

1. Portfolio risk True or false?
 - a. Investors prefer diversified companies because they are less risky.
 - b. If stocks were perfectly positively correlated, diversification would not reduce risk.
 - c. Diversification over a large number of assets completely eliminates risk.
 - d. Diversification works only when assets are uncorrelated.
 - e. A stock with a low standard deviation always contributes less to portfolio risk than a stock with a higher standard deviation.
 - f. The contribution of a stock to the risk of a well-diversified portfolio depends on its market risk.
 - g. A well-diversified portfolio with a beta of 2.0 is twice as risky as the market portfolio.
 - h. An undiversified portfolio with a beta of 2.0 is less than twice as risky as the market portfolio

2. Suppose the standard deviation of the market return is 20% (assume a correlation of 1 between a well-diversified portfolio and the market)
 - a. What is the standard deviation of returns on a well-diversified portfolio with a beta of 1.3?
 - b. What is the standard deviation of returns on a well-diversified portfolio with a beta of 0?
 - c. A well-diversified portfolio has a standard deviation of 15%. What is its beta?

3. Lonesome Gulch Mines has a standard deviation of 42% per year and a beta of +.10. Amalgamated Copper has a standard deviation of 31% a year and a beta of +.66. Explain why Lonesome Gulch is the safer investment for a diversified investor.

4. There are few, if any, real companies with negative betas. But suppose you found one with $\beta = -0.25$.
 - a. How would you expect this stock's rate of return to change if the overall market rose by an extra 5%? What if the market fell by an extra 5%?
 - b. You have \$1 million invested in a well-diversified portfolio of stocks. Now you receive an additional \$20,000 bequest. Which of the following actions will yield the safest overall portfolio return? Explain your answer.
 - i. Invest \$20,000 in Treasury bills (which have $\beta = 0$).
 - ii. Invest \$20,000 in stocks with $\beta = 1$.
 - iii. Invest \$20,000 in the stock with $\beta = -.25$.

5. You can form a portfolio of two assets, A and B, whose returns have the following characteristics:

| Stock | Expected Return | Standard Deviation | Correlation |
|-------|-----------------|--------------------|-------------|
| A | 10% | 20% | 0,5 |
| B | 15% | 40% | |

If you demand an expected return of 12%, what are the portfolio weights? What is the portfolio's standard deviation? (7.20)

6. True or false? Explain or qualify as necessary.
- Investors demand higher expected rates of return on stocks with more variable rates of return.
 - The CAPM predicts that a security with a beta of 0 will offer a zero expected return.
 - An investor who puts \$10,000 in Treasury bills and \$20,000 in the market portfolio will have a beta of 2.0.
 - Investors demand higher expected rates of return from stocks with returns that are highly exposed to macroeconomic risks.
 - Investors demand higher expected rates of return from stocks with returns that are very sensitive to fluctuations in the stock market.
7. Mark Harrywitz proposes to invest in two shares, X and Y. He expects a return of 12% from X and 8% from Y. The standard deviation of returns is 8% for X and 5% for Y. The correlation coefficient between the returns is 0.2.
- Compute the expected return and standard deviation of the following portfolios:

| Portfolio | x_1 | x_2 |
|-----------|-------|-------|
| X | 1.00 | .00 |
| 1 | .50 | .50 |
| 2 | .25 | .75 |
| 3 | .75 | .25 |
| Y | .00 | 1.00 |

- Sketch the set of portfolios composed of X and Y.
8. You are asked to evaluate the risk of a portfolio that is *long* (buy) \$100 of AAPL and *short* (sell) \$100 of XOM. The standard deviation of returns for AAPL is 40%. The standard deviation of returns for XOM is 30%. The correlation between the two is 37.5%. What is the standard deviation of the portfolio? What is the standard deviation of each position separately?
9. A portfolio, with a standard deviation of \$30 million contains three positions. The three positions, in turn, have standard deviations of \$10 million, \$20 million, and \$30million.What is the diversification score of the portfolio?

10. A hedge fund is considering hiring two different portfolio managers, Alice and Bob. The fund's Sharpe ratio is currently believed to be 1.00. Based on historical data, you believe that Alice has a Sharpe ratio of 0.80 and is 30% correlated with the fund's existing portfolio. Bob has a Sharpe ratio of 1.10 and is 90% correlated with the existing portfolio. Calculate the incremental Sharpe ratio for both managers. Assuming these values are correct, at the margin, which manager would improve the fund's overall Sharpe ratio the most?
11. Take the Excel file "EDP & Galp" and calculate for both companies;
- $\text{VaR}_{5\%}$, $\text{VaR}_{95\%}$
 - $\text{CVaR}_{5\%}$, $\text{CVaR}_{95\%}$
 - Skewness and Kurtosis;
 - Comparing both companies, what type of relation exists between Kurtosis and the extreme risk measures?
 - The standard deviation (experimental and analytical) of the resulting portfolio, assuming a 50% weight for each company;
 - There is a diversification effect in the portfolio?
 - Which risk measures in this example satisfy the subadditivity property?
12. Assume a portfolio returns follows a normal distribution with standard deviation of 0.10. Calculate:
- $\text{VaR}_{5\%}$, $\text{VaR}_{95\%}$
 - The $\text{CVaR}_{5\%}$, $\text{CVaR}_{95\%}$ will have higher or lower values when compared with $\text{VaR}_{5\%}$, $\text{VaR}_{95\%}$?
13. You are asked to evaluate the risk of a portfolio containing two securities. The first security has an expected shortfall of $-\$400$ (a loss of $\$400$). The second security has an expected shortfall of $-\$300$. What is the minimum (worst-possible) expected shortfall of the portfolio?
14. You have created a Monte Carlo simulation to calculate the one-day, 99% VaR of a portfolio containing a large number of options. In your simulation, you generate 1,000 sample one-day returns. The following table contains the 12 worst losses from your simulation. (Here, losses are represented as positive numbers, so 16% is a loss of 16% or a profit of -16%).

| | Loss (%) |
|----|----------|
| 1 | 17% |
| 2 | 14% |
| 3 | 14% |
| 4 | 13% |
| 5 | 13% |
| 6 | 12% |
| 7 | 12% |
| 8 | 12% |
| 9 | 12% |
| 10 | 11% |
| 11 | 11% |
| 12 | 11% |

What is the one-day 99% VaR? What is the one-day 99% expected shortfall?

15. In the proceeding example, if instead of 17% and 14%, the two worst losses were 27% and 24%, what would the one-day 99% VaR and expected shortfall be? Losses 3 through 12 in the table remain the same.

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- Choose 2 company's from this list: <https://companiesmarketcap.com/usa/largest-companies-in-the-usa-by-market-cap/>
- Go to <https://finance.yahoo.com/> and download the monthly closing (close*) share prices for the last 5 years (5D) for both companies.

Example for Apple: <https://finance.yahoo.com/quote/AAPL/history?p=AAPL>



- Calculate the logarithmic returns $\ln(P_t/P_{t-1})$ for both companies, being P the monthly closing price extracted in 2.
- Using the logarithmic returns calculate the average return and standard deviation returns for the portfolio formed by both companies where one of the companies has a portfolio weight of 40% and the other has a 60% weight.
- Assume that you want to impose a given return for your portfolio (choose a value in between both companies' average returns) and now evaluate which new weight each company should have in your portfolio. Use "Goal seek" in Excel. See figure 1 as an example.
- Indicate which is the new standard deviation for the new portfolio and which is the $VaR_{5\%}$ (Value at Risk at 5%). Use Excel "percentile" function.
- Download from Yahoo Nasdaq Index, monthly, for the last 5 years, assume it as your Market Index and calculate the Beta for each of your companies. Which one is more risky?

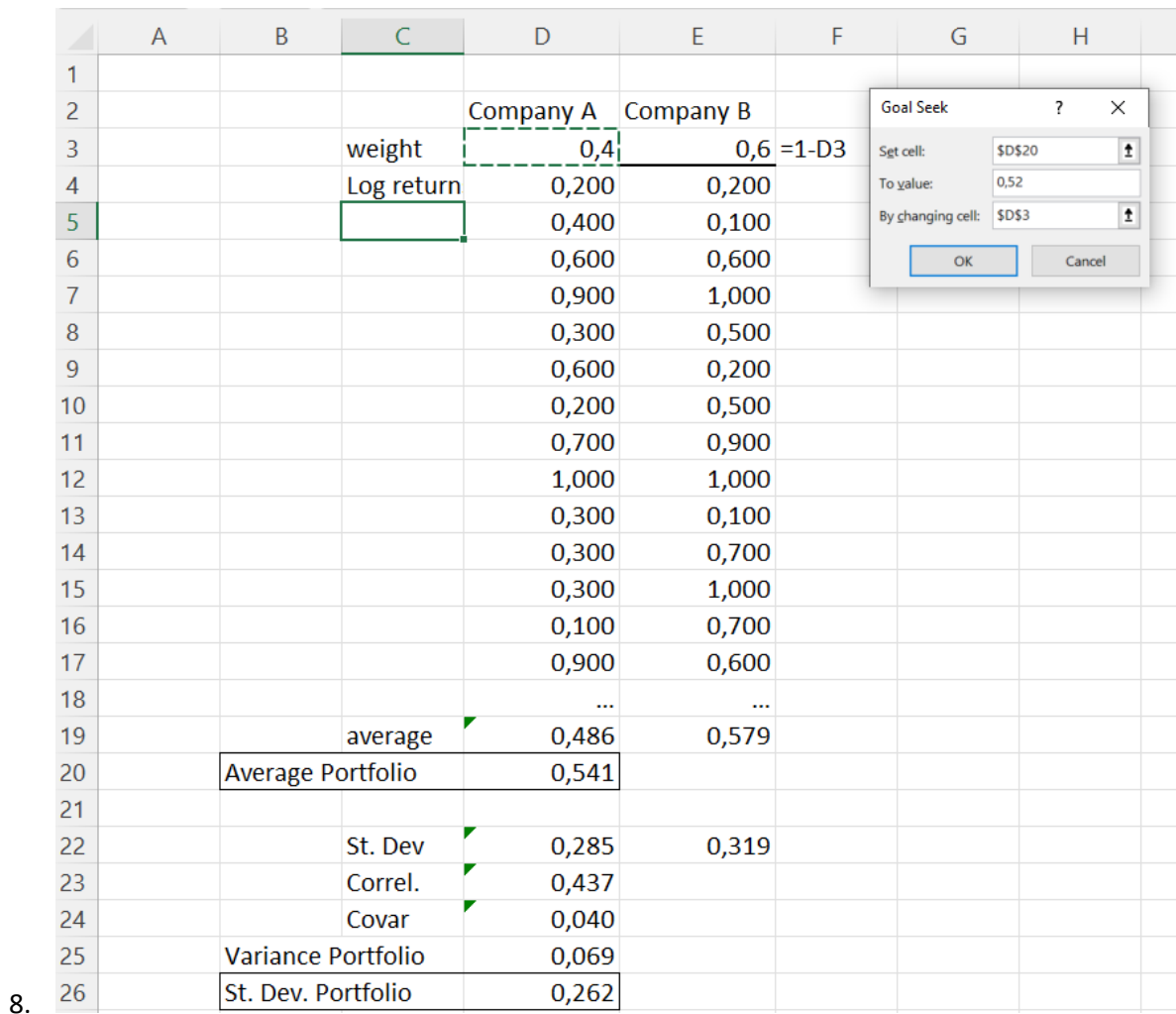


Figure 1