Universität Zürich
Institute for Computational Science
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ESC403

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INTRODUCTION TO DATA SCIENCE FINAL EXAM 2021

Solutions from David Linder

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1 Time Series

1.1

To be considered stationary a time series should have the following properties:

- The mean $E[X_t]$ is the same for all times t
- The variance $Var[X_t]$ is the same for all times t
- The covariance between X_t and X_{t-1} is the same for all t, n

That means we want

- no obvious trends
- constant variance with time
- constant autocorrelation structure over time
- no periodic fluctuations (no seasonality)

I found some examples here: In figure 1 we see that most of the series are non-stationary except series (b) and (g). In series (g) there are cycles but they are not periodic.

1.2

1.3

2 Image classification

2.1

2.2

2.3

2.4

2.5 Bonus Question

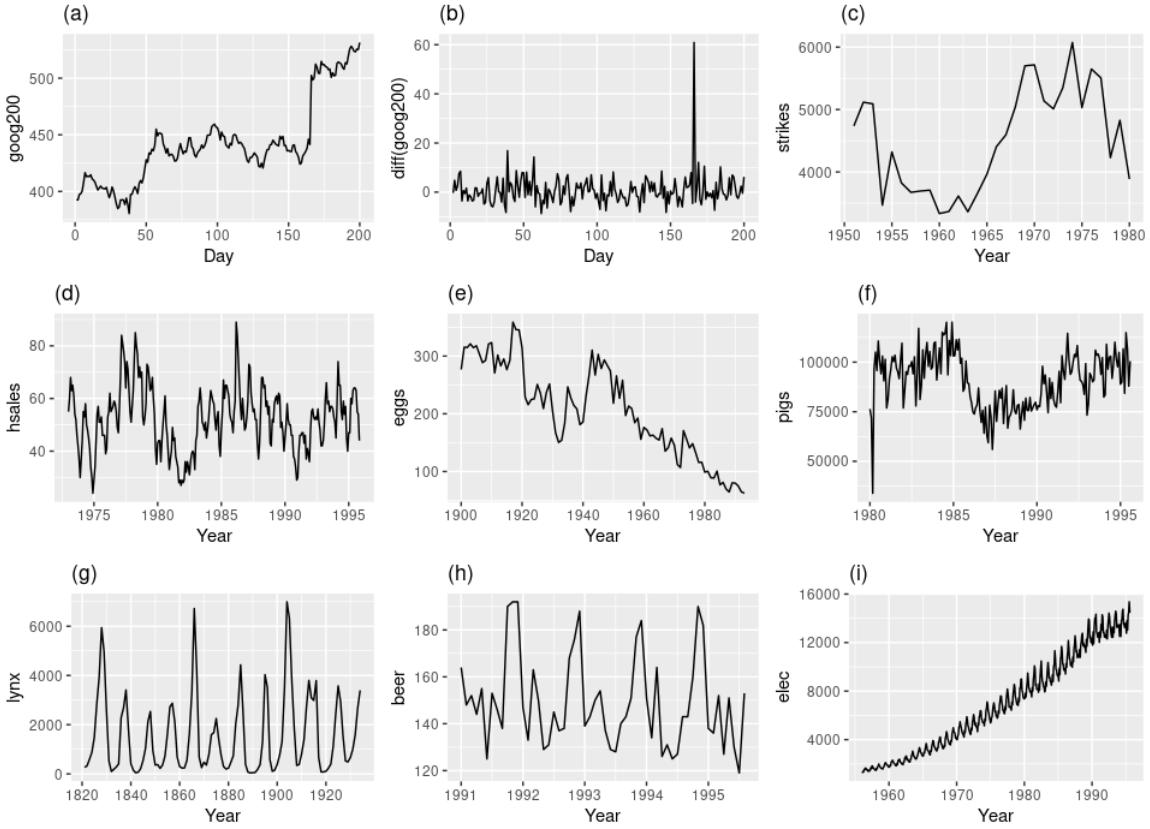

Figure 1: (a) Google stock price for 200 consecutive days; (b) Daily change in the Google stock price for 200 consecutive days; (c) Annual number of strikes in the US; (d) Monthly sales of new one-family houses sold in the US; (e) Annual price of a dozen eggs in the US (constant dollars); (f) Monthly total of pigs slaughtered in Victoria, Australia; (g) Annual total of lynx trapped in the McKenzie River district of north-west Canada; (h) Monthly Australian beer production; (i) Monthly Australian electricity production.