

Midterm 1

1. (40 points) Calculate the present value of each cashflow using a discount rate of 7%. Which do you most prefer most? Show and explain all supporting calculations!

Cashflow A: receive \$60 today and then receive \$60 in four years.

Cashflow B: receive \$12 every year, forever, starting today.

Cashflow C: pay \$50 every year for five years, with the first payment being next year, and then subsequently receive \$30 every year for 20 years.

Cashflow D: receive \$9 every other year, forever, with the first payment being next year.

$$A: PV \text{ of A} = 60 + 60 * 1.07^{-4} = \$105.77.$$

$$PV \text{ of B} = 12 + 12/0.07 = \$183.43$$

$$PV \text{ of C} = -50/0.07 * (1 - 1.07^{-5}) + 30/0.07 * (1 - 1.07^{-20}) * 1.07^{-5} = \$21.59$$

$$PV \text{ of D} = 9 / (1.07^2 - 1) * 1.07 = \$66.46$$

The PV of cashflow B is largest and thus most preferred.

2. (15 points) Consider a project costing \$1m each year from year 1 to year T. Then starting in year T+1, the project will generate a profit of \$700k each year, forever.

a) Write a formula for the present value of this project with a discount rate of r .

b) Write a formula in terms of r for the value of T at which you break even (ignoring the issue of whether T is an integer).

$$A: PV = -\$1m * (1 - (1+r)^{-T}) / r + \$700k * (1+r)^{-T} / r$$

$$PV = 0 \text{ implies } (\$700k + \$1m)(1+r)^{-T} = \$1m$$

$$\text{so } T = \log 1.7 / \log (1+r)$$

3. (20 points) Suppose you had \$10,000 to invest for one year. You are deciding between a savings account with a 2% annual interest rate compounded daily (alternative A) and one with a 2% annual interest rate compounded monthly (alternative B). You are about to invest in the alternative A, but then you realize that since that bank is in downtown Chicago, you'll need to spend an extra \$1 for parking when opening the account. Alternative B does not have this cost (it's a bank in Evanston). Should you change your decision or stick with alternative A? Show and explain all supporting calculations!

A: FV of alternative A: $\$9999 * (1 + 0.02/365)^{365} = \$10,200.99$. FV of alternative B: $10,000 * (1 + 0.02/12)^{12} = \$10,201.84$. Since the FV of B is greater than the FV of A, you should change your decision and go with alternative B.

4. (5 points) Northwestern's endowment spent \$10,000 a year ago to buy some bonds paying semiannual coupons at an annual coupon rate of 10%. What is the dollar amount of each coupon payment?

- (a) \$1200
- (b) \$1000
- (c) \$600
- (d) \$500

- (e) zero
- (f) Something else.
- (g) More information is required to answer the question. State what is needed.

A: g. We need the face value of the bond.

5. (5 points) You need to invest money for one year and decide to buy a 10-year Treasury bond issued this month with a 4.8% yield. What risk results from this mismatch of when you need the money and when the bond matures?

- a) funding liquidity risk
- b) inflation risk
- c) interest-rate risk
- d) reinvestment risk
- e) credit risk

A: c. You will need to sell the bond after 1 year (i.e., before it matures), so its value depends on the current interest rates.

6 (15 points) Suppose that on 1/4/2011 the state of Illinois issued at par \$200m of 1-year bonds with an annual coupon rate of 5%. It then took this money and invested it in junk bonds with no coupon, a 5-year maturity, and yielding 7%. Since then the yield of the junk bonds fell by 1% (100 basis points) and that of the Illinois bonds rose by 1% (100 basis points). Did the state of Illinois make a profit, a loss, or is there not enough information to say? Explain. (Hint: suppose the state of Illinois sold its junk bonds and bought back its own bonds.)

A: Profit. The change in yield makes the junk bonds more valuable and the Illinois bonds less valuable. So selling the junk bonds and buying back the Illinois bonds give a profit.