

Final Examination, BUS312, D1+ E1

NAME: _____

SFU Student number: _____

Instructions: For qualitative questions, point form is not an acceptable answer. For quantitative questions, an indication of how you arrived at particular numbers is required for the purpose of assigning part marks. This examination is composed of 8 questions and 8 pages (**not** equally marked for a total of 100). Please answer all questions on the examination. The examination period is 3 hour.

1. a. (7 marks) To replace an existing non-depreciable asset whose market value is \$40,000 requires the purchase of a new asset which costs \$80,000 and is expected to generate savings of \$11,500 per year for each of the next 9 years. If the discount rate is 11% and the tax rate is 40%, should the machine be replaced?

b. (3 marks) Discuss under which circumstances should the machine be replaced in the future?

2. RPM telecommunications predicts that its dividend will grow by 10% for the next two periods and 5% thereafter. RPM has 1 million shares outstanding, and has recently paid dividends payments of 1.5 million dollars. The required return on similar securities is 12%.

a) (5 marks) What will be the price of RPM stock one year from now?

b) (5 marks) Suppose a year passes and RPM announces that due to changing circumstances it will not increase its annual dividend. The company also predicts that its dividend growth rate from now on will stay constant (forever). After the announcement the shares are traded at \$12.5. What is the market perception of the firm's growth rate?

c) (5 marks) Suppose that another year passes (you are at year 2) and the company decides on a new policy and announces the following: "The company will increase next year its dividend (above the current \$1.5 level) due to a new investment option, however 2 years from now the company will be liquidated and a final dividend of 30 dollars per share will be paid to shareholders". After this announcement the shares are traded for \$25.71. What is the market perception of the dividend growth rate during the coming year (year 3)?

3. (15 marks) Assume $x > 0$ and that the discount rate is positive. You have been asked to analyze an investment with the following cash flows:

Time	0	1	2	3
Cash Flow		$-(x+1)$	$2x$	$-x$

Is this investment acceptable? Why or why not? (You do not need to make any calculation, but only provide the logic behind your answer)

4. (10 marks) Cakun Company has a level-coupon bond outstanding with a 9% coupon rate, payable annually. The bond has 50 years to maturity and a face value of \$1000; similar bonds currently yield 7%.

By prior agreement the company will skip the coupon interest payment in years 8, 9, and 10. These payments will be repaid without interest, at maturity. What is the bond's value?

5. (10 marks) The Junk Company has been hit hard due to increased competition. The company's analysts predict that earnings (and dividends) will decline at a rate of 5% annually for an indefinite period of time. Assume that the required return consists of 3% dividend yield and 8% capital gain components, and that the most recent dividend per share was \$2.00. What will be the price of the company's stock in three years?

6. You purchase a corporate bond with 10 years till maturity and a face value of \$1000. The YTM on the bond is 10%, and the coupon rate is 8% paid annually.

- (5 marks) Suppose that at the end of the first year, YTM on similar bond is still 10%. What is your return for the first year?
- (5 marks) During year 2, the YTM on similar bonds increases to 15%, what is your rate of return in the second year? (hint: to calculate the rate of return assume you buy at the beginning of year 2 (end of 1) and sell at the end of year 2).
- (5 marks) In year 3, the firm announces bankruptcy (when YTM on similar bonds is still 15%). The bankruptcy agreement states that the bond will be bought back by the corporation at the end of the year. However, bondholders receive only $\frac{1}{2}$ of the face and coupon value at the end of the year. What is your rate of return for year 3? What was the EAR for the three year period?

7. (10 marks) Calculate the present value of an **infinitely** lived financial asset that pays the stream of cash flows described in the table, where time=0 is now, and the discount rate is 10%.

time	0	1	2	3	4	5	6	7	8	9	10	11	12
	200	100	200	100	200	100	200	100	200	100	200	100	200

8. (15 marks) You have just signed a 2 year contract as an associate at an Investment Bank. As a highly paid investment banker, you naturally must drive a BMW 325 IS during these two years. Since you currently do not have any money, you are contemplating between three different options:

- (1) Buying the car immediately for \$100,000 and selling it in two years time for an expected price of \$80,000. You can get a loan of 4% from the bank to be paid back (principal+ loan) in two years time.
- (2) Lease the car at 6% compounded monthly. The lease payments are calculated assuming 15 year life span at which point the value of the car is zero.
- (3) Renting the car for \$250 a week (to be paid at the beginning of each week, assume 52 weeks in a year).

If the appropriate annual discount rate is 3%, which option should you pursue? Show complete calculations.

Solutions

1. a. The initial investment is: $80,000 - 40,000 = 40,000$. The total cash flows after taxes are:

$\$11,500 \times (1 - 0.4) = 6900$ per year. The NPV is $-40,000 + 6,900 \times \text{PVAF}(11\%, 9)$

$$= -40,000 + 6,900 \times 5.537 = -40,000 + 38,205.62 = -1794$$

This is a negative NPV project and the machine should not be replaced.

b. As long as the market value of the machine, the savings, the tax rate, and the discount rate stay constant, the machine should not be replaced. However, if things change, such as tax rate goes down or interest rate goes down, it seems that the project might be worthwhile, as the NPV is only marginally negative.

2. a) Current dividend: $1.5/1 = \$1.5$ per share

year 1 dividend: $1.5 \times 1.1 = 1.65$

year 2 dividend: $1.65 \times 1.1 = 1.815$

At year 1 the value of the growing perpetuity is $P1 = d2 / (r - g) = 1.815 / (.12 - .05) = \25.93

b) year 1 dividend stay at $\$1.5$.

$$P1 = 12.5 = d2 / (r - g) = 1.5 / (r - g)$$

$$r - g = 1.5 / 12.5 = 0.12$$

Since $r = 0.12$, it must mean that the market expects the growth rate to be zero, i.e., $g = 0$.

c) At year 2: $PV = 1.5 \times (1 + g) / 1.12 + 30 / (1.12^2) = 25.71$

$$1.339 \times (1 + g) = 25.71 - 23.916 = 1.795$$

$$1 + g = 1.34$$

The expected dividend growth is 34%.

3. This investment has a negative NPV for any positive discount rate.

Note that for $r = 0$:

$$\text{NPV} = -(x+1) + 2x - x = -1 < 0$$

For higher interest rates one can partition the two cash flows into three projects.

Time	0	1	2	3
Project A		-x	x	
Project B			x	-x
Project C		-1		

Note that $\text{NPV}(A) < 0$, while $\text{NPV}(B) > 0$. In fact, both projects have the same amount of cash flow but while project A has first $-x$ and then x , project B has first x and then $-x$. This means that at $t=1$, the NPV of project B has the same value (but a different sign, positive rather than negative) as project A at $t=0$. In other words, the negative cashflow of project A comes before the same positive cashflow of project B, so $\text{NPV}(A-B) < 0$. Since $\text{NPV}(C)$ is obviously negative the sum of the three projects is always negative.

Note: Some students may provide an actual mathematical proof by solving a quadratic equation and showing that the NPV is never zero (i.e., there is no solution to the quadratic equation).

4. The way to calculate this problem is (1) to assume that all coupon are paid, (2) then deduct the present value of the skipped payments, (3) then add the present value of the payments made at maturity.

$$(1) \text{ PV of bond assuming all payments are made } PV = 90 * PVAF(50, 7\%) + 1000 / (1.07)^{50}.$$

$$= 90 * 13.80075 + 33.94776 = 1276.02$$

$$(2) \text{ PV of skipped coupons } PV = 90 / 1.07^8 + 90 / 1.07^9 + 90 / 1.07^{10} = 147.09$$

$$(3) \text{ PV of extra payments at maturity: } PV = 270 / 1.07^{50} = 9.17$$

$$\rightarrow \text{Bond value} = 1276.02 - 147.09 + 9.17 = 1138.10$$

$$5. D4 = 2.00 * (1 - .05)^4 = 1.63$$

$$\text{Required return} = 3\% + 8\% = 11\%$$

$$P3 = 1.63 / (.11 - (-.05)) = 10.19$$

6. Since YTM does not change, your return is 10%.

a. We need to calculate both prices, at the end of year 1, and at the end of year 2.

$$\text{Year 1 P} = 80 * PVAF(9, 10\%) + 1000 / 1.1^9 = 80 * 5.76 + 424.099 = 884.83$$

$$\text{Year 2 P} = 80 * PVAF(8, 15\%) + 1000 / 1.15^8 = 80 * 4.487 + 326.902 = 685.862$$

$$\text{Rate or return} = (80 + 685.862 - 884.82) / 884.83 = -0.13445 \rightarrow -13.45\%$$

c. Bond holders receive $(1000 + 80) / 2 = 540$

$$\text{Rate of return in year 3} = (540 - 685.862) / 685.862 = -0.2127 \rightarrow -21.27\%$$

$$EAR = ((1 + .1)(1 - 0.1345)(1 - 0.2127))^{(1/3)} - 1 = -0.2485 \rightarrow -9.16\%$$

7. One can notice that this stream of cash flow is made of two perpetuities. There are two main ways to solve:

Way 1 : The sum of two perpetuities that have a cash flow every two periods: one of 200 (perpetuity due) and one of 100 (which starts only after one half a of the two year period)

$$\text{The two period discount rate is: } r = (1.1)^2 - 1 = 0.21 \rightarrow 21\%$$

$$\text{The PV of the 200 perpetuity is perpetuity due: } = 200 + 200 / .21 = 200 + 952.381 = 1152.381$$

The 100 perpetuity comes at time 1, 3, 5., so infact all cash flows comes one period faster than a regular perpetuity of two periods which comes at 2, 4, 6, 8.

Thus, the PV of the 100 perpetuity should be multiplied by $(1+r)$

$$= 100/.21 * (1+.1) = 523.8096$$

$$\text{Total value PV} = 1152.381 + 523.8096 = 1676.19$$

Way 2: time 0 flow (200) + perpetuity of 100, and a 100 perpetuity that has a 2 period difference between cash flows.

$$\text{PV} = 200 + 100/.1 + 100/.21 = 1676.19$$

8. (1) Buying the car immediately : you have to pay back to the bank: $100k * (1.04)^2 = 108,160$
This means that the PV of this deal = $80000/1.03^2 - 108160/1.03^2 = -28160/1.03^2 = -26,543$

- (2) Lease the car. We first calculate the annuity of the lease. Since it is APR = $6/12 = 0.5\%$ per month.

$$T = 15 * 12 = 180$$

$$100k = C * \text{PVAF}(0.5\%, 180) = 118.503C \rightarrow C = 843.86$$

The monthly effective rate if $(1.03)^{(1/12)} - 1 = 0.2466\%$

$$\text{PV} = -843.86 * \text{PVAF}(0.2466\%, 24) = 843.86 * 23.278 = -19641$$

- (3) We need to find the effective weekly rate $(1.03)^{(1/52)} - 1 = 0.0568\%$

There are $52 * 2 - 1 = 103$ payments after the initial payment.

$$\text{Renting, is simply an annuity due} = 250 + 250 * \text{PVAF}(103, 0.0568\%) = 250 + 250 * 98.16 = -24,790$$

According to the calculation leasing is the best option since it costs the least in PV terms.