

OPIM 5603-B14 — Statistics in Business Analytics

Fall 2019, University of Connecticut

Homework 6 - v1

Instructions: Please complete the following questions and submit them as an RNotebook (as an Rmd file) via the submission link on HuskyCT. You must submit the assignment by the time and due date listed on the course syllabus. Failure to submit a file by the deadline will result in a score of 0 on the assignment.

Set the heading of the RNotebook as an `html_document`, with a table of contents and without numbered sections. Add your name and a date to the header as well. The solution to each problem should be a separate section (specified by `#`), and each subproblem should be set as a subsection (specified as `##`). For example, for Problem 2, you should have a section titled Problem 2, specified by:

```
# Problem 2
```

in your RNotebook. Also, for subproblem b in Problem 2, you should have a subsection, specified by:

```
## Problem 2b
```

As with all course material, the problems appearing in this homework assignment are taken from the instructor's real-world experiences, from other courses taught at the University of Connecticut, and from the sources listed in the course syllabus.

Note that R code submitted should work independent of the data that sits in the data structure. For example, suppose there was a vector `r_vec` with the values (1, 2, 6) and the problem asks for you to create R code to create a vector `answer` which doubles each element of `r_vec`. The answer

```
answer <- c(2, 4, 12)
```

would be given no credit. The answer

```
answer <- 2*r_vec
```

would be an appropriate answer.

You must show all steps in your solution. For example, if a problem asks for the expected value of a random variable that is binomially distributed with $n = 10$ and $\pi = 0.3$, and you simply write

3,

this will be given no credit. However,

$10 * 0.3$

would be given credit.

If you have any questions, please submit them via email to the instructor and/or the teaching assistant prior to submitting your solution.

Problem 1 (100 points)

In this problem you will be answering question from the reading *Finance Reading: Risk and Return 1: Stock Returns and Diversification* by Timothy A. Luehrman, which you should purchase from the following link: <https://hbsp.harvard.edu/import/671870>. Please answer the following questions, which were adapted from the reading.

- a. Which of the following is not true of risk-aversion?
 1. Risk-averse investors are willing to accept less reward in exchange for less risk.
 2. A risk-averse person would prefer a safer gamble to a riskier one offering the same expected reward.
 3. Risk-averse investors need to be compensated to be induced to make riskier investments.
 4. A risk-averse person would always prefer a greater, non-guaranteed reward to a lesser, but guaranteed reward.
- b. Which of the following asset classes has had the highest cumulative return since 1926?
 1. Large-cap stocks
 2. Small-cap stocks
 3. Corporate bonds
 4. Treasury bonds
- c. Consider the returns for various asset classes presented in Exhibit 1. Which of the following statements is not correct?
 1. Large-cap stocks have earned a higher return than Treasury bonds.
 2. Treasury bonds have earned a higher return than Treasury bills.
 3. Treasury bonds have earned a higher return than corporate bonds.
 4. Small-cap stocks have earned a higher return than large-cap stocks.
- d. Given two stock return distributions such as those displayed in Exhibit 2, which of the two stocks is riskier?
 1. The one with the lower expected return.
 2. The one with a distribution that is less spread out.
 3. The one with a greater variance of returns.
 4. The one with potential outcomes more concentrated around its expected return.
- e. Figure 1 depicts the expected returns and standard deviations for five assets. Which assets are not dominated by any other asset?
- f. Two stocks have annual return volatilities of 31% and 34%. The covariance between their returns is 0.033. What is the correlation coefficient? Round your answer to three decimal places.

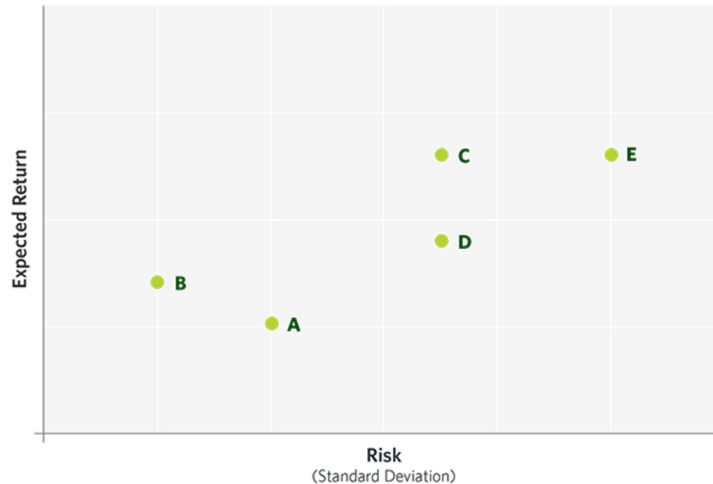


Figure 1: Plot for Question 1.e.

- g. A stock earned annual returns of 10%, 3%, and 12% over three consecutive years. During the same time period, market returns were 5%, 12%, and 8%. What was the correlation between the stock and market returns during this time period? Round your answer to three decimal places.
- h. Assume that the correlation between a stock's returns and market returns is 0.89, and the standard deviation of returns for the stock and the market index are 21% and 18%, respectively. What is the stock's beta? Round your answer to two decimal places.
- i. A stock earned annual returns of 2%, 2%, 14%, and 8% over four consecutive years. During the same time period, the annual market returns were 2%, 8%, 9%, and 2%, respectively. What is the stock's beta? Round your answer to three decimal places.
- j. This question should be answered based on the CSV file titled `AAPL.csv` available for download at HuskyCT, which provides stock prices and cash dividends for Apple (AAPL) and the S&P 500 Total Return index (S&P500TR) as of the end of each month between September 2011 and September 2016. What was the correlation between the monthly returns for Apple and the S&P 500 between September 2011 and September 2016? Round your answer to three decimal places.
- k. This question should be answered based on the CSV file titled `AAPL.csv` available for download at HuskyCT, which provides stock prices and cash dividends for Apple (AAPL) and the S&P 500 Total Return index (S&P500TR) as of the end of each month between September 2011 and September 2016. What is Apple's beta based on return data between September 2011 and September 2016? Round your answer to two decimal places.
- l. Which of the following is not correct regarding beta?
 1. If a stock has returns that are negatively correlated with market returns, then the stock has a negative beta.

2. If a stock's returns are perfectly correlated with market returns, the beta of the stock must be one.
 3. The beta of a broad market index equals one.
 4. If a stock's returns are uncorrelated with market returns, the beta of the stock must be zero.
- m. Consider two assets having returns R_1 and R_2 , respectively. Assume that a portfolio contains fixed proportions of those two assets, so that the portfolio return equals $x_1R_1 + x_2R_2$ for fixed portfolio weights x_1 and x_2 . Which of the following statements is not correct?
1. In general, the lower the correlation between the returns of the two assets, the lower the risk of a portfolio that consists of fixed proportions of those two assets.
 2. With two uncorrelated assets, the standard deviation of the portfolio equals $x_1\sigma_{R_1} + x_2\sigma_{R_2}$.
 3. The expected return on the portfolio is a weighted average of the expected returns of the individual component assets.
 4. It is possible to create a portfolio with a lower standard deviation than the deviation of return of either individual asset.
- n. Suppose you have \$20,000 invested in a stock with an annual return volatility of 40% and \$38,000 invested in a stock with an annual return volatility of 38%. If the correlation coefficient between the two returns is 0.1, what is the standard deviation of your portfolio returns? Round your answers to two decimal places.