Time Series Analysis & Modeling

Homework # 8 Partial Correlation Coefficient

DATS 6450

Using the "numpy" and "pandas" library and the python program you wrote for the correlation coefficient before, perform the followings steps:

1- Load the "tute1.csv" dataset. Write a python program that calculate the correlation coefficient between Sales and AdBuget and display the following message on the console.
"*Correlation Coefficient between Sales and AdBugdet is _____*"

2- Write a python program that calculate the correlation coefficient between AdBuget and GDP and display the following message on the console:
"*Correlation Coefficient between AdBugdet and GDP is _____*"

3- Write a python program that calculate coefficient between Sales and GDP and display the following message on the console:
"*Correlation Coefficient between Sales and GDP is _____*"

4- Using the hypothesis test (t-test) show whether the correlation coefficients in step 2, 3, and 4 are statistically significant? Assume the level of confident to be 95% with two tails ($\alpha = 0.05$).

5- Write a python program that calculate the partial correlation coefficient between Sales and AdBudegt. Using the hypothesis test, step 5, shows whether the derived coefficient is statistically significant. Write down your observation. Hint: Partial correlation coefficient between variable A and B with confounding variable C can be calculated as :

$$r_{AB.C} = \frac{r_{AB} - r_{AC}r_{BC}}{\sqrt{1 - r_{AC}^2}\sqrt{1 - r_{BC}^2}}$$

6- Write a python program that calculate the partial correlation coefficient between Sales and GDP. Using the hypothesis test, shows whether this coefficient is statistically significant. Write down your observation. The t-value can be calculated as follow. The critical t-value can be found from the t-table.

$$t_0 = r\sqrt{\frac{n - 2 - k}{1 - r^2}}$$

Where r is the partial correlation coefficient and n is the number of observations.

7- Write a python program that calculate the partial correlation coefficient between AdBudegt and GDP. Using the hypothesis test, shows whether this coefficient is statistically significant. Write down your observation.

8- Create a table and place all the results from step 2 through 8 inside the table. Compare the correlation coefficients and partial correlation coefficients for (Sales, AdBudget), (Sales, GDP) and (AdBudegt, GDP). Write down your observation.

9- If you must drop one of the predictors (AdBudegt or GDP) which predictor do you pick for elimination? You need to justify your answer using the results above.

Be ready to upload the **solution report (as a single pdf**) plus **the .py file** through BB by the due date.