IE 306
SYSTEM SIMULATION
Homework 2
Group 4

Group Members

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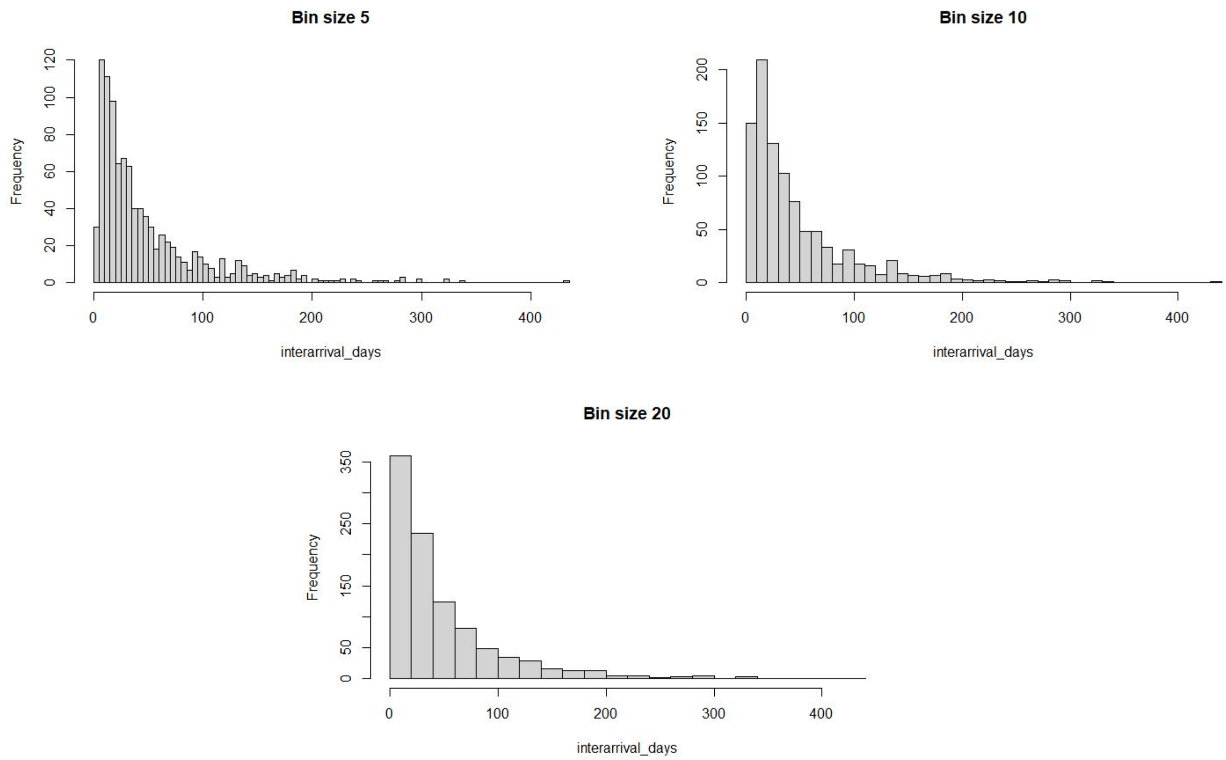
1. Reject

When we plotted the interarrival frequency histograms we saw that the trend of interarrival times resembles the exponential distribution and we could not observe a uniform trend on the histograms. We applied the Kolmogorov-Smirnov Test with 0.05 significance to find out if the data comes from a uniform distribution U(0,400) and we rejected this hypothesis since our D value was higher than the desired D value for 0.05 significance.

2.

Mean: 49.2516507285974
Standard deviation: 54.1217094501167
Max: 434.444444444444
Min: 0
Range: 434.444444444444
Median: 30
Mode: 20

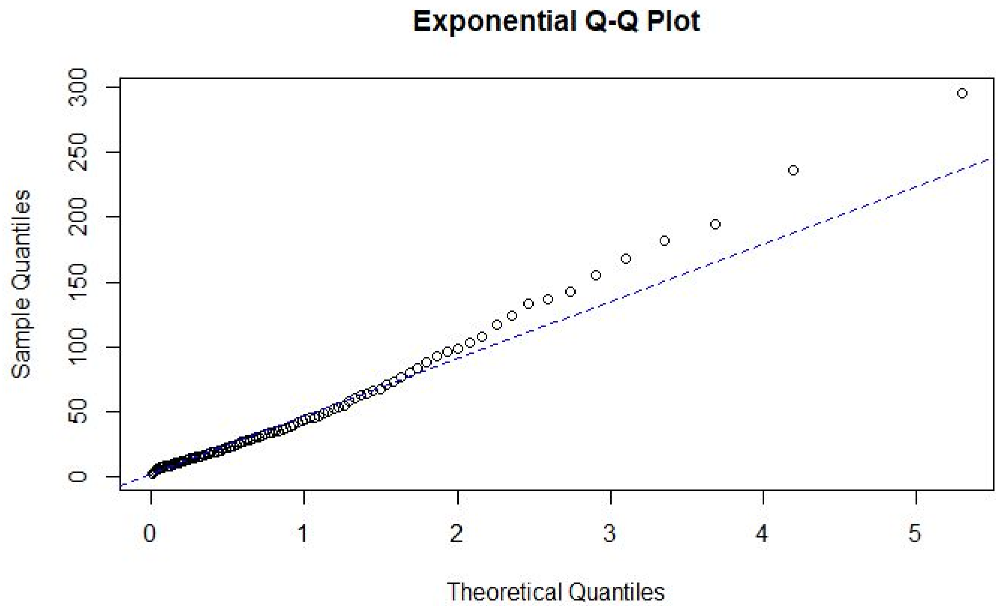
3.



In all three histograms, we observed that the data resembles the exponential distribution. However, we also see that as the bin size gets smaller we can observe fluctuations in the frequencies. In histograms with bin sizes 10 and 5, we see that the frequency of the first bin is significantly lower than the frequency of the second bin which made us suspicious about the resemblance between interarrival data distribution and exponential distribution.

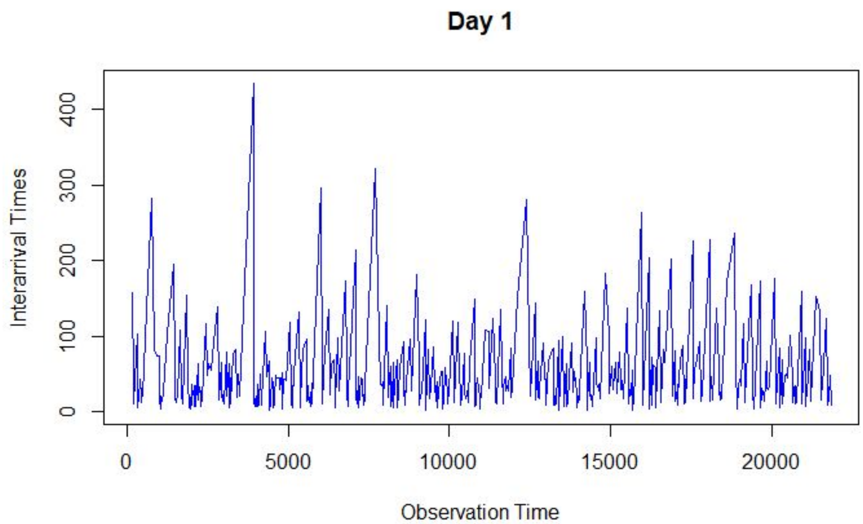
4. "Reject: exponential with mean 49.2516507285974". We can not say that data is coming from an exponential distribution with mean 49.25, with 95% confidence. (alpha = 0.05)

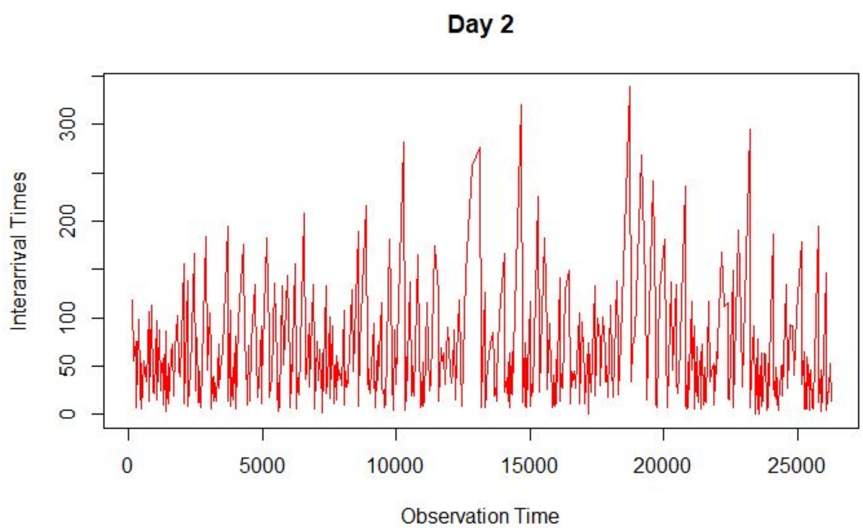
5.



Reject: the exponential Q-Q plot test result above says that the data do not come from an exponential distribution. Because we can observe the deviation between the line and data especially at the end of the graph.

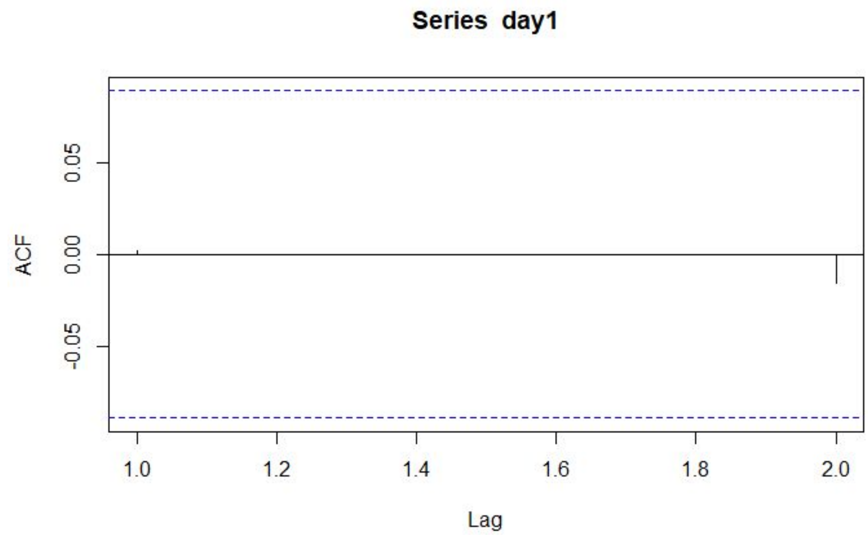
6.



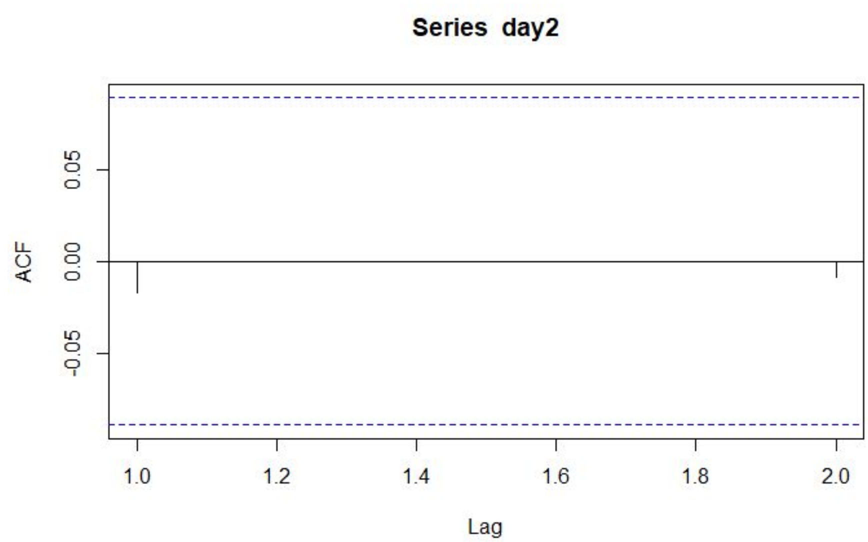


Firstly, we can say that the data for the first day fluctuate between 0 and 450 seconds. For the second day it fluctuates between 0 and 300 seconds. We can not say the data is stationary because the mean and variance for both days differs over time. And there is not any obvious pattern to recognize for both days. The data is chaotic.

7.



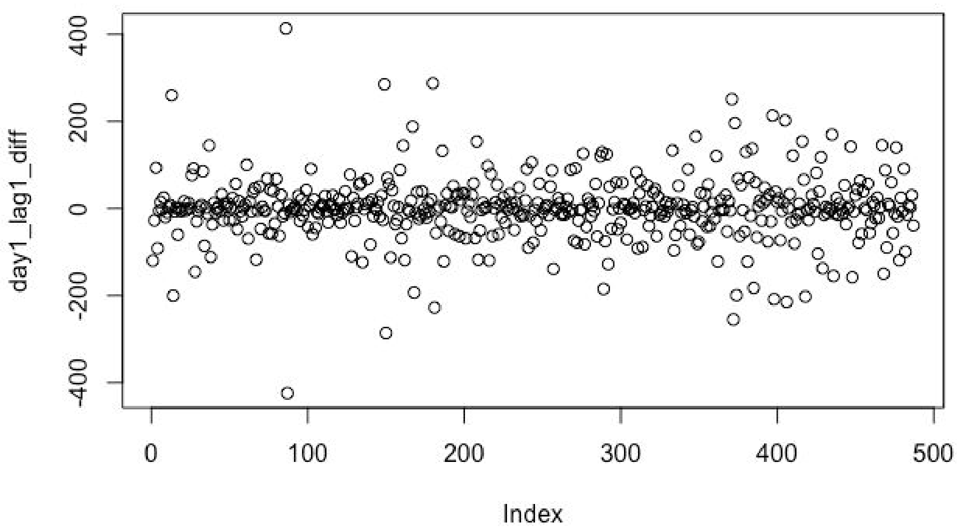
Autocorrelations of series ‘day1’, by lag: Lag 1 = 0.002 Lag 2 = -0.015



Autocorrelations of series ‘day2’, by lag: Lag 1 = -0.017 Lag 2 = -0.008

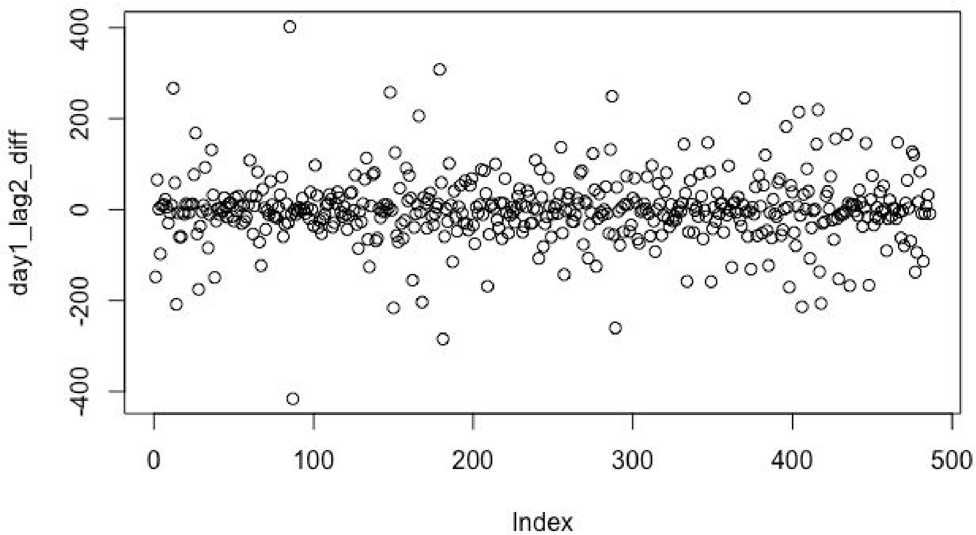
There is almost no correlation between consecutive two interarrival times in both days. The correlation numbers are so small that comparing two days does not make any sense. It won’t provide a meaningful conclusion.

The plot of lag 1 difference of day 1



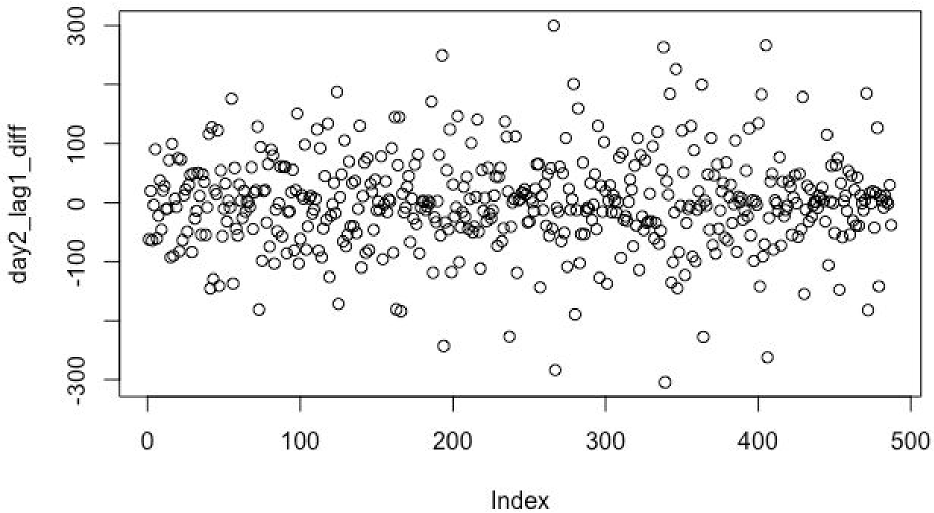
The lag 1 difference for each data point is aggregated around 0, which means the interarrival times do not differ much. However, we see that the aggregation around 0 is corrupted as the index (X-axis) grows. This property is consistent with the fluctuation we saw in Q5 (QQPlot) and Q6.

The plot of lag 2 difference of day 1



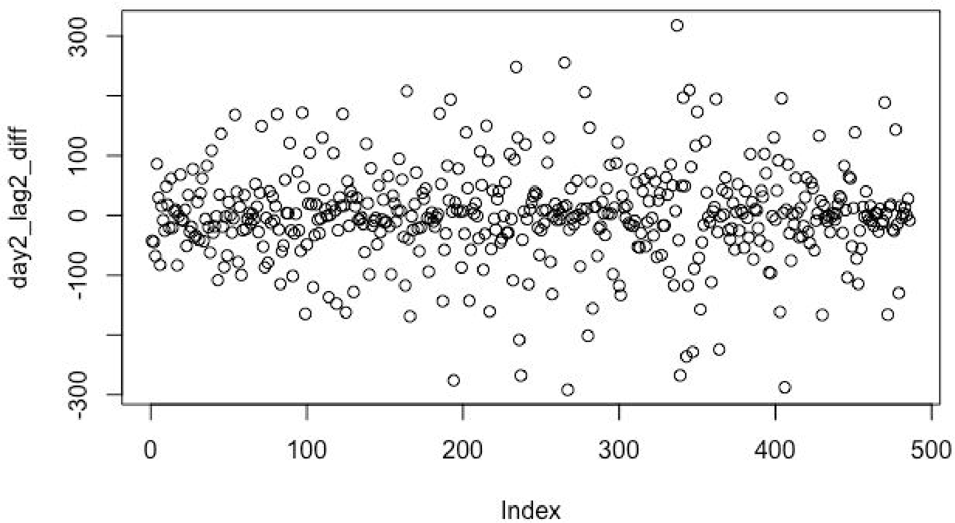
Again, we see an aggregation around 0 but this time it is not as straight as the one in the lag1 day1 plot. However, it is still observable. Again diversion increases as the index grow like the data shown in the Q5 (QQPlot).

The plot of lag 1 difference of day 2



The aggregation around 0 is nearly seen. The plot shows that there is no correlation and supports the lag 1 correlation result of day 2. Again diversion increases as the index grow like the data shown in the Q5 (QQPlot).

The plot of lag 2 difference of day 2



This time aggregation around 0 is more visible compared to the lag1-day2 graph above, meaning that day2 is more autocorrelated by lag 2 as we calculated at the beginning of the Q7. These two conclusions are consistent.