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Homework 4

Question 1:

Branch Inc. is a company that produces construction material by using its assets at full capacity. According to the end of 2020 financial statements, Branch Inc. has \$5,000,000 in assets that are financed 50% by equity and 50% by debt. Assume that Branch Inc. does not have any spontaneous liabilities and it does not have any scheduled long term principal debt payments until 5 years from now. Assume Branch Inc. had an annual profit of \$800,000 in 2020 and does not have any depreciation.

Requirement: Branch Inc. is not planning on selling or buying back stocks or distributing dividends.

If annual sales grow at the internal growth rate, fill out the following table given that the profit margin stays the same and assets need to increase at the same rate as sales.

$$\text{ROA} = \text{Net Income} / \text{Total Assets} = 800,000 / 5,000,000 = 0.16$$

$$\text{retention ratio } b = \text{Retained Earnings} / \text{Net Income} = 800,000 / 800,000 = 1$$

$$\text{Internal Growth Rate} = \text{ROA} * b / (1 - \text{ROA} * b) = 0.16 / 0.84 \approx 0.1905 = 19.05\%$$

$$2,500,000 - 800,000 = 1,700,000$$

$$1,700,000 + 800,000 * 1.1905 = 2,652,400$$

$$1,700,000 + 800,000 * 1.1905^2 \approx 2,833,832.2$$

$$1,700,000 + 800,000 * 1.1905^3 \approx 3,049,827.23$$

$$1,700,000 + 800,000 * 1.1905^4 \approx 3,306,969.32$$

	2020	2021	2022	2023	2024
Equity	2,500,000	2,652,400	2,833,832.2	3,049,827.23	3,306,969.32
Debt	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000
D/E	1	1.06	1.13	1.22	1.32

Question 2:

The accounts related to the Balance Sheet as well as Income Statement for a company are given below as of Dec 31st 20XX. Assume that the company does not distribute any dividends and has no depreciation and no current liabilities. Company is not planning to purchase or sell stock, and will increase its assets at the same rate as sales next year. Costs are expected to increase half as fast as the sales since the company will take advantage of economies of scale (that is, if sales grow at 10%, costs will grow at 5%). Interest next year will be equal to 2% of the total debt in 20XX. If the company would like to grow by r in 2020 and would like to keep its D/E ratio as in 20XX, produce the pro-forma income statement and balance sheet for the next year.

r = sale increase rate = assets increase rate

Income Statement		
	20XX	Projected
Sales	70	$70 \cdot (1 + r)$
Costs	10	$10 \cdot (1 + r/2)$
Interest	0	$1,520 \cdot 0.02 = 30.4$
Taxable Income	60	$65r + 29.6$
Taxes (40%)	24	$26r + 11.84$
Net Income	36	$39r + 17.76$

$D/E = 2.74$

Balanced Sheet					
	20XX	Projected		20XX	Projected
Current Assets	75	$75 \cdot (1 + r)$	Debt	1,520	$1,520 + 1520 \cdot r$
Fixed Assets	2,000	$2,000 \cdot (1 + r)$	Common Stock	100	100
Total Assets	2,075	$2,075 \cdot (1 + r)$	Retained Earnings	455	$1520 + 555 \cdot r$

Question 3:

Suppose a firm maintains a positive retention ratio and keeps its debt-equity ratio constant every year. When sales grow by 20%, the firm has a negative projected EFN.

a) Can you tell, with certainty, that the sustainable growth rate is greater than/equal to/less than 20%? Why/why not?

SGR is greater than 20% in order for the company to preserve the constant debt to equity ratio given that SGR should reflect what the firm can fund without external equity financing.

$$\text{Sustainable growth rate} = \text{ROE} * b / (1 - \text{ROE} * b)$$

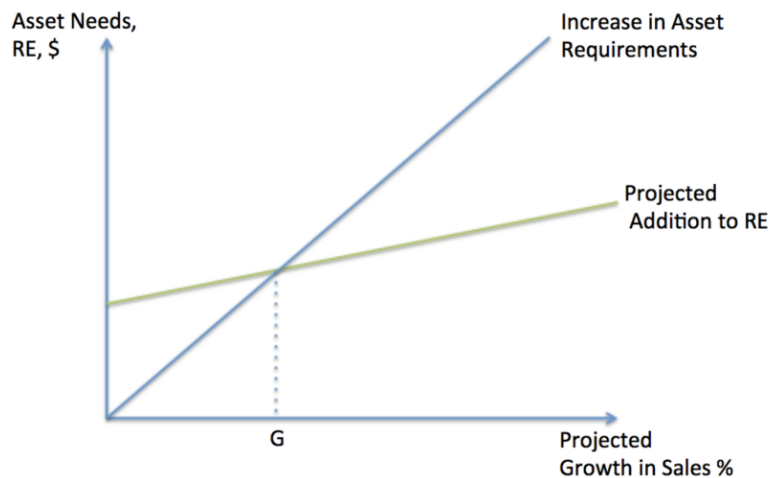
The sustainable growth rate is greater than 20%, because at a 20% growth rate the negative EFN indicates that there is excess financing still available.

b) Do you know with certainty that the internal growth rate is greater than/equal to/ less than 20%? Why/Why not?

IGR is less than 20% because IGR represents the maximum growth rate that the company is able to achieve without the external financing. We know that the negative EFN reflects how the company has money and surplus for financing, but if the company also wants to keep its DE ratio constant, the firm must take more debt and consequently, have lower than 20% IGR.

$$\text{Internal growth rate} = \text{ROA} * b / (1 - \text{ROA} * b)$$

Question 4:



In the above diagram, Paddington Inc.'s asset increase requirements in relation to its projected addition to retained earnings are given at each projected growth rate. (Assets are **ONLY** supposed to be increased at the rate of the sales growth rate)

Financial objective: No new stocks will be issued. Dividend payout ratio will stay the same.

a) If the planned growth rate for next year is less than G , is it possible for the company to have a higher D/E ratio next year compared to this year? Why/Why not? Is it possible for the company to have a lower D/E ratio next year compared to this year? Why/Why not?

No, the company should not have a higher D/E ratio next year; because having a retained earning higher than the needed assets, there is no point a company should borrow more money when there is a surplus.

Yes, the company is possible to have a lower D/E ratio because of the surplus of funds.

b) If the planned growth rate is more than G , is it possible for the company to keep its D/E ratio next year the same as this year? Why/Why not? Is it possible for the company to have a higher or lower D/E ?

No, the company should not keep the same D/E ratio next year because when the planned growth rate is more than G , the company is under a deficit and it needs more external funds from debt. Therefore, the company should have a higher D/E ratio.

c) If the company plans to grow at rate G , is it possible to keep D/E ratio the same as this year? Why/Why not?

Yes, the company could have the same D/E ratio since the internal fund is capable to cover the asset requirement.

Question 5:

Read the HBR document titled “Financial Statement Forecasting”. Explain clearly how the numbers marked with red arrows on the last page are obtained.

The marked numbers are a projected attempt to deal with the circularity introduced when forecasts need to account for interest expense, which relies on the debt needed that year, which relies on net income, which relies on interest expense, etc. The left value is simply determined by referencing the interest expenses from the prior year (2018), and then using that value to calculate net income and debt required. The right value is determined by referencing 2018's outstanding debts, plugging that value in as a starting amount for the interest expense, and then linking that interest expense to the bet balance. This allows us to use this linked interest expense to project a new value for net income. The rest of the values represent that a base value of 6% increase in revenue was used to drive the forecast, along with other assumptions made using the context of the industry/firm/market etc. This allows us to use the methods discussed earlier in the reading, such as percentage of revenue and forecasting ratios to fill in the other line items.

Question 6:

You are offered three investment opportunities, each at a cost of \$10,000 to be paid today with a cash inflow to be obtained in one bulk payment in 5 years.

A: provides 2% every quarter

B: provides 4.5% every 6 months

C: provides x% every month

a) What are the effective annual rates of A and B? Which one would you choose?

$$EAR_A = \left[1 + \frac{0.02}{4}\right]^4 - 1$$

$$EAR_A = 0.02015 = 2.015\%$$

$$EAR_B = \left[1 + \frac{0.045}{2}\right]^2 - 1$$

$$EAR_B = 0.04551 = 4.551\%$$

We would choose investment opportunity B due to it having the higher EAR.

b) If C has the same effective annual rate as your choice in part a, what is x?

$$0.04551 = \left[1 + \frac{x}{12}\right]^{12} - 1$$

$$\sqrt[12]{1.04551} = 1 + \frac{x}{12}$$

$$x = 4.458$$

Question 7:

Two years ago, when the market rate was 5%, your company purchased a fixed asset for \$50,000. Starting a year after the purchase, fixed assets started to bring in \$20,000 annual revenue with annual costs of \$8,000. The expected lifetime of the asset is 8 years. You obtained your second cash flow today and due to the changes in the market, you will need to update your revenue, costs, as well as the interest rate. Going forward, annual revenue will drop by 40% and annual costs will go up by 20%.

a) Assuming that the market rate is still 5% for now and the coming 6 years, if you could sell the asset today at \$13,000, should you?

With the revenue and cost changes, the asset will make an annual profit of:

$$(20,000 \times 0.6) - (8,000 \times 1.2) = 2,400$$

This translates to an NPV of:

$$\frac{2,400}{(1 + 0.05)^1} + \frac{2,400}{(1 + 0.05)^2} + \frac{2,400}{(1 + 0.05)^3} + \frac{2,400}{(1 + 0.05)^4} + \frac{2,400}{(1 + 0.05)^5} + \frac{2,400}{(1 + 0.05)^6} = 12,181.66$$

This means we would sell the asset today, as the NPV of \$12,181.66 that we'd get by keeping the asset is less than the NPV of \$13,000 we'd get from selling it.

b) Assuming that market rate is now 1% and is expected to stay at 1% for the coming 6 years, then, would you sell the fixed asset at \$13,000 today?

This translates to an NPV of:

$$\frac{2,400}{(1 + 0.01)^1} + \frac{2,400}{(1 + 0.01)^2} + \frac{2,400}{(1 + 0.01)^3} + \frac{2,400}{(1 + 0.01)^4} + \frac{2,400}{(1 + 0.01)^5} + \frac{2,400}{(1 + 0.01)^6} = 13,909.14$$

This means we would not sell the asset today, as the NPV of \$13,909.14 that we'd get by keeping the asset is more than the NPV of \$13,000 we'd get from selling it.

Question 8:

You are offered two investment opportunities with the following cash flow starting a year from today.

	Year 1	Year 2	Year 3	Year 4
A	1,800	2,600	2,000	1,850
B	1,200	2,200	1,800	1,900

You can get A at a cost of C and B at a cost of C+100 at time 0 (today). The value of option A is twice as much as option B to you today. If your alternative is earning 6% annually in the market, what is C?

We can calculate each opportunity's NPV as follows:

$$NPV_A = \frac{1,800}{(1 + 0.06)^1} + \frac{2,600}{(1 + 0.06)^2} + \frac{2,000}{(1 + 0.06)^3} + \frac{1,850}{(1 + 0.06)^4} = 7,156.71$$

$$NPV_B = \frac{1,200}{(1 + 0.06)^1} + \frac{2,200}{(1 + 0.06)^2} + \frac{1,800}{(1 + 0.06)^3} + \frac{1,900}{(1 + 0.06)^4} = 6,106.36$$

We know:

$$NPV_A - C = 2(NPV_B - C - 100)$$

Therefore:

$$NPV_A - C = 2NPV_B - 2C - 200$$

$$C = 2NPV_B - NPV_A - 200$$

$$C = 4,856.01$$