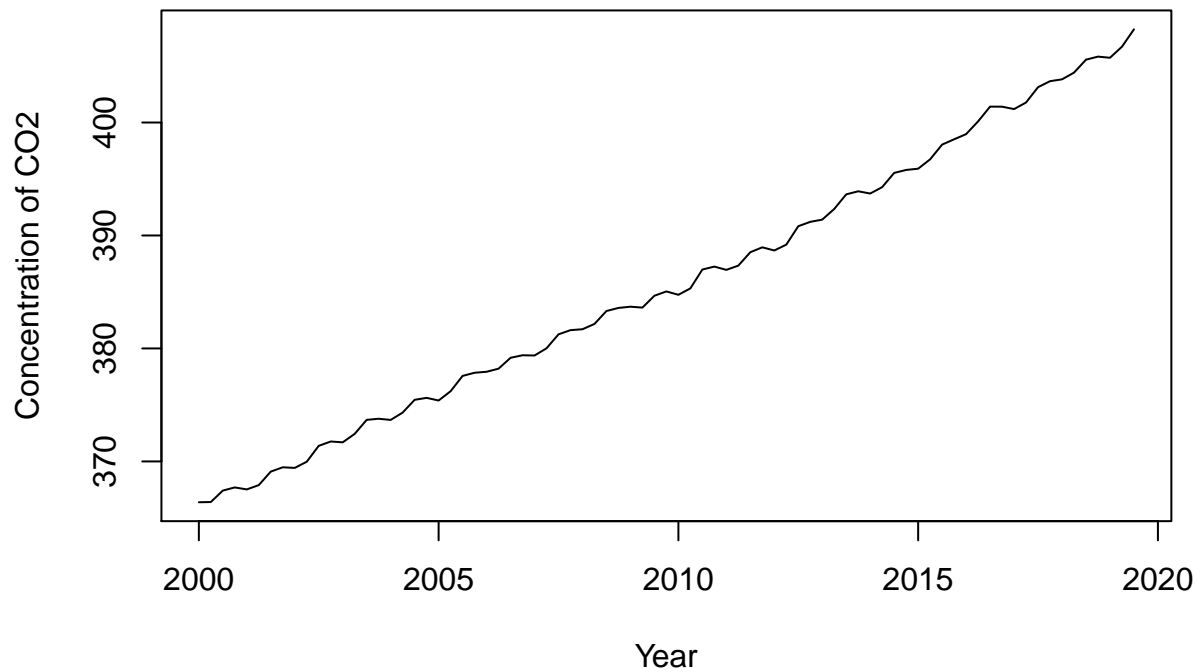
Question 5.

Monthly Average of CO2 at Cape Grim
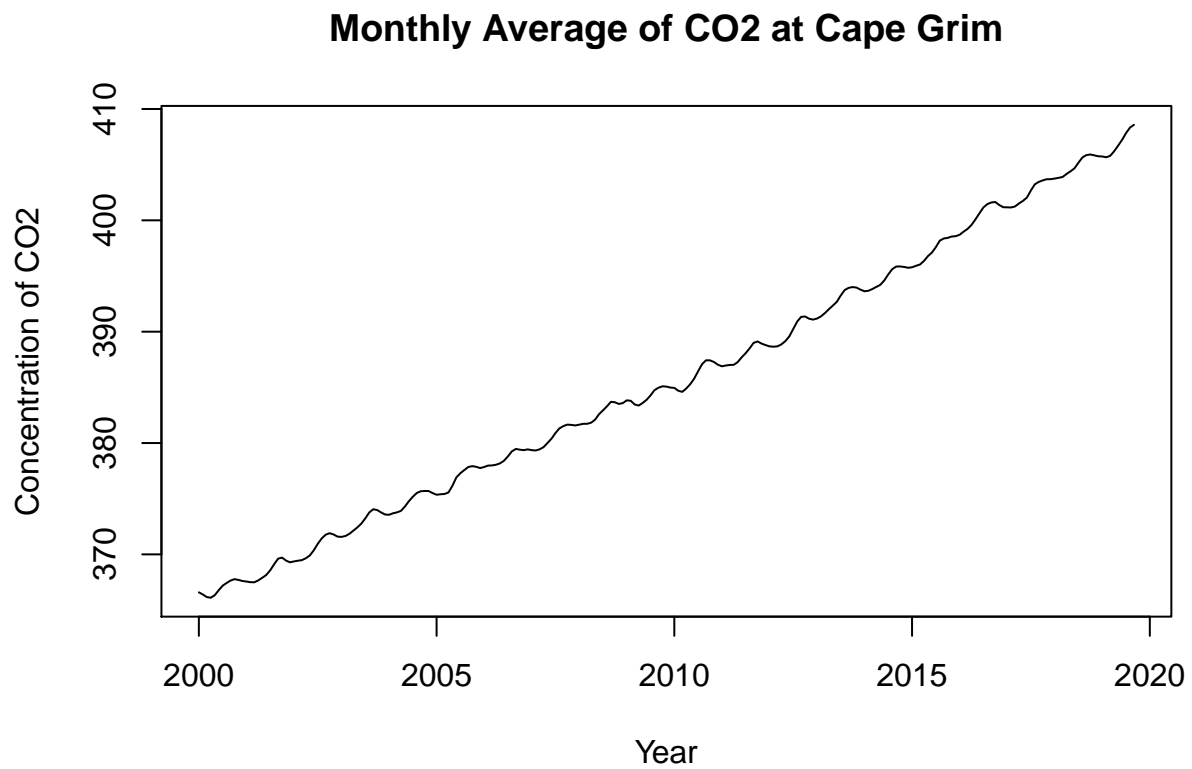
Convert the data into the average concentration of CO2 in the atmosphere for each quarter from 2000 to 2019.

```
CO2.ts2 = aggregate(CO2.ts, nfrequency = 4, FUN = mean)
```

Quarterly Average of CO2 at Cape Grim

Comment

The time series describes the average concentration of CO2 in the atmosphere at Cape Grim, Tasmania, Australia (2000-2019). The average concentration of CO2 has been increasing steadily each year. It is showing a clear positive linear trend over 20 years with a weak seasonal component. The quarterly average seems smoother than the monthly average with very similar patterns. We can see small peaks and valleys around the same time each year.