



#### Investigation 4. Time Series in Action

You are going to complete your own time series investigation and submit a word document (or PDF) summarizing your findings. You may either:

- **Survey your peers** (e.g., ask them about their daily/weekly behaviour), or
- **Research data online** (e.g., from ABS, Bureau of Meteorology, sports statistics, Google Trends, etc.).

**Step 1 – Choose your question.** Pick something that changes over time, and preferably something that interests you. Examples:

- *Average hours of sleep each night over 2 weeks*
- *Weekly hours spent on social media*
- *Weekly sales data for a product (from ABS or other source)*

Clearly define your investigation question: \*\*“How does \_\_\_\_\_ change over \_\_\_\_\_ ?”\*\*

#### Step 2 – Collect raw data.

- Record at least 10–20 time periods (days, weeks, etc) over multiple cycles.
- Present your data in a table using Excel.

#### Step 3 – Use Excel to plot a time series graph (using raw data)

#### Step 4 – Smooth the data

- Apply a moving average (3-point, 5-point, or 7-point depending on your data).
- Plot the smoothed series on the same graph as the raw data from step 3.

#### Step 5 – Deseasonalise the data

- Calculate the seasonal indices for your data
- Use your seasonal indices to deseasonalise the data.
- Plot both the raw and deseasonalised series on a new graph using Excel.

#### Step 6 – Fit a model

- Use your CAS calculator to fit a least-squares regression line to the deseasonalised data. Write down the equation, gradient, intercept,  $r$ , and  $r^2$ .

#### Step 7 – Communicate your findings

Use the template on the next page to prepare a report for your investigation.



## SUGGESTED ORDER FOR INVESTIGATION REPORT.

1. **Cover Page**
2. **Table of Contents**
3. **Introduction**
  - State the question clearly (e.g., “How do daily steps vary across 14 days?”).
  - Explain why it is relevant/interesting.
4. **Methodology**
  - How data was collected (survey, ABS, Google, etc.).
  - Any assumptions made (sample size, time frame, limitations).
  - Tools used (Excel, CAS calculator).
5. **Results**
  - Present the raw data in a neat table.
  - Graphs: raw time series, smoothed data, deseasonalised data, regression line (copied from Excel)
  - Calculations: seasonal indices, deseasonalised values, regression equation,  $r$ ,  $r^2$
  - Clear headings and figure numbers for every graph/table.
6. **Discussion / Interpretation**
  - What the results show in context (trend, seasonality, patterns).
  - What the gradient and intercept mean.
  - Meaning of  $r$  and  $r^2$ .
  - Limitations (sample size, randomness, accuracy).
7. **Conclusion**
  - Restate the question.
  - Provide a concise answer backed up by evidence.
  - Suggest how the findings could be useful
8. **References (if external data is used)**
  - ABS, BOM, Google Trends, etc.
9. **Appendices**
  - All Excel data / graphs / tables
  - CAS calculator screenshots (if possible).
  - Any working that didn’t fit neatly in the main body.