

IE 306.02 Spring 2022 Assignment 2

Due Date: Sunday, May 15th 2022

A service system is subject to customer arrivals with random interarrival times. Customers arrive one by one. The interarrival times are observed in seconds for two eight-hour workdays. In order to build the model first the interarrival time process has to be determined. In that respect, the task is to fit a distribution to the interarrival times of customers (i.e. time between two consecutive customers), if possible (and show why not, if it is not possible). To this end, first analyze the data as discussed in class and perform the tasks given below. Then, once you determine the arrival process simulate it using the event orientation approach.

1. Find sample mean, standard deviation and other descriptive statistics that you deem appropriate.
2. One of the managers claims that it is safe to assume that inter-arrival times are distributed normally with mean 200 seconds and standard deviation 50 seconds. Test the validity of this claim using the Kolmogorov-Smirnov test with a significance level of 0.05.
3. Draw frequency histograms of the data for 5, 10 and 20 second intervals. Comment on the shape of the histograms.
4. Perform a chi-square test at a significance level of 0.05 with 10 second intervals to test whether the data comes from an exponential distribution where the mean is as found in step 1.
5. Draw the QQ-plot to test whether the data comes from an exponential distribution.
6. **Plot** the inter-arrival times with respect to observation times. Is there an obvious pattern? Analyze visually if the data is stationary or not.
7. Test whether the data is autocorrelated. Plot the lag 1, lag 2 and lag 3 differences. Find and report the correlation for lag 1,2 and 3 differences. Comment on the results.

Using Excel is sufficient for this assignment. In obtaining QQ-plots with Excel you have to understand the logic behind drawing them. If you need to use a statistical package a good choice is [the R project](#) which is publicly available. Here is a [tutorial](#) on the use of R.

The data is given in a separate excel file in the Moodle link. Every group has a unique dataset for this assignment. **Use the dataset in the tab that matches your group number.**

Please do not use any other software or try to develop your own programs for the assignment. Upload a **single zipped file** that contains a **well written report** along with your Excel and/or R codes through this interface.