STAT410 Advanced Reading Topic Assessment

Due: 18ᵗʰ May 11:59pm AEST

Inflation is a hot topic in the current global economic climate, and is important for the impact it has on many factors of the economy, including interest rates which are impacting household budgets (directly and indirectly) significantly.

The data in the file inflation.csv contains annual inflation data for 5 developed nations for the period of 1960 to 2023.

There are three variables in the data set:

- **Country:** Country. Treat this as an ID variable. IE do not include it in the modelling.
- **Year:** year inflation was recorded.
- **Inflation:** annual inflation (%).
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The research question is:

Is there evidence that yearly inflation data is changing over time? If so, how is it changing?

Question 1   **5 marks**

Produce an informative exploratory plot using `ggplot()`. What does this plot suggest about the research question?

Question 2   **20 marks**

Using `poly()` function in R, fit a polynomial regression model to Inflation as a function of Year. Produce and interpret relevant diagnostics for your chosen model and interpret your findings in the context of the research question. As part of your interpretation, explain and justify how you determined the appropriate order of the polynomial. Finally, using `ggplot()`, plot the data, the fitted polynomial curve as well as 95% confidence bands for your model.

NOTE: We have not used the `poly()` function in the unit so far. You will need to investigate its use independently.

Question 3   30 marks

In the reading materials for the advanced reading topic, you have explored kernel smoothers, splines and local polynomials (loess). Apply these methods to the data to fit smooth curves to Inflation as a function of Year. Make sure you justify the amount of smoothing that you think is appropriate for each method.

Question 4   20 marks

Compare the fits from the different methods, with reference to features of the various fitted curves. Produce a single plot using `ggplot()` that shows all the fitted curves; polynomial, kernel, spline and loess, and which includes an informative legend.

Question 5   20 marks

Summarise your results, relating them to the context of the research question. This should include discussion of the advantages and disadvantages of the various methods.

Presentation and R code   5 marks

5 marks are allocated for notation, presentation and Rscript:

- Clear expression, correct use of terminology and mathematical notation (using an equation editor)
- Presentation of figures and tables: ensure that all relevant R output is included and labelled/captioned
- Include your clear and concisely annotated R code as an appendix.