

**Multiple Choice (3 points each)**

1. Which of the following is correct?

- a) Geometric average return is the same as the holding period return when the return for each year is exactly the same.
- b) Geometric average return is used to assess the average return that may prevail in the future.
- c) Holding period return is always greater than the annual arithmetic average return.
- d) Geometric average return is the same as the arithmetic average return when the return for each year is exactly the same.
- e) None of the above.

2. Consider the following three projects with the same initial cost at year 0:

Year	Project A	Project B	Project C
1	1,000	3,000	1,000
2	1,000	1,000	3,000
3	3,300	1,000	1,000

Which of the following is correct concerning these three projects?

- a) Payback period of A is greater than the payback period of B for an initial cost of \$5,000 or less.
- b) A may be preferred to B depending on the initial cost.
- c) NPV of A is less than NPV of B for any positive interest rate less than 100%.
- d) NPV of C is greater than NPV of B for any interest rate between 0% and 100%.
- e) None of the above.

3. You purchased a 10-year bond exactly one year ago at a price lower than its face value. If the coupon rate is the same as the market rate this year and you expect no market rate changes in the future, it must be the case that:

- a) You made a capital loss from last year to this year.
- b) You are expecting no capital gains yield from this year to next year.
- c) Market rate went up from last year to this year.
- d) You are expecting positive capital gains yield from this year to next year.
- e) None of the above.

4. Company X has a current assets of \$90,000, inventory of \$88,000, and a net working capital of \$6,000. Then, one can deduce that:

- a) X has an inventory turnover of 14.7 implying a high sales volume.
- b) If all the inventory is sold on credit, current ratio of X would increase provided X makes a profit.
- c) X may have problems meeting its short term obligations.
- d) Quick ratio and current ratio of X are the same.
- e) None of the above.

5. According to the capital asset pricing model, if stock A has negative beta:

- a) Stock A's expected return is positively correlated with the market rate.
- b) Risk free rate is positively correlated with the expected return of stock A.
- c) Stock A's expected return is higher than the market rate.
- d) Stock A's expected return is lower than the risk free rate.
- e) None of the above.

6. A young company has been growing at a high rate and has not been distributing any dividends. If the company is not expected to distribute any dividends in the near future, the current price of the company's stock can be estimated by:

- a) Dividing the difference between its current assets and current liabilities by the number of shares.
- b) Dividing the difference between its total assets and total liabilities by the number of shares.
- c) Adding the earnings per share to the per share net present value of growth opportunities.
- d) Adding earnings per share to the internal growth rate.
- e) None of the above.

7. According to the 85-year stock market data set we analyzed in class, which of the following is **not correct**?

- a) Long-term corporate bond returns are less volatile than small-company stock returns.
- b) Average annual inflation is around 2%.
- c) 3-month treasury bills never had a negative annual return.
- d) Standard deviation of small-company returns is higher than the standard deviation of large-company returns.
- e) None of the above.

8. A company has an internal growth rate of 12% and it would like to grow at 20% next year without increasing its debt. Which of the following **would not help** in achieving this objective?

- a) Increasing retention ratio
- b) Issuing new stock
- c) Buying back new stock
- d) Decreasing dividend payout ratio
- e) None of the above would help

9. Which of the following is **correct** regarding the idiosyncratic and non-idiosyncratic risk of a stock?

- a) Idiosyncratic risk can be reduced by investing only on one stock.
- b) Non-idiosyncratic risk of a portfolio can be reduced by investing on stocks in the same industry.
- c) Non-idiosyncratic risk can be reduced by adding negative beta stocks to a portfolio.
- d) Idiosyncratic risk cannot be reduced.
- e) None of the above.

10. It is highly likely for the yield curve to flatten:

- a) preceding a recession.
- b) when investors sell short term bonds and buy long term bonds.
- c) when investors want to avoid reinvestment risk when rates are low in the future.
- d) company profits are expected to go down in the future.
- e) All of the above.

### Numerical/Concept Questions:

**11. (16 points)** The following information is given for a \$1,000-face value, 10-year bond that was issued on June 14, 2010. All yields/prices are calculated right after the coupon payment is made:

Price on June 14, 2012: \$1,323  
Current yield on June 14, 2012: 7.56%  
Capital gains yield on June 14, 2012: -2.56%

If the market rate stayed at the same level since 2012, what is the current yield of this bond today?

*Solution: Yield to Maturity on June 14, 2012 is 7.56%-2.56%=5%. (3 points)*

*Price on June 14, 2012 =  $1000/1.05^8 + C/0.05 * (1-1/1.05^8)$*

*C=100 (3 points)*

*Current Yield today =  $100 / \text{Price today} = 100 / (1000/1.05^2 + (100/0.05)*(1-1/1.05^2)) = 9.15\%$  (4 points)*

**12. (12 points)** READER Inc. has total assets of \$3,000,000 and profit of \$900,000. READER is growing at a constant rate equal to its internal growth rate of 37%. Companies as risky as READER offer a return of 47% to their investors.

- a) If the current stock price of READER is \$2.65, and it has 1,000,000 shares trading in the market, what is READER's total debt ?

$$ROA = 900,000/3,000,000 = 0.3$$

$$IGR = 17.65\% = ROA * b / (1 - ROA * b) = 0.3 * b / (1 - 0.3 * b)$$

$$b = 0.5 \text{ (3 points)}$$

$$EPS = 900,000/1,000,000 = 0.9$$

$$P = Div/R - g = EPS(1-b)/(R - ROE * b)$$

$$2.65 = 0.9 * 0.5 / (0.47 - ROE * 0.5)$$

$$ROE = 0.6 \text{ (2 points)}$$

$$900,000/E = 0.6$$

$$E = 1,500,000$$

$$\text{Total Debt} = \text{Total Assets} - \text{Total Equity} = 3,000,000 - 1,500,000 = 1,500,000 \text{ (1 point)}$$

- b) Would the investors prefer READER to retain more of its profit within the company?

*Since the sign of  $dP/db$  depends on whether ROE is greater than R or not (3 points), we should compare READER's ROE and R, the return that is expected in the market from companies of the same risk level as READER:*

$$0.6 > 0.47$$

*Then, READER should increase its retention ratio. This will increase the stock price. (3 points)*

**13. (10 points)** You and your friend are invested on two separate portfolios. Your portfolio has an expected return of 32%. The probability of at least doubling your investment is 2.5%. Your friend's portfolio is twice as risky as yours (measured by the standard deviation) and has an expected return of 86%. Assuming that the returns follow a normal distribution, with what probability your friend will lose half or more of her investment next year?

*(Graders: please note that most of the points should be given to the method for this question)*

**Your Portfolio:** (4 points)

*Doubling your investment refers to a return of 100%. The probability of you at least doubling your investment is  $(1-95\%)/2 = 2.5\%$ . This means that two standard deviation to the right of the expected return (32%) is 100%. Then the standard deviation of your portfolio is  $(100\%-32\%)/2=34\%$ .*

**Your Friend's Portfolio:** (4 points)

*Standard deviation: 68%*

Losing half of the investment means that the return is -50%.

$86\% - 2 \times 68\% = -50\%$ , this is two standard deviation to the left of the expected return.

Then, probability of losing half or more of the investment is  $(1-0.95)/2 = 0.05/2 = 0.025 = 2.5\%$

**14. (12 points)** You have the following information about a project (introducing a new product) that has a financial break-even quantity of 270 when interest rate is 12%, tax rate is 20%, and the sale price per unit is \$P.

Project length: 5 years

Initial Investment: \$120,000

Variable Cost per unit: \$22

Annual Fixed Cost: \$18,000

- a) (5 points) Can you find the Profitability Index (PI) of this project at the financial break-even point without making any calculations? What is the PI? Explain with one sentence.

*PI is equal to 1 at the financial break-even since the benefits are exactly equal to costs after taking time-value of money into account.*

- b) (7 points) Provide the numerical calculation of the Profitability Index below

*Financial break-even when interest is 12% :*

$$EAC = \$120,000 \times 0.12 / (1 - 1/(1.12^5)) = \$33,290$$

$$(EAC + \text{Fixed Costs}) \times (1 - t) - t \times \text{Depr.} / (\text{Sales Price} - \text{Var. Cost}) \times (1 - t) \\ = [\$33,290 + \$18,000(1 - .20) - 24,000(.20)] / [(P - 22)(1 - .20)] = 270 \text{ units}$$

$$P = 220.56$$

$$\text{Annual Cash Flow: } (270 \times (220.56 - 22) - 18,000 - 24,000) \times 0.8 + 24,000 = 33,290$$

$$PI = (33,290/1.12 + 33,290/1.12^2 + 33,290/1.12^3 + 33,290/1.12^4 + 33,290/1.12^5) / 120,000 \\ PI = 1$$

**15. (20 points)** Consider three stocks, A, B, and C with the following characteristics:

Stock	Expected Return(%)	Standard Deviation(%)
A	9	22
B	15	45
C	18	52

The covariance between the returns of A and B is 0.001, A and C is 0.07, and B and C is -0.04.

- a) (10 points) You invested 50% of your funds on A, 25% on B, and the rest on C. What is the risk (as it is measured by the standard deviation) and the expected return of your portfolio?

*Let the risky portfolio be denoted by P.*

$$E(r_P) = 0.5 \times 9\% + 0.25 \times 15\% + 0.25 \times 18\% = 12.75\%$$

$$\sigma_P^2 = x_A^2 \sigma_A^2 + x_B^2 \sigma_B^2 + x_C^2 \sigma_C^2 + 2x_A x_B \text{Cov}(A, B) + 2x_A x_C \text{Cov}(A, C) + 2x_B x_C \text{Cov}(B, C)$$

$$\sigma_P^2 = 0.5^2(0.22)^2 + 0.25^2(0.45)^2 + 0.25^2(0.52)^2 + 2 \times 0.5 \times 0.25 \times 0.001 + 2 \times 0.5 \times 0.25 \times 0.07 - 2 \times 0.25 \times 0.25 \times 0.04$$

$$\sigma_P^2 = 0.0544$$

$$\sigma_P = 0.2333$$

- b) (5 points) Given that the risk free rate is 3%, what is the maximum expected return you can obtain if you would like to invest on risk free asset and the portfolio you formed in part (a), and your risk tolerance is 15% ?

*Let the new portfolio be denoted by Q*

$$\sigma_Q^2 = x_P^2 \sigma_P^2$$

$$0.15^2 = x_P^2 0.0544$$

*$x_P = 0.64$ , Then the weight of the risk free asset is 0.36.*

$$E(r_Q) = 0.64 * 12.75\% + 0.36 * 3\% = 9.24\%$$

- c) (5 points) If we could form any portfolio composed of A, B, C, and the risk free asset, and our overall risk tolerance were to be 15%, would the maximum return we can obtain be given by the rate we found in part(b)? Why or why not? Explain with one or two sentences. No calculation is necessary.

*No, it would not be. For the maximum return with any given risk level, the separation principle should be used. That is, first the efficient frontier should be found and the line that is tangent to the efficient frontier passing through the risk free rate should be found. The portfolio at the tangent point should be used as the risky portfolio.*