Two resampling techniques for computing confidence intervals for harmonic mean – **Jackknife & Bootstrap**

For a given data set (IPC)

IPC_data = [1.01, 0.99, 0.78, 1.12, 1.20, 0.86, 0.65, 0.56, 0.87, 0.63, 0.70, 1.24, 1.40]

n = 13

(a)

Using the **Jackknife's technique** as described in the Patil and Lilja,

- A new sample size of (n-1) was formed, that is 13-1=12, since data set is 13, at every resampling each time.
- Then I evaluate the estimator which is the harmonic mean for each sample
- And also compute the standard deviation of these samples each
- The standard deviation value was used to compute the confidence level, which is 90 percent, and using the t-table since our data set is less than 30.

Results

C1 - 0.96
C2 - 1.20

Please find attached the code – Jackknife.py

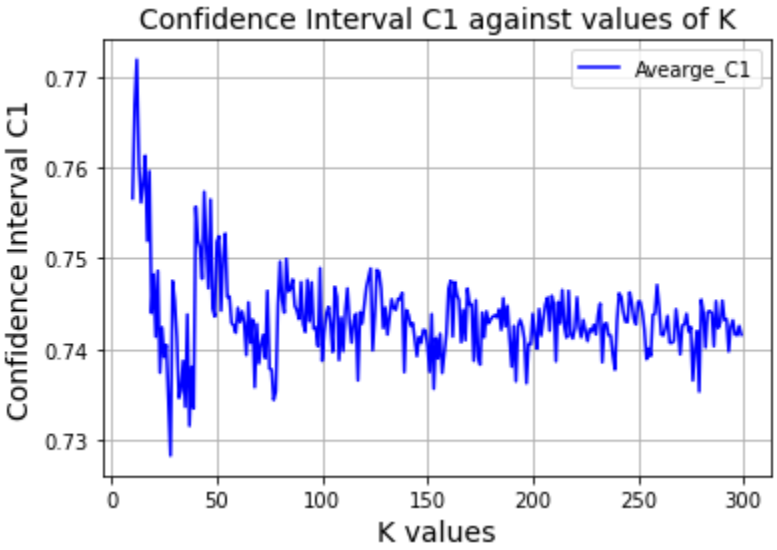
(b)

Using the **Bootstrap's technique** as described in the same paper,

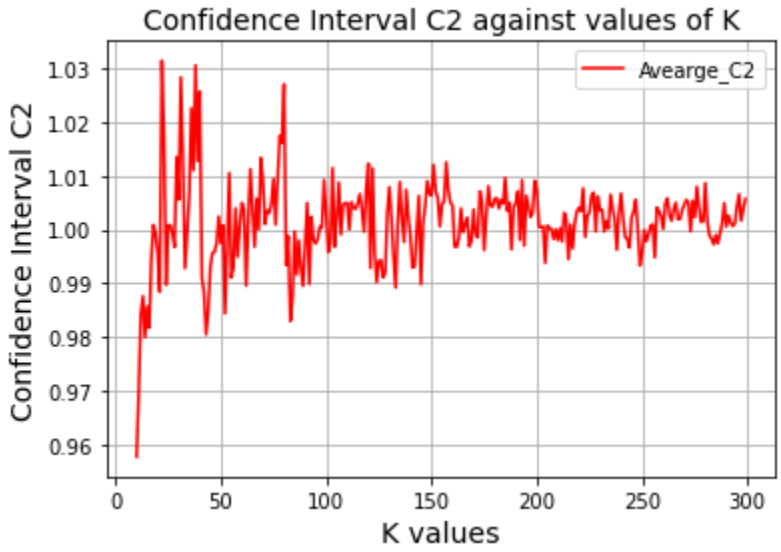
- The given set is subjected to random sampling with replacement
- With given **k – [10 :300],** number of samples, harmonic mean, standard deviation, and confidence intervals are computed in 20 iterations.
- Then, I sorted the harmonic means to get the two confidence intervals – C1 & C2 per K values

- For a confidence level of 95 percent, (0.025*k)th value gives the lower limit, C1 and (0.975*k)th value gives the upper limit, C2 from the sorted list as the required percentile.
- Average of all C1 and C2 were calculated and plotted against all the values of K.
- Average of all standard deviation of each iteration plotted against the values of K.

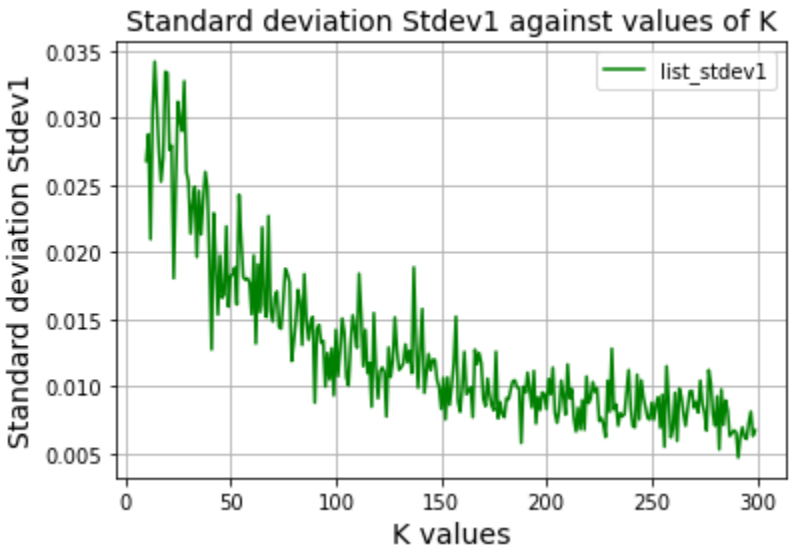
Results



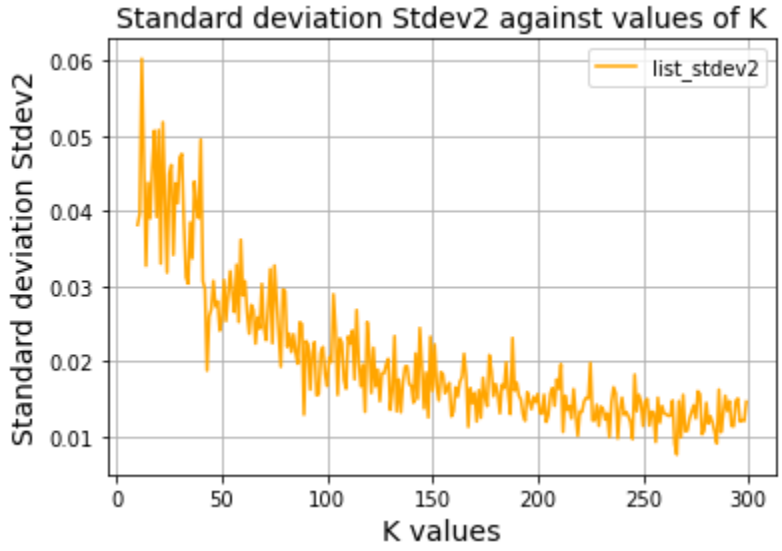
Confidence Interval C1 against values of K



Confidence Interval C2 against values of K



Standard deviation Stdev1 against values of K



Standard deviation Stdev2 against values of K

Please find attached the code – Bootstrap.py