

Nisan Langberg
 Corporate Finance FINA4330

Problem Set #4

Start by solving the following short practice questions

P1. For each of the following pairs of investments, state which would always be preferred by a rational investor (assuming that these are the only investments available to the investor):

- a. Portfolio A: $r=18\%$ $\sigma=20\%$ Portfolio B: $r=14\%$ $\sigma=20\%$
- b. Portfolio C: $r=15\%$ $\sigma=18\%$ Portfolio D: $r=16\%$ $\sigma=8\%$
- c. Portfolio E: $r=14\%$ $\sigma=16\%$ Portfolio F: $r=14\%$ $\sigma=10\%$

P2. Suppose that the Treasury bill rate is 4% and that the expected return on the market is 10%.

Firm	β	Firm	β	Firm	β
Amazon	2.16	Starbucks	1.16	Newmont	0.63
Ford	1.75	Boeing	1.14	Exxon Mobil	0.55
Dell	1.41	Disney	0.96	Campbell Soup	0.30

- a. Plot the Security Market Line (SML).
- a. Locate all stocks on your graph.
- b. Find the highest expected return that is offered by one of these stocks.
- c. Find the lowest expected return that is offered by one of these stocks.
- d. Would Ford offer a higher or lower expected return if the interest rate were 6% rather than 4%? Assume that the expected market return stays at 10%.
- e. Would Exxon Mobil offer a higher or lower expected return if the interest rate were 8%?
- f. What would be the expected return on a portfolio with 50% invested in Amazon and 50% invested in Campbell Soup? What is the portfolio's beta? Locate the portfolio on the SML.

P3. True or False?

- a. The CAPM implies that if you could find an investment with a negative beta, its expected return would be less than the interest rate.
- b. The expected return on an investment with a beta of 2.0 is twice as high as the expected return on the market.
- c. If a stock lies below the security market line, it is undervalued.
- d. The CAPM predicts that a security with a beta of 0 will offer a zero expected return.
- e. An investor who puts \$10,000 in treasury bills and \$20,000 in the market portfolio will have a beta of 2.0.

1. **[Capital Budgeting]** Suppose that a steel company has an existing blast furnace that will last for another 10 years. The company is evaluating a proposal to refurbish the existing blast furnace. You have just completed a \$1M feasibility study and have found the following: Refurbishing the blast furnace will result in \$50M dollars in new sales per year and will save \$90M per year in expenses (the current sales and costs are \$500M and \$350M respectively). Suppose that the new equipment costs \$1,000M and uses some parts from the (fully-depreciated) old furnace that could be sold elsewhere for \$30M. The existing (non-refurbished) blast furnace and the refurbished blast furnace will both last for 10 years at which time the non-refurbished furnace will have a salvage value of 0 and the refurbished furnace will have a salvage value of \$200M. Finally, the project will require \$20M of extra working capital over the 10 year life of the project, beginning at time zero. Suppose that the firm uses straight - line depreciation for tax purposes (over ten years) and pays 35% in corporate income taxes. Finally, suppose that the opportunity cost of the firm's investors is $r = 10\%$. Should the company refurbish the blast furnace (use the attached table)?

	Year	0	1-9	10
1	Cash Revenue			
2	Operating Expenses			
3	Capital Expenditures			
4	Depreciation			
5	Other Income			
6	Taxable Earnings (1)-(2)-(4)+(5)			
7	Taxes			
8	Change in Working Capital			
9	After Tax Operation Cash Flow (1)-(2)-(3)+(5)-(7)-(8)			

2. [Risk and Return] Suppose that the risk free interest rate is 5% and consider a risky assets, A, with expected return of 10% and standard deviation of 20%.

(a) What is the expected return and standard deviation of a portfolio with 50% invested in the risk free asset and 50% invested in the risky asset A?

(b) Construct a portfolio with weight w_f in the risk free asset and $(1-w_f)$ in asset A such that the expected return on the portfolio is 8%. What is the standard deviation of the return on this portfolio?

(c) Repeat part (b) for the following four cases: (1) expected return on the portfolio is 2%, (2) 5%, (3) 10%, and (4) 15%.

(d) Plot the above portfolios where the “x” axis is standard deviation and the “y” axis is expected return on the portfolio. Are all the above portfolios efficient?

(e) If you had \$100 to invest, how much money would you invest in the risky asset and the risk free asset in order to achieve an expected return of 15% on your investment?

3. [Diversification] Consider two risky assets, A and B. Asset A (as before) has expected return of 10% and standard deviation of 20%. Asset B (also) has expected return of 10% and standard deviation of 20%.

(a) Suppose that the correlation between the two risky assets is 0.5. What is the expected return and standard deviation of a portfolio with 50% invested in asset A and 50% invested in asset B? Are you better off investing your wealth in this portfolio or investing in one security alone?

(b) Repeat part (a) for the following four cases: the correlation between the two risky assets is (1) -1, (2) -0.5, (3) 0, (4) 1. When do you benefit the most from diversification? When do you benefit the least from diversification?

(c) Consider the case of correlation -1. Suppose that you could borrow \$100 to invest in the above risky assets. If your cost of capital was 9% could you earn an arbitrage (that is could you gain a certain expected return that is higher than 9%)?

4. [Risk and Return] Consider two risky assets, A and C. Asset A (as before) has expected return of 10% and standard deviation of 20%. Asset C has expected return of 20% and standard deviation of 30%. Suppose that the correlation between the two risky assets is 0.

(a) Construct a portfolio (let's call this P) with weight w_A in asset A and $(1-w_A)$ in asset C such that the expected return on the portfolio is 15%. What is w_A ?

(b) What is the standard deviation of the return on this portfolio?

(c) Plot portfolio P, assets A and asset C, where the "x" axis is standard deviation and the "y" axis is expected return on the portfolio. Is a portfolio fully invested in asset A efficient?