MIDTERM EXAM
Corporate Finance, Section 001
Spring 2004

Student Name:

SOLUTIONS

INSTRUCTIONS

1. There are 5 questions on the exam for a total of 50 points
2. For full credit on a question, please show your work and write the answer in the space provided. Blue books are provided if you require additional space. If you wish the grader to look at the blue book, please mark this clearly on the exam.
3. At the end of the exam return the exam and all blue books.

Remember: Read each question carefully.

The questions are not in order of difficulty. If you get stuck, just go on to the next question.

1. (10 pts) Consider a semi-annual coupon bond maturing in 3 years. The face value of this bond is \$1000. The coupon rate is 8%.

   (a) (3 pts) Calculate the price of this bond, assuming the yield to maturity is 8.7% (semi-annual compounding).

$$\begin{aligned} P &= \frac{40}{1.0435} + \frac{40}{1.0435^2} + ... + \frac{40}{1.0435^5} + \frac{1040}{1.0435^6} \\ P &= \frac{40}{.0435}\left(1 - \frac{1}{1.0435^6}\right) + \frac{1000}{1.0435^6} = \$981.85 \end{aligned}$$

   (b) (3 pts) Suppose you hold this bond for two years and then sell it just after receiving a coupon payment. Suppose the yield to maturity is now 7.5% (semi-annual compounding). Calculate the price at which you sold the bond

$$\begin{aligned} P &= \frac{40}{1.0375} + \frac{1040}{1.0375^2} \\ P &= \$1004.73 \end{aligned}$$

   (c) (4 pts) Assume the same situation as in part (b). In addition, assume that you have reinvested the intermediate coupon payments at a stated annual interest rate of 7.5% (semi-annual compounding). What is your annualized holding period return?

$$\begin{aligned} 40(1.0375^3) &= \$44.67 \\ 40(1.0375^2) &= \$43.06 \\ 40(1.0375^1) &= \$41.50 \\ &= \$40.00 \\ SUM &= \$169.23 \end{aligned}$$

$$HPR = \left(\frac{1004.73 + 169.23}{981.85}\right)^{0.5} - 1 = 9.35\%$$

2. (8 pts) Golf Ball Inc. expects earnings to be \$10,000 per year in perpetuity if it pays out all of its earnings in dividends. Suppose the firm has an opportunity to invest \$1,000 of next year's earnings to upgrade its machinery. It is expected that this upgrade will increase earnings in all future years (starting two years from now) by \$140. Assume that Golf Ball's next dividend is one year from now. The required rate of return is 12%.

   (a) (3 pts) What is the value of Golf Ball Inc. if it does not undertake the upgrade?

$$P_0 = \frac{10000}{.12} = \$83333.33$$

   (b) (5 pts) What is the value of Golf Ball Inc if it undertakes the upgrade? Should it upgrade its equipment?

$$\begin{aligned} NPV &= -1000 + \frac{140}{.12} = \$166.67 \\ DiscountBack & \\ NPVGO &= \frac{166.67}{1.12} = \$148.81 \\ P_0 &= 83333.33 + 148.81 = \$83482.14 \\ Upgrade & \end{aligned}$$

3. (12 pts) You are considering the following two mutually exclusive investments:

Proj	Yr 0	Yr 1	Yr 2
A	-$80	0	$120
B	-$40	$28	$28

(a) (4 pts) Which project has the higher NPV if the required rate of return is 5%? Which project has the higher NPV if the required rate of return is 15%? Calculate the NPVs for each project under each required rate of return.

$$\begin{aligned} ProjectA@5\% &= -80 + \frac{120}{1.05^2} = \$28.84 \\ ProjectA@15\% &= -80 + \frac{120}{1.15^2} = \$10.73 \end{aligned}$$

$$\begin{aligned} ProjectB@5\% &= -40 + \frac{28}{1.05} + \frac{28}{1.05^2} = \$12.06 \\ ProjectB@15\% &= -40 + \frac{28}{1.15} + \frac{28}{1.15^2} = \$5.52 \end{aligned}$$

Project A is Always Better

(b) (4 pts) What is the IRR of Project A? Is the IRR of Project B larger or smaller?

$$ProjectA : 0 = -80 + \frac{120}{IRR_A^2} \Rightarrow IRR_A = 22.5\%$$

$$ProjectB : 1.5171 = -40 + \frac{28}{1.225} + \frac{28}{1.225^2}$$

Project B has a higher IRR ($1.5171 > 0$)

(c) (4 pts) Suppose you could double the scale of project B so that the cash flows are now as follows:

Proj	Yr 0	Yr 1	Yr 2
A	-$80	0	$120
B	-$80	$56	$56

Describe how your answers to (a) and (b) change (if at all).
Answers to (b) do not change but answers to (a) change:

$$\begin{aligned} ProjectB@5\% &= \$24.12 \\ ProjectB@15\% &= \$11.04 \end{aligned}$$

Project B has a higher NPV when r = 15% but the answers don't change when r = 5%.

4. (10 pts) The year is 1900, and Buggy-Whip International (BWI) has projected nominal earnings one year from now of \$2.08 per share. For the next 6 years (1901–1906), earnings are expected to remain constant in real terms. Thereafter, earnings are expected to shrink, in real terms, at a rate of 5% a year. This shrinkage is expected to continue indefinitely. Assume that BWI pays out all of its earnings as dividends, and will continue to do so. The next dividend will be paid one year from now. If the nominal discount rate is 12.3% and inflation is 4% per year, what is the value of BWI today?

   Use the real discount rate:

$$1 + r_{real} = \frac{1+r}{1+.04} = \frac{1.123}{1.04} = 1.08$$

$$\begin{aligned}
EPS_1 &= \frac{\$2.08}{1.04} = \$2 \\
EPS_2 &= \$2 \\
\vdots &= \vdots \\
EPS_6 &= \$2 \\
EPS_7 &= \$2(1-.05) \\
EPS_8 &= \$2(1-.05)^2 \\
\vdots &= \vdots \\
PhaseI &= \$2\left[\frac{1}{.08} - \frac{1}{.08(1.08)^6}\right] = \$9.25 \\
PhaseII &= \frac{\$2(.95)}{.08+.05} = \$14.62 \\
PhaseII(@t=0) &= \frac{\$14.62}{1.08^6} = \$9.24
\end{aligned}$$

$$P_0 = \$9.24 + \$9.21 = \$18.45$$

5. (10 pts) SHDH coffee company is considering the purchase of a new top-of-the-line espresso machine. The cost of the espresso machine is $50,000. This machine will be depreciated over 4 years, with schedule given as follows (note that depreciation is expressed in nominal terms):

Year	Depreciation expense
0	0
1	$16,670
2	$22,220
3	$7405
4	$3705

Last year, SHDH completed a $5000 study of espresso-drinking habits. From the results of this study, SHDH determined that the machine is capable of earning revenues of $40,000 per year (in real terms), starting one year from now, while operating costs will be $15,000 per year (also in real terms). The machine will last for four years, after which its salvage value will be zero. Assume the tax rate is 34%. If the nominal required rate of return for SHDH is 10% and inflation is 3%, calculate the NPV of the investment in the espresso machine.

Yr	(1) Revenue-Costs (R-C)	(2) R-C After Taxes	(3) Tax Shield	(4) (2) + (3)	(5) Present Value of (4)
0	0	0	0	0	0
1	25750.00	16995.00	5667.80	22662.80	20602.55
2	26522.50	17504.85	7554.80	25059.65	20710.45
3	27318.18	18030.00	2517.70	20547.70	15437.79
4	28137.72	18570.90	1259.70	19830.60	13544.56
				Sum	70295.35

NPV = 70295.35 - 50000 = 20295.35