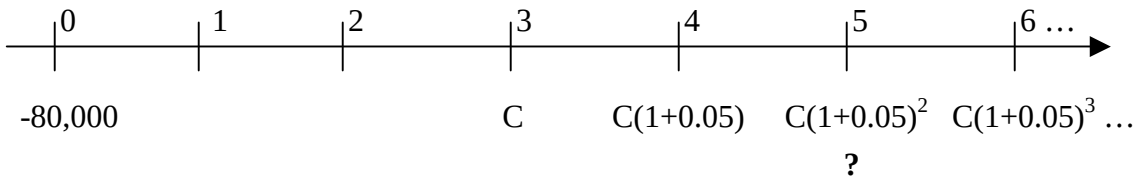
Economics 134A, Fall 2004
Monday-Wednesday class

# Midterm 1 SOLUTIONS:

**1.** (*25 points*) **A zero Net Present Value project involves an expenditure of $80,000 now. It will generate positive cash flows every year forever starting 3 years from now, which will then grow at a constant annual rate of 5%.**

**If the interest rate is 10%, what will the cash flow be 5 years from now?**

**Solutions:**




Let C be the cash flow starting 3 years from now.

Then C solves $\frac{C}{0.1 - 0.05}\frac{1}{(1+0.1)^2} = \$80{,}000$

C = $4840.

The cash flow after 5 years will be $4840*(1.05)^2$, or $\underline{\$5336.1.}$

**2.** (*25 points*) **A bond is traded at par. Its face value equals $1,000, and the coupons are paid semiannually. If the effective annual interest rate is 8.16%, what is the semiannual coupon payment?**

**Solutions**:

First, solve for *stated* annual interest rate using $r_{effective} = (1+r_{stated}/2)^2 - 1 = 0.0816$. This gives $r_{stated} = 8\%$.

Since the bond is traded at par, it means that this is an 8% bond, so it has semiannual coupons of 8%*$1,000/ 2 = $\underline{\$40}$.

**3.** (*25 points*) **Marick bought at par value of $1,000 a 5-year bond with annual 7% coupons. A year later the interest rate rose to 10% and Marick, extremely upset, sold the bond.**

**(a) What price did Marick sell the bond for?**

**(b) What holding period yield (annual rate of return) did Marick realize on his investment?**

**Solutions**:

a) You get the value of the coupons from the annuity formula: the coupon is $70 and the remaining time to maturity is T=4 years, the interest rate is 10%. The discounted value of the principal is $1000/ (1+0.1)^4 = 683.01$. The bond price is the sum of both: Bond Price = $\$70\ A^4_{0.1} + \$1{,}000/ (1+0.1)^4 = \$221.89 + \$683.01 = \$\underline{904.9}$.

b) The holding period yield is ($70 + $904.9)/$1,000 – 1, which equals <u>–2.51%.</u>

**4.** (*25 points*) **A firm is considering two alternative construction plans for a factory (meaning that the firm cannot implement both plans). Under both plans the construction cost is $100 million. In addition, under both plans the factory will receive only one cash flow in the future. Under plan A the factory will generate a revenue of $130 million two years from now. Under plan B the anticipated revenue is $150 million, but this revenue will not be received until four years in the future.**

**Depending on the discount rate, the firm might (a) implement plan A, (b) implement plan B, or (c) implement neither. Compute the range of discount rates for which each decision is optimal.**

**Solutions**: Project A has 0 NPV for the value of r that solves $130/(1+r)^2 = 100$, or r=14%. Project B has 0 NPV for the value of r that solves $150/(1+r)^4 = 100$, or r = 10.7%.

So you do <u>neither project if r > 14%</u>. The firm has equal NPV for the value of r that solves $130/(1+r)^2 = 150/(1+r)^4$, or r = 7.4%. So <u>project B is best if r<7.4%</u> and <u>A is best if 7.4% < r < 14%</u>.