E-120: Principles of Engineering Economics

Midterm Exam
March 19, 2008
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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. If you need more space to show major computations you performed to obtain your answer for a particular problem, use the back of the preceding page.

• Present your work in an organized and neat fashion.

Good Luck!

Problem (points)	1 (40)	2 (30)	3 (35)	Total (100 + 5 bonus)
Score				

Problem 1 (40 points)

You have just graduated and have been offered the following job:

- If you accept the offer, you will receive monthly salaries. The starting monthly salary is $8,000 to be paid at the end of January 2009. The monthly salary will increase by 6 percent at the end of each year (So, you will receive 12 monthly salaries of $8,000 in 2009; 12 monthly salaries of $8,480 in 2010 and so on). You will be given your last monthly salary at the end of December 2038. Also, as a bonus, at the end of each year, the company will give you a bond (for free) with the following features:

  - *A 10-year 10 percent bond with a $10,000 face value which pays annual coupons. All bonds will have a constant YTM of 10%.*

  You will receive the first bond at the end of 2009 and the last bond at the end of 2038. You can either sell these bonds as soon as you receive them or hold them until their respective maturities, whichever yields the highest present value.

Find the present value of the payments you will be receiving if you accept this job offer. Assume that the discount rate is 12 percent **compounded monthly.**

Problem 2 (30 points)

XYZ, Inc., uses the net present value rule to decide which projects to choose. In all net present value calculations, a single discount rate is used which is equal to the **market required rate of return.**

The company has just paid a dividend of $1 and the dividends are expected to increase at a constant rate of 10 percent per year forever. The current stock price is $11. (You will use this information to find the discount rate to be used in the present value calculations).

The company is considering the following two **mutually-exclusive** projects:

Project 1: This project has an initial cost of $1,000. It will pay $500 at the end of each year for 10 years. The corresponding cash flow is:

$$(-1000, 500, 500, 500, 500, 500, 500, 500, 500, 500, 500)$$

Project 2: This project also has an initial cost of $1,000. The profitability index of the project is 2.2.

Which project should the company choose according to the NPV rule?

Problem 3 (35 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**) If the "interest paid" on an income statement increases by $1,000,000, then the "net income" will decrease by $1,000,000.

(**b**) All other things being equal, the higher the closing costs on a mortgage loan, the higher the APR.

(**c**) All other things being equal, the higher the coupon rate on a bond, the higher the duration.

(**d**) If the payback period of a project is equal to 1 year, then the NPV of this project must be positive.

(**e**) Given two mutually-exclusive projects, the one with the higher IRR should be chosen.