AP/ADMS4540

Assignment #2

Summer 2015

Instructions:

(1) This assignment is to be done individually. You must sign and submit the standard cover page supplied as the last page of this assignment; otherwise you will be deducted 5 points.

(2) Before you start, please note the necessary working steps to be shown as explained in the first lecture.

(3) This assignment is due in the last lecture.

(4) This assignment must be handwritten. Any work that is not original handwritten (e.g., printed or photocopied) will receive zero credit. Work that is too difficult to read due to messiness and poor handwriting will also receive zero credit. You must show all the necessary working steps to receive full credit.

(5) This assignment carries a total of 100 points.

(6) Late assignments will not be accepted whether for technical or any other reasons except for illness. A student must submit an Attending Physician's Statement as evidence of illness if the student has received prior written permission from the course director to submit a late assignment. Under no circumstances would a late assignment be accepted after the answer key to the assignment has been posted on the course website.

(7) Decimal places: please keep at least 8 in your calculations and round to the nearest penny or basis point in your final answers.

Question 1

POP Consulting Ltd. is evaluating a new product launching project for Smart Inc. POP finds that the project will cost $550,000, have a five-year life with no salvage value, depreciation is straight line to zero. Sales are projected at 250 units per year and the selling price per unit will be $4,000; variable cost per unit will be $2,000 and fixed costs will be $150,000 per year. The cost of capital for the project is 10% and Smart's corporate tax rate is 40%. Find the followings:

a) What is the cash break-even level of output for this project, ignoring taxes? (**2 points**)
b) What is the accounting break-even level of output? (**3 points**)
c) What is the financial break-even level of output? (**4 points**)
d) What relationship do you find among the different break-even levels of output? (**2 points**)
e) What happens to NPV and IRR when a firm breaks even on i) cash basis, ii) accounting basis and iii) financial basis? (**6 points**)
f) Using the tax shield approach to determine OCF, what is the degree of operating leverage at the projected level of sales of 250 units? How do you interpret this number? **(4 points)**
g) Is DOL calculated in f) remains the same for all levels of sales? Justify your answer finding DOL at a sales level of 300 units. **(4 points)**

Solution:

a) The cash breakeven is:

$Q_C = FC/ (P – v)$

$Q_C = \$150,000/ (\$4,000 – 2,000)$

$Q_C = 75$ units **(2 points)**

b) The accounting breakeven is:

$Q_A = (FC + D)/ (P – v)$, where depreciation, $D = \$550,000/5 = \$110,000$ **(1 point)**

$Q_A = [\$150,000 + \$110,000]/ (\$4,000 – 2,000)$

$Q_A = 130$ units **(2 points)**

c) At the financial breakeven, the project will have a zero NPV.

NPV = 0 implies $\$550,000 = OCF^* \times (PVIFA_{10\%,5})$

$OCF^* = \$145,088.61$ **(2 points)**

The financial breakeven is:

$Q_F = (FC + OCF^*)/ (P – v)$

$Q_F = (\$150,000 + \$145,088.61)/ (\$4,000 – 2,000)$

$Q_F = 147.54$ units (**2 points**)

d) The general relationship between the three break-even level output is :

Cash break-even < Accounting break-even < Financial break-even **(2 points)**

e) The status of NPV and IRR are shown in the following table:

Break-even	NPV	IRR
Cash	NPV is negative and equal to the initial outlay	IRR = -100 percent
Accounting	Negative	IRR = 0
Financial	NPV = 0	IRR = cost of capital, *k*

(6 points)

f) At the projected level of sales of 250 units, the DOL is:

DOL = 1 + FC/OCF

Now, OCF = [($4,000 – 2,000) (250) – $150,000] (0.60) + 0.40($550,000/5)

OCF = $254,000 **(2 points)**

DOL = 1 + ($150,000/$254,000) = 1.59 **(1 point)**

For each 1% increase in unit sales, OCF will increase by 1.59% **(1 point)**

g) DOL is different at different levels of sales as OCF changes with the level of sales. When sales level goes up, OCF increases and DOL decreases. **(1 point)**
At level of sales of 300 units:

OCF = [($4,000 – 2,000) (300) – $150,000] (0.60) + 0.40($550,000/5)

=$314,000 **(2 points)**

DOL = 1 + ($150,000/$314,000) = 1.48 **(1 point)**

Question 2

Leasing (25 points)

York finance plans to either purchase or lease a machine that costs $250,000 and is subject to a 20 percent CCA rate using the declining balance method. The required lease payments are $30,000 for 4 years and are paid at the beginning of the year. The maintenance of the equipment will be provided by the lessor and included in the lease contract. York has estimated it would incur $20,000 per year in maintenance expenses if it decides to purchase the machine. It is estimated that the machine could be sold for its UCC after four years. The firm's before tax

borrowing rate is 8%, and its effective tax rate is 40%. Should York purchase or lease the machine, assuming the acquisition of the machine has a positive NPV and that the lease would qualify as an operating lease? The asset pool remains open and the half year rule is applicable. **(25 points)**

Solution

NPV(leasing) = CF0 (i.e., purchase price savings) + PV(maintenance savings) – PV(foregone depreciation tax savings) – PV(foregone salvage value) – PV(after-tax lease payments)

CF0 = $250,000;

After-tax borrowing cost = 8% × (1 – 0.40) = 4.8% **(4 points)**

PV(maintenance savings) = $20{,}000 \times (1 - 0.4) \times \left[\frac{1 - \frac{1}{(1.048)^4}}{.048}\right] = \$42{,}750$

Or, using financial calculator:

N = 4; I/Y = 4.8%; PMT = $12,000; FV = 0; CPT PV = $42,750 **(4 points)**

Since the salvage value is the ending UCC at the end of four years.

$$PV(CCA\ Tax\ Shield) = \frac{(C_0)(d)(T)}{d+k} \times \frac{(1+.5k)}{(1+k)} - \frac{(SV_n)(d)(T)}{(d+k)} \times \frac{1}{(1+k)^n}$$

$$= \frac{(250{,}000)(.20)(.40)}{.20+.048} \times \frac{(1+.5\times.048)}{(1+.048)} - \frac{(115{,}200)(.20)(.40)}{.20+.048} \times \frac{1}{(1.048)^4}$$

= 78,798 – 30,807 = $47,991**(4 points)**

PV(Salvage value) = $115{,}200 \times \left[\frac{1}{(1.048)^4}\right] = \$95{,}501$

Or, using financial calculator:

N = 4; I/Y = 4.8%; PMT = 0; FV = 115,200; CPT PV = $95,501**(4 points)**

PV(after-tax lease payments)

= $30{,}000 \times (1 - 0.4) \times \left[\frac{1 - \frac{1}{(1.048)^4}}{.048}\right] \times (1.048) = \$67{,}203$ **(4 points)**

NPV(leasing) = CF0 + PV(maintenance savings) – PV(foregone depreciation tax savings) – PV(foregone salvage value) – PV(after-tax lease payments)

= 250,000 + 42,750 – 47,991 – 95,501 – 67,203 = $82,055 > 0**(3 points)**

The firm should lease rather than buy the machine. **(2 points)**

Question 3

M&A (25 points)

Vittoria Financial Group (VFG) is considering a merger with Pestway Capital Corporation (PCC). Both VFG and PCC have no debt. VFG estimates the merger will generate incremental after-tax cash flows of $720,000 per year indefinitely. The appropriate discount rate for the incremental cash flows is 12.5 percent. The following information shows the pre-merger stock price and the number of shares outstanding of each corporation.

	VFG	PCC
Pre-merger stock price	$15	$5
Number of shares outstanding	2,500,000	2,000,000

VFG and PCC have agreed on a transaction value of $6 per share for PCC's stock, but are negotiating methods of payment for an all-cash offer, and a stock exchange offer.

a. What is the synergy from the merger? Calculate the takeover premium of each alternative. **(9 points)**

b. Calculate the NPV of each alternative. **(2 points)**

c. Assume the synergy is re-estimated to be $2,400,000 based on recent developments in the financial markets. What is the maximum cash price per share that could be paid for PCC? **(2 points)**

d. Calculate the takeover premium for a cash and stock exchange offer ($3.50 cash per share of PCC plus 1 share of VFG for every 10 shares of PCC). Assume the synergy remains $2,400,000 as in part (c). **(7 points)**

Solution:

a.

Synergy = 720,000/12.5% = $ 5,760,000 **(1 point)**

Pre-merger value of VFG: $V_V = 15 \times 2{,}500{,}000 = \$37{,}500{,}000$

Pre-merger value of PCC: $V_P = 5 \times 2000{,}000 = \$10{,}000{,}000$ **(1 point)**

All-Cash offer:

P_P = 6× 2,000,000 = $12,000,000

TP = P_P – V_P = 12,000,000 – 10,000,000 = $2,000,000 **(1 point)**

Stock Exchange offer:

V_{VP} = V_V + V_P + Synergy – Cash = 37,500,000 + 10.000,000 + 5,760,000 – 0

= $53,260,000 **(1 point)**

Need to calculate the number of new shares

Exchange ratio: 156 = 2.5 (One share of VFG for 2.5 shares of PCC)

2,000,000 /2.5 = 800,000 new shares to PCC's shareholders

(Or let n= # of new shares: $15 × n = $6 × 2,000,000 → n = 800,000 new shares) **(1 point)**

The total shares outstanding for VFG is 2,500,000 + 800,000 = 3,300,000 **(1 point)**

The price per share for the merged company: P_{VP} = 53,260,000 /3,300,000 = $16.14 **(1 point)**

The actual price paid to PCC is P_P = 800.000 × $16.14 = $12,912,000

TP = 12,912,000– 10,000,000 = $2,912,000 **(2 points)**

b.

All-Cash offer:

NPV= Gain to VFG = S -TP = 5,760,000 – 2,000,000 = $3,760,000

(Or NPV = (S + V_P) – P_P = (5,760,000 + 10,000,000) – 12,000,000 = $3,760,000) **(1 point)**

Stock Exchange offer:

NPV= Gain to VFG = S -TP = 5,760,000 –2,912,000 = $2,848,000

(Or NPV = (S + V_P) – P_P = (5,760,000 + 10,000,000) – 12,912,000 = $2,848,000 **(1 point)**

c.

Maximum price per share = $5 + (2,400,000/2,000,000) = $6.20 (**2 points)**

d.

V_{VP} = V_V + V_P + Synergy – Cash = 37,500,000 + 10,000,000 + 2,400,000 – (3.50×2,000,000)

= $42,900,000 **(2 points)**

New shares to PCC's shareholders = 2,000,000/10 = 200,000

The total shares outstanding for VFG is 2,500,000 + 200,000 = 2,700,000 **(1 point)**

The price per share for the merged company: P_{VP} = 42,900,000 / 2,700,000 = \$15.89 **(1 point)**

The actual price paid to PCC is:

P_P = (15.89 × 200,000) + (3.50 × 2,000,000) = \$ 10,178,000 **(2 points)**

TP = P_P – V_P = 10,178,000 – 10,000,000 = \$178,000 **(1 point)**

Question 4
Risk and return (25 points)

a. Assume that security returns are generated by the single-index model, $R_i = \alpha_i + \beta_i R_M + \varepsilon_i$, where R_i is the excess return for security i and R_M is the market's excess return. The risk-free rate is 2%. Suppose also there are 3 securities A, B and C, characterized by the following data:

Security	β_i	$E(R_i)$	$\sigma(\varepsilon_i)$
A	0.8	10%	25%
B	1.0	12%	10%
C	1.2	14%	20%

(i) If σ_M = 20%, help Caillou calculate the variance of returns of securities A, B and C. **(3 points)**

(ii) Now assume there are an infinite number of assets with return characteristics identical to those of A, B and C, respectively. If one forms a well-diversified portfolio of type A securities, what will be the mean and variance of the portfolio's excess returns? What about portfolios composed only of type B and type C stocks? **(2 points)**

(iii) Is there an arbitrage opportunity in the market? If so, show Caillou the money. **(2 points)**

b. Assume the correlation coefficient between the Sid Science Fund and the S&P/TSX index is 0.70. What percentage of Sid Science Fund's total risk is specific or unsystematic? **(3 points)**

c. Watching YouTube Videos: Watch the following YouTube videos on your PC or laptop or mobile device and then ***write up*** a two-page summary of what you learnt from these YouTube videos. There will not be an answer key provided for this question. Instead, the markers will also have watched these videos, and if what you write of these videos is consistent with their understanding **and different from other students**, you will receive full credit. **(15 points)**

Bear Stearns is fine?

https://www.youtube.com/watch?v=1QEKdsEfLY0

Lessons from the father of modern portfolio theory

http://www.youtube.com/watch?v=5Y1MBc_Vj3w
There are no shortcuts to investing: Nobel laureate William Sharpe
http://www.youtube.com/watch?v=pGIzygsvqck

a. i. $\sigma^2 = \beta^2\sigma_M^2 + \sigma^2(e)$

$\sigma_A^2 = (0.8^2 \times 20^2) + 25^2 = 881$ **(1 point)**

$\sigma_B^2 = (1.0^2 \times 20^2) + 10^2 = 500$ **(1 point)**

$\sigma_C^2 = (1.2^2 \times 20^2) + 20^2 = 976$ **(1 point)**

ii. If there are an infinite number of assets with identical characteristics, then a well-diversified portfolio of each type will have only systematic risk since the non-systematic risk will approach zero with large n. The mean will equal that of the individual (identical) stocks. **(2 points)**

iii. There is no arbitrage opportunity because the well-diversified portfolios all plot on the security market line (SML). Because they are fairly priced, there is no arbitrage. **(2 points)**

b. The R^2 of the regression is: $0.70^2 = 0.49$ **(1.5 points)**

Therefore, 51% of total variance is unexplained by the market; this is nonsystematic risk. **(1.5 points)**

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ADMS 4540

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Due date for all sections is in class in the last lecture.

Personal Work Statement **I, the undersigned:** • **Warrant that the work submitted herein is my work and not the work of others** • **Acknowledge that I have read and understood the Senate Policy on Academic Honesty** • **Acknowledge that it is a breach of the University regulations to give and receive unauthorized assistance on a graded piece of work**		
Name (typed or printed)	**York Student #**	**Signature**