6 Multivariate Volatility Models and PCA

1. PCA and Orthogonal GARCH
   (a) Get historical prices for: Google, Facebook, Mastercard and Visa, from 04-04-2014 to 28-10-2022, convert into log returns.
   (b) Estimate the 4 Principal Components (PCs) and decide how many to use.
   (c) Build your in-sample variance covariance matrix with your chosen PCs from the previous question.
   (d) Compare the estimated correlations for 12-04-2017 and 30-03-2020.
2. PCA - Interest rates
   (a) Using the provided data on interest rates (Treasury Yields.csv) perform a principal component analysis.
   (b) What fraction of the total variance is explained by each component.
   (c) How would you interpret the first three principal components?
3. PCA - Currency returns
   (a) Using the provided data on currency excess returns perform PCA analysis. Currency Excess Returns.csv contains monthly excess returns for nine currencies from the perspective of a USD-based investor.
   (b) What fraction of the total variance is explained by each component.
   (c) How many components would you choose in a multivariate volatility model for currencies?