E 120: Principles of Engineering Economics

Midterm Exam

July 27, 2009

Professor Ilan Adler

Name: ____ (please print)

SID: ____

- Unless explicitly specified, assume the usual model of an existence of a bank in which one can borrow/deposit unlimited amounts for a fixed positive rate.
- 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.**
- You can use formulas developed in class or specified in the textbook but no quotes from any sources (including homework and exercise from the textbook) are allowed.
- 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	1 (35)	2 (35)	3 (30)	Total (100)
Score				

Problem 1 (35 points)

You as a financial manager of a corporation find two investment options for the company. Both investments require an immediate payment of $1,000,000. The investments yield the following payback in the future.

- *Option 1*: If you choose this option, you will receive **semiannual** pay back forever as follows: The first payment of $55,000 will be paid on January 01, 2010 and it will grow by 2% every 6 months.

- *Option 2*: If you choose this option, you will receive **annual** payments for a fixed period of time as follows: You will receive the first payment on January 01, 2010 and the last payment on January 01, 2017. However, the payment amount in odd years is $200,000 whereas the payment amount in even years is $500,000 (i.e., $500,000 on Jan 01, 2010; $200,000 on Jan 01, 2011; $500,000 on Jan 01, 2012; etc...).

Assume that APR is 8% compounded semiannually.

If your decision is solely based on the present value of the cash flow streams corresponding to the payment plans, which payment plan would you choose?

Problem 2 (35 points)

Suppose a bank offers a loan of \$100,000 with the following conditions:

- Monthly payments of \$1,000, starting six months from now.
- 4 points (that is, you have to pay 4% of the loan when you get the loan).
- APR=12% (compounded monthly).
- One "balloon payment" of \$8,000 (in addition to the regular \$1,000 payment) at the end of the 3rd year.

(a) How many months will it take for the loan to be paid off? **(Non-integer number is ok)**

(b) Suppose that after 3 years, the APR has dropped to 10%. If you keep making the monthly payments of \$1,000, in how many years after you made the balloon payment will you be able to pay off your loan? **(Non-integer number is ok)**

(c) Suppose that after year 3, the APR fell to 10% and you want to pay off the loan in the next 5 years (that is, you would like to pay off the rest of the loan during years 4-8 with the knowledge of the applicable APR for this period is 10% - compounded monthly). How much do you have to pay each month during years 4-8?

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 an example as appropriate.
(No explanation – no credit)

(a) The stock price decreases if the interest rate increases while all future dividends stay the same. (Using the model in which the future dividends of the stock determines its current value)

(b) The price of a bond anytime before maturity is always greater than the face value of the bond if the coupon value is positive.

(c) Consider two cash flows (a_1, a_2) and (b_1, b_2) in which $a_1 > b_1$ and $a_1 + a_2 > b_1 + b_2$. Then for any positive interest rate the present value of the first cash flow is bigger than the present value of the second cash flow.

(d) Suppose there are two bonds with same price and same maturity T. The first is a bond with yearly positive coupon payment c and face value zero; the second is a zero-coupon bond with face value equals to $T \times c$. Then the price of first bond is always better than the second one. (assume that all payments are certain)

(e) Suppose bonds A and B have the same YTM, semi-annual coupons and face values. In addition, suppose that Bond B has two more years to maturity (compared to bond A), then the price of bond A is higher than the price of bond B.