UNIVERSITY OF MANITOBA
Faculty of Management
Department of Accounting and Finance

9.220 Corporation Finance Final Exam
Paper Number 308 April 17, 2001 9:00 a.m. – 12:00 p.m. Page 1 of 22
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CIRCLE THE NAME OF THE PROFESSOR FOR YOUR SECTION

Note: It is your responsibility to verify that this examination has 22 pages.

Name: Key

Student Identification Number: _____

Section: _____

- Write or print legibly in the space provided for answering the question.
- Section I of the exam has 15 multiple-choice questions worth 2 points each. Answer all multiple choice questions on your bubble sheet.
- Section II of the exam contains 11 long-answer questions worth a total of 70 points. Answer all questions in the spaces provided. Show all relevant work (i.e., formulas and substitutions). **DO NOT INDICATE WHICH CALCULATOR BUTTONS YOU HAVE PRESSED.** Do not round any intermediate calculations. Final dollar answers should be rounded to two decimal places, unless otherwise specified. Final interest rate answers should be rounded to 4 decimal places if stated as a percentage, and 6 decimal places otherwise, unless otherwise specified. Other final answers may be rounded to 6 decimal places, unless otherwise specified.

Question	Maximum Total Marks	Marks Awarded
Multiple Choice	30	
Long Q. 1	5	
Long Q. 2	6	
Long Q. 3	8	
Long Q. 4	3	
Long Q. 5	5	
Long Q. 6	5	
Long Q. 7	18	
Long Q. 8	5	
Long Q. 9	5	
Long Q. 10	5	
Long Q. 11	5	
Total Marks	100	

Section I: Multiple Choice Questions: Answer on the bubble sheet provided. 2 points each.

1. A young couple wants to take a 25-year Canadian mortgage with the Toronto Dominion Bank with equal monthly payments (rounded to the nearest cent). The stated annual rate on the mortgage is 7.25%, compounded semiannually. Assume that the mortgage rate remains at 7.25% for the remaining time of the mortgage. The combined after-tax income of the young couple is $3,000 per month. After careful planning, they decide that they can spend 40% of their monthly after-tax income on their mortgage. What is the maximum amount of mortgage that they can get?

   a) $167,616.80
   b) $177,797.68
   c) $251,425.21
   d) $419,042.01
   e) None of the above

2. The effective annual required rate of return on the ordinary shares of Southeast Corporation is 18%. The shares' expected dividend yield for year one is 4%. The shares' annual dividends are expected to grow at a constant annual rate forever. Which of the following is a correct statement?

   a) The expected annual dividend growth rate is 4%.
   b) The expected annual dividend growth rate is 14%.
   c) The expected annual dividend growth rate is 22%.
   d) The shares' expected capital gains yield for year one is 18%.
   e) None of the above.

3. A firm issued 30-year $1,000 par value bonds ten years ago at par. At that time, yield to maturity for such bonds was 9%. Today these bonds are selling for $1,100. Coupon is paid annually. What is the yield to maturity (rounded to two decimal places) for these bonds today?

   a) 10.06%
   b) 9.00%
   c) 8.99%
   d) 7.98%
   e) Not enough information

4. Which of the following is a correct statement regarding an investment in a fairly priced bond that pays coupons annually?

   a) The PV of its promised future cash flows must be zero
   b) The NPV of promised future cash flows must be positive
   c) Its effective annual IRR must equal the bond's annual coupon rate
   d) If its effective annual IRR is higher than the bond's annual coupon rate, then its NPV is positive
   e) If its effective annual IRR is lower than the bond's annual coupon rate, the PV of its promised future cash flows must be greater than the bond's par value

5. Kraemer Industries Corp. (KIC) is considering an investment project that is expected to generate a constant annuity of cash inflows throughout the project's life. Each annual cash inflow in this project is exactly 20% of the initial cash outflow required for the project. The first annual cash inflow is assumed to occur at the beginning of the first year. Assume that the effective annual discount rate for the project is 8%. What is the minimum number of annual cash inflows the project should pay for it to be acceptable (rounded oto two decimal places)?

a) 0.25
b) 2.36
c) 6.01
d) 7.64
e) There isn't enough information.

6. Consider project X with an effective annual required rate of return of 12%, and with the following annual cash flows:

$C_0 = ?, C_1 = 800, C_2 = 2,500, C_3 = 1,800, C_4 = 2,901, C_5 = 2,101.$

Given that the project's Profitability Index is 1.3, the IRR of the project _____.

a) is 12.0000%
b) is 12.3467%
c) is 19.6236%
d) is ~~20.0777%~~ 22.0777%
e) cannot be calculated with the given information.

7. Two stocks A and B have the following standard deviation of their return distribution.

Security	Expected Return	Standard Deviation
A	0.08	0.12
B	0.14	0.18

The correlation coefficient is: $\rho_{AB} = -1$. The expected return on the minimum-variance portfolio calculated with respect to stocks A and B is _____.

a) 8.0000%
b) 10.4000%
c) 12.8000%
d) 14.0000%
e) None of the above

8. In an efficient market, the announcement that a company earned profits last year that exceeded analysts' expectations should cause the stock price to

a) Rise gradually as investors learn of the news
b) Be unchanged since no one can benefit abnormally
c) Be unchanged since it was unexpected news
d) React unpredictably up or down
e) Rise very quickly

9. You are a securities analyst for a large brokerage firm. Your analysis of future market conditions reveals that during the next year the economy will exhibit a high growth rate or a recession. Your analysis also predicts that the returns for Soutel Inc. shares and for the TSE300 stock index will be as follows:

State of the Economy	Soutel Inc. Shares Return	TSE300 Return
High Growth	16.60%	22.92%
Recession	29.72%	6.52%

Based on the above predictions, the beta for Soutel Inc shares _____.

a) is approximately 0.80
b) is approximately 1.25
c) is approximately –1.25
(d) is approximately –0.80
e) Cannot be determined without knowledge of the probability of each state of the economy

10. It is given that assets A and B are priced in the market by the CAPM, with the following data:

Stock	Expected Return *	Beta
A	25%	1.5
B	-10%	-1.0
* Expected returns are based on the CAPM.		

Assets C and D are priced in the market by the dividend growth model, with the following data:

Stock	Expected Return **	Beta
C	28.60%	2.00
D	16.80%	0.75
** Expected returns are based on the dividend growth model.		

Assume that the correct asset-pricing model is the CAPM. Based on the above data, we say that asset C is _____ and asset D is _____.

a) overpriced; overpriced
b) underpriced; underpriced
c) underpriced; overpriced
(d) overpriced; underpriced
e) Since all asset-pricing models in finance are in agreement, assets C and D are correctly priced.

11. Susan's portfolio is formed by placing half her funds in the riskless asset and the remainder in the market portfolio. Consider the following statements:

I. This is an inefficient portfolio because only half the funds are invested in the market portfolio.
II. The portfolio's beta will be one half.
III. The portfolio's variance will be half the variance of the market portfolio.

Which of the above statements is (are) true?

a) Statement I only.
b) Statement II only.
c) Statement III only.
d) Statements I and II only.
e) Statements II and III only.

12. The inclusion of bankruptcy risk in a capital structure theory:

a) acknowledges that, everything else being equal, as a firm increases its debt financing, expected costs of financial distress increase, and as a result the cost of debt increase.
b) provides a rationale for the existence of an optimal capital structure.
c) amplifies the tax advantage of debt financing.
d) both (a) and (b) are correct.
e) both (b) and (c) are correct.

13. Trans Continental Corporation (TCC) has an effective annual WACC of 9.60%. It is financed with 40% debt and 60% equity. TCC's effective annual cost of equity is 12.80% and its corporate tax rate is 40%. The debt issued by TCC is 30-year bonds, paying coupons semiannually at a stated annual rate of 8%. Each TCC bond has a face value of $1,000. What is the value of each TCC bond?

a) $1,076.74
b) $1,027.93
c) $1,017.67
d) $1,000.00
e) It cannot be determined with the information given

14. An investor would not enter a _____ position in a _____ if s/he believes that the price of the underlying stock will fall in the near future.

a) short; call option on an underlying stock
b) long; call option on an underlying stock
c) long; forward contact on an underlying stock
d) long; put option on an underlying stock
e) short; forward contact on an underlying stock

15. A European call option and a European put option share the same underlying (non-dividend-paying) stock, exercise price, and date of expiration. In light of the put-call parity relation, consider the following statements:

I. The call will have a higher price than the put if the underlying stock price equals to option exercise price.

II. The call will have a higher price than the put if the underlying stock price is less than the present value of option exercise price discounted at the risk-free rate.

III. The call will have a higher price than the put if the underlying stock price is greater than the present value of option exercise price discounted at the risk-free rate.

Which of the above statements is (are) true?

a) Statement I only.
b) Statement II only.
c) Statement III only.
d) Statements I and II only.
e) Statements I and III only.

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Section II: Long Questions

1. You will pay into a pension fund until you are aged 60. You are expected to live until your 85th birthday. You are currently 24 years of age. Pension fund contributions are made bi-weekly (use **n=2/52**) beginning in 2 weeks time. You are promised an interest rate of 8% compounded monthly. Assume that this rate will remain constant for all future time periods. Following your final contribution at age 60, you will retire. You will begin to withdraw money at the end of each month at a declining rate. Each subsequent withdrawal will fall by a constant rate of 0.4% per month for the duration of your life. You will withdraw the final payment an instant before you die. What is the most that you can withdraw on your first payment?

Each bi-weekly contribution is $100. **(5 points)**

* Finding the FV at contribution:

1 pt (Also accept $EPR_{\frac{1}{12}} = 8\%$)

Step 1:

Finding $EPR_{\frac{2}{52}}$:

We have: $r_{\frac{1}{12}} = 0.08 \Rightarrow EPR_{\frac{1}{12}} = \frac{0.08}{12} = 0.006667$

Therfore: $EAR = (1+EPR_{\frac{1}{12}})^{12} - 1 = 1.006667^{12} - 1 = 8.299951\%$

$\Rightarrow EPR_{\frac{2}{52}} = (1+EAR)^{\frac{2}{52}} - 1 = 0.30714192\%$

1.5 pts (no carry over)

Step 2:

You are 24, and you save until you are 60 $= 60 - 24 = 36$ years $\approx 36 \times 26 = 936$ bi-weekly contributions of $100 each.

$FV_{60} = \frac{100}{0.00307142}\left[1.00307142^{936} - 1\right] = \$541,926.141857$

* Solving for first payment (X):

1.5 pts (no carry over)

Step 3:

You withdraw 12 pmts/year for $85 - 60 = 25$ years $= 300$ monthly pmts.

We solve for X by setting: $FV_{60} = PV_{60}$ (pmts)

We use: $EPR_{\frac{1}{12}} = 0.666667\%$ and $g = -0.4\%$ (negative!!!):

$PV_{60} = \frac{X}{0.006667 + 0.004}\left[1 - \left(\frac{1-0.004}{1.006667}\right)^{300}\right] = 541,926.141857$

1 pt (no carry over)

$\Rightarrow X = \underline{\$6,027.27}$

2. The financial analyst for Superdome Company provides you with a report on a 30-year project her company was exploring. She informs you that the annual inflation rate is 2.75%, which she expects to be the same throughout the life of the project. She also tells you that the expected effective annual real discount rate is 16.4% for this project, and that following an initial investment of $290,000, the project is expected to yield $56,000 per year in real cash flows, at the end of each year for the next 30 years. Use the growing annuity formula and the nominal amounts to find the NPV of the project **(Note: you will earn only one point for this question if you correctly answer using the regular annuity formula and real amounts instead).** **(6 points)**

$\Pi = 0.0275$, $r_r = 0.164$

Cash inflows: $I = 290{,}000$, $C_{rt} = 56{,}000$ $t = 1, 2, \ldots, 30$

Year: 0	1	2	3	...	30
	57,540	$57{,}540 \cdot 1.0275$	$57{,}540 \cdot 1.0275^2$		$57{,}540 \cdot 1.0275^{29}$

We use: $C_{nt} = C_{rt}(1+\Pi)^t$. For year 1:

$C_{n1} = C_{r1}(1+\Pi)^1 = 56{,}000 \cdot 1.0275 = \$57{,}540$

For any time t, $t > 1$, we have:

$C_{nt} = C_{rt}(1+\Pi)^t = C_{n1}(1+\Pi)^{t-1}$

$= 57{,}540(1.0275^{t-1})$

For $t = 2$:

$C_{n2} = 57{,}540 \cdot 1.0275$

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2 pts — Step 1: $r_n = (1+r_r)(1+\Pi) - 1 = 1.164 \cdot 1.0275 - 1$

$= 19.601\%$

3 pts — Step 2: $NPV = -I + PV$

$= -290{,}000 + \frac{57{,}540}{0.19601 - 0.0275}\left[1 - \left(\frac{1.0275}{1.19601}\right)^{30}\right]$

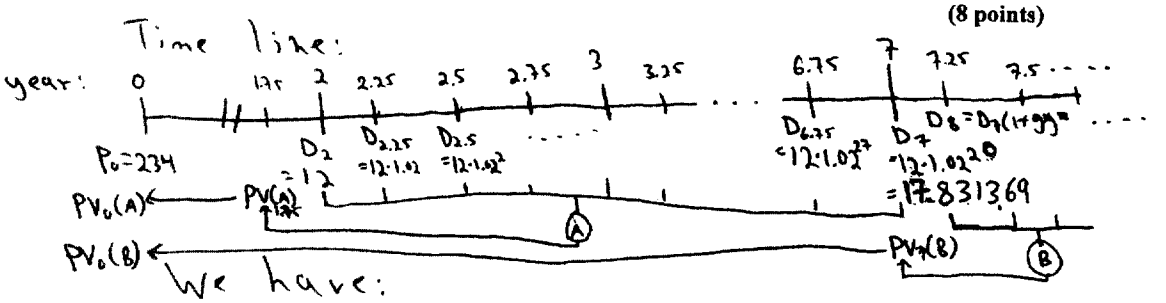
1 pt — $= \$47{,}876.22$

Give only 1 pt if calc. NPV (correctly) with regular annuity formula and real amounts

3. This morning, Western Realty Inc. (WRI) announced a $12 dividend to be paid in two year's time (this is WRI' first dividend). It also announced that it intends to pay dividends on a quarterly basis thereafter. An analyst informs you that she expects these dividends to grow at a quarterly rate of 2% during the first five years of dividends (i.e., between year 2 and year 7), and then grow at a constant quarterly rate of g^* forever. The current price of WRI stock is $234. If the effective annual required rate of return on WRI's equity is 18%, what is the value of g^* consistent with the current stock price?

(8 points)

Time line:



We have:

$$P_0 = PV_0(A) + PV_0(B)$$

Step 1:

1 pt. [$EPR_{\frac{1}{4}} = (1+EAR)^{\frac{1}{4}} - 1$
$= 1.18^{\frac{1}{4}} - 1 = 4.22466\%$

Step 2:

2 pts [$PV_{1.75}(A) = \frac{12}{0.0422466 - 0.02}\left[1 - \left(\frac{1.02}{1.0422466}\right)^{21}\right]$
$= 196.529128$

Deduct 1 pt if did not use 21 periods.

0.5 pts [$PV_0(A) = \frac{PV_{1.75}(A)}{(1+EAR)^{1.75}} = \frac{196.529128}{1.18^{1.75}} = 147.107026$

Step 3:

1 pt [$PV_7(B) = \frac{D_{7.25}}{0.0422466 - g^*}$

1 pt [$D_{7.25} = D_7(1+g^*) = (12 \cdot 1.02^{20})(1+g^*)$
$= 17.831369(1+g^*)$

1 pt [=> $PV_0(B) = \frac{PV_7(B)}{(1+EAR)^7} = \frac{\frac{17.831369(1+g^*)}{0.0422466 - g^*}}{1.18^7}$

Step 4:

$PV_0(B) = P_0 - PV_0(A)$

1 pt [=> $\frac{\frac{17.831369(1+g^*)}{0.0422466 - g^*}}{1.18^7} = 234 - 147.107026$ => $g^* = -2.0832\%$

0.5 pt

4. You are told that last year security X paid a continuously compounded annual **real** interest rate of 12%. Equivalently, in nominal terms security X paid an effective annual **nominal** rate of 16%. Find last year's annual inflation rate.

(3 points)

$r_r^{cc} = 12\%$, $EAR_n = 16\%$

1 pt [Step 1: $EAR_r = e^{r_r^{cc}} - 1 = e^{0.12} - 1 = 0.12749685$

The Fisher relation:

$$1 + EAR_n = (1 + EAR_r)(1 + \Pi)$$

.5 pt [Step 2: =>

$$1.16 = 1.12749685\,(1 + \Pi)$$

(no carry over)

0.5 pt [=> $\Pi = 0.028828 = 2.8828\%$

5. ASB Corp. is considering the following two investment proposals X and Y. The projected cash flows for project X are as follows:

End of Period:	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Project X	-580	-218	438	420	656	220

The projected cash flows for project Y are as follows:

End of Period:	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Project Y	2000	-1440	-720	-360	-180	-144	-130

The effective annual required rate of return for both projects is 32%.

a) Suppose that projects X and Y are mutually exclusive. Use the IRR method with incremental project (Y-X) to show which project is preferred. Explain your result. **(4 points)**

Step 1:

2 pts — End of Period: 0 | 1 | 2 | 3 | 4 | 5 | 6

(Y − X): 2,580 | -1,222 | -1,158 | -780 | -836 | -364 | -130

Deduct 1 pt if worked with (X-Y)

Step 2:

1 pt (No carry over) $NPV_{Y-X} = 2{,}580 + \frac{-1{,}222}{1.32} + \frac{-1{,}158}{1.32^2} + \frac{-780}{1.32^3} + \frac{-836}{1.32^4} + \frac{-364}{1.32^5} + \frac{-130}{1.32^6}$

$= 259.73 > 0 \Rightarrow$ accept ~~since NPV>0~~

1 pt Step 3: $\Rightarrow$ accept Y and reject X

Can replace Step 2 with IRR: $IRR_{Y-X} = 25.7346\% < 32\% = r$

since Y-X is a financing project $\Rightarrow$ reject (Y-X)

b) The discounted payback period for project X is between _____ and _____ years. **(1 point)**

0.5 pts

Year	CF	PV(CF)	Cumulative PV(CF)
0	-580	-580	-580
1	-218	-165.15	-745.15
2	438	251.38	-493.77
3	420	182.61	-311.16
4	656	216.08	-95.09
5	220	54.90	-40.19

0.5 pts (no carry over) → No Payback Period

6. Consider the following information:

a) The cash inflows stream of an investment project is a 25-year annuity paying C dollars at the end of every year starting one year from today. The project requires an initial investment of $6C$. The required rate of return of this project is 15%. Should you invest in this project?
(3 points)

We accept if NPV > 0.

2 pts $\left[NPV = -6C + \frac{C}{0.15}\left[1 - \frac{1}{1.15^{25}}\right]\right.$

$= -6C + 6.464149C =$

1 pt (only if consistent with recommendation) $\left[= 0.464149 \cdot C > 0 \Rightarrow \underline{\text{accept}}\right.$

(C is positive since it says "cash inflows...")

Or:

2 pts $\left[-6C + \frac{C}{IRR}\left[1 - \frac{1}{(1+IRR)^{25}}\right] = 0\right.$

1 pt (only if consistent with recommendation) $\left[\Rightarrow IRR = 16.2830\% > 15\% \Rightarrow \underline{\text{accept}}\right.$

b) You live in a Modigliani and Miller (M&M) with corporate taxes. The Canadian Government is considering a proposal to increase the corporate tax rate from 40% to 60%. Suppose that you are a major shareholder of a Canadian corporation. Would you support the proposal?

2 pts (full answer) or Zero

Circle one: (Yes) or No

Justify your answer in no more than 3 lines.
(2 points)

In an MM world with corp. taxes the value of a levered firm is: $V_L = V_u + T_c B \Rightarrow V_L \uparrow$ as $T_c \uparrow \Rightarrow$ higher taxes are better.

7. Suppose you have been hired as a financial consultant by York Electronics, Inc., a large, publicly traded firm that is the market share leader in virtual reality modules (VRMs). The company is looking at setting up a manufacturing plant overseas to produce a line of VRMs. This will be a five-year project. The company bought some land five years ago for $8 million in anticipation of using it as a toxic dump site for waste chemicals, but it built a piping system to safely discard the chemicals instead. The land was appraised last week at $300,000. The company wants to build its new manufacturing plant on this land.

The new plant will cost $10 million to build, and it would be placed in a CCA pool with a rate of 25% where York currently has many assets. The UCC of this pool will not be terminated in the foreseeable future. Assume the plant has a five-year life with a salvage value of $200,000, and that York uses the entire CCA as a tax deductible expense.

If York decides to undertake the proposed project, it will incur $1 million in annual fixed costs for the duration of the project. The plan is to manufacture 45,000 VRMs per year and sell them at $260 per machine; the variable production costs are $155 per VRM. The proposed project will require the following levels of current assets and current liabilities items during the life of the project:

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Raw Materials	$150,000	$180,000	$190,000	$220,000	$280,000	$0
Cash	$50,000	$350,000	$360,000	$340,000	$330,000	$0
Accounts Receivable	$0	$120,000	$160,000	$110,000	$145,000	$0
Accounts Payable	$20,000	$80,000	$70,000	$90,000	$85,000	$0
Taxes Payable	$0	$50,000	$50,000	$50,000	$50,000	$0

It is anticipated that the proposed new VRM project will impact sales on York's original line of VRMs currently on the market. You believe that the newer line will quickly be recognized as superior, and therefore anticipate that old VRMs will be obsolete in a year. York currently sells 80,000 units of the old VRM for $200 each, at a variable cost of $160 per machine. You estimate lost old VRM sales of 50% in the first year, and believe that after the first year York will decide to terminate the production of the old VRM.

Suppose that York's corporate income tax rate is 40%, and consider the following current market data on York and other securities:

Debt: 10,000 9.5 percent coupon bonds outstanding, 10 years to maturity, selling for $880 each. The bonds have a $1,000 par value each and make semiannual payments (i.e., York has 10,000 such bonds outstanding, each selling for $880).

Common Stock: 400,000 shares outstanding selling for $35 per share; the equity beta is 1.3.

Market: 7 percent expected market risk premium; 5 percent risk-free rate.

a) Assuming the project has the same beta and financial leverage as the whole firm, calculate the appropriate discount rate to use when evaluating the proposed new VRM project. **(2 points)**

0.5 pts Step 1: $r_s = r_f + \beta_s [r_m - r_f]$
$= 0.05 + (1.3 \cdot 0.07)$
$= 14.1\%$

0.5 pts Step 2: $880 = \frac{47.5}{y_{\frac{1}{2}}/2}\left[1 - \frac{1}{(1+(y_{\frac{1}{2}}/2))^{20}}\right] + \frac{1{,}000}{(1+(y_{\frac{1}{2}}/2))^{20}}$

$\Rightarrow y_{\frac{1}{2}} = 5.777387\%$

$\Rightarrow r_B = EAY = (1 + \frac{y_{\frac{1}{2}}}{2})^2 = (1 + 0.05777387)^2 - 1 = 11.888556\%$

0.5 pt [Step 3: $B = 10{,}000 \cdot 880 = 8{,}800{,}000$; $S = 400{,}000 \cdot 35 = 14{,}000{,}000$
$\Rightarrow V = S + B = 22{,}800{,}000$

0.5 pts [Step 4: $WACC = \frac{S}{S+B} r_S + \frac{B}{S+B} r_B (1 - T_c)$
$= \frac{14}{22.8} \cdot 14.1\% + \frac{8.8}{22.8} \cdot 11.888556\% (1 - 0.4)$
$= 11.4110\%$

b) Alternatively, assume the VRM project has the same financial leverage as the whole firm, but a different beta. This is mainly because the new VRM project is somewhat riskier than a typical project for York, due to the plant being located overseas. Management has told you to use a beta of 1.8 to account for this increased level of risk. Given this new information, calculate the appropriate discount rate to use when evaluating York's proposed new VRM project.

(1 points)

0.5 pts [Step 1:
$r_S = r_f + 1.8 [E[r_m] - r_f]$
$= 5\% + (1.8 \cdot 7\%)$
$= 17.6\%$

0.5 pts [Step 2:
$WACC = \frac{14}{22.8} 17.6\% + \frac{8.8}{22.8} \cdot 11.888556\% (1 - 0.4)$
$= 13.5602\%$

For the remainder of this question, assume the appropriate discount rate to use when evaluating York's proposed new VRM project is 15%.

c) What is the impact on the NPV of the proposed project of the overseas land York already owns (and on which the proposed project will be built if accepted)?

(1 points)

1 pt or Zero [Decrease NPV by $300,000

d) What is the impact of the building of the new plant on the NPV of the proposed project? **(Ignore the effect of any possible CCA tax shields and salvage)**

(1 points)

1 pt. for zero [Decrease NPV by $10,000,000

e) What is the impact on the NPV of the proposed project of the net working capital requirements associated with the project?

(3 points)

Year:	0	1	2	3	4	5
NWC	180,000	520,000	590,000	530,000	620,000	0
ΔNWC	180,000	340,000	70,000	-60,000	90,000	-620,000

1 pt. ← ΔNWC

1 pt [NPV = $180{,}000 + \frac{340{,}000}{1.15} + \frac{70{,}000}{1.15^2} + \frac{-60{,}000}{1.15^3} + \frac{90{,}000}{1.15^4} + \frac{-620{,}000}{1.15^5}$

= $232,339.47

1 pt. [=> Decrease NPV by: $232,339.47

f) What is the impact on the NPV of the proposed project of the salvage of the plant at the end of the project? **(Ignore the effect of any lost CCA tax shields)**

(1 points)

0.5 pt [$PV(\text{Salvage}) = \frac{200{,}000}{1.15^5} = 99{,}435.35$

0.5 pt [=> Increase NPV by: $99,435.35

g) What is the impact on the NPV of the proposed project of the CCA tax shield associated with the use of the plant in the project?

(2 points)

1.5 pts (Zero if did not use formula)

$$PV\left(\begin{matrix}CCA\\ Tax\\ shield\end{matrix}\right) = \frac{C \cdot d \cdot T_c}{r+d} \times \left[\frac{1+0.5r}{1+r}\right] - \frac{S \cdot d \cdot T_c}{r+d} \times \frac{1}{(1+r)^n}$$

0.5 pt.

$$= \frac{10{,}000{,}000 \cdot 0.25 \cdot 0.4}{0.15+0.25}\left(\frac{1.075}{1.15}\right) - \frac{200{,}000 \cdot 0.25 \cdot 0.4}{0.15+0.25}\left(\frac{1}{1.15^5}\right)$$

0.5 pt. 0.5 pt.

$$= \$2{,}312{,}097.68$$

0.5 pt [Increase NPV by: $2,312,097.68

h) What is the impact on the NPV of the proposed project of any side effects?

(2 points)

1.5 pts [

NOCF from old VRM:

$80{,}000(200-160)(1-0.4) = \$1{,}920{,}000$

In year 1 we lose: $\frac{1{,}920{,}000}{2} = \$960{,}000$ → 1 pt

and every year after (in perpetuity) we lose $1,920,000

$PV(\text{side effects}) = \frac{960{,}000 + \frac{1{,}920{,}000}{0.15}}{1.15} = \$11{,}965{,}217.39$ 0.5 pt.

Reasonable

Note: accept any assumption w/r to the duration of lost sales.

0.5 pts [Decrease NPV by: $11,965,217.39

i) What is the impact on the NPV of the project of the incremental revenues and expenses associated with the project (excluding side effects on other projects, and any opportunity costs)?
(3 points)

PV (incremental revenues) =

2 pts $= \frac{[45{,}000(260-155) - 1{,}000{,}000](1-0.4)}{0.15}\left[1 - \frac{1}{1.15^5}\right]$

0.5 pts $= \$7{,}492{,}066.64$

0.5 pts [Increase NPV by : $ 7,492,066.64

j) What is the NPV of the proposed project & what is your recommendation?
(2 points)

2 pts if both consistant. Deduct 1 pt if did not show work.

NPV = $-12{,}593{,}957.19$ ∴ the proposed project should be rejected.

8. A financial analyst provides you with the following (incomplete) data regarding returns of Nortel stock in the following year:

State of Economy	Probability	Nortel's Return
Boom	?	5%
Normal	0.2	16%
Recession	?	36%

The analyst believes that the expected return for Nortel stock for the next year is 27.04%. What must be the probabilities the analyst attached to the "Boom" and the "Recession" states?

(5 marks)

Let:

P_B = probability of "Boom"

P_R = " " "Recession"

P_N = " " "Normal"

We have:

$E[r] = P_B r_B + P_N r_N + P_R r_R$

2 pts [$\Rightarrow 27.04 = 5P_B + 16(0.2) + 36 P_R$

Since $P_R = 1 - P_N - P_B = 1 - 0.2 - P_B = 0.8 - P_B$,

we have:

2 pts [$27.04 = 5 P_B + 16(0.2) + 36(0.8 - P_B)$

Solving, we get:

1 pt (no carry over) Give zero if: $P_R + P_B \neq 0.8$ [$\boxed{P_B = 0.16}$

and

$P_R = 0.8 - P_B =$

$= 0.8 - 0.16$

$\Rightarrow \boxed{P_R = 0.64}$

9. You construct a portfolio by taking the following positions:
   - Long a European put option on XYZ Company stock, with an exercise price of $42, and an expiration in three months
   - Long a forward contract on XYZ Company stock, with a forward price of $42, and an delivery in three months
   - Short a European call option on XYZ Company stock, with an exercise price of $42, and an expiration in three months
   - Short a three-month Treasury bill, having a face value of $42

Denoting XYZ's stock price in three months with S_T, consider two states of the world that can materialize in three months: S_T <42 and S_T >42. In the following table, fill in the payoffs for each of the above positions and for the total portfolio that correspond to the above states in three months time.

		State of the World	
	Position	S_T<42	S_T>42
1pt	Long Put	$42-S_T$	0
1pt	Long Forward	S_T-42	S_T-42
1pt	Short Call	0	$-(S_T-42)$
1pt	Short T-bill	-42	-42
1pt	**Total Portfolio**	-42	-42

no carry over for the total

Accept answers with E instead of 42. (5 points)

10. Your firm is a jewellery manufacturer that needs 100,000 ounces of silver at the beginning of September for the fall production run. You would like to lock in your costs today, because you're concerned that silver prices might go up between now and September.

Below is a list of closing prices for futures contracts of 5,000 ounces of silver that are available today (April 17, 2001). Note that each futures contract represents the obligation to buy/sell 5,000 ounces of silver and that the quoted futures price is per one ounce.

Metal	Quantity	Delivery date	Futures price
Silver	5,000 ounces	July 01, 2001	$5.16
Silver	5,000 ounces	Sep 01, 2001	$5.20
Silver	5,000 ounces	Dec 01, 2001	$5.23

a) How could you use silver futures contracts to hedge your risk exposure? What price would you be effectively locking in?

(2 points)

0.5 pt for Long, 0.5 pt. for 20 Sept.

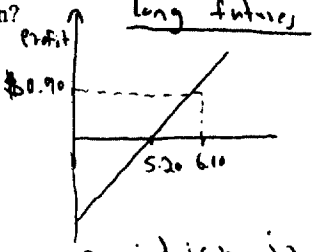
Long $\frac{100,000}{5,000} = 20$ September 1, 2001 contracts.

1 pt for either $5.20 or $520,000

This will effectively lock in a price of $5.20 per ounce. Or lock in a total cost of $100,000 \cdot 5.20 = \$520,000$

b) Suppose silver prices are $6.10 per ounce in September. What is the total profit or loss on your futures position?

(2 points)



* 0.5 pt. for profit=0.9

* no marks for loss

For a long position in 5,000 contracts, there will be a profit when price > initial futures price.

$Profit = 20 \cdot 5,000 \cdot (6.10 - 5.20) = \$90,000$ → 2 pts.

c) What is the name of the mechanism, which credits (charges) you with the profit (loss) you incur from your futures position? **(no more than one line)**

(1 points)

1 pt Marking to market.

11. Assume the M & M model with corporate taxes and financial distress holds and that the CAPM is true. Trenton Corporation Inc. (TCI) is a corporation financed with debt (*B*)and equity (*S*). $150 million of its assets are financed by debt paying an effective annual return of 6%, and the remainder with equity. TCI's earnings are subject to corporate taxes at a rate of 40%. A financial analyst has estimated that if TCI were an all-equity firm, it would have a market value of $420 million and that the return on investment in TCI's equity would be 14%. The financial analyst believes that there are costs of financial distress associated with debt, and she estimates the present value of these costs to be:

$$PV_{\text{Costs of Financial Distress}} = e^{B/30}$$

(both B and $PV_{\text{Costs of Financial Distress}}$ are represented in millions of dollars in this function).

a. Calculate the market value of TCI under its leveraged capital structure.

(2 points)

$V_L = V_U + T_c B - e^{B/30}$

0.5 pt. 0.5 pt. 0.5 pt.

1.5 pts. $= 420 + (0.4 \cdot 150) - e^{\frac{150}{30}}$

0.5 pts. $= \$331.59$ million

b. Find the optimal amount of debt for TCI. Verify that it yields the maximum value of TCI.

(3 points)

We have:

$V_L = 420 + 0.4B - e^{B/30}$

To find maximum:

2 pts $\frac{\partial V_L}{\partial B} = 0.4 - \frac{1}{30} e^{B/30} = 0$

$\Rightarrow e^{B/30} = 0.4 \cdot 30 = 12$

Take natural logarithm of both sides:

No marks if did not take the derivative

$B/30 = \ln(12)$

$\Rightarrow B = 30 \ln(12)$

0.5 pts $\Rightarrow B^* = \$74.55$ million

Verifying that this is a maximum:

0.5 pts $\frac{\partial^2 V_L}{\partial B^2} = -\left(\frac{1}{30}\right)^2 e^{B/30} < 0 \Rightarrow$

$\Rightarrow$ since $\frac{\partial V_L}{\partial B^2} < 0$ the above solution is a maximum.

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