

**DEPARTMENT OF FOIS
FACULTY OF BUSINESS
BROCK UNIVERSITY**

SOLUTION FINAL EXAM

Course: FNCE 2P91

Date of Examination: December 14, 2005

Question 1. (5 marks)

Choose only one of the 5 choices and clearly circle the letter in each question.

1. Which of the following statements is/are true?

- (i) The total risk can be reduced by diversification only if returns of the component stocks are negatively correlated each other.
- (ii) Returns of two stocks are perfectly negatively correlated, the systematic risk can be diversified away.
- (iii) If a correlation coefficient of returns of any 2 stocks is 0.8, the total risk of a portfolio consisting of the 2 stocks will be less than the weighted average of the 2 individual stocks' standard deviations.

- A) (i)
- B) (iii)**
- C) (ii)
- D) none of the above
- E) both (i) and (iii)

2. Which of the following is not an example of a source of the systematic risk for a firm?

- A) Interest rate changes
- B) Changes in the overall economic outlook
- C) Capabilities of the management**
- D) Changes in inflation rate
- E) All of the above

3. Beta is:

- A) a measure of the systematic risk
- B) measuring the extent to which returns on an asset and the market move together
- C) a slope of the securities market line
- D) all of the above
- E) both A) and B)**

4. The Canadian financial market is said to be highly efficient. This means that the market

- A) processes stock trades accurately and quickly
- B) provides quick access to a firm's financial statements
- C) quickly reflects information relevant to determining stock value**
- D) both all of the above
- E) none of the above

5. Last year Tom could earn much higher returns than the S&P/TSX index returns by investing in a diversified portfolio of small-sized and high book-to-market stocks (book-to-market = book value per share divided by stock price). This is _____ efficient market hypothesis (EMH).

- A) evidence favorable to the semi-strong form
- B) evidence against the semi-strong form**
- C) evidence favorable to the strong form
- D) none of the above
- E) both A) and C)

Question 2. (8 marks)

Mr. Savvy is planning for his retirement. Niagara Dominion Bank has offered him a plan that requires him to deposit \$8,000 at the beginning of each of the next 25 years. The retirement plan guarantees a 12% annual compounding rate over the next 25-year time period. When he retires at the end of the 25th year, the interest earned on the savings in his account is guaranteed to increase at 15% annually. Mr. Savvy likes to make 30 equal withdrawals at the beginning of each year from the account after he retires. The first withdrawal will be made at the end of the 25th year. How much Mr. Savvy can withdraw each year after he retires?

Consider the values of the 2 CF streams at t=25.

$$8000(1.12) + 8000(1.12)^2 + \dots + 8000(1.12)^{25} = c + c/(1.15) + \dots + c/(1.15)^{29}$$

$$8000\{1.12 + 1.12^2 + \dots + 1.12^{25}\} = c\left\{1 + \frac{1}{1.15} + \left(\frac{1}{1.15}\right)^2 + \dots + \left(\frac{1}{1.15}\right)^{29}\right\}$$

$$8000\left[\frac{1.12\{1.12^{25} - 1\}}{1.12 - 1}\right] = c\left[\frac{1 - \left(\frac{1}{1.15}\right)^{30}}{1 - \frac{1}{1.15}}\right]$$

$$1,194,671.48 = c[7.5509]$$

$$c = 158,216.26$$

Question 3. (8 marks)

In light of recently announced potential changes to the dividend tax credit you are looking at increasing your dividend (from the \$6 just paid shareholders) to \$9 in the coming year. You expect to be able to grow the coming dividend at an annual rate of 10% for the next 12 years after which point you expect to be able to grow dividends at an annual rate of 1%. Assume that the market requires a 16% return.

1. What would you determine the value of your shares to be? (6 marks)

In two years (ie 17 years left) bond sells for 950

Yield at that time = 11.17%

Question 5. (14 marks)

Returns and associated information of 3 stocks, X, Y, and Z, are given as follows. Column (B) in the table below shows the expected returns generally agreed among investors in the market. The standard deviation of returns for the market portfolio is 0.085. (Show 3 decimal places in all calculations).

Stock (A)	Expected Return (B)	Standard Deviation (C)	Correlation with Market Portfolio Returns (D)	Beta (E)	Required Return by CAPM (F)
X	0.130	0.120	-0.250	-0.350	
Y	0.200	0.240	0.750		0.229
Z	0.105	0.160	0.300	0.560	

1. Based on the information given above, complete Column (E) by computing the beta of Stock Y and filling out the blank cell. (2 marks)

$$\beta_Y = \frac{Cov(r_Y, r_M)}{\sigma_M^2} = \frac{\rho_{Y,M} \sigma_Y \sigma_M}{\sigma_M^2} = \frac{(0.750)(0.240)(0.085)}{(0.085)^2} = 2.118$$

2. The market portfolio return is 0.14 and the risk-free rate is 0.06. Complete Column (F) by computing the required returns based on the capital asset pricing model (CAPM) and filling out the 2 blank cells. (3 marks)

$$\bar{r}_X^{CAPM} = 0.06 + \beta_X * (0.14 - 0.06) = 0.06 + (-0.35)(0.08) = 0.032$$

$$\bar{r}_Z^{CAPM} = 0.06 + \beta_Z * (0.14 - 0.06) = 0.06 + (0.56)(0.08) = 0.105$$

Thus, we have the following table:

stock (A)	expected return (B)	standard deviation (C)	correlation with market portfolio returns (D)	beta (E)	required return by CAPM (F)
X	0.130	0.120	-0.250	-0.350	0.032
Y	0.200	0.240	0.750	2.118	0.229
Z	0.105	0.160	0.300	0.560	0.105

3. Based on the answers to 1) and 2) above, which stock is priced correctly? Which stock is under-priced (and thus attractive to buy)? Briefly explain why in each question. (3 marks)

a) **Stock Z is priced correctly because the expected return in the market is the same as the CAPM-based expected return.**

b) *Stock X is under-priced and thus attractive to buy. Reason: Stock X's CAPM-based expected return (= should-be return in equilibrium) is 0.032. However, Stock X's expected return in the market (= the return that may not be in equilibrium yet) is 0.130, which is substantially larger than the CAPM-based expected return. Graphically, X is currently above the SML. This means that Stock X's current price (P_t) is too low (under-priced) and thus its expected return (\bar{r}_{t+1}) in the market is too high.*

Note that $r_{t+1} = \frac{P_{t+1} - P_t}{P_t}$ (, ignoring the dividend).

4. Suppose you have a *well-diversified portfolio* which includes all the above 3 stocks. Which of the 3 stocks would you consider the riskiest? Why do you think so? (3 marks)

Stock Y, because it has the largest beta.

5. Now you plan to invest 60% of your funds in Stock X and 40% in Stock Y. The correlation coefficient of the 2 stock returns is -0.32. Compute the expected return and standard deviation of your portfolio. (3 marks)

$$r_p = 0.60 r_X + 0.40 r_Y, \rho_{X,Y} = -0.32$$

a) $E(r_p) = E(0.60 r_X + 0.40 r_Y) = 0.60 E(r_X) + 0.40 E(r_Y) = 0.60(0.13) + 0.40(0.20) = 0.158$

b) $\sigma_p = \sqrt{\text{Var}(r_p)}$

$$\text{Var}(r_p) = \text{Var}(0.60 r_X + 0.40 r_Y) = 0.60^2 \text{Var}(r_X) + 0.40^2 \text{Var}(r_Y) + 2(0.60)(0.40)\text{Cov}(r_X, r_Y)$$

But we know that $\text{Cov}(r_X, r_Y) = \rho_{X,Y} \sigma_X \sigma_Y$

$$\sigma_p = \sqrt{0.60^2 (0.12^2) + 0.40^2 (0.24^2) + 2(0.60)(0.40) (-0.32)(0.12)(0.24)} = \sqrt{0.00997632} = 0.0999$$

Question 6. (9 marks)

<u>Scenario</u>	<u>Probability</u>	<u>Rate of Return</u>	
		<u>Stocks</u>	<u>Bonds</u>
Recession	0.20	-5%	14%
Normal Economy	0.60	15%	8%
Boom	0.20	25%	4%

1. Is it reasonable to assume that bonds will provide higher returns in recessions than in booms? (2 marks)

Yes

2. Calculate the expected rate of return and standard deviation for each investment. (4 marks)

$$E[R(\text{stocks})]=0.2*(-5\%)+0.6*(15\%)+0.2*(25\%)=13\%$$

$$\text{Var}[R(\text{stocks})]=0.2(-5\%-13\%)^2+0.6(15\%-13\%)^2+0.2(25\%-13\%)^2=0.0096,$$

$$\text{STD}[R(\text{stocks})] = 9.79796\%$$

$$E[R(\text{bonds})]= 0.2*(14\%)+0.6*(8\%)+0.2*(4\%)=8.4\%$$

$$\text{Var}[R(\text{bonds})]=0.2(14\%-8.4\%)^2+0.6(8\%-8.4\%)^2+0.2(4\%-8.4\%)^2=0.001024,$$

$$\text{STD}[R(\text{bonds})] = 3.2\%$$

3. Which investment would you prefer? Explain. (3 marks)

Choice depends on the risk preference of the investor. When return is higher, risk is higher as well.

Question 7. (14 marks)

Better Mousetraps has developed a new trap. It can go into production for an initial investment in equipment of \$6 million. This equipment falls into class 8 (CCA rate = 20 percent) for CCA purposes, and it can be sold after 5 years for \$500,000. The firm believes that working capital at each date must be maintained at a level of 10 percent of next year's forecast sales. The firm estimates production costs equal to \$1.50 per trap and believes that the traps can be sold for \$4 each. The number of traps that the firm expects to sell is given in the following table. The project will come to an end in 5 years, when the trap becomes technologically obsolete. The firm's tax bracket is 35 percent, and the required rate of return on the project is 12 percent. Based on these preliminary project estimates, what is the NPV of the project? Should the project be accepted?

Year: **1** **2** **3** **4** **5**
 Traps (millions of traps): 0.5 0.6 1.0 1.0 0.6

$$(\text{PV tax shield on CCA} = \frac{[CdT_c]}{d+k} \times \frac{[1+0.5k]}{1+k} - \frac{SdT_c}{d+k} \times \frac{1}{(1+k)^n})$$

1st way to solve the problem

Cost of Equipment = 6,000,000

Year	UCC	CCA	Year	Sales	NWC	Change in NWC
1	3,000,000	600,000	0		200,000	200,000
2	5,400,000	1,080,000	1	2,000,000	240,000	40,000
3	4,320,000	864,000	2	2,400,000	400,000	160,000
4	3,456,000	691,200	3	4,000,000	400,000	0
5	2,764,800	552,960	4	4,000,000	240,000	-160,000
			5	2,400,000	0	-240,000

Year	0	1	2	3	4	5
		0.50	0.60	1.00	1.00	0.60

Units		500,000	600,000	1,000,000	1,000,000	600,000
Price per unit		4	4	4	4	4
Sales		2,000,000	2,400,000	4,000,000	4,000,000	2,400,000
Prod Costs		750,000	900,000	1,500,000	1,500,000	900,000
Depreciation		600,000	1,080,000	864,000	691,200	552,960
EBIT		650,000	420,000	1,636,000	1,808,800	947,040
Tax (0.35)		227,500	147,000	572,600	633,080	331,464
Net Income		422,500	273,000	1,063,400	1,175,720	615,576
OCF		1,022,500	1,353,000	1,927,400	1,866,920	1,168,536
Change in NWC	-200,000	-40,000	-160,000	0	160,000	240,000
Cap Spending	-6,000,000					500,000
TOTAL Cash Flow (*)	-6,200,000	982,500	1,193,000	1,927,400	2,026,920	1,908,536
PV of Total CF	-6,200,000	877,232	951,052	1,371,885	1,288,144	1,082,955
NPV =		-628,731				

IRR = 8.28%, found by using TOTAL Cash Flow (*)

Reject the project

2nd way to solve the problem

Year	0	1	2	3	4	5
Units		500,000	600,000	1,000,000	1,000,000	600,000
Price per unit		4	4	4	4	4
Sales		2,000,000	2,400,000	4,000,000	4,000,000	2,400,000
Production Costs		750,000	900,000	1,500,000	1,500,000	900,000
(S-PC)*(1-Tax)		812,500	975,000	1,625,000	1,625,000	975,000
OCF		812,500	975,000	1,625,000	1,625,000	975,000
Change in NWC	200,000	40,000	160,000	0	-160,000	240,000
Cap Spending	6,000,000					500,000
TOTAL Cash Flow	-6,200,000	772,500	815,000	1,625,000	1,785,000	1,715,000
PV of Total CF	-6,200,000	689,732	649,713	1,156,643	1,134,400	973,137
Total Present Value		-1,596,375				

PV of CCA Tax Shield:

C =	6,000,000
d =	0.20
Tc =	0.35
S =	500,000
k =	0.12
n =	5

PV of CCA Tax Shield: 1,180,125

NPV = **-416,250**

B.

1. Briefly list the potential problems with the use of the internal rate of return as an investment decision criterion. (4 marks)

The IRR rule fails when these conditions do not hold: Cash flow Sign Rule (If the cash flows are not of the form of one negative and the rest positive), then Multiple IRR (many intersections in the NPV profile) or no IRR.

Comparing Mutually Exclusive Projects:

One might think that the rule should accept the project with the highest IRR.

Unfortunately this is incorrect.

The problem is that IRR ignores project size and duration

If Interest Rates Change over Time (the yield curve is not flat), the IRR of a project is a single number. What should you compare a project IRR against? The IRR rule makes no sense with changing interest rates

2. Briefly describe the sensitivity analysis and list its main advantages (4 marks)

Sensitivity analysis measures the effect of changes in a variable on the project's NPV.

To perform a sensitivity analysis, all variables are fixed at their expected values, except for the variable in question which is allowed to fluctuate. The resulting changes in NPV are noted.

You can then use these different NPVs to come up with an expected (or weighted average) NPV. Example: How sensitive is the NPV if sales end up being more or less than projected? Sensitivity analysis identifies variables that may have the greater potential impact on profitability. This allows management to focus on those variables that are most important