ECE 472 Tutorial Review Questions for Chapter 2a

Question 1 – Debt Ratio

The following statement was overheard at the Rotman School of Business:

> "Investors always demand a higher rate of return for a company's equity than they do for its debt. Therefore, a company should always be financed with 90% debt and 10% equity. This debt-financing ratio would result in the lowest possible cost of capital for a company."

Discuss this statement. You may wish to consider the characteristics and trade-offs between debt and equity as well as show how the cost of capital varies as more debt is used. If you do not agree with the above statement, what is a more appropriate debt ratio?

Question 2 – Cost of Capital

Netstar Corporation has retained the investment banking firm of Rich, Richer & Richest (RR&R) to advise on raising $10 000 000 for the company's expansion plans. RR&R has analyzed Netstar and the financial markets and determined that investors will require a return of 22% on any equity investment in Netstar. RR&R also believes that the financial markets will react favourably to a Netstar bond issue of $2 500 000. Bond investors would demand a return of 10%.

a) Netstar management does not like the idea of going into debt. If Netstar raised all the money by selling shares, what would Netstar's cost of capital be?
b) Why has RR&R recommended that Netstar sell bonds? If management accepted this financing proposal, what would Netstar's cost of capital be?
c) Outline the issues and trade-offs surrounding RR&R's recommendation for a $2 500 000 bond issue. Why, for example, did they not recommend selling 7 or 8 million dollars worth of bonds?

Question 3 – Equity Versus Debt Financing

Together with her business partner, Suzie Skule, P. Eng., has built up a small business from scratch over the past 5 years and now is a 50% owner of a company that is worth on the order of $6 000 000. The company is doing well and has a profit of $750 000 per year. Suzie has decided that now that the business is well established, more leisure time is in order and she now wishes to buy a hobby farm in the country. She needs to raise $700 000 to buy this farm. Her bank manager is willing to lend her that amount, on an interest only basis (i.e., as long as the interest is being paid, the $700 000 does not have to be paid back), for an annual interest rate of 6.0%. She doesn't like the idea of paying interest and would prefer to sell a portion of her equity in the company to raise the money as she believes there really aren't any costs, like interest, associated with that approach. What advice would you give her? Be sure to quantify the monetary advantage of your recommendation and explain your recommendation fully.

Question 4 – Corporate Financing

DarTek Engineering Corporation wishes to raise enough funding for this year's capital budget. It plans on selling a number of shares and raising the balance though a long-term bond issue. Bondholders require a rate of return of 8% and equity investors are willing to pay $42.00 per share which should yield a return of 17% to the shareholders. DarTek has always used a D/V ratio of 0.3. DarTek has five capital budget project proposals under serious consideration for this year.

Project	First Costs	Rate of Return
A	4 000 000	15%
B	3 000 000	11%
C	6 000 000	19%
D	2 000 000	17%
E	3 000 000	14%

(a) What is DarTek's cost of capital?
(b) What projects should DarTek's board of directors approve and how large should this year's capital budget be?
(c) How many shares should DarTek sell and how large should the DarTek bond issue be?

Assume that management's choice of D/V is optimal at 0.3 for DarTek. Discuss what you would expect to happen to the cost of capital should management at DarTek decide to raise long-term funding by using a much higher amount of debt than you determined in Part (d) and reducing the amount of equity. Be sure to illustrate your answer showing how the cost of capital varies as a function of the debt ratio.

Question 5 – Cost of Capital Numeric Example

This example shows how the individual costs of debt and equity increase as the debt ratio rises. Note how the overall cost of capital decreases at first, then reaches its optimal low point at the ratio D/V = 0.20, and then how it increases beyond this optimal ratio.

Question 1 – Debt Ratio – Solution

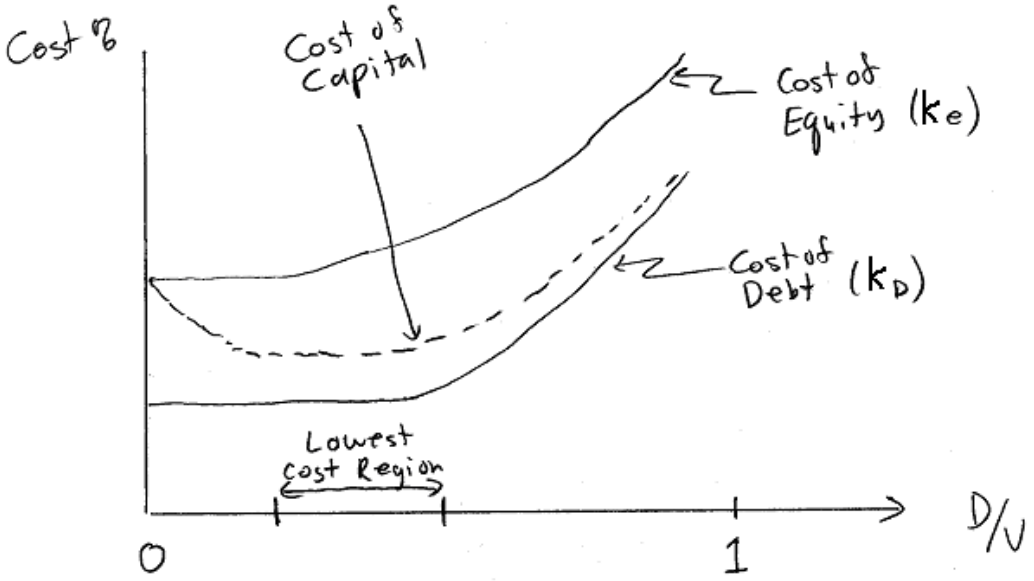
The debt of a company is less risky than the equity because bondholders are guaranteed a fixed return and repayment of the amount lent at the end of the loan. There are no guarantees to the shareholders; they simply share in the profits and have the right to sell their shares at whatever price the stock market offers. Moreover, if the company can't pay the bondholders, they have first claim over all the assets of the company above the shareholders. Therefore, debt is less risky and bondholders will accept a lower rate of return; thereby costing the company less. Most companies use both debt and equity to finance engineering projects, so the total cost of capital is the weighted- average of the two:

Cost of Capital = $ Debt / ($ Debt + $ Equity) * Debt Cost
+ $ Equity / ($ Debt + $ Equity) * Equity Cost.

$$k = \frac{D}{V} k_D + \frac{E}{V} k_E$$

D - $ Value of Debt
E - $ Value of Equity
V - $ Raised (capital budget)
V = D + E
Debt Ratio = D / V
Debt-Equity Ratio = D / E
k_D – Cost of debt financing
k_E – Cost of equity financing
k – Cost of capital (weighted average cost)

Therefore, it would appear that the more debt that a company uses, the cheaper the cost of capital. However, what makes the question statement wrong (90% debt) is that as more and more debt is used, the probability that the company cannot meet its debt obligations goes up with the attendant risk of bankruptcy. This additional risk causes investors' required rates of return to go up. This drives up the cost of capital at high debt-equity ratios. While the exact ratio varies from company to company, a 20 to 40% debt proportion would be a more reasonable amount of debt that would result in the lowest possible cost of capital for a company. The chart below summarizes the cost of capital as more and more debt is used in the capital structure of a company.



D - $ Debt; E - $ Equity

V = D + E (total amount of money raised)

$$\text{Cost of Capital} = \frac{D}{V} k_D + \frac{E}{V} k_e$$

Question 2 – Cost of Capital – Solution

$$\text{Cost of Capital} = k = \frac{\$\,\text{Bond}}{\$\,\text{Total}} k_{bond} + \frac{\$\,\text{Equity}}{\$\,\text{Total}} k_{equity}$$

a) Raising the money by only selling shares means $\$\,\text{Bonds} = 0$, $\$\,\text{Equity} = 10$

$$\therefore k = \frac{0}{10} 10\% + \frac{10}{10} 22\% = \boxed{22\%}$$

Netstar must return 22% to its equity investors in dividends and increased share price. Share prices will increase, if Netstar invests the money in projects returing at least 22%.

b). RR&R is recommending debt, or a bond issue, because at 10% it is cheaper that the 22% shares. RR&R also believes that Netstar should have little trouble making the interest payments on $2.5M of bonds

$$k = \frac{2.5}{10} 10\% + \frac{7.5}{10} 22\% = \boxed{19\%}$$

c) As more debt is used, the interest payments become larger, and the probability that Netstar cannot make the payments increase. This leads to increased risk to Netstar, as bond holders can force the company into bankruptcy if the interest payments are not made. In bankruptcy, the shareholder generally lose significantly. At 25% debt, interest payments are small and there is little chance than Netstar will not make the payments even in an economic slowdown. However, RR&R probably believes that at 70% to 80% debt, there is a real risk of non-payment. As shown here, a modest <u>and reasonable</u> amount of debt lowers the cost of capital without increasing the risk. Therefore, most companies use both debt & equity in financing their projects (also referred to as the capital structure.)

Question 3 – Equity Versus Debt Financing – Solution

INTEREST COST OF LOAN PER YEAR $700000 * 0.06 = \$42 000$

EQUITY COST

VALUE OF COMPANY	\$6 000 000	
SS P.Eng share (50%)	3 000 000	
Amount $ required	700 000	
Her share of company to be sold	23.3%	$= \frac{700}{3000}$
Her share of annual profit before sale (50%)	\$375000	$= \frac{750}{2}$
Amount of profit to go to new partner	\$87 500	$= 0.233 * \$375000$
Cost of Equity Financing	12.5%	$= \frac{87\,500}{700\,000}$

To raise the \$700 000 through an equity sale Suzie will have to give up \$87 500 of profit each year. The bank loan interest is only \$42 000. Therefore, recommend the bank loan for a savings of \$45,500 per year (12.5% equity cost versus 6.0% debt cost).

Question 4 – Corporate Financing – Solution

(a) $D/V = 0.3 \therefore E/V = 0.7$

$k = 0.3(8\%) + 0.7(17\%) = 14.3\%$ (Cost of Capital)

(b) For a project to add value to DarTek, rate of return $> k$; therefore, select A, C and D for a capital budget of \$12 million.

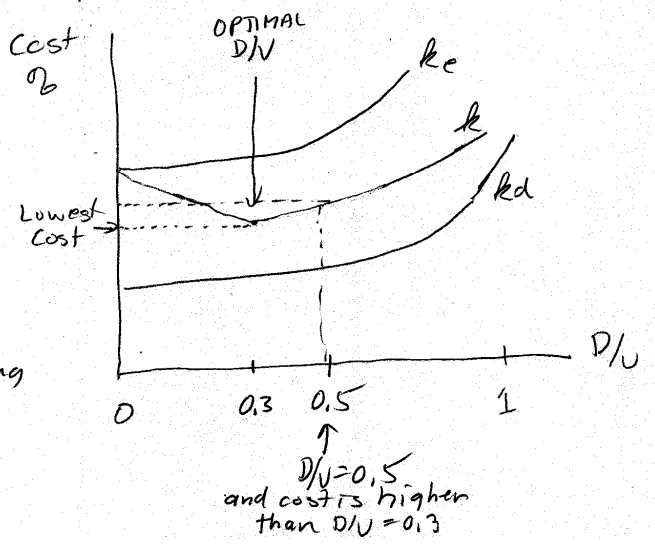
(c) $\frac{E}{V} = 0.7 \therefore$ need $0.7(\$12 \text{ million})$ in equity financing

$= \$8\,400\,000$ or $\frac{\$8\,400\,000}{\$42.00} = 200000$ shares.

(d) Bond issue $\frac{D}{V} = 0.3 \therefore 0.3(\$12 \text{ million}) = \$3\,600\,000.$

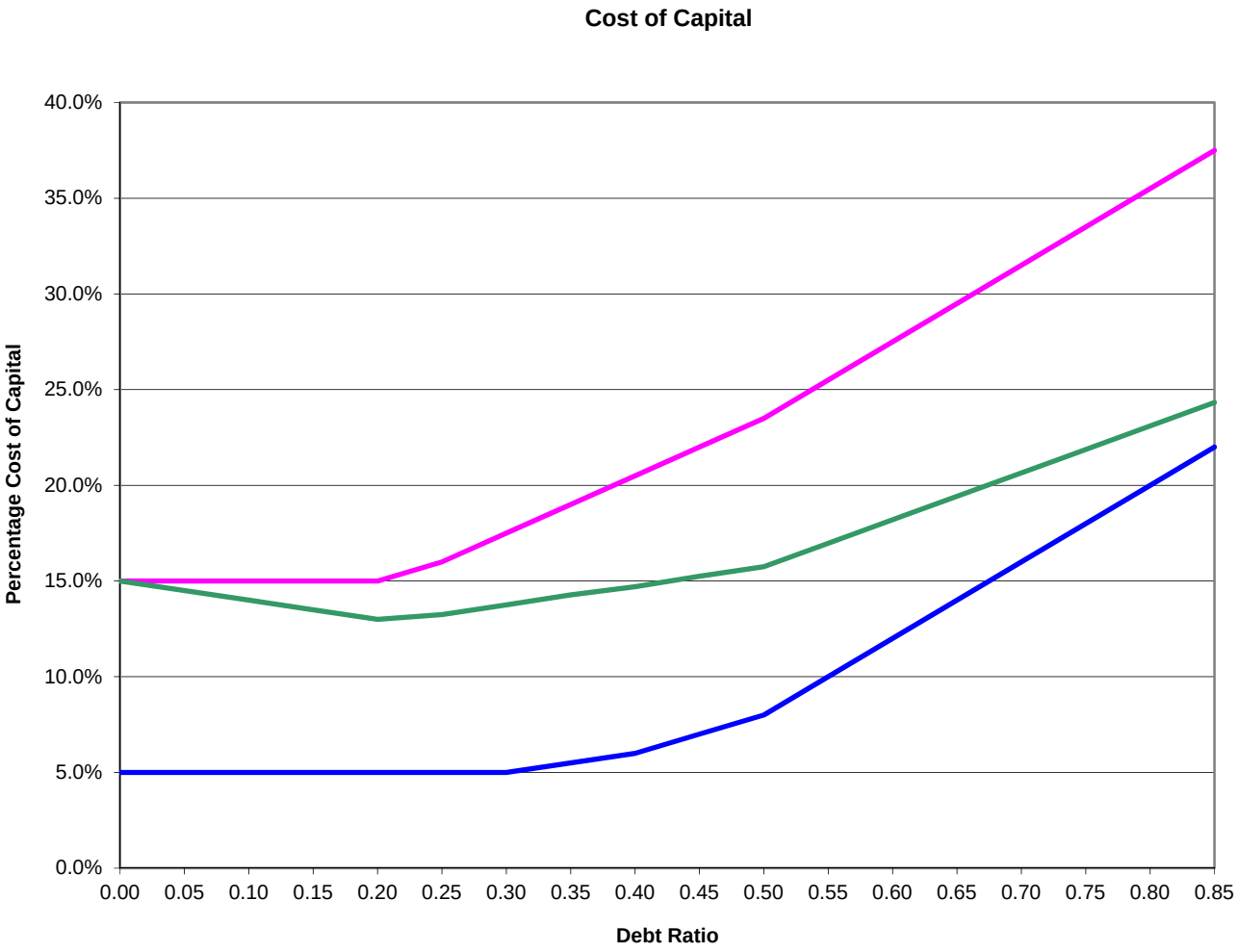
(e) If $D/V = 0.3$ is optimal for DarTek then this ratio of debt and equity provides the lowest possible cost of capital to DarTek as shown in the diagram.

Debt however appears to be cheaper than equity. If significantly more debt is used, the risk perceived by both bondholders and shareholders increases. This causes them to increase the return on investment that they demand. To obtain funding, DarTek must therefore pay more which increases its cost of capital. For example, from the graph, using more debt (say $D/V = 0.5$) causes the cost to go up.



Question 5 – Cost of Capital Numeric Example – Solution

D/V	E/V	k_d	k_e	k	
0.00	1.00	5.0%	15.0%	15.0%	
0.05	0.95	5.0%	15.0%	14.5%	
0.10	0.90	5.0%	15.0%	14.0%	
0.15	0.85	5.0%	15.0%	13.5%	
0.20	**0.80**	**5.0%**	**15.0%**	**13.0%**	**(Optimal Ratio)**
0.25	0.75	5.0%	16.0%	13.3%	
0.30	0.70	5.0%	17.5%	13.8%	
0.35	0.65	5.5%	19.0%	14.3%	
0.40	0.60	6.0%	20.5%	14.7%	
0.45	0.55	7.0%	22.0%	15.3%	
0.50	0.50	8.0%	23.5%	15.8%	
0.55	0.45	10.0%	25.5%	17.0%	
0.60	0.40	12.0%	27.5%	18.2%	
0.65	0.35	14.0%	29.5%	19.4%	
0.70	0.30	16.0%	31.5%	20.7%	
0.75	0.25	18.0%	33.5%	21.9%	
0.80	0.20	20.0%	35.5%	23.1%	
0.85	0.15	22.0%	37.5%	24.3%	



In this example, based on the data in the schedule above, the cost of capital has a minimum value of 13.0% at a D/V of 0.20. At this debt ratio, the cost of debt is 5.0% and the cost of equity is 15.0%.