PCA

File

- Multi-asset PCA_CHANGES=4w.csv : contains the 4 weeks returns of the factors
- Traditional Assets_Multi-asset PCA_CHANGES=4w.csv : contains the 4 weeks return of traditional assets
- Systematic Strategies_Multi-asset PCA_CHANGES=4w.csv : contains the 4 weeks return of famous hedge fund strategies

Assignment

PCA

- Make the PCA of the factors in Multi-asset PCA_CHANGES=4w.csv
- Display the loadings of the first 6 Components (PC1, PC2 ... PC6)
- Display the fraction of the variance explained by each PCA (sorted by the explained variance) and the cumsum
- How many components are needed to explain 75% of the variance? 80%?
- Diplay the cumsum of the returns of the 3 main components
- Regress each factors to each of the first 6 components and display the DataFrame:
  - Index: the factors
  - Columns: the 6 main components
  - Content: the r^2 of the regression of the factors vs the components
  - What is the factor the best explained by PC1? Display the cumsum of that factor and of PC1
  - What is the factor the best explained by PC2? Display the cumsum of that factor and of PC2
  - What is the factor the best explained by PC3? Display the cumsum of that factor and of PC3

Study of the Traditional Assets

- load the Traditional Assets_Multi-asset PCA_CHANGES=4w.csv file
- Compute the correlation of each assets with PC1 and PC2
- Display the DataFrame:
  - Index: Traditional Asset
  - Column: PC1 and PC2
  - Contains: the correlation between Traditional Asset and the PCs
- Make a scatter plot of the previous DataFrame displaying also the name of the points

Systematic Strategies

Do the same with the file Systematic Strategies_Multi-asset PCA_CHANGES=4w.csv

Portfolio Optimization
- load equity_factor_performance_data.csv
- it displays the value of funds based on traditional trading factors
- compute the returns of the fund
- construct the min variance portfolio, display its cumsum return
- At the begining of each month construct a portfolio using
  - expected return : past month performance
  - long only
  - total allocation 1
  - cannot trade more than 0.05 per factor
  - each factor cannot be allocated more than 0.25
  - total trading cannot be more than 0.15
- Display the PnL
- Do the same monthly optimization but this time you can get short and the GMV must be 1