QUESTION 3. Exploiting Correlation

Financial Data is meant not only to process data but to understand how meaningful factors can be used to summarize or represent the data. Let's understand the role that correlation and principal components play.

a. Generate 5 uncorrelated Gaussian random variables that simulate yield changes (they can be positive or negative with a mean close to 0 and a standard deviation that is small).

b. Run a Principal Components using EITHER the correlation OR covariance matrix.

c. Write a paragraph explaining how the variances of each component compare with each other. In this paragraph, you will address the following question: how much variance is explained by Component 1, Component 2, Component 3?

d. Produce a screeplot (see https://en.wikipedia.org/wiki/Scree_plot) of the variance explained for each component.

Now let's work with real data:

e. Collect the daily closing yields for 5 government securities, say over 6 months.

f. Be sure to compute the daily yield changes!

g. Re-run the Principal Components using EITHER the correlation or covariance matrix.

h. How do the variances of each component compare? In other words, how much variance is explained by Component 1, Component 2, Component 3, etc.?

i. Produce a screeplot of the variance explained for each component.

j. How does the screeplot from the uncorrelated data compare with the screeplot from the government data?