Optimal Capital Structure

Learning Problems

Answer Keys

**Problem: Business Risk at Acme**

1. MeanEBIT = 11,500

Standard DeviationEBIT = 3,547

Coefficient of VariationEBIT = $\frac{3,547}{11,500}$ = .31

1. The coefficient of variation of EBIT measures the variability of EBIT relative to the average EBIT. This measures business risk which is a combination of sales risk and operating risk and is the main determinant of how much financial leverage a company can safely utilize.

**Problem: Operating Leverage at Acme**

1. **% Change in Sales**

= $\frac{38,400-32,000}{32,000}$ = .20 or 20%

**% Change in Contribution Margin**

= $\frac{19,200-16, 000}{16, 000}$ = .20 or 20%

Percent change in sales and contribution margin are the same because the only difference between the two amounts is variable costs which rise and fall with sales.

1. **% Change in EBIT**

= $\frac{13,200-10, 000}{10, 000}$ = .32 or 32%

 % change in EBIT is higher than the % change in contribution sales or contribution margin because of the presence of fixed operating costs. As sales rise these fixed costs will remain the same leading to a larger % increase in EBIT compared to the % increase in sales or contribution margin. If sales would have fallen, the % decrease in EBIT would also have been larger than the % decrease in sales or contribution margin due to fixed operating costs which would not have declined. Whenever the % change in EBIT is greater than the % change in sales or contribution margin, and it usually is, this indicates the presence of operating leverage or fixed operating costs. The more operating leverage a company has, the less financial leverage it can use which determines its optimal capital structure.

1. DOL = $\frac{32\%}{20\%}$ = 1.6

If you do not have company financial statements in contribution format at two different volume levels then DOL can be calculated as follows:

DOL = $\frac{10,000 (3.2-1.6)}{10,000 \left(3.2-1.6\right)-6,000}$ = 1.6

DOL measures how much more variable EBIT will be compared to sales or contribution margin based on the current level of fixed costs and the use of operating leverage.

1. No, the DOL does not remain constant. It falls because fixed costs remain the same over the relevant range so they will make up a smaller portion of total costs as sales volume increases. As sales volume rises, DOL will fall:

DOL = $\frac{10,937 (3.2-1.6)}{10,937 \left(3.2-1.6\right)-6,000}$ = 1.53

1. (Coefficient of VariationSales) (DOL) = (Coefficient of VariationEBIT)

(CVSales) (1.6) = .31

CVSales = .194

Sales will have a CV of .194, but the addition of operating leverage (use of fixed costs) will raise the CV of EBIT to .31. The higher CV of EBIT will limit the amount of financial leverage that the company will be able to use safely.

**Problem: Financial Leverage at Acme**

1. **% Change in EBIT**

= $\frac{13,200-10,000}{10,000}$ = .32 or 32%

1. **% Change in EBT**

= $\frac{12,000-8,800}{8,800}$ = .36 or 36%

 % change in EBT is higher than the % change in EBIT because of the presence of fixed interest costs. As sales rise these fixed interest costs will remain the same leading to a larger % increase in EBT compared to the % increase in EBIT. If sales would have fallen, the % decrease in EBT would also have been larger than the % decrease in EBIT due to fixed interest costs which would not have declined. Whenever the % change in EBT is greater than the % change in EBIT, this indicates the presence of financial leverage or borrowing. The more operating leverage a company has, the less financial leverage they should use which determines their optimal capital structure.

1. DFL = $\frac{36\%}{32\%}$ = 1.13

If you do not have company financial statements in contribution format at two different volume levels then DFL can be calculated as follows:

DFL = $\frac{10,000 \left(3.2-1.6\right)-6,000}{10,000 \left(3.2-1.6\right)-6,000-1,200}$ = 1.14

DFL measures how much more variable EBT will be compared to EBIT given the current level of fixed interest costs or the use of financial leverage.

1. No, the DFL ratio does not remain constant. It falls because the fixed interest costs remain the same over the relevant range so they will make up a smaller portion of total costs as sales volume increases. As sales volume rises, DFL will fall:

DFL = $\frac{10,937 \left(3.2-1.6\right)-6,000}{10,937 \left(3.2-1.6\right)-6,000-1,200}$ = 1.12

1. (Coefficient of VariationEBIT) (DFL) = (Coefficient of VariationEBT)

(.31) (1.14) = ((Coefficient of VariationEBT)

CVEBT = .35

EBIT has a CV of .31, but the addition of financial leverage (use of fixed interest costs) will raise the CV of EBT to .35. Because of the high DOL and CV of EBIT, Acme limited its borrowing as measured by the DFL resulting in a sustainable CV of EBT. Companies with high operating leverage need to reduce their financial leverage to maintain an acceptable overall risk level (business risk and financial risk).

1. (DOL) (DFL) = (DCL)

(1.6) (1.14) = 1.82

or

DCL = $\frac{10,000 \left(3.2-1.6\right)}{10,000 \left(3.2-1.6\right)-6,000-1,200}$ = 1.82

**Problem: Capital Structure Theories**

1. **Market timing theory.** Despite a debt-to-equity ratio that is above its target level, Bricker continues to raise new debt financing and use most of the proceeds to repurchase its common shares. The company is purchasing its stock to take advantage of a low share price during an economic slowdown. Market timing theory states that firms buy and sell shares and debt at opportune times to benefit existing shareholders leading to considerable variation in the firm’s capital structure.
2. **Agency theory.** Allison appears to have surplus funds that managers are using to make unprofitable corporate takeovers as opposed to distributing them to shareholders as dividends or stock repurchases. Instead of raising the dividend, the board has chosen to increase the firm’s borrowing level. This may be dangerous during an economic downturn, but it will prevent management from wasting resources and force them to operate the business more efficiently to meet the higher debt servicing obligations. The agency theory results in a capital structure that is above the firm’s optimal level.
3. **Financial slack and unused borrowing capacity.** Hudson is maintaining high cash balances and is borrowing at a level below the industry average, so it has enough financial flexibility to take advantage of profitable investment opportunities when they become available. This theory leads to a capital structure that is below the firm’s optimal level.
4. **Pecking order theory.** Companies do not like to issue new common shares because floatation costs are high, and the shares may be undervalued. They finance operations using retained earnings first, then debt, following by preferred shares, and only issue new equity as a last resort or not at all and forgo potentially profitable projects. The pecking order theory results in considerable variation in the firm’s capital structure.
5. **Static trade-off theory**. Jasper has an optimal capital structure, but there is considerable variation in its debt-to-equity ratio due to other factors included in the pecking order, signaling, and market timing theories. Due to this variation, this theory may be referred to as the dynamic trade-off theory instead of the static trade-off theory.
6. **Signaling theory.** Kelso’s management issued debt as they felt their common shares were undervalued since investors did not have full information about the company’s prospects. Investors took this issuance as a sign that Kelso’s shares were undervalued and bid the price up. The signaling theory results in considerable variation in the firm’s capital structure.

**Problem: Optimal Capital Structure at Cuthbert**

1. Based on the historical data collected, Cuthbert’s optimal capital structure is approximately 40-45%.

|  |  |  |  |
| --- | --- | --- | --- |
| **Debt Ratio** | **kC** | **After-tax kd** | **WACC** |
| 21% | 11.32% | 5.47% | 10.09% |
| 31% | 11.94% | 5.78% | 10.03% |
| 43% | 12.45% | 6.19% | 9.76% |
| 51% | 14.21% | 6.83% | 10.45% |
| 62% | 16.34% | 7.91% | 11.11% |
| 68% | 19.78% | 9.54% | 12.82% |

Cuthbert’s sales risk and operating risk (i.e. business risk) may have changed over the six-year sample period due to changes in its business strategy. The company’s marginal tax rate could have changed which would affect the benefits of borrowing.

**Problem: Analyzing Capital Structure at ABC**

1.

|  |  |  |
| --- | --- | --- |
| **2010 Ratios** | **ABC** | **Industry Average** |
| 1Debt ratio | .58 | .40 |
| 2Long-term debt to total capitalization | .50 | .25 |
| 3Times interest earned | 1.58 | 4.00 |
| 4Cash flow coverage  | .89 | 3.50 |

1 Debt ratio = $\frac{95,000+180,000}{475,000}$ = .58

2 Long-term debt to total capitalization = $\frac{180,000+20,000}{180,000+20,000+10,000+190,000}$ = .50

3 Times interest earned = $\frac{39,500}{25,000}$ = 1.58

4 Cash flow coverage = $\frac{39,500+25,000+10,000}{25,000+25,000+\frac{20,000}{(1-.4)}}$ = .89

ABC appears to be using too much financial leverage compared to the industry average debt ratio and long-term debt to total capitalization ratio. The industry appears to be much more profitable as their coverage ratios are more than twice those of ABC.

2. The long-term debt to total capitalization ratio is preferred to the debt ratio as it excludes short-term bank financing and trade credit which change throughout the year due to seasonal variation in net working capital.

 The cash flow coverage ratio is better than the times interest earned ratio because it is based on cash flows and not accounting income – bills are paid with cash. It also focuses on all required payments (rent, interest, and principal payments) and not just interest.

**Problem: Analyzing Capital Structure at Delisle, Didsbury, Harmony**

1.

**Delisle**

The use of financial leverage is well below the industry average, but this is likely due to low profitability (cash flow) since the cash flow coverage ratio is at the industry average. The company is compensating for low profitability (cash flow) by carrying less debt and should probably remain at this lower level of financial leverage until profitability improves.

**Didsbury**

The use of financial leverage is slightly below the industry average and the cash flow coverage ratio is slightly higher. It is difficult to manage your debt level so it is always exactly at a certain level. It tends to vary around the long-term goal. What may be happening is that the long-term debt to total capitalization ratio has fallen during the year as profits were added to retained earnings. It will probably rise again as dividends are paid out (retained earnings will fall) and new borrowing is undertaken to fund growth.

**Harmony**

The use of financial leverage well exceeds the industry average. Firm C is compensating for this with its high profitability (cash flow) as its cash flow coverage rate is near the industry average. It may have decided to use more leverage than the industry as long as it maintains above-average profitability.

2.

* A company may have a long-term debt to total capitalization ratio that is below the industry average to compensate for a DOL that is above the industry average. A company may have more fixed costs in its cost structure than its competitors leading to more variability in EBIT. To compensate, it may reduce its borrowing costs.
* Generally, industries and the economy tend to “get carried away” using financial leverage the longer it has been since the last recession – they forget the consequences. Industry measures of debt utilization may become higher than they should be. This is where a worst-case scenario analysis can help determine what the appropriate debt level should be. Remember, it takes a lifetime to build a business, but only a short time to lose it if you are over-leveraged.
* When all companies in an industry simply follow each other’s debt ratio, no company is doing any original analysis, and the measures of debt utilization may become distorted. A least some companies in the industry must make an independent analysis of what their debt level should be. Again, a worst-case analysis would be invaluable here.

**Problem: Analyzing Capital Structure at Deluxe**

1.

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| --- | --- | --- |
| **Ratios** | **Deluxe** | **Industry Average** |
| 1Long-term debt to total capitalization | .53 | .65 |
| 2Cash flow coverage | 3.33 | 4.00 |

1 Long-term debt to total capitalization = $\frac{103,662}{103,662+95,158}$ = .53

2 Cash flow coverage = $\frac{36,000+14,000}{15,000}$ = 3.33

2. Deluxe uses a below-average amount of debt to compensate for low profitability (cash flow). Given that its cash flow coverage ratio is still well below the industry average, they should reduce their usage of debt even further.

3. DOL = $\frac{10,000 (76-55)}{10,000 \left(76-55\right)-174,000}$ = 5.83

 DFL = $\frac{36,000}{36,000-15,000} $= 1.71

 DCL = 5.83 X 1.71 = 9.97

4. DOL – Measures the variability of EBIT relative to sales or contribution margin – greater variability indicates that the company has more fixed costs in its cost structure

 DFL - Measures the variability of EBT relative to EBIT – greater variability indicates that the company has more fixed interest costs in its cost structure

5. DFL should be lower to compensate for the higher DOL compared to the industry. Overall, Deluxe’s DCL approximates the industry average which indicates that they are likely doing this.

**Problem: Analyzing Capital Structure at Jones**

1.

* Jones is using far too much financial leverage compared to the industry average. Their long-term debt to total capitalization ratio is well above the industry average and their cash flow coverage ratio is well below the industry average. Jones should borrow less to return both these ratios to industry average levels.
* Jones’ DOL is above the industry average meaning it has more fixed operating costs in its cost structure. Jones should be borrowing less than the industry average to compensate.
* The worst-case scenario indicates that Jones and the industry are overleveraged. They may be able to meet their debt commitments now, but if a severe recession occurs, Jones and other companies in the industries may experience financial difficulties. Jones should reduce its borrowing to a level that will allow it to survive a worst-case scenario as soon as possible.

**Problem: Analyzing Capital Structure at Amsterdam**

* Amsterdam is using too much financial leverage compared to the industry average. Their long-term debt to total capitalization ratio approximates the industry average, but their cash flow coverage ratio is significantly below the industry average indicating low profitability (cash flow). Jones should compensate by borrowing less. This will raise its cash flow coverage ratio to industry average levels and help to ensure it does not run into cash flow difficulties.
* Jones’ DOL is below the industry average meaning it has fewer fixed operating costs in its cost structure. This will allow Jones to borrow more than the industry average once it returns its profitability to a level that is comparable to the industry.
* The worst-case scenario indicates that Jones and the industry are overleveraged. They may be able to meet their debt commitments now, but if a severe recession occurs, Amsterdam and other companies in the industries may experience financial difficulties. Amsterdam should reduce its borrowing to a level that will allow it to survive a worst-case scenario as soon as possible.

**Problem: Practical Capital Structure Considerations**

1. **Lower.** Delisle’s interest tax shield is worth less as its loss carryforwards will lower its marginal tax rate favoring equity over debt.
2. **Higher.** Carruthers could lose control if new equity is issued, so the company may choose to issue debt instead.
3. **Higher.** Jones’ compensation is based 100% on stock options with a short vesting period which may encourage excessive risk-taking and more borrowing.
4. **Lower.** Inkster’s collateral is quite specialized and prone to obsolescence because of the high rate of technological change in the industry which will reduce the amount financial institutions will lend.
5. **Lower or higher.**  Edstan has a limited financial track record which will reduce how much financial institutions will lend, but general-purpose collateral may compensate as it can be sold quickly at closer to full value.
6. **Lower.** Phillips may have to limit its borrowing to maintain its A credit rating. Financial institutions are more concerned about the safety of their loans and the quality of their collateral than maximizing shareholder value by adhering to the optimal capital structure.
7. **Higher.** Benjiro may increase its borrowing to function as a takeover defence to stop the transaction and protect management positions.
8. **Higher.** State-owed corporations like BC Hydro borrow more heavily because they are typically in mature industries with lower business risk and governments can limit their equity investment by providing loan guarantees which are readily accepted because of the province’s financial strength.
9. **Lower.** Rolston’s assets are mostly intangible and subject to considerable technological change making them poor collateral for lenders.
10. **Lower.** Timmins will likely issue equity instead of debt to capitalize on the company’s rising share price.

**Problem: Unleveraged and Leverage Beta**

1. 1.23 = Bu (1 + (1 - .25) (.24)) Bu = 1.04

BL = 1.04 (1 + (1 - .25) (.43)) BL =1.38

Conversion of Boswal’s debt ratio to debt-to-equity ratio

Debt ratio = $\frac{.3}{1}$ = .3

Debt-to-equity ratio = $\frac{.3}{1- .3}$ = .43

2.

Business risk = 1.04 / 1.38 = .7536 or 75.36%

Financial risk = (1.38 - 1.04) / 1.38 = .2464 or 24.64%