

Corporate Finance

Problem Set 4

Question 1

Here are the returns and standard deviations for four investments

Security	Return (%)	Standard Deviation (%)
Treasury Bills	6	0
Stock P	10	14
Stock Q	14.5	28
Stock R	21	26

Calculate the standard deviations of the following portfolios.

- 50% in Treasury bills, 50% in stock P.
- 50% each in Q and R, assuming the shares have

- perfect positive correlation
- perfect negative correlation
- no correlation

c. Stock Q has a lower return than R but a higher standard deviation. Does that mean that Q's price is too high or that R's price is too low?

Question 2

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 .2.

- Compute the expected return and standard deviation of the following portfolios:
 - 50% in X / 50% in Y,
 - 25% in X / 75% in Y,
 - 75% in X / 25% in Y.
- Sketch the set of portfolios composed of X and Y.
- Suppose that Mr. Harrywitz can also borrow or lend at an interest rate of 5%. Show on your sketch how this alters his opportunities. Given that he can borrow or lend, what proportions of the common stock portfolio should be invested in X and Y?

Question 3

ChemCo has an 8% debt cost of capital and a 15% equity cost of capital. ChemCo's debt has a market value of \$500 million in perpetual bonds with a promised yield of 10%. Currently there are 10 million shares outstanding, each valued at \$50. The risk-free rate is 4% and expected return on the market portfolio is 12%. Calculate the following quantities:

- Equity and debt beta
- Return on assets and asset beta

Question 4

The liability side of Cox Chemicals' balance sheet has the following components:

Security	Beta	Market Value (\$ millions)
Supersenior Debt	0	28
Senior Debt	0.1	250
Junior Debt	0.15	75
Equity	0.9	340

Calculate the expected return on assets for Cox. The risk-free rate is 5% and expected market return is 11%. Ignore taxes.

Question 5

Your firm is considering expanding into the electric car business. You have the following information on other firms in the industry:

	Equity beta	Stock Price	Number of shares	Debt
Tesla (Electric only)	2.07	242	3.17B	5.81B
Rivian (Electric only)	2.29	21	931.51M	3.22B
Ford (both electric and non-electric)	1.61	12	3.93B	144.85B

The risk free rate is 5%. The historical market risk premium is 4%. There are no taxes. Assume debt betas are 0. Firms maintain a constant debt to value ratio. What is the cost of equity for an unlevered firm (100% equity financed) in the electric car business?

Question 6

XYZ Inc., a diversified conglomerate, is deciding whether to buy a copper mine. XYZ already owns some gold mines and has recently invested in the biotech industry. XYZ's cost of capital is currently 10%. The following is a list of other companies for which market data are available. As a simplifying assumption you can set all debt betas equal to zero.

Firm	Industry	# shares (in \$M)	Price/share	Debt (book value in \$M)	Beta equity
A	Gold/Biotech	3	10	15	1
B	Copper	1	5	1	1.02
C	Copper	2	20	0	0.8
D	Copper	1.5	3	3	1.37

What opportunity cost of capital should XYZ use for evaluating whether to buy the copper mine? Use a risk-free rate of 7% and a market risk premium ($r_m - r_f$) of 8%.

Question 7

ZERO is an organization that invests in gold and in cars. The financial manager wants to estimate the cost of capital of ZERO. The equity risk premium is 9.5% and the risk-free rate is -1%. Gold is countercyclical (return goes up when the market goes down), so the market average beta for a company investing in gold is -0.1. In an industry analysis, the financial manager found that three similar car companies have betas of 1.5, 2, and 2.5. Assume that ZERO is only financed with equity and that twenty-five percent of its business is cars.

- a. What's is ZERO's cost of capital for the gold division?
- b. What is ZERO's cost of capital for the cars division?
- c. What is ZERO's total cost of equity capital?

ZERO changes its mind and decides to open a hydrogen car company along with gold investment. Fifty percent of the business is gold while fifty percent is producing hydrogen cars.

- d. The expected return of the joint company is 10%, what must be the beta of the hydrogen car industry? Assume no debt.