Quantitative Portfolio Management

Assignment #2

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Instructions for each assignment . . . I

- Each assignment should be emailed as a Jupyter file
  - To Raman.Uppal@edhec.edu
  - The subject line of the email should be: "QPM: Assignment n," where $n = \{1, 2, \ldots, 8\}$.
  - Assignment n is due before Lecture n, where $n = \{1, 2, \ldots, 8\}$.
  - Assignments submitted late will not be accepted (grade $= 0$), so please do not email me assignments after the deadline.

Instructions for each assignment . . . II

- The Jupyter file should include the following (use Markdown):
  - Section "0" with information about your submission:
    - Line 1: QPM: Assignment *n*
    - Line 2: Group members: listed alphabetically by last name
    - Line 3: Any comments/challenges about the assignment
  - Section "*k*" where $k = \{1, 2, \ldots\}$.
    - First type Question *k* of Assignment *n*.
    - Then, below each question, provide your answer.
    - Your code should include any packages that need to be imported.

Questions for Assignment 2

- Please do the following.

  Q2.1 Download daily stock prices for FAANG stocks (Facebook/Meta, Amazon, Apple, Netflix, Google/Alphabet) from January 2015 until December 2020. Note that the ticker symbols for the five stocks are: META, AMZN, AAPL, NFLX, and GOOG.

  Q2.2 Compute the first and second moments of stock returns for each of these stocks (i.e., their means, variances, and covariances).

  Q2.3 Compute the skewness and excess kurtosis for the returns for each of these stocks. Do the daily stock returns have a Normal distribution?

Discussion of Assignment 2: Initial setup

Load packages and initial definitions

```
import pandas as pd
import numpy as np
import yfinance as yf

# For Q2.3, we will also import scipy
```

Discussion of Assignment: Q2.1

Q2.1 Download daily stock prices for FAANG stocks (Facebook/Meta, Amazon, Apple, Netflix, Google/Alphabet) from January 2015 until December 2020. Note that the ticker symbols for the five stocks are: META, AMZN, AAPL, NFLX, and GOOG.

Code for Q2.1

```
# Define the list of ticker symbols for FAANG stocks
FAANG_list = ["META", "AMZN", "AAPL", "NFLX", "GOOG"]

# Define the start and end dates
start_date = "2015-01-01"
end_date = "2020-12-31"

# Create an empty pandas data frame to store the stock prices
FAANG = pd.DataFrame()

# Download stock prices for each ticker symbol and append to the DataFrame
for ticker in FAANG_list:
    FAANG_data = yf.download(ticker, start=start_date, end=end_date)
    FAANG[ticker] = FAANG_data["Adj Close"]

FAANG
```

- The output is shown on the next page.

Output for Q2.1

- Daily stock prices for FAANG stocks.

Date	META	AMZN	AAPL	NFLX	GOOG
2014-12-31	78.019997	15.517500	24.733969	48.801430	26.247936
2015-01-02	78.449997	15.426000	24.498678	49.848572	26.168653
2015-01-05	77.190002	15.109500	23.808516	47.311428	25.623152
2015-01-06	76.150002	14.764500	23.810762	46.501431	25.029282
2015-01-07	76.150002	14.921000	24.144634	46.742859	24.986401
...	...	...	...	...	...
...	...	...	...	...	...
...	...	...	...	...	...
2020-12-23	268.109985	159.263504	128.856781	514.479980	86.619003
2020-12-24	267.399994	158.634506	129.850616	513.969971	86.942497
2020-12-28	277.000000	164.197998	134.494751	519.119995	88.804497
2020-12-29	276.779999	166.100006	132.704010	530.869995	87.935997
2020-12-30	271.869995	164.292496	131.572495	524.590027	86.975998

Discussion of Assignment: Q2.2

Q2.2 Compute the first and second moments of stock returns for each of these stocks (i.e., their means, variances, and covariances).

Code for Q2.2

```
# Calculate log returns for each stock
log_ret = np.log(FAANG / FAANG.shift(1)).dropna() # drop the first line

# Compute the first and second moments of log-returns
log_ret_mean = log_ret.mean()
log_ret_var = log_ret.var()
log_ret_cov = pd.DataFrame(log_ret.cov())

# Print the results
print("Mean:", log_ret_mean)
print("Variance:", log_ret_var)
print("Cov:")
log_ret_cov
```

- The output is shown on the next page

Output for Q2.2

- Means and variances of returns

Moment	META	AMZN	AAPL	NFLX	GOOG
Mean	0.000827	0.001563	0.001107	0.001573	0.000793
Variance	0.000407	0.000375	0.000349	0.000704	0.000286

- Variance-covariance matrix of returns

	META	AMZN	AAPL	NFLX	GOOG
META	0.000407	0.000236	0.000217	0.000241	0.000229
AMZN	0.000236	0.000375	0.000202	0.000275	0.000215
AAPL	0.000217	0.000202	0.000349	0.000208	0.000193
NFLX	0.000241	0.000275	0.000208	0.000704	0.000217
GOOG	0.000229	0.000215	0.000193	0.000217	0.000286

Discussion of Assignment: Q2.3

Q2.3 Compute the skewness and excess kurtosis for these stock returns. Do the stock returns have a Normal distribution?

Code for Q2.3

```
import scipy
from scipy.stats import skew
from scipy.stats import kurtosis

print(skew(log_ret, axis=0, bias=True))
print(kurtosis(log_ret, axis=0, bias=True, fisher=False))
# bias = False: Calculations are corrected for statistical bias
# fisher =  False: Pearson's definition will be used (Normal kurtosis = 3.0)
```

Moment	META	AMZN	AAPL	NFLX	GOOG
Skewness	−0.77696544	0.51955009	−0.32543467	0.34620426	0.22421021
Kurtosis	17.18809587	9.26707823	9.84453811	9.29061936	12.27114537

- Daily returns are slightly skewed but have very fat tails (if returns were normally distributed, then kurtosis should be equal to 3).

End of assignment