

# **Solutions Manual**

## ***Corporate Finance***

**Ross, Westerfield, and Jaffe  
Asia Global Edition**

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# **CHAPTER 3**

## **FINANCIAL STATEMENTS ANALYSIS AND FINANCIAL MODELS**

### **Answers to Concepts Review and Critical Thinking Questions**

1. Time trend analysis gives a picture of changes in the company's financial situation over time. Comparing a firm to itself over time allows the financial manager to evaluate whether some aspects of the firm's operations, finances, or investment activities have changed. Peer group analysis involves comparing the financial ratios and operating performance of a particular firm to a set of peer group firms in the same industry or line of business. Comparing a firm to its peers allows the financial manager to evaluate whether some aspects of the firm's operations, finances, or investment activities are out of line with the norm, thereby providing some guidance on appropriate actions to take to adjust these ratios if appropriate. Both allow an investigation into what is different about a company from a financial perspective, but neither method gives an indication of whether the difference is positive or negative. For example, suppose a company's current ratio is increasing over time. It could mean that the company had been facing liquidity problems in the past and is rectifying those problems, or it could mean the company has become less efficient in managing its current accounts. Similar arguments could be made for a peer group comparison. A company with a current ratio lower than its peers could be more efficient at managing its current accounts, or it could be facing liquidity problems. Neither analysis method tells us whether a ratio is good or bad, both simply show that something is different, and tells us where to look.
2. If a company is growing by opening new stores, then presumably total revenues would be rising. Comparing total sales at two different points in time might be misleading. Same-store sales control for this by only looking at revenues of stores open within a specific period.
3. The reason is that, ultimately, sales are the driving force behind a business. A firm's assets, employees, and, in fact, just about every aspect of its operations and financing exist to directly or indirectly support sales. Put differently, a firm's future need for things like capital assets, employees, inventory, and financing are determined by its future sales level.
4. Two assumptions of the sustainable growth formula are that the company does not want to sell new equity, and that financial policy is fixed. If the company raises outside equity, or increases its debt-equity ratio, it can grow at a higher rate than the sustainable growth rate. Of course, the company could also grow faster than its profit margin increases, if it changes its dividend policy by increasing the retention ratio, or its total asset turnover increases.

5. The sustainable growth rate is greater than 20 percent, because at a 20 percent growth rate the negative EFN indicates that there is excess financing still available. If the firm is 100 percent equity financed, then the sustainable and internal growth rates are equal and the internal growth rate would be greater than 20 percent. However, when the firm has some debt, the internal growth rate is always less than the sustainable growth rate, so it is ambiguous whether the internal growth rate would be greater than or less than 20 percent. If the retention ratio is increased, the firm will have more internal funding sources available, and it will have to take on more debt to keep the debt/equity ratio constant, so the EFN will decline. Conversely, if the retention ratio is decreased, the EFN will rise. If the retention rate is zero, both the internal and sustainable growth rates are zero, and the EFN will rise to the change in total assets.
6. Common-size financial statements provide the financial manager with a ratio analysis of the company. The common-size income statement can show, for example, that cost of goods sold as a percentage of sales is increasing. The common-size balance sheet can show a firm's increasing reliance on debt as a form of financing. Common-size statements of cash flows are not calculated for a simple reason: There is no possible denominator.
7. It would reduce the external funds needed. If the company is not operating at full capacity, it would be able to increase sales without a commensurate increase in fixed assets.
8. ROE is a better measure of the company's performance. ROE shows the percentage return for the year earned on shareholder investment. Since the goal of a company is to maximize shareholder wealth, this ratio shows the company's performance in achieving this goal over the period.
9. The EBITD/Assets ratio shows the company's operating performance before interest, taxes, and depreciation. This ratio would show how a company has controlled costs. While taxes are a cost, and depreciation and amortization can be considered costs, they are not as easily controlled by company management. Conversely, depreciation and amortization can be altered by accounting choices. This ratio only uses costs directly related to operations in the numerator. As such, it gives a better metric to measure management performance over a period than does ROA.
10. Long-term liabilities and equity are investments made by investors in the company, either in the form of a loan or ownership. Return on investment is intended to measure the return the company earned from these investments. Return on investment will be higher than the return on assets for a company with current liabilities. To see this, realize that total assets must equal total debt and equity, and total debt and equity is equal to current liabilities plus long-term liabilities plus equity. So, return on investment could be calculated as net income divided by total assets minus current liabilities.
11. Presumably not, but, of course, if the product had been *much* less popular, then a similar fate would have awaited due to lack of sales.
12. Since customers did not pay until shipment, receivables rose. The firm's NWC, but not its cash, increased. At the same time, costs were rising faster than cash revenues, so operating cash flow declined. The firm's capital spending was also rising. Thus, all three components of cash flow from assets were negatively impacted.
13. Financing possibly could have been arranged if the company had taken quick enough action. Sometimes it becomes apparent that help is needed only when it is too late, again emphasizing the need for planning.

14. All three were important, but the lack of cash or, more generally, financial resources, ultimately spelled doom. An inadequate cash resource is usually cited as the most common cause of small business failure.
15. Demanding cash up front, increasing prices, subcontracting production, and improving financial resources via new owners or new sources of credit are some of the options. When orders exceed capacity, price increases may be especially beneficial.

### Solutions to Questions and Problems

*NOTE: All end-of-chapter problems were solved using a spreadsheet. Many problems require multiple steps. Due to space and readability constraints, when these intermediate steps are included in this solutions manual, rounding may appear to have occurred. However, the final answer for each problem is found without rounding during any step in the problem.*

#### Basic

1.  $ROE = (PM)(TAT)(EM)$   
 $ROE = (.043)(1.75)(1.55) = .1166$  or 11.66%
2. The equity multiplier is:

$$EM = 1 + D/E$$
$$EM = 1 + 0.80 = 1.80$$

One formula to calculate return on equity is:

$$ROE = (ROA)(EM)$$
$$ROE = 0.097(1.80) = .1746, \text{ or } 17.46\%$$

ROE can also be calculated as:

$$ROE = NI / TE$$

So, net income is:

$$NI = ROE(TE)$$
$$NI = (.1746)(\$735,000) = \$128,331$$

3. This is a multi-step problem involving several ratios. The ratios given are all part of the DuPont Identity. The only DuPont Identity ratio not given is the profit margin. If we know the profit margin, we can find the net income since sales are given. So, we begin with the DuPont Identity:

$$ROE = 0.15 = (PM)(TAT)(EM) = (PM)(S / TA)(1 + D/E)$$

Solving the DuPont Identity for profit margin, we get:

$$PM = [(ROE)(TA)] / [(1 + D/E)(S)]$$
$$PM = [(0.15)(\$1,310)] / [(1 + 1.20)(\$2,700)] = .0331$$

Now that we have the profit margin, we can use this number and the given sales figure to solve for net income:

$$PM = .0331 = NI / S$$

$$NI = .0331(\$2,700) = \$89.32$$

4. An increase of sales to \$42,300 is an increase of:

$$\text{Sales increase} = (\$42,300 - \$37,300) / \$37,300$$

$$\text{Sales increase} = .1340, \text{ or } 13.40\%$$

Assuming costs and assets increase proportionally, the pro forma financial statements will look like this:

Pro forma income statement

Sales	\$42,300.00
Costs	<u>29,258.45</u>
EBIT	13,041.55
Taxes (34%)	<u>4,434.13</u>
Net income	<u>\$ 8,607.43</u>

Pro forma balance sheet

Assets	\$ 144,024.13	Debt	\$ 30,500.00
		Equity	<u>102,272.31</u>
Total	<u>\$ 144,024.13</u>	Total	<u>\$132,772.31</u>

The payout ratio is constant, so the dividends paid this year is the payout ratio from last year times net income, or:

$$\text{Dividends} = (\$2,500 / \$7,590)(\$8,607.43)$$

$$\text{Dividends} = \$2,835.12$$

The addition to retained earnings is:

$$\text{Addition to retained earnings} = \$8,607.43 - 2,835.12$$

$$\text{Addition to retained earnings} = \$5,772.31$$

And the new equity balance is:

$$\text{Equity} = \$96,500 + 5,772.31$$

$$\text{Equity} = \$102,272.31$$

So the EFN is:

$$\text{EFN} = \text{Total assets} - \text{Total liabilities and equity}$$

$$\text{EFN} = \$144,024.13 - 132,772.31$$

$$\text{EFN} = \$11,251.82$$

## 6 – SOLUTIONS MANUAL

5. The maximum percentage sales increase without issuing new equity is the sustainable growth rate. To calculate the sustainable growth rate, we first need to calculate the ROE, which is:

$$\text{ROE} = \text{NI} / \text{TE}$$

$$\text{ROE} = \$9,702 / \$81,000$$

$$\text{ROE} = .1198$$

The plowback ratio,  $b$ , is one minus the payout ratio, so:

$$b = 1 - .30$$

$$b = .70$$

Now we can use the sustainable growth rate equation to get:

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

$$\text{Sustainable growth rate} = [.1198(.70)] / [1 - .1198(.70)]$$

$$\text{Sustainable growth rate} = .0915, \text{ or } 9.15\%$$

So, the maximum dollar increase in sales is:

$$\text{Maximum increase in sales} = \$54,000(.0915)$$

$$\text{Maximum increase in sales} = \$4,941.96$$

6. We need to calculate the retention ratio to calculate the sustainable growth rate. The retention ratio is:

$$b = 1 - .20$$

$$b = .80$$

Now we can use the sustainable growth rate equation to get:

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

$$\text{Sustainable growth rate} = [.13(.80)] / [1 - .13(.80)]$$

$$\text{Sustainable growth rate} = .1161 \text{ or } 11.61\%$$

7. We must first calculate the ROE using the DuPont ratio to calculate the sustainable growth rate. The ROE is:

$$\text{ROE} = (\text{PM})(\text{TAT})(\text{EM})$$

$$\text{ROE} = (.074)(2.20)(1.40)$$

$$\text{ROE} = .2279 \text{ or } 22.79\%$$

The plowback ratio is one minus the dividend payout ratio, so:

$$b = 1 - .40$$

$$b = .60$$

Now, we can use the sustainable growth rate equation to get:

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

$$\text{Sustainable growth rate} = [.2279(.60)] / [1 - .2279(.60)]$$

$$\text{Sustainable growth rate} = .1584 \text{ or } 15.84\%$$

8. An increase of sales to \$7,280 is an increase of:

$$\text{Sales increase} = (\$7,280 - \$6,500) / \$6,500$$

$$\text{Sales increase} = .12, \text{ or } 12\%$$

Assuming costs and assets increase proportionally, the pro forma financial statements will look like this:

Pro forma income statement

Sales	\$ 7,280
Costs	<u>5,958</u>
Net income	<u>\$ 1,322</u>

Pro forma balance sheet

Assets	\$ 19,488	Debt	\$ 8,400
		Equity	<u>10,322</u>
Total	<u>\$ 19,488</u>	Total	<u>\$ 18,722</u>

If no dividends are paid, the equity account will increase by the net income, so:

$$\text{Equity} = \$9,000 + 1,322$$

$$\text{Equity} = \$10,322$$

So the EFN is:

$$\text{EFN} = \text{Total assets} - \text{Total liabilities and equity}$$

$$\text{EFN} = \$19,488 - 18,722 = \$766$$

9. a. First, we need to calculate the current sales and change in sales. The current sales are next year's sales divided by one plus the growth rate, so:

$$\text{Current sales} = \text{Next year's sales} / (1 + g)$$

$$\text{Current sales} = \$420,000,000 / (1 + .10)$$

$$\text{Current sales} = \$381,818,182$$

And the change in sales is:

$$\text{Change in sales} = \$420,000,000 - \$381,818,182$$

$$\text{Change in sales} = \$38,181,818$$

We can now complete the current balance sheet. The current assets, fixed assets, and short-term debt are calculated as a percentage of current sales. The long-term debt and par value of stock are given. The plug variable is the additions to retained earnings. So:

<u>Assets</u>		<u>Liabilities and equity</u>	
Current assets	\$76,363,636	Short-term debt	\$57,272,727
		Long-term debt	\$120,000,000
Fixed assets	<u>286,363,636</u>	Common stock	\$48,000,000
		Accumulated retained earnings	<u>137,454,545</u>
		Total equity	<u>\$185,454,545</u>
Total assets	<u>\$362,727,273</u>	Total liabilities and equity	<u>\$362,727,273</u>

- b. We can use the equation from the text to answer this question. The assets/sales and debt/sales are the percentages given in the problem, so:

$$EFN = \left( \frac{\text{Assets}}{\text{Sales}} \right) \times \Delta \text{Sales} - \left( \frac{\text{Debt}}{\text{Sales}} \right) \times \Delta \text{Sales} - (\text{PM} \times \text{Projected sales}) \times (1 - d)$$

$$EFN = (.20 + .75) \times \$38,181,818 - (.15 \times \$38,181,818) - [(.09 \times \$420,000,000) \times (1 - .30)]$$

$$EFN = \$4,085,455$$

- c. The current assets, fixed assets, and short-term debt will all increase at the same percentage as sales. The long-term debt and common stock will remain constant. The accumulated retained earnings will increase by the addition to retained earnings for the year. We can calculate the addition to retained earnings for the year as:

$$\text{Net income} = \text{Profit margin} \times \text{Sales}$$

$$\text{Net income} = .09(\$420,000,000)$$

$$\text{Net income} = \$37,800,000$$

The addition to retained earnings for the year will be the net income times one minus the dividend payout ratio, which is:

$$\text{Addition to retained earnings} = \text{Net income}(1 - d)$$

$$\text{Addition to retained earnings} = \$37,800,000(1 - .30)$$

$$\text{Addition to retained earnings} = \$26,460,000$$

So, the new accumulated retained earnings will be:

$$\text{Accumulated retained earnings} = \$137,454,545 + 26,460,000$$

$$\text{Accumulated retained earnings} = \$163,914,545$$



The pro forma balance sheet will be:

<u>Assets</u>		<u>Liabilities and equity</u>	
Current assets	\$84,000,000	Short-term debt	\$63,000,000
		Long-term debt	\$120,000,000
Fixed assets	<u>\$315,000,000</u>	Common stock	\$48,000,000
		Accumulated retained earnings	<u>163,914,545</u>
		Total equity	<u>\$211,914,545</u>
Total assets	<u>\$399,000,000</u>	Total liabilities and equity	<u>\$394,914,545</u>

The EFN is:

EFN = Total assets – Total liabilities and equity

EFN = \$399,000,000 – 394,914,545

EFN = \$4,085,455

10. a. The sustainable growth is:

$$\text{Sustainable growth rate} = \frac{\text{ROE} \times b}{1 - \text{ROE} \times b}$$

where:

$b$  = Retention ratio =  $1 - \text{Payout ratio} = .60$

So:

$$\text{Sustainable growth rate} = \frac{.131 \times .60}{1 - .131 \times .60}$$

Sustainable growth rate = .0853, or 8.53%

- b. It is possible for the sustainable growth rate and the actual growth rate to differ. If any of the actual parameters in the sustainable growth rate equation differs from those used to compute the sustainable growth rate, the actual growth rate will differ from the sustainable growth rate. Since the sustainable growth rate includes ROE in the calculation, this also implies that changes in the profit margin, total asset turnover, or equity multiplier will affect the sustainable growth rate.
- c. The company can increase its growth rate by doing any of the following:
- Increase the debt-to-equity ratio by selling more debt or repurchasing stock.
  - Increase the profit margin, most likely by better controlling costs.
  - Decrease its total assets/sales ratio; in other words, utilize its assets more efficiently.
  - Reduce the dividend payout ratio.

Intermediate

11. The solution requires substituting two ratios into a third ratio. Rearranging D/TA:

Firm A

$$D / TA = .35$$

$$(TA - E) / TA = .35$$

$$(TA / TA) - (E / TA) = .35$$

$$1 - (E / TA) = .35$$

$$E / TA = .65$$

$$E = .65(TA)$$

Firm B

$$D / TA = .55$$

$$(TA - E) / TA = .55$$

$$(TA / TA) - (E / TA) = .55$$

$$1 - (E / TA) = .55$$

$$E / TA = .45$$

$$E = .45(TA)$$

Rearranging ROA, we find:

$$NI / TA = .09$$

$$NI = .09(TA)$$

$$NI / TA = .07$$

$$NI = .07(TA)$$

Since ROE = NI / E, we can substitute the above equations into the ROE formula, which yields:

$$ROE = .09(TA) / .65(TA) = .09/.65 = 13.85\%$$

$$ROE = .07(TA) / .45(TA) = .07/.45 = 15.56\%$$

12.  $PM = NI / S = -£37,543 / £345,182 = -.1088$  or 10.88%

As long as both net income and sales are measured in the same currency, there is no problem; in fact, except for some market value ratios like EPS and BVPS, none of the financial ratios discussed in the text are measured in terms of currency. This is one reason why financial ratio analysis is widely used in international finance to compare the business operations of firms and/or divisions across national economic borders. The net income in dollars is:

$$NI = PM \times \text{Sales}$$

$$NI = -0.1088(\$559,725) = -\$60,877.32$$

13. a. The equation for external funds needed is:

$$EFN = \left( \frac{\text{Assets}}{\text{Sales}} \right) \times \Delta \text{Sales} - \left( \frac{\text{Debt}}{\text{Sales}} \right) \times \Delta \text{Sales} - (PM \times \text{Projected sales}) \times (1 - d)$$

where:

$$\text{Assets/Sales} = \$24,800,000 / \$30,400,000 = 0.82$$

$$\Delta \text{Sales} = \text{Current sales} \times \text{Sales growth rate} = \$30,400,000(.15) = \$4,560,000$$

$$\text{Debt/Sales} = \$6,400,000 / \$30,400,000 = .2105$$

$$PM = \text{Net income/Sales} = \$2,392,000 / \$30,400,000 = .0787$$

$$\text{Projected sales} = \text{Current sales} \times (1 + \text{Sales growth rate}) = \$30,400,000(1 + .15) = \$34,960,000$$

$$d = \text{Dividends/Net income} = \$956,800 / \$2,392,000 = .40$$

so:

$$EFN = (.82 \times \$4,560,000) - (.2105 \times \$4,560,000) - (.0787 \times \$34,960,000) \times (1 - .40)$$

$$EFN = \$1,109,520$$

- b. The current assets, fixed assets, and short-term debt will all increase at the same percentage as sales. The long-term debt and common stock will remain constant. The accumulated retained earnings will increase by the addition to retained earnings for the year. We can calculate the addition to retained earnings for the year as:

$$\text{Net income} = \text{Profit margin} \times \text{Sales}$$

$$\text{Net income} = .0787(\$34,960,000)$$

$$\text{Net income} = \$2,750,800$$

The addition to retained earnings for the year will be the net income times one minus the dividend payout ratio, which is:

$$\text{Addition to retained earnings} = \text{Net income}(1 - d)$$

$$\text{Addition to retained earnings} = \$2,750,800(1 - .40)$$

$$\text{Addition to retained earnings} = \$1,650,480$$

So, the new accumulated retained earnings will be:

$$\text{Accumulated retained earnings} = \$10,400,000 + 1,650,480$$

$$\text{Accumulated retained earnings} = \$12,050,480$$

The pro forma balance sheet will be:

<u>Assets</u>		<u>Liabilities and equity</u>	
Current assets	\$8,280,000	Short-term debt	\$7,360,000
		Long-term debt	\$4,800,000
Fixed assets	<u>20,240,000</u>	Common stock	\$3,200,000
		Accumulated retained earnings	<u>12,050,480</u>
		Total equity	<u>\$16,350,800</u>
Total assets	<u>\$28,520,000</u>	Total liabilities and equity	<u>\$27,410,800</u>

The EFN is:

$$\text{EFN} = \text{Total assets} - \text{Total liabilities and equity}$$

$$\text{EFN} = \$28,520,000 - 27,410,800$$

$$\text{EFN} = \$1,109,200$$

- c. The sustainable growth is:

$$\text{Sustainable growth rate} = \frac{\text{ROE} \times b}{1 - \text{ROE} \times b}$$

where:

$$\text{ROE} = \text{Net income} / \text{Total equity} = \$2,392,000 / \$13,600,000 = .1759$$

$$b = \text{Retention ratio} = \text{Retained earnings} / \text{Net income} = \$1,435,200 / \$2,392,000 = .60$$

So:

$$\text{Sustainable growth rate} = \frac{.1759 \times .60}{1 - .1759 \times .60}$$

$$\text{Sustainable growth rate} = .1180 \text{ or } 11.80\%$$

- d. The company cannot just cut its dividends to achieve the forecast growth rate. As shown below, even with a zero dividend policy, the EFN will still be \$9,200.

<u>Assets</u>		<u>Liabilities and equity</u>	
Current assets	\$8,280,000	Short-term debt	\$7,360,000
		Long-term debt	\$4,800,000
Fixed assets	<u>20,240,000</u>	Common stock	\$3,200,000
		Accumulated retained earnings	<u>13,150,800</u>
		Total equity	<u>\$16,350,800</u>
Total assets	<u><u>\$28,520,000</u></u>	Total liabilities and equity	<u><u>\$28,510,800</u></u>

The EFN is:

$$\text{EFN} = \text{Total assets} - \text{Total liabilities and equity}$$

$$\text{EFN} = \$28,520,000 - 28,510,800$$

$$\text{EFN} = \$9,200$$

The company does have several alternatives. It can increase its asset utilization and/or its profit margin. The company could also increase the debt in its capital structure. This will decrease the equity account, thereby increasing ROE.

14. This is a multi-step problem involving several ratios. It is often easier to look backward to determine where to start. We need receivables turnover to find days' sales in receivables. To calculate receivables turnover, we need credit sales, and to find credit sales, we need total sales. Since we are given the profit margin and net income, we can use these to calculate total sales as:

$$\text{PM} = 0.093 = \text{NI} / \text{Sales} = \$265,000 / \text{Sales}; \text{Sales} = \$2,849,462$$

Credit sales are 80 percent of total sales, so:

$$\text{Credit sales} = \$2,849,462(0.80) = \$2,279,570$$

Now we can find receivables turnover by:

$$\text{Receivables turnover} = \text{Credit sales} / \text{Accounts receivable} = \$2,279,570 / \$145,300 = 15.69 \text{ times}$$

$$\text{Days' sales in receivables} = 365 \text{ days} / \text{Receivables turnover} = 365 / 15.69 = 23.27 \text{ days}$$

- 15.** The solution to this problem requires a number of steps. First, remember that  $CA + NFA = TA$ . So, if we find the CA and the TA, we can solve for NFA. Using the numbers given for the current ratio and the current liabilities, we solve for CA:

$$CR = CA / CL$$

$$CA = CR(CL) = 1.25(\$950) = \$1,187.50$$

To find the total assets, we must first find the total debt and equity from the information given. So, we find the net income using the profit margin:

$$PM = NI / \text{Sales}$$

$$NI = \text{Profit margin} \times \text{Sales} = .094(\$5,780) = \$543.32$$

We now use the net income figure as an input into ROE to find the total equity:

$$ROE = NI / TE$$

$$TE = NI / ROE = \$543.32 / .182 = \$2,985.27$$

Next, we need to find the long-term debt. The long-term debt ratio is:

$$\text{Long-term debt ratio} = 0.35 = LTD / (LTD + TE)$$

Inverting both sides gives:

$$1 / 0.35 = (LTD + TE) / LTD = 1 + (TE / LTD)$$

Substituting the total equity into the equation and solving for long-term debt gives the following:

$$1 + \$2,985.27 / LTD = 2.86$$

$$LTD = \$2,985.27 / 1.86 = \$1,607.46$$

Now, we can find the total debt of the company:

$$TD = CL + LTD = \$950 + 1,607.46 = \$2,557.46$$

And, with the total debt, we can find the TD&E, which is equal to TA:

$$TA = TD + TE = \$2,557.46 + 2,985.27 = \$5,542.73$$

And finally, we are ready to solve the balance sheet identity as:

$$NFA = TA - CA = \$5,542.73 - 1,187.50 = \$4,355.23$$

16. This problem requires you to work backward through the income statement. First, recognize that  $\text{Net income} = (1 - t_c)\text{EBT}$ . Plugging in the numbers given and solving for EBT, we get:

$$\text{EBT} = \$8,320 / (1 - 0.34) = \$12,606.06$$

Now, we can add interest to EBT to get EBIT as follows:

$$\text{EBIT} = \text{EBT} + \text{Interest paid} = \$12,606.06 + 1,940 = \$14,546.06$$

To get EBITD (earnings before interest, taxes, and depreciation), the numerator in the cash coverage ratio, add depreciation to EBIT:

$$\text{EBITD} = \text{EBIT} + \text{Depreciation} = \$14,546.06 + 2,730 = \$17,276.06$$

Now, simply plug the numbers into the cash coverage ratio and calculate:

$$\text{Cash coverage ratio} = \text{EBITD} / \text{Interest} = \$17,276.06 / \$1,940 = 8.91 \text{ times}$$

17. We can start by multiplying ROE by Total assets / Total assets

$$\text{ROE} = \frac{\text{Net income}}{\text{Equity}} = \frac{\text{Net income}}{\text{Equity}} \times \frac{\text{Total assets}}{\text{Total assets}}$$

Rearranging, we get:

$$\text{ROE} = \frac{\text{Net income}}{\text{Total assets}} \times \frac{\text{Total assets}}{\text{Equity}}$$

Next, we can multiply by Sales / Sales, which yields:

$$\text{ROE} = \frac{\text{Net income}}{\text{Total assets}} \times \frac{\text{Equity}}{\text{Total assets}} \times \frac{\text{Sales}}{\text{Sales}}$$

Rearranging, we get:

$$\text{ROE} = \frac{\text{Net income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Total assets}} \times \frac{\text{Total assets}}{\text{Equity}}$$

Next, we can multiply the preceding three factor DuPont equation by EBT / EBT, which yields:

$$\text{ROE} = \frac{\text{Net income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Total assets}} \times \frac{\text{Total assets}}{\text{Equity}} \times \frac{\text{EBT}}{\text{EBT}}$$

We can rearrange as:

$$\text{ROE} = \frac{\text{Net income}}{\text{EBT}} \times \frac{\text{EBT}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Total assets}} \times \frac{\text{Total assets}}{\text{Equity}}$$

Finally, multiplying this equation EBIT / EBIT and rearranging yields:

$$\text{ROE} = \frac{\text{Net income}}{\text{EBT}} \times \frac{\text{EBT}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Total assets}} \times \frac{\text{Total assets}}{\text{Equity}} \times \frac{\text{EBIT}}{\text{EBIT}}$$

$$\text{ROE} = \frac{\text{Net income}}{\text{EBT}} \times \frac{\text{EBT}}{\text{EBIT}} \times \frac{\text{EBIT}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Total assets}} \times \frac{\text{Total assets}}{\text{Equity}}$$

(1)            (2)            (3)            (4)            (5)

The interpretation of each term is as follows:

- (1) This is the company's tax burden. This is the proportion of the company's profits retained after paying income taxes.
- (2) This is the company's interest burden. It will be 1.00 for a company with no debt or financial leverage
- (3) This is the company's operating profit margin. It is the operating profit before interest and taxes per dollar of sales.
- (4) This is the company's operating efficiency as measured by dollar of sales per dollar of total assets.
- (5) This is the company's financial leverage as measured by the equity multiplier.

18.	2012	Common size	2013	Common size	Common base year
<b>Assets</b>					
Current assets					
Cash	\$8,014	2.86%	\$9,954	3.13%	1.2421
Accounts receivable	20,453	7.29%	22,937	7.21%	1.1214
Inventory	36,822	13.12%	41,797	13.14%	1.1351
Total	\$65,289	23.26%	\$74,688	23.48%	1.1440
Fixed assets					
Net plant and equipment	215,370	76.74%	243,340	76.52%	1.1299
Total assets	\$280,659	100%	\$318,028	100%	1.1331
<b>Liabilities and Owners' Equity</b>					
Current liabilities					
Accounts payable	\$40,898	14.57%	\$45,884	14.43%	1.1219
Notes payable	17,464	6.22%	17,035	5.36%	0.9754
Total	\$58,362	20.79%	\$62,919	19.78%	1.0781
Long-term debt	24,000	8.55%	31,000	9.75%	1.2917
Owners' equity					
Common stock and paid-in surplus	\$38,000	13.54%	\$39,200	12.33%	1.0316
Accumulated retained earnings	160,297	57.11%	184,909	58.14%	1.1535
Total	\$198,297	70.65%	\$224,109	70.47%	1.1302
Total liabilities and owners' equity	\$280,659	100%	\$318,028	100%	1.1331

The common-size balance sheet answers are found by dividing each category by total assets. For example, the cash percentage for 2012 is:

$$\$8,014 / \$280,659 = .0286 \text{ or } 2.86\%$$

This means that cash is 2.86% of total assets.

The common-base year answers for Question 18 are found by dividing each category value for 2013 by the same category value for 2012. For example, the cash common-base year number is found by:

$$\$9,954 / \$8,014 = 1.2421$$

This means the cash balance in 2013 is 1.2421 times as large as the cash balance in 2012.

19. To determine full capacity sales, we divide the current sales by the capacity the company is currently using, so:

$$\text{Full capacity sales} = \$725,000 / .90$$

$$\text{Full capacity sales} = \$805,556$$

So, the dollar growth rate in sales is:

$$\text{Sales growth} = \$805,556 - 725,000$$

$$\text{Sales growth} = \$80,556$$

20. To find the new level of fixed assets, we need to find the current percentage of fixed assets to full capacity sales. Doing so, we find:

$$\text{Fixed assets} / \text{Full capacity sales} = \$690,000 / \$805,556$$

$$\text{Fixed assets} / \text{Full capacity sales} = .8566$$

Next, we calculate the total dollar amount of fixed assets needed at the new sales figure.

$$\text{Total fixed assets} = .8566(\$830,000)$$

$$\text{Total fixed assets} = \$710,938$$

The new fixed assets necessary is the total fixed assets at the new sales figure minus the current level of fixed assets.

$$\text{New fixed assets} = \$710,938 - 690,000$$

$$\text{New fixed assets} = \$20,938$$

21. Assuming costs vary with sales and a 20 percent increase in sales, the pro forma income statement will look like this:

FAR EAST TOURS INC.	
Pro Forma Income Statement	
Sales	\$ 1,003,320
Costs	780,840
Other expenses	<u>20,520</u>
EBIT	\$ 201,960
Interest	<u>12,600</u>
Taxable income	\$ 189,360
Taxes(35%)	<u>66,276</u>
Net income	<u>\$ 123,084</u>



The payout ratio is constant, so the dividends paid this year is the payout ratio from last year times net income, or:

$$\text{Dividends} = (\$30,300 / \$101,205)(\$123,084)$$

$$\text{Dividends} = \$36,850$$

And the addition to retained earnings will be:

$$\text{Addition to retained earnings} = \$123,084 - 36,850$$

$$\text{Addition to retained earnings} = \$86,234$$

The new retained earnings on the pro forma balance sheet will be:

$$\text{New retained earnings} = \$176,855 + 86,234$$

$$\text{New retained earnings} = \$263,089$$

The pro forma balance sheet will look like this:

**FAR EAST TOURS INC.**  
**Pro Forma Balance Sheet**

Assets		Liabilities and Owners' Equity	
Current assets		Current liabilities	
Cash	\$ 28,842	Accounts payable	\$ 77,520
Accounts receivable	46,398	Notes payable	<u>16,150</u>
Inventory	<u>99,066</u>	Total	\$ 93,670
Total	\$ 174,306	Long-term debt	<u>150,000</u>
Fixed assets		Owners' equity	
Net plant and equipment	<u>470,820</u>	Common stock and paid-in surplus	\$ 130,000
		Retained earnings	<u>263,089</u>
		Total	\$ 393,089
Total assets	<u>\$ 645,126</u>	Total liabilities and owners' equity	<u>\$ 636,759</u>

So the EFN is:

$$\text{EFN} = \text{Total assets} - \text{Total liabilities and equity}$$

$$\text{EFN} = \$645,126 - 636,759$$

$$\text{EFN} = \$8,367$$

**22.** First, we need to calculate full capacity sales, which is:

$$\text{Full capacity sales} = \$836,100 / .80$$

$$\text{Full capacity sales} = \$1,045,125$$

The full capacity ratio at full capacity sales is:

$$\text{Full capacity ratio} = \text{Fixed assets} / \text{Full capacity sales}$$

$$\text{Full capacity ratio} = \$392,350 / \$1,045,125$$

$$\text{Full capacity ratio} = .37541$$

The fixed assets required at full capacity sales is the full capacity ratio times the projected sales level:

$$\text{Total fixed assets} = .37541(\$1,003,320) = \$376,656$$

So, EFN is:

$$\text{EFN} = (\$174,306 + 376,656) - \$636,759 = -\$85,797$$

Note that this solution assumes that fixed assets are decreased (sold) so the company has a 100 percent fixed asset utilization. If we assume fixed assets are not sold, the answer becomes:

$$\text{EFN} = (\$174,306 + 392,350) - \$636,759 = -\$70,103$$

**23.** The D/E ratio of the company is:

$$\text{D/E} = (\$80,750 + 150,000) / \$306,855$$

$$\text{D/E} = .75198$$

So the new total debt amount will be:

$$\text{New total debt} = .75198(\$393,089)$$

$$\text{New total debt} = \$295,596$$

This is the new total debt for the company. Given that our calculation for EFN is the amount that must be raised externally and does not increase spontaneously with sales, we need to subtract the spontaneous increase in accounts payable. The new level of accounts payable will be the current accounts payable times the sales growth, or:

$$\text{Spontaneous increase in accounts payable} = \$64,600(.20)$$

$$\text{Spontaneous increase in accounts payable} = \$12,920$$

This means that \$12,920 of the new total debt is not raised externally. So, the debt raised externally, which will be the EFN is:

$$\text{EFN} = \text{New total debt} - (\text{Beginning LTD} + \text{Beginning CL} + \text{Spontaneous increase in AP})$$

$$\text{EFN} = \$295,596 - (\$150,000 + 80,750 + 12,920) = \$51,926$$

The pro forma balance sheet with the new long-term debt will be:

FAR EAST TOURS INC.  
Pro Forma Balance Sheet

Assets		Liabilities and Owners' Equity	
Current assets		Current liabilities	
Cash	\$ 28,842	Accounts payable	\$ 77,520
Accounts receivable	46,398	Notes payable	<u>16,150</u>
Inventory	<u>99,066</u>	Total	\$ 93,670
Total	\$ 174,306	Long-term debt	<u>201,926</u>
Fixed assets		Owners' equity	
Net plant and equipment	<u>470,820</u>	Common stock and paid-in surplus	\$ 130,000
		Retained earnings	<u>263,089</u>
		Total	\$ 393,089
Total assets	<u>\$ 645,126</u>	Total liabilities and owners' equity	<u>\$ 688,685</u>

The funds raised by the debt issue can be put into an excess cash account to make the balance sheet balance. The excess debt will be:

$$\text{Excess debt} = \$688,685 - \$645,126 = \$43,559$$

To make the balance sheet balance, the company will have to increase its assets. We will put this amount in an account called excess cash, which will give us the following balance sheet:

FAR EAST TOURS INC.  
Pro Forma Balance Sheet

Assets		Liabilities and Owners' Equity	
Current assets		Current liabilities	
Cash	\$ 28,842	Accounts payable	\$ 77,520
Excess cash	43,559		
Accounts receivable	46,398	Notes payable	<u>16,150</u>
Inventory	<u>99,066</u>	Total	\$ 93,670
Total	\$ 217,865	Long-term debt	<u>201,926</u>
Fixed assets		Owners' equity	
Net plant and equipment	<u>470,820</u>	Common stock and paid-in surplus	\$ 130,000
		Retained earnings	<u>263,089</u>
		Total	\$ <u>393,089</u>
Total assets	\$ <u>688,685</u>	Total liabilities and owners' equity	\$ <u>688,685</u>

The excess cash has an opportunity cost that we discussed earlier. Increasing fixed assets would also not be a good idea since the company already has enough fixed assets. A likely scenario would be the repurchase of debt and equity in its current capital structure weights. The company's debt-assets and equity-assets are:

$$\text{Debt-assets} = .75198 / (1 + .75198) = .43$$

$$\text{Equity-assets} = 1 / (1 + .75198) = .57$$

So, the amount of debt and equity needed will be:

$$\text{Total debt needed} = .43(\$645,126) = \$276,900$$

$$\text{Equity needed} = .57(\$645,126) = \$368,226$$

So, the repurchases of debt and equity will be:

$$\text{Debt repurchase} = (\$93,670 + 201,926) - 276,900 = \$18,696$$

$$\text{Equity repurchase} = \$393,089 - 368,226 = \$24,863$$

Assuming all of the debt repurchase is from long-term debt, and the equity repurchase is entirely from the retained earnings, the final pro forma balance sheet will be:

FAR EAST TOURS INC.  
Pro Forma Balance Sheet

Assets		Liabilities and Owners' Equity	
Current assets		Current liabilities	
Cash	\$ 28,842	Accounts payable	\$ 77,520
Accounts receivable	46,398	Notes payable	<u>16,150</u>
Inventory	<u>99,066</u>	Total	\$ 93,670
Total	\$ 174,306	Long-term debt	<u>183,230</u>
Fixed assets		Owners' equity	
Net plant and equipment	<u>470,820</u>	Common stock and paid-in surplus	\$ 130,000
		Retained earnings	<u>238,226</u>
		Total	\$ 368,226
Total assets	<u>\$ 645,126</u>	Total liabilities and owners' equity	<u>\$ 645,126</u>

Challenge

24. The pro forma income statements for all three growth rates will be:

FAR EAST TOURS INC. Pro Forma Income Statement			
	<i>15 % Sales Growth</i>	<i>20% Sales Growth</i>	<i>25% Sales Growth</i>
Sales	\$961,515	\$1,003,320	\$1,045,125
Costs	748,305	780,840	813,375
Other expenses	19,665	20,520	21,375
EBIT	<u>\$193,545</u>	<u>\$201,960</u>	<u>\$210,375</u>
Interest	12,600	12,600	12,600
Taxable income	<u>\$180,945</u>	<u>\$189,360</u>	<u>\$197,775</u>
Taxes (35%)	63,331	66,276	69,221
Net income	<u><u>\$117,614</u></u>	<u><u>\$123,084</u></u>	<u><u>\$128,554</u></u>
Dividends	\$35,213	\$36,850	\$38,488
Add to RE	82,401	86,234	90,066

We will calculate the EFN for the 15 percent growth rate first. Assuming the payout ratio is constant, the dividends paid will be:

$$\text{Dividends} = (\$30,300/\$936,100)(\$117,614)$$

$$\text{Dividends} = \$35,213$$

And the addition to retained earnings will be:

$$\text{Addition to retained earnings} = \$117,614 - 35,213$$

$$\text{Addition to retained earnings} = \$82,401$$

The new retained earnings on the pro forma balance sheet will be:

$$\text{New retained earnings} = \$176,855 + 82,401$$

$$\text{New retained earnings} = \$259,256$$

The pro forma balance sheet will look like this:

*15% Sales Growth:*

FAR EAST TOURS INC.  
Pro Forma Balance Sheet

Assets		Liabilities and Owners' Equity	
Current assets		Current liabilities	
Cash	\$ 27,640	Accounts payable	\$ 74,290
Accounts receivable	44,465	Notes payable	<u>16,150</u>
Inventory	<u>94,938</u>	Total	\$ 90,440
Total	\$ 167,043	Long-term debt	\$ 150,000
Fixed assets		Owners' equity	
Net plant and equipment	<u>451,203</u>	Common stock and paid-in surplus	\$ 130,000
		Retained earnings	<u>259,256</u>
		Total	<u>\$ 389,256</u>
Total assets	<u>\$ 618,246</u>	Total liabilities and owners' equity	<u>\$ 629,696</u>

So the EFN is:

$$\text{EFN} = \text{Total assets} - \text{Total liabilities and equity}$$

$$\text{EFN} = \$618,246 - 629,696$$

$$\text{EFN} = -\$11,451$$

At a 20 percent growth rate, and assuming the payout ratio is constant, the dividends paid will be:

$$\text{Dividends} = (\$30,300/\$101,205)(\$123,084)$$

$$\text{Dividends} = \$36,850$$

And the addition to retained earnings will be:

$$\text{Addition to retained earnings} = \$123,084 - 36,850$$

$$\text{Addition to retained earnings} = \$86,234$$

The new retained earnings on the pro forma balance sheet will be:

$$\text{New retained earnings} = \$176,855 + 86,234$$

$$\text{New retained earnings} = \$263,089$$

The pro forma balance sheet will look like this:

20% Sales Growth:

FAR EAST TOURS INC.  
Pro Forma Balance Sheet

Assets		Liabilities and Owners' Equity	
Current assets		Current liabilities	
Cash	\$ 28,842	Accounts payable	\$ 77,520
Accounts receivable	46,398	Notes payable	<u>16,150</u>
Inventory	<u>99,066</u>	Total	\$ 93,670
Total	\$ 174,306	Long-term debt	<u>150,000</u>
Fixed assets		Owners' equity	
Net plant and equipment	<u>470,820</u>	Common stock and paid-in surplus	\$ 130,000
		Retained earnings	<u>263,089</u>
		Total	\$ 393,089
Total assets	<u>\$ 645,126</u>	Total liabilities and owners' equity	<u>\$ 636,759</u>

So the EFN is:

EFN = Total assets – Total liabilities and equity

EFN = \$645,126 – 636,759

EFN = \$8,367

At a 25 percent growth rate, and assuming the payout ratio is constant, the dividends paid will be:

Dividends =  $(\$30,300 / \$101,205)(\$128,554)$

Dividends = \$38,488

And the addition to retained earnings will be:

Addition to retained earnings = \$128,554 – 38,488

Addition to retained earnings = \$90,066

The new retained earnings on the pro forma balance sheet will be:

New retained earnings = \$176,855 + 90,066

New retained earnings = \$266,921

The pro forma balance sheet will look like this:

25% Sales Growth:

FAR EAST TOURS INC.  
Pro Forma Balance Sheet

Assets		Liabilities and Owners' Equity	
Current assets		Current liabilities	
Cash	\$ 30,044	Accounts payable	\$ 80,750
Accounts receivable	48,331	Notes payable	<u>16,150</u>
Inventory	<u>103,194</u>	Total	\$ 96,900
Total	\$ 181,569	Long-term debt	\$ 150,000
Fixed assets		Owners' equity	
Net plant and equipment	<u>490,438</u>	Common stock and paid-in surplus	\$ 130,000
		Retained earnings	<u>266,921</u>
		Total	<u>\$ 396,921</u>
Total assets	<u>\$ 672,006</u>	Total liabilities and owners' equity	<u>\$ 643,821</u>

So the EFN is:

EFN = Total assets – Total liabilities and equity

EFN = \$672,006 – 643,821

EFN = \$28,186

25. The pro forma income statements for all three growth rates will be:

FAR EAST TOURS INC.  
Pro Forma Income Statement

	20% Sales Growth	30% Sales Growth	35% Sales Growth
Sales	\$1,003,320	\$1,086,930	\$1,128,735
Costs	780,840	845,910	878,445
Other expenses	20,520	22,230	23,085
EBIT	<u>\$201,960</u>	<u>\$218,790</u>	<u>\$227,205</u>
Interest	12,600	12,600	12,600
Taxable income	<u>\$189,360</u>	<u>\$206,190</u>	<u>\$214,605</u>
Taxes (35%)	66,276	72,167	75,112
Net income	<u>\$123,084</u>	<u>\$134,024</u>	<u>\$139,493</u>
Dividends	\$36,850	\$40,126	\$41,763
Add to RE	86,234	93,898	97,730

At a 30 percent growth rate, and assuming the payout ratio is constant, the dividends paid will be:

Dividends = (\$30,300/\$101,205)(\$134,024)

Dividends = \$40,126



And the addition to retained earnings will be:

Addition to retained earnings = \$134,024 – 40,126

Addition to retained earnings = \$93,898

The new addition to retained earnings on the pro forma balance sheet will be:

New addition to retained earnings = \$176,855 + 93,898

New addition to retained earnings = \$270,753

The new total debt will be:

New total debt = .75198(\$400,753)

New total debt = \$301,260

So, the new long-term debt will be the new total debt minus the new short-term debt, or:

New long-term debt = \$301,260 – 100,130

New long-term debt = \$201,230

The pro forma balance sheet will look like this:

*Sales growth rate = 30% and debt/equity ratio = .75198:*

FAR EAST TOURS INC.  
Pro Forma Balance Sheet

Assets		Liabilities and Owners' Equity	
Current assets		Current liabilities	
Cash	\$ 31,246	Accounts payable	\$ 83,980
Accounts receivable	50,265	Notes payable	<u>16,150</u>
Inventory	<u>107,322</u>	Total	\$ 100,130
Total	\$ 188,832	Long-term debt	<u>201,230</u>
Fixed assets		Owners' equity	
Net plant and equipment	<u>510,055</u>	Common stock and paid-in surplus	\$ 130,000
		Retained earnings	<u>270,753</u>
		Total	<u>\$ 400,753</u>
Total assets	<u>\$ 698,887</u>	Total liabilities and owners' equity	<u>\$ 702,133</u>

So the excess debt raised is:

Excess debt = \$702,133 – 698,887

Excess debt = \$3,226

At a 35 percent growth rate, and assuming the payout ratio is constant, the dividends paid will be:

$$\text{Dividends} = (\$30,300/\$101,205)(\$139,493)$$

$$\text{Dividends} = \$41,763$$

And the addition to retained earnings will be:

$$\text{Addition to retained earnings} = \$139,493 - 41,763$$

$$\text{Addition to retained earnings} = \$97,730$$

The new retained earnings on the pro forma balance sheet will be:

$$\text{New retained earnings} = \$176,855 + 97,730$$

$$\text{New retained earnings} = \$274,585$$

The new total debt will be:

$$\text{New total debt} = .75198(\$404,585)$$

$$\text{New total debt} = \$304,241$$

So, the new long-term debt will be the new total debt minus the new short-term debt, or:

$$\text{New long-term debt} = \$304,241 - 103,360$$

$$\text{New long-term debt} = \$200,881$$

*Sales growth rate = 35% and debt/equity ratio = .75198:*

FAR EAST TOURS INC.  
Pro Forma Balance Sheet

Assets		Liabilities and Owners' Equity	
Current assets		Current liabilities	
Cash	\$ 32,447	Accounts payable	\$ 87,210
Accounts receivable	52,198	Notes payable	<u>16,150</u>
Inventory	<u>111,449</u>	Total	\$ 103,360
Total	\$ 196,094	Long-term debt	\$ 200,881
Fixed assets		Owners' equity	
Net plant and equipment	<u>529,673</u>	Common stock and paid-in surplus	\$ 130,000
		Retained earnings	<u>274,585</u>
		Total	<u>\$ 404,585</u>
Total assets	<u>\$ 725,767</u>	Total liabilities and owners' equity	<u>\$ 708,826</u>

So the excess debt raised is:

$$\text{Excess debt} = \$708,826 - 725,767$$

$$\text{Excess debt} = -\$16,940$$

At a 35 percent growth rate, the firm will need funds in the amount of \$16,940 in addition to the external debt already raised. So, the EFN will be:

$$\text{EFN} = \$50,881 + 16,940$$

$$\text{EFN} = \$67,822$$

- 26.** We need the ROE to calculate the sustainable growth rate. The ROE is:

$$\text{ROE} = (\text{PM})(\text{TAT})(\text{EM})$$

$$\text{ROE} = (.053)(1 / 0.75)(1 + 0.40)$$

$$\text{ROE} = .0989 \text{ or } 9.89\%$$

Now, we can use the sustainable growth rate equation to find the retention ratio as:

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

$$\text{Sustainable growth rate} = .12 = [.0989b] / [1 - .0989b]$$

$$b = 1.08$$

This implies the payout ratio is:

$$\text{Payout ratio} = 1 - b$$

$$\text{Payout ratio} = 1 - 1.08$$

$$\text{Payout ratio} = -0.08$$

This is a dividend payout ratio of negative 8 percent, which is impossible. The growth rate is not consistent with the other constraints. The lowest possible payout rate is 0, which corresponds to retention ratio of 1, or total earnings retention.

The maximum sustainable growth rate for this company is:

$$\text{Maximum sustainable growth rate} = (\text{ROE} \times b) / [1 - (\text{ROE} \times b)]$$

$$\text{Maximum sustainable growth rate} = [.0989(1)] / [1 - .0989(1)]$$

$$\text{Maximum sustainable growth rate} = .1098 \text{ or } 10.98\%$$

- 27.** We know that EFN is:

$$\text{EFN} = \text{Increase in assets} - \text{Addition to retained earnings}$$

The increase in assets is the beginning assets times the growth rate, so:

$$\text{Increase in assets} = A \times g$$

The addition to retained earnings next year is the current net income times the retention ratio, times one plus the growth rate, so:

$$\text{Addition to retained earnings} = (\text{NI} \times b)(1 + g)$$

And rearranging the profit margin to solve for net income, we get:

$$\text{NI} = \text{PM}(S)$$

Substituting the last three equations into the EFN equation we started with and rearranging, we get:

$$EFN = A(g) - PM(S)b(1 + g)$$

$$EFN = A(g) - PM(S)b - [PM(S)b]g$$

$$EFN = -PM(S)b + [A - PM(S)b]g$$

28. We start with the EFN equation we derived in Problem 27 and set it equal to zero:

$$EFN = 0 = -PM(S)b + [A - PM(S)b]g$$

Substituting the rearranged profit margin equation into the internal growth rate equation, we have:

$$\text{Internal growth rate} = [PM(S)b] / [A - PM(S)b]$$

Since:

$$ROA = NI / A$$

$$ROA = PM(S) / A$$

We can substitute this into the internal growth rate equation and divide both the numerator and denominator by A. This gives:

$$\text{Internal growth rate} = \{ [PM(S)b] / A \} / \{ [A - PM(S)b] / A \}$$

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

To derive the sustainable growth rate, we must realize that to maintain a constant D/E ratio with no external equity financing, EFN must equal the addition to retained earnings times the D/E ratio:

$$EFN = (D/E)[PM(S)b(1 + g)]$$

$$EFN = A(g) - PM(S)b(1 + g)$$

Solving for g and then dividing numerator and denominator by A:

$$\text{Sustainable growth rate} = PM(S)b(1 + D/E) / [A - PM(S)b(1 + D/E)]$$

$$\text{Sustainable growth rate} = [ROA(1 + D/E)b] / [1 - ROA(1 + D/E)b]$$

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

29. In the following derivations, the subscript “E” refers to end of period numbers, and the subscript “B” refers to beginning of period numbers. TE is total equity and TA is total assets.

For the sustainable growth rate:

$$\text{Sustainable growth rate} = (ROE_E \times b) / (1 - ROE_E \times b)$$

$$\text{Sustainable growth rate} = (NI/TE_E \times b) / (1 - NI/TE_E \times b)$$

We multiply this equation by:

$$(TE_E / TE_E)$$

$$\text{Sustainable growth rate} = (NI / TE_E \times b) / (1 - NI / TE_E \times b) \times (TE_E / TE_E)$$

$$\text{Sustainable growth rate} = (NI \times b) / (TE_E - NI \times b)$$

Recognize that the denominator is equal to beginning of period equity, that is:

$$(TE_E - NI \times b) = TE_B$$

Substituting this into the previous equation, we get:

$$\text{Sustainable rate} = (NI \times b) / TE_B$$

Which is equivalent to:

$$\text{Sustainable rate} = (NI / TE_B) \times b$$

$$\text{Since } ROE_B = NI / TE_B$$

The sustainable growth rate equation is:

$$\text{Sustainable growth rate} = ROE_B \times b$$

For the internal growth rate:

$$\text{Internal growth rate} = (ROA_E \times b) / (1 - ROA_E \times b)$$

$$\text{Internal growth rate} = (NI / TA_E \times b) / (1 - NI / TA_E \times b)$$

We multiply this equation by:

$$(TA_E / TA_E)$$

$$\text{Internal growth rate} = (NI / TA_E \times b) / [(1 - NI / TA_E \times b) \times (TA_E / TA_E)]$$

$$\text{Internal growth rate} = (NI \times b) / (TA_E - NI \times b)$$

Recognize that the denominator is equal to beginning of period assets, that is:

$$(TA_E - NI \times b) = TA_B$$

Substituting this into the previous equation, we get:

$$\text{Internal growth rate} = (NI \times b) / TA_B$$

Which is equivalent to:

$$\text{Internal growth rate} = (NI / TA_B) \times b$$

$$\text{Since } ROA_B = NI / TA_B$$

The internal growth rate equation is:

$$\text{Internal growth rate} = ROA_B \times b$$

30. Since the company issued no new equity, shareholders' equity increased by retained earnings. Retained earnings for the year were:

$$\begin{aligned}\text{Retained earnings} &= \text{NI} - \text{Dividends} \\ \text{Retained earnings} &= \$90,000 - 43,000 \\ \text{Retained earnings} &= \$47,000\end{aligned}$$

So, the equity at the end of the year was:

$$\begin{aligned}\text{Ending equity} &= \$176,000 + 47,000 \\ \text{Ending equity} &= \$223,000\end{aligned}$$

The ROE based on the end of period equity is:

$$\begin{aligned}\text{ROE} &= \$90,000 / \$223,000 \\ \text{ROE} &= 40.36\%\end{aligned}$$

The plowback ratio is:

$$\begin{aligned}\text{Plowback ratio} &= \text{Addition to retained earnings} / \text{NI} \\ \text{Plowback ratio} &= \$47,000 / \$90,000 \\ \text{Plowback ratio} &= .5222, \text{ or } 52.22\%\end{aligned}$$

Using the equation presented in the text for the sustainable growth rate, we get:

$$\begin{aligned}\text{Sustainable growth rate} &= (\text{ROE} \times b) / [1 - (\text{ROE} \times b)] \\ \text{Sustainable growth rate} &= [.4036(.5222)] / [1 - .4036(.5222)] \\ \text{Sustainable growth rate} &= .2670, \text{ or } 26.70\%\end{aligned}$$

The ROE based on the beginning of period equity is

$$\begin{aligned}\text{ROE} &= \$90,000 / \$176,000 \\ \text{ROE} &= .5114, \text{ or } 51.14\%\end{aligned}$$

Using the shortened equation for the sustainable growth rate and the beginning of period ROE, we get:

$$\begin{aligned}\text{Sustainable growth rate} &= \text{ROE} \times b \\ \text{Sustainable growth rate} &= .5114 \times .5222 \\ \text{Sustainable growth rate} &= .2670, \text{ or } 26.70\%\end{aligned}$$

Using the shortened equation for the sustainable growth rate and the end of period ROE, we get:

$$\begin{aligned}\text{Sustainable growth rate} &= \text{ROE} \times b \\ \text{Sustainable growth rate} &= .4036 \times .5222 \\ \text{Sustainable growth rate} &= .2108, \text{ or } 21.08\%\end{aligned}$$

Using the end of period ROE in the shortened sustainable growth equation results in a growth rate that is too low. This will always occur whenever the equity increases. If equity increases, the ROE based on end of period equity is lower than the ROE based on the beginning of period equity. The ROE (and sustainable growth rate) in the abbreviated equation is based on equity that did not exist when the net income was earned.