Econ 134 - Financial Economics

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Problem Set # 5

You will be graded for serious effort on two out of three problems, for a max. of 60 points. In addition, one question on two problems (to be determined by Hee Yeul) will be graded on correctness, for an additional 2x10 points max. Maximal total score: 60+20=80 points. *Make sure to box all your answer to receive credit.*

1. (30) A firm has the choice between investing into either of two mutually exclusive investment projects A and B, or not to invest at all. Project A costs 20M$ now, and will generate a positive cash-flow of 2.4 M$ in perpetuity starting next year. Project B costs 30M$ now, and will generate a positive cash-flow of 3.3 M$ in perpetuity starting next year. The required rate of return is 8%.

i) Which project has the higher NPV? Which project has the higher IRR? Which project should the firm choose, if any?

ii) As explained in class, one way of thinking about the decision between A and B is to hypothetically assume an investment in A "anyway", and to ask whether an investment into B "rather than" A (given by the cash stream B-A) is profitable.

What is the investment B-A's NPV?

What is its IIR?

Based on these numbers, which project should the firm choose?

iii) *Without any further computation,* determine the better project if the required rate of return was 9.5%

iv) For both projects A and B, plot the NPV as a function of the discount rate in the range between 7% and 13%, based on precise values for r=8%, r=9%, r=11%, r=12%.

Hint: you need to compute only an additional three *NPVs.*

v) Verify that your graph is consistent with your answer to iii).

2. (30) The U.S. Government has 5 different issues of zero discount bonds (with standard face value of \$1000) expiring 1 through 5 years from now. Their prices are shown in the table below.

Years to Mature	1	2	3	4	5
Current Price	943	874	794	709	622

i) What is the PV of a 5-year bond B with a face value of \$1000 and a 10% annual coupon? Recall that this implies that the annual coupon payment is \$100. (*Hint: the answer involves a* straightforward *computation that does* not *involve spot rates).* Why is it not possible to apply the annuity formula?

ii) If the yield-to-maturity of bond B *were* 10%, what would its present value be?

iii) Based on i) and ii), is the actual yield-to-maturity of this bond higher, lower, or equal to 10%? Explain briefly.

3. (30) You invest \$100,000 in a mutual fund which does not pay dividends but appreciates at 6% p.a. After 20 years, you decide to sell. According to the U.S. tax code, you need to pay capital gains whenever you sell assets that have appreciated in value over the holding period. Suppose for the following that capital gains are taxed uniformly at 25%.

i) How much do you owe in capital gains taxes in 20 years (in \$)?

ii) In light of i), how large is your annualized *after-tax* return from this investment?

iii) Suppose that you decide to sell your mutual fund shares after 10 years, reinvest the proceeds (after paying capital gains tax) into another mutual fund which likewise pays no dividends and appreciates at 6% p.a. You again cash in 20 years from now, paying applicable capital gains taxes. Compare your after-tax wealth in iii) and i), and explain why you end up worse off in iii).

iv) As a final variant, suppose that you switch mutual funds every year, reinvest the proceeds (after paying capital gains tax) into another mutual fund which pays no dividends and appreciates at 6% p.a. . What will your after-tax return be under this strategy? What will your after-tax wealth be 20 years from now?