DEPARTMENT OF FOIS
FACULTY OF BUSINESS
BROCK UNIVERSITY

SOLUTIONFINAL EXAM

Course: FNCE 2P91
Date of Examination: July 4, 2006
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Question 1. (5 marks)

Choose only one of the 5 choices and clearly circle the letter in each question. No credit will be given based on scratch-works in or between lines without clear marking.

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. Ronaldino 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. Ronaldino 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. Ronaldino can withdraw each year after he retires?

Consider the values of the 2 CF streams at t=25.
$8000(1.12) + 8000(1.12)^2 + \ldots + 8000(1.12)^{25} = c + c/(1.15) + \ldots + c/(1.15)^{29}$

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

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

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)

Current Price is calc'd from
i) value of $9 growing annuity for 12 years @ 10%
= 70.69

ii) Value of growing perp of D13 discounted to today's dollars:

D_{12}	$	25.68	
D_{13}	$	25.93	= D12 * (1+.01)

Value of perp	$	172.90
Discounted to today	$	29.13

Value today equals		70.69
	+ $	29.13
Stock Price		99.82

2. What is your current dividend yield? (2 marks)

Dividend Yield

D_1	$	9.00
P_0		99.82
Yield = D_1/P_0		9.02%

Question 4. (6 marks)

A bond with a Face value of $1,000, a 10.5% annual coupon and 19 years to maturity is currently priced at yield 8%.

1. What is the market value of the bond? (4 marks)

Price is made of:			
i) PV of Coupons for 19 years			
Annual Coupon	$	105	
PV Annuity Factor		9.6036	=(1-1/(1+.08)^19)/.08
PV of Coupon Pymts =	$	1,008.38	
ii) PV of Face			
Face	$	1,000	
PV Factor		0.2317	=1/(1+.08)^19
PV of Face	$	231.71	
Total Value:			
PV of Coupon Pymts =	$	1,008.38	
PV of Face =	$	231.71	
= Market Value of Bond	$	1,240.09	

2. In two years the bond is selling for $950. What is the yield at this time? (2 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 $r_{t+1} = \dfrac{P_{t+1} - P_t}{P_t}$ ***(, 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 two stock returns is -0.32. Compute the expected return and standard deviation of your portfolio. (3 marks)

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

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

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

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

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

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

Question 6. (9 marks)

		Rate of Return	
Scenario	*Probability*	*Stocks*	*Bonds*
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(stocks)]=0.2*(-5%)+0.6*(15%)+0.2*(25%)=13%

Var[R(stocks)]=0.2(-5%-13%)^2+0.6(15%-13%)^2+0.2(25%-13%)^2=0.0096,
STD[R(stocks)] = 9.79796%

E[R(bonds)]= 0.2*(14%)+0.6*(8%)+0.2*(4%)=8.4%

Var[R(bonds)]=0.2(14%-8.4%)^2+0.6(8%-8.4%)^2+0.2(4%-8.4%)^2=0.001024,
STD[R(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)

Best Singers (BS), Inc., projects unit sales for a new opera tenor emulation implant as follows:

Year	Unit Sales
1	100,000
2	105,000
3	110,000
4	114,000
5	120,000

Production of the implants will require $600,000 in net working capital to start and additional net working capital investments each year equal to 40 percent of the projected sales increase for the following year. Total fixed costs are $200,000 per year, variable production costs are $200 per unit, and the units are priced at $325 each. The equipment needed to begin production has an installed cost of $13,250,000. Because the implants are intended for professional singers, this equipment is considered industrial machinery and thus falls into class 8 (CCA rate = 20 percent) for CCA purposes. In five years, this equipment can be sold for about 30 percent of its acquisition cost. BS is in the 35 percent marginal tax bracket and has a required return on all its projects of 30 percent. Based on these preliminary project estimates, what is the NPV of the project? What is the IRR? Should the project be accepted?

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

1st way to solve the problem

Cost of Equipment = 13,250,000

Year	UCC	CCA	Year	Sales	Sales Increase	Change in NWC
1	6,625,000	1,325,000	0			600,000
2	11,925,000	2,385,000	1	32,500,000	1,625,000	650,000
3	9,540,000	1,908,000	2	34,125,000	1,625,000	650,000
4	7,632,000	1,526,400	3	35,750,000	1,300,000	520,000
5	6,105,600	1,221,120	4	37,050,000	1,950,000	780,000
			5	39,000,000		3,200,000

Year	0	1	2	3	4	5
Units		100,000	105,000	110,000	114,000	120,000
Price per unit		325	325	325	325	325
Sales		32,500,000	34,125,000	35,750,000	37,050,000	39,000,000
VC		20,000,000	21,000,000	22,000,000	22,800,000	24,000,000
FC		200,000	200,000	200,000	200,000	200,000
Depreciation		1,325,000	2,385,000	1,908,000	1,526,400	1,221,120
EBIT		10,975,000	10,540,000	11,642,000	12,523,600	13,578,880
Tax (0.35)		3,841,250	3,689,000	4,074,700	4,383,260	4,752,608
Net Income		7,133,750	6,851,000	7,567,300	8,140,340	8,826,272
OCF		8,458,750	9,236,000	9,475,300	9,666,740	10,047,392
NWC	-600,000	-650,000	-650,000	-520,000	-780,000	3,200,000

Cap Spending	-13,250,000					3,975,000
TOTAL Cash Flow	-13,850,000	7,808,750	8,586,000	8,955,300	8,886,740	17,222,392
PV of Total CF	-13,850,000	6,006,731	5,080,473	4,076,149	3,111,495	4,638,491
NPV =	9,063,339					

2nd way to solve the problem

Year	0	1	2	3	4	5
Units		100,000	105,000	110,000	114,000	120,000
Price per unit		325	325	325	325	325
Sales		32,500,000	34,125,000	35,750,000	37,050,000	39,000,000
VC		20,000,000	21,000,000	22,000,000	22,800,000	24,000,000
FC		200,000	200,000	200,000	200,000	200,000
(S-VC-FC)*(1-Tax)		7,995,000	8,401,250	8,807,500	9,132,500	9,620,000
OCF		7,995,000	8,401,250	8,807,500	9,132,500	9,620,000
Change in NWC	600,000	650,000	650,000	520,000	780,000	3,200,000
Cap Spending	13,250,000					3,975,000
TOTAL Cash Flow	-13,850,000	7,345,000	7,751,250	8,287,500	8,352,500	16,795,000
PV of Total CF	-13,850,000	5,650,000	4,586,538	3,772,189	2,924,442	4,523,382
Total Present Value	7,606,552					

PV of CCA Tax Shield:

C =	13,250,000
d =	0.20
Tc =	0.30
S =	3,975,000
k =	0.30
n =	5

PV of CCA Tax Shield: 1,278,068

NPV = **8,884,621**

Question 8. (16 marks)

The Niagara Vintage Wine Company is planning a major purchase of vineyards in Southern Ontario and Kelowna BC. The estimated cost of this expansion is $10 million.

The existing book value capital structure of the company.

Bonds – 5.5% Coupon	$20 million
Preferred Stock – 7% Dividend ($100 par)	5 million
Common Stock ($20 par value)	20 million
TOTAL	$45 million

The company plans to maintain its current capital structure at market value, which is considered to be optimal.

The $1,000 face value 5.5% bonds have a current market price of $980 while the preferred shares are currently selling at a price of $104 and the current market price of the common stock is $50. The firm has recently examined its potential sources of financing and has found that:

- New $1000 debentures with an 11% coupon and a 30 year maturity can be sold to the public to net the company $919.25 each.
- Preferred stock can be sold at the par value of $100 if a 6.75% dividend is offered however the after tax underwriting costs are 5% of the market price.
- Common stock could be issued at the current market price. Total earnings available to the common shareholders last year were $3 million. The company has consistently maintained 2/3 payout ratio for common dividends, i.e., 2/3 of earnings are paid out in dividends to the owners. The dividend paid per common share five years ago was $1.36. The company expects its growth rate to continue indefinitely. The after tax floatation costs on common

stock would be 3% of the present market price of the stock. The firm's marginal tax rate is 40%.

1. What is the firm's optimal market value capital structure? (5 marks)

2. What is the cost for the firm of 1) debt financing, 2) preferred share financing and 3) financing using retained earnings, 4) financing issuing new common stock. (5 marks)

3. What is the weighted Average Cost of Capital if retained earnings are used for common equity financing? (2 marks)

4. What is the Weighted Average Cost of Capital if the firm issues new common stock as equity financing? (2 marks)

5. At what level of total capital used would the firm exhaust its retained earnings and have to switch to issuing common stock if it maintains the optimal capital structure. (2 marks)

Question 9. (20 marks)

A.
Use Figure 1 that shows the net present value profile of two projects W and Y to answer the following questions:

1. What is the internal rate of return on project Y? (2 marks)
There are two IRR: 3% and 12%

2. Determine the "approximate" discount rate at which you would be indifferent between the two projects? (2 marks)
The crossover rate is close to 18% where the two NPV are equal and strictly positive.

3. Find the "approximate" net present value of project W when the discount rate is 10%. (2 marks)
The NPV is close to $2000 using figure 1.

4. If the future cash flows of project W over its three-year life are $200, $4,100, and $4,713 estimate the initial investment. (4 marks)

The initial investment is obtained by using the IRR that make the NPV of project W equals to zero. It will equal to $5000.

5. If the two projects are mutually exclusive, over what discount rate range(s) would project Y be preferred to project W? (2 marks)
Y is preferred to W when its NPV is higher and strictly positive. This occurs when the discount rate is strictly greater than 18%.

6. If the two projects are independent and the discount rate is 8%, what decision should the firm make? Why? (2 marks)
In this case, only the NPV of W is strictly positive. Thus only project W is accepted.

7. If projects W and Y are independent and the discount rate is less than 3%, what decision should the firm make? Why? (2 marks)
In this case, both NPV are strictly positive and the two projects should be accepted.

B.
1. Briefly list the potential problems with the use of the internal rate of return as an investment decision criterion. (2 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 (2 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.