Analysis:

An initial examination of the dataset through plots reveals six variables with varying fluctuations. Notably, variables A3 and A4 exhibit constant values after a certain point in time. A correlation plot highlights weak relationships for most variables, with the exception of A3, which shows a strong negative correlation with A4 and A6. Visualizing the characteristics of each variable using rolling mean and standard deviation plots against the actual values indicates nonstationarity, as the mean and standard deviation change over time. A2 stands out as an exception, displaying lower volatility compared to the others. An augmented Dickey–Fuller test confirms the stationarity of A2.

The dataset spans three years, allowing us to split it accordingly. We can test relationships between key pairs of variables: A1 and A2, A1 and A3, A4 and A5, and A4 and A6. To assess if significant intrayear changes occur between variables, we can perform a rolling cointegration analysis with a fixed window to track changes in the p-value. When the p-value falls below our predefined threshold, it can be considered statistically significant. We can complement this analysis with covariance and correlation coefficients.

For the year 2021, the covariance between A1 and A2 is 10.46, and both Pearson and Spearman correlations hover around 0.04, indicating a weak positive correlation. The covariance between A1 and A3 is 7.95, and both Pearson and Spearman correlations are approximately -0.293, indicating a weak negative correlation. The rolling cointegration analysis reveals statistically significant changes occurring at various points throughout the year, often concentrated in the first two quarters for brief periods. This trend appears consistent in subsequent years.

However, the relationships between A4 and A5, as well as A4 and A6, differ significantly. The frequency of the p-value dropping below our 5% threshold is notably lower compared to A1 and A2 or A1 and A3. This is largely due to the constant values observed for a significant portion of 2022 and 2023, rendering the calculation of correlation coefficients unfeasible. Further analysis is required to interpret the specific implications of these observations.