**CIDM/ECON 6308 Lab Exercise 3 Submission**

(30 points in total; Due 11:59pm CST, April 9th, 2023)

Requirements: This lab exercise is open book, open slides, and open notes, but you are not allowed to collaborate with anyone else before the due time. This is an individual lab exercise, so sharing your queries, screenshots, or answers with other students or parties is considered as cheating, which will be reported to the university authority. In addition, it is your responsibility to make your screenshots meet the requirements. Screenshots without appropriate date and time will receive a penalty of 50% of grade. If identical screenshots are found from two or more students, an academic violation is involved and such a case will be reported to the university authority too. Please read, understand, and comply with these requirements in this lab exercise by typing your name as below.

Your name: Mehnaz Afrose

**Deliverables:**

Soft drink data (10 points)

1. A screenshot of the decomposed time series with date and time in RM: The screenshot must clearly show original value, trend, seasonal, remainder components, and seasonally adjusted series of at least the first 20 records (3 points).

A screenshot of a computer

Description automatically generated

A screenshot of a computer

Description automatically generated

1. A screenshot of an appropriate visual in RM with date and time to display the original value, the trend (or trend-cycle) component, and the seasonal component (3 points)

Graphical user interface

Description automatically generated

1. A brief discussion about this series’ patterns: Your discussion must include trend and seasonality (cycle is optional); you must use the description that you observe from the visual above to justify your discussion (e.g., this time series has a decreasing trend because ……). (4 points: 2 points for each pattern; 1 point for identifying each correct pattern and 1 point for your justification; for example, if you identify a correct pattern but without an appropriate justification, you will only 1 point)

**Trend pattern:** The time series shows an **increasing** trend throughout time, which is shown by the general slope of the line in the plot traveling up from left to right.

**Justification:** The progressive increase in values over time implies that the data is trending positively.

**Seasonality pattern**: The time series has a regular seasonality pattern, with peaks occurring around every year at the time Q2(second quarter), followed by a steady fall until Q1(first quarter) next year.

**Justification:** There is a presence of a repeating pattern of peaks and troughs, and this pattern happens at a fixed interval of time. This clearly shows that there is a yearly seasonality pattern in this data.

Beers data (10 points)

1. A screenshot of the decomposed time series with date and time in Excel: The screenshot must clearly show original value, trend-cycle component, seasonal component, remainder component, and seasonally adjusted series of at least the first 20 records (3 points).

Graphical user interface, application, table, Excel

Description automatically generated

1. A screenshot of an appropriate visual in Excel with date and time to display the original value, the trend (or trend-cycle) component and the seasonal component (3 points)

Graphical user interface, application

Description automatically generated

1. A brief discussion about this series’ patterns: Your discussion must include trend and seasonality (cycle is optional); you must use the description that you observe from the visual above to justify your discussion (e.g., this time series has a decreasing trend because ……). (4 points: 2 points for each pattern; 1 point for identifying each correct pattern and 1 point for your justification; for example, if you identify a correct pattern but without an appropriate justification, you will only 1 point)

**Trend pattern:** The time series shows a **slightly decreasing** trend throughout time, which is shown by the general slope of the line in the plot traveling down from left to right.

**Justification:** The decrease in values over time implies that the data is trending negatively.

**Seasonality pattern**: The time series has a regular seasonality pattern, with peaks occurring around the same time each year Q4 (fourth quarter), followed by a fall until Q2 (second quarter) next year.

**Justification:** There is a presence of a repeating pattern of peaks and troughs, and this pattern happens at a fixed interval of time. This clearly shows that there is a yearly seasonality pattern in this data.

Summary Question (2 bonus points): Briefly discuss how visualization and decomposition help you identify a time series’ patterns. You must incorporate your experience from this lab exercise into your discussion.

**Answer:** To find trends in a time series, visualization and decomposition are key tools. We can see the overall behavior of the data and detect any trends or seasonality that may exist via visualization. For example, in this lab exercise, we were able to identify an increasing trend and a distinct seasonal pattern in the data by visually inspecting the line linking the data points and the recurring spikes throughout quarters.

Another approach for identifying patterns in a time series is decomposition. It involves splitting the time series into its parts, such as trend, seasonality, and random fluctuations. By isolating each component, we can investigate its distinct behavior and identify any patterns that may present. In this lab assignment, we used seasonal decomposition to extract the trend and seasonality components of the data. This helped us verify the upward/downward trend and clearly identify the seasonal pattern.