

E-120: Principles of Engineering Economics

Midterm Exam

March 18, 2009

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Name: _____ (please print)

SID: _____

- Clearly state all the mathematical expressions that are needed to solve the problems.
No credit will be given to numerical answers without the proper setup.
- Answer each of the following questions in the space provided.
- Present your work in an organized and neat fashion.

Good Luck!

Problem	1 (40)	2 (30)	3 (30)	Total (100)
Score				

Problem 1 (40 points)

Today's date is Jan 1 2009. Same Old Question Corporation (SOQ) is a consulting firm in the US. The firm provides retirement benefits for its one employee, Jeffrey Lebowski. According to accounting law in the US, the firm has to report the present value of its retirement-benefit obligations for Jeffrey Lebowski.

Lebowski will retire on Jan 01 2022. He will receive quarterly retirement-benefit payments from SOQ for 20 years (80 payments in total). The first quarterly payment of \$10,000 is made on the day of his retirement. The amount of the quarterly payment is increased by 6 percent every year (i.e., the first 4 payments are \$10,000 each; the next 4 payments are \$10,600 each;...).

(a) What is the present value today of the retirement-benefit obligations of SOQ for Jeffrey Lebowski if the relevant discount rate is 12 percent compounded monthly?

(b) All bonds in this part have a face value of \$1000. SOQ wants to raise \$1,000,000 by issuing zero-coupon bonds with 1 year to maturity today. The company already has the following two bonds in the market:

- A zero-coupon bond with 2 years to maturity. The price of this bond is \$890.
- A 10% bond with 2 years to maturity which pays annual coupons. The next coupon payment is in one year and the price of this bond is \$1072.

How many bonds does SOQ need to issue?

Problem 2 (30 points)

Phyllis H. Jeffrey is a financial analyst who covers the manufacturing industry. One of the companies she follows, Fuzzy Inc., is evaluating a new machine. The financial figures are as follows:

- Project life is 2 years.
- Fixed capital outlay is \$600,000 at the beginning of the project. This is the purchase price of the machine.
- Net working capital (NWC) will be increased by \$300,000 at the beginning of the project, and decreased by \$100,000 the following year. NWC goes back to its initial level at the end of the project.
- Annual sales will remain at its previous value which is \$1,000,000 per year.
- Annual cash operating expenses will be reduced from \$700,000 to \$300,000.
- At the end of the project, the machine can be sold for \$20,000.
- The machine will be depreciated using straight-line method such that the book value of the machine at the end of the project is \$200,000.
- Tax rate is 40%.
- Required rate of return is 12%.

What is the NPV of the project? Should the company accept the project?

Problem 3 (30 points)

For each of the following statements, determine whether it is *true* or *false*.
Justify your answer providing either a proof or a counter-example as appropriate.
(No explanation – No credit)

- a. The following information is given:
- Bond A is a zero-coupon bond with 10 years to maturity. Bond B is a premium bond with a duration of 8 years. Both bonds have a face value of \$1,000.
- The interest rate risk of Bond A must be less than the interest rate risk of Bond B.
- b. Suppose that a conventional cash flow stream with a payback period of 3 years has a negative cash flow at time zero. Its profitability ratio must be greater than or equal to 1 if the required rate of return is zero.
- c. The following information is given:
- Loan A and Loan B are two 30-year mortgage loans with monthly payments. The loan amounts of both loans are the same. Monthly payment of Loan A is greater than the monthly payment of Loan B. Rates and APR's of both loans are compounded monthly.
- APR of Loan A must be greater than the “rate” of Loan B.
- d. Suppose that the dividend discount model holds. The following information is given:
- Company A and Company B pay annual dividends. Company A will pay constant dividends for 10 years and then stop paying dividends. The dividends of Company B will increase at a positive growth rate forever.
- The stock price of Company A must be less than the stock price of Company B.
- e. The following information is given:
- Walter and Maude are trying to find the NPV of a project. Walter discounts nominal cash flows of the project at the nominal required rate of return whereas Maude discounts real cash flows of the project at the real required rate of return.
- Maude will calculate a higher NPV than Walter does.