

CFRM 501 - Investment Science

Homework Assignment 2

Due: October 19, 2020 - 11:59 pm

Late submissions will receive an automatic grade of zero.

Question 1: Suppose an asset is worth \$100 today. Over the next month it experiences an arithmetic return of 20%. Then, over the next month the arithmetic return is -35%. What is the final value of the asset? If we replace the word “arithmetic” with “logarithmic” what is the final value of the asset? Confirm in this example that the logarithmic returns aggregate additively through time but that the arithmetic returns do not.

Question 2: Suppose two assets are worth $P_0^{(1)} = 100$ and $P_0^{(2)} = 250$ today. A portfolio consists of three units of the first asset and two units of the second. Over the next month, the first asset has a return of 10% and the second asset has a return of 15%. What is the final value of the portfolio? Confirm that the arithmetic return of the portfolio is a weighted average of the returns of its components.

Question 3: Download daily stock prices of MSFT from November 1, 2015 to September 30, 2020 and reproduce the histogram/pdf figure from the lecture slides using the following procedure:

- i) Compute the daily arithmetic returns from the price data.
- ii) Compute the sample mean, $\bar{\mu}$, and sample variance, $\bar{\sigma}^2$, of the returns.
- iii) Plot a histogram of the returns (normalize the heights of all bars so that the total area is 1).
- iv) On the same figure as part iii), plot the probability density function of a Gaussian with parameters $\mu = \bar{\mu}$ and $\sigma = \bar{\sigma}$.

Report the numerical values of the sample mean, variance, skewness, and kurtosis of the daily returns. Repeat the entire exercise using AMZN and GOOG.

Continued Reading: Chapters 1, 2, and 3 of Asset Management by Andrew Ang must be completed before the midterm (November 9, 2020).