

Chapter 4 Solutions

Overview:

Problem Length

{S}

{M}

{L}

Problem #s

1, 9-12

3, 5, 6, 13-18, 22, 24

2, 4, 7, 8, 19-21, 23, 25-27

1.{S} a.

- (i) The identical amount is subtracted from both numerator (CA) and denominator (CL). Since the ratio (before subtraction) is greater than 1, the effect will be to increase the ratio.
- (ii) The ratio will increase since the denominator (assets) will decrease.
- (iii) The ratio will decrease since the numerator (cash) will decrease
- (iv) The ratio will decrease since the numerator (debt) will decrease.

b. All the answers will be the same as in A except for {i} Current ratio. Since the ratio now is less than 1, the effect will be to decrease the ratio.

2.{L} The Walt Disney Company

- (i) Accounts receivable turnover = Revenue / Receivables
= \$25,402 / \$3,599 = 7.06

This ratio measures the effectiveness of the firm's credit policies and the capital required to maintain the firm's sales level.

- (ii) Total asset turnover = Sales / Total assets
= \$25,402 / \$45,027 = 0.56

This ratio is designed to evaluate the efficiency of long-term capital investment in productive capacity by measuring sales generated by investments in total assets.

- (iii) Current ratio = current assets / current liabilities
= \$10,007 / \$8,402 = 1.19

The current ratio is the broadest measure of current and potential resources available to meet short-term obligations.

- (iv) CFO to current liabilities = $\$6,434 / \$8,402 = 0.77$
 Unlike the current ratio, this measure compares actual cash flows to current obligations.
- (v) Debt to equity = $\$6,959 / \$24,100 = 0.29$
 A measure of risk compared to the owners' investment in the firm. Note that this ratio should include the current portion of financial obligations in the numerator. An alternative computation is based on the sum of operating and financial obligations:
 $(\$8,402 + \$6,959) / \$24,100 = 0.64$
- (vi) The times interest earned ratio =
 $\text{EBIT}/\text{interest expense} = (\$2,526 + \$558) / \$558 = 5.53$
 is an indicator of safety for creditors as it measures the extent to which earnings are available to meet interest charges.
- (vii) Operating income to sales = $\$2,848 / \$25,402 = 0.11$
 This is a measure of the profitability of a firm's "core" business.
- (viii) Return on sales = net income / sales
 $= \$920 / \$25,402 = 3.62\%$
 An indicator of overall profitability.
- (ix) Return on assets =
 $(\text{Net income} + \text{after-tax interest})/\text{total assets} =$
 $(\$920 + \$203^1) / \$45,027 = 2.49\%$
 This ratio measures the efficiency of the use of assets in generating operating profits and of the return accruing to capital used in the operations. It may also be measured on a pretax basis to exclude the impact of differences in tax position and financial policy:
 $\text{EBIT} / \text{total assets} = \$3,084 / \$45,027 = 6.85\%$

¹ The tax-rate is estimated as $(\text{income tax expense})/(\text{pretax income}) = \$1,606/\$2,526 = 63.6\%$. Thus after-tax interest expense = $36.4\% \times \$558 = \203

3. {M} a. **Five component disaggregation of ROE:**

		1997	2000
1. Operating margin	EBIT/Sales	= 18.16%	12.14%
x 2. Interest burden	Pretax income/EBIT	= 0.83X	0.82X
x 3. Tax burden	Net income/Pretax income	= 0.58X	0.36X
x 4. Asset turnover	Sales/Average assets	= 0.59X	0.56X
x 5. Leverage	Average assets/Average equity	= <u>22.50X</u>	<u>1.87X</u>
= Return on equity	Net income/Average equity	= 117.09%	3.82%

Note: Due to rounding errors, ROE computed by multiplying out the components does not equal actual ROE

- b. The primary causes of the decline in ROE are the lower operating margin, the higher tax burden, and the lower leverage effect as equity is substantially higher.

4. {L} a. **Activity Ratios:**

(i) Inventory turnover = COGS/average inventory
 = \$12,000 / \$4,100 = **2.93X**

(ii) Accounts receivable turnover = Sales/ average receivables
 = \$19,000 / \$3,250 = **5.85X**

(iii) Fixed asset turnover = sales/average fixed assets
 = \$19,000 / \$13,400 = **1.42X**

(iv) Total asset turnover = sales/average assets
 = \$19,000 / \$22,850 = **.83X**

b. **Liquidity Ratios:**

(i) Operating cycle = 365 [1/inventory turnover + 1/receivable turnover]
 = 365 [1/2.93 + 1/5.85] = **187 days**

(ii) Cash cycle:
 Purchases = COGS + increase in inventory
 = \$12,000 + \$200 = \$12,200`

Number of days payable = 365 x average payables / purchases
 = 365 x \$2,520/\$12,200 = 75.4 days

Therefore cash cycle = 187 - 75.4
 = **111.6 days**

- (iii) Current ratio = current assets / current liabilities
 $= \$9,900 / \$4,400 = \mathbf{2.25X}$
- (iv) Quick ratio = (cash + receivables) / current liabilities
 $= \$5,700 / \$4,400 = \mathbf{1.30X}$
- (v) Cash ratio = cash / current liabilities
 $= \$2,200 / \$4,400 = \mathbf{0.50X}$
- (vi) Defensive interval
 $= 365 \times [\text{cash} + \text{receivables}] / \text{projected expenditures}$
 $= 365 \times \$5,700 / \$14,200 = \mathbf{146.5 \text{ days}}$
- Where projected expenditures estimated as total costs and expenses less depreciation
 $= \$15,700 - \$1,500 = \$14,200$

c. **Solvency Ratios**

- (i) Debt to equity = debt (nontrade) / equity
 $= \$15,004 / \$4,296 = \mathbf{3.5}$
- (ii) Debt to capital = debt / (debt + equity)
 $= \$15,004 / \$19,300 = \mathbf{.78}$
- (iii) Times interest earned = earnings before interest and tax/interest expense
 $= \$4,500 / \$1,200 = \mathbf{3.75}$

d. **Profitability Ratios**

- (i) Gross Margin: = (sales - COGS) / sales
 $= (\$19,000 - \$12,000) / \$19,000 = \mathbf{36.8\%}$
- (ii) Operating income to sales
 $= \text{operating income} / \text{sales}$
 $= \$4,500 / \$19,000 = \mathbf{23.7\%}$
- (iii) Return on sales = net income / sales
 $= \$1,860 / \$19,000 = \mathbf{9.8\%}$

$$\begin{aligned} \text{(iv) Return on assets} &= (\text{net income} + [\text{interest expense} \\ &\times (1 - \text{tax rate})]) / \text{average assets} \\ &= (\$1,860 + [\$1,200(1 - .436)]) / \$22,850 = \mathbf{11.1\%} \end{aligned}$$

$$\begin{aligned} \text{Return on assets (pretax)} &= \text{earnings before} \\ &\text{interest and taxes} / \text{Average assets} \\ &= \$4,500 / \$22,850 = \mathbf{19.7\%} \end{aligned}$$

$$\begin{aligned} \text{(v) Return on equity} &= \text{net income} / \text{average equity} \\ &= \$1,860 / \$3,648 = \mathbf{51\%} \end{aligned}$$

5. {M} **Three component disaggregation of ROE:**

1. Profitability	net income / sales	=	9.8%
x 2. Asset turnover	sales / average assets	=	0.83X
x 3. Leverage	average assets / average equity	=	<u>6.26X</u>
= Return on equity	net income / average equity	=	<u>51.0%</u>

Five component model:

1. Operating margin	EBIT / sales	=	23.7%
x 2. Interest burden	pretax income / EBIT	=	0.73X
x 3. Tax burden	net income / pretax income	=	0.56X
x 4. Asset turnover	sales / average assets	=	0.83X
x 5. Leverage	average assets / average equity	=	<u>6.26X</u>
= Return on equity	net income / average equity	=	<u>51.0%</u>

6. {M}a. Estimate of fixed and variable costs:

S = Sales

F = Fixed costs

V = Variable costs

v = Variable costs as a percentage of sales

TC = total costs = F + V = F + vS

$$\begin{aligned} v &= \frac{\text{TC (year 2)} - \text{TC (year 1)}}{\text{S (year 2)} - \text{S (year 1)}} \\ &= \frac{\$15,700 - \$10,400}{\$19,000 - \$12,000} \\ &= 0.757 \end{aligned}$$

$$\begin{aligned} F &= \text{TC} - vS \\ &= \$15,700 - (0.757 \times \$19,000) \\ &= \$1,317 \end{aligned}$$

$$\begin{aligned} V &= \text{TC} - F \\ &= \$15,700 - \$1,317 = \$14,383 \text{ for 2002} \end{aligned}$$

$$= \$10,400 - \$1,317 = \$ 9,083 \text{ for } 2001$$

- b. Financial Leverage Effect (FLE)
 = operating income/pretax income

$$\begin{array}{ll} 2001: \text{FLE} = \$2,900/\$1,600 & 2002: \text{FLE} = \$4,500/\$3,300 \\ = 1.81 & = 1.36 \end{array}$$

- Operating Leverage Effect (OLE)
 = contribution margin/operating income

$$\begin{array}{ll} 2001: \text{OLE} = \$2,917/\$2,900 & 2002: \text{OLE} = \$4,617/\$4,500 \\ = 1.01 & = 1.03 \end{array}$$

where contribution margin is pretax income plus fixed costs (\$1,317 for both years).

Total Leverage Effect (TLE) = OLE x FLE = Contribution margin/net income

$$\begin{array}{ll} 2001: \text{TLE} = \$2,917/\$1,600 & 2002: \text{TLE} = \$4,617/\$3,300 \\ = 1.82 & = 1.40 \\ = 1.01 \times 1.81 & = 1.03 \times 1.36 \end{array}$$

- c. The basic formula used to estimate fixed and variable costs assumes that the underlying relationships are constant. Brown's rapid growth is probably accompanied by increasing fixed costs, and perhaps the ratio of variable costs to sales.

A partial solution would be to deduct known fixed costs like depreciation and interest expense from total costs before applying the formula. All of the problems discussed in Appendix 4-A, including relevant range and the non-linear relationship between costs and output, apply in this case as well.

The calculation of OLE in part b is not meaningful given the inability to estimate variable and fixed cost components. Brown's operating leverage is surely greater than the OLE calculated. The total leverage effect (TLE) is also understated in the part b computation.

9.{S} Common size statements are the first step in developing insights into the economic characteristics of different industries and of different firms in the same industry. They are also used to standardize components of financial statements by expressing them as a percentage of a relevant base, e.g. total assets for the balance sheet or cash flow from operations for the cash flow statement.

- 10.{S}(i) Use the average of end of year and end of first quarter assets in denominator, or alternatively, use end of year assets.
- (ii) Use weighted average: $.25 \times \text{opening assets} + .75 \times \text{closing assets}$; this matches the numerator that reflects a return on the additional assets for 3/4 of the year. Alternatively, use end of first quarter assets.
- (iii) Average of opening and closing assets is weighted average.
- (iv) Use weighted average: $.75 \times \text{opening assets} + .25 \times \text{closing assets}$. If assets added at the end of the fourth quarter, use opening assets.

11.{S} Operating leverage measures the effect of fixed operating costs on income whereas financial leverage measures effects of fixed financing costs. Total leverage is the product of operating and financial leverage ($TL = OL \times FL$), measuring the effect of all fixed costs. That amount (TL) can be equal for both companies even if the individual components (OL and FL) are not. One company may have high fixed operating costs, whereas the second may have high fixed interest costs, but overall total fixed costs may be identical.

12.{S} Can be solved by either disaggregating ROE

$$ROE = NI/E = NI/S \times S/E = 5.5\% \times 4.2 = 23.1\%$$

Or by use of the 3 component Dupont Model

ROE= Profitability x Turnover x Leverage

$$ROE = NI/S \times S/A \times A/E$$

$$\text{Now } A/E = (S/E) / (S/A) = 4.2 / 2.0 = 2.1$$

$$ROE = 5.5\% \times 2 \times 2.1 = 23.1\%$$

$$(iv) \text{ ROA} = \frac{[\text{NI} + ((1 + \text{tax rate}) \times \text{interest})]}{\text{Sales}} \times \frac{\text{Sales}}{\text{Assets}}$$

Now

$$\frac{[\text{NI} + ((1 + \text{tax rate}) \times \text{interest})]}{\text{Sales}} = \frac{\text{NI}}{\text{Sales}} + (1 + \text{tax rate}) \frac{\text{Interest}}{\text{Sales}}$$

$$= 10\% + (.8 \times 4\%) = 13.2\%$$

Therefore **ROA = 13.2% x 3.5 = 46.2%**

$$(v) \text{ EBT/sales} = (\text{NI/sales}) / (1 - \text{tax rate})$$

$$= 10\% / 0.8 = 12.5\%$$

$$\text{EBIT/sales} = \text{EBT/sales} + \text{I/sales} = 12.5\% + 4\% = 16.5\%$$

$$\text{EBIT/I} = (\text{EBIT/S}) / (\text{I/S}) = 16.5\% / 4\% = \mathbf{4.1}$$

15. {M}a.

	2001	2002	2003
Current ratio	2.00X	2.00X	2.00X
Quick ratio	1.20	1.10	1.00
Cash ratio	.40	.30	.25

- b. Common size statements would show that cash as a percentage of (current) assets is declining; accounts receivable and inventory are growing. Similarly, current liabilities would show the proportion of (bank) borrowing growing relative to credit granted by suppliers.
- c. Although the current ratio has remained constant over the 2001- 2003 period, its components have not. The quick and cash ratios have deteriorated. The firm's liquidity position has weakened over the period as its current assets are less liquid (more inventory and receivables, less cash). At the same time its debt financing relative to trade credit has grown.
- d. The CFO to current liabilities and turnover ratios would be used to measure the length of the operating and cash cycle. We would expect slower turnover and therefore longer operating and cash cycles. Similarly, CFO and the CFO to current liabilities ratio would be expected to decline.

16. {M} a. Purchases = COGS + change in inventory

$$1999 = \$1,349 + (\$221 - \$30) = \$1,540$$

$$2000 = \$2,106 + (\$171 - \$221) = \$2,056$$

b.

		1999	2000
Inventory turnover	$\frac{\text{COGS}}{\text{Average inventory}}$	10.75	10.74
A/P turnover	$\frac{\text{Purchases}}{\text{Average A/P}}$	5.35	4.34
# of days inventory = operating cycle*	$\frac{365}{\text{Inventory turnover}}$	33.96	33.97
# of days A/P	$\frac{365}{\text{A/P turnover}}$	(68.26)	(84.15)
Cash cycle		(34.30)	(50.18)

**Because Amazon has no receivables, its cash cycle is equal to the number it takes to convert inventory into sales.*

Note: The # of days are calculated from the unrounded turnover ratios rather than the rounded ratios shown.

c. Like other companies doing business on the Internet, Amazon is able to finance operations through its operating and cash cycles. Amazon's turnover ratio is high, perhaps because most of its sales are in a relatively small number of items. Amazon collects cash from its customers immediately (through credit cards) but takes two to three months to pay its suppliers.

17. {M} a.

	Common size statements			
	<u>Company 1</u>	<u>Company 2</u>	<u>Company 1</u>	<u>Company 2</u>
Sales	\$ 1,084	\$ 977	100%	100%
<u>COGS</u>	<u>(536)</u>	<u>(644)</u>	<u>(49)%</u>	<u>(66)%</u>
Gross margin	\$ 548	\$ 333	51%	34%
<u>Oper. expense</u>	<u>(414)</u>	<u>(241)</u>	<u>(38)%</u>	<u>(25)%</u>
Oper. income	\$ 134	\$ 92	12%	9%

b. ROA equals asset turnover times profitability:

	Company 1		Company 2	
Asset turnover	<u>Sales / Assets</u> \$1,084 / \$765	= 1.42	<u>Sales / Assets</u> \$977 / \$413	= 2.37
Profitability	<u>Oper. income</u> <u>Sales</u> \$134 / \$1,084	= 12%	<u>Oper. income</u> <u>Sales</u> \$92 / \$977	= 9%
ROA		17.5%		22.3%

c. and d.

Company 1 has higher gross margin, higher operating expense relative to sales, higher operating profit margin, and lower turnover than Company 2. This indicates that Company 1 is Ann Taylor and Company 2 is the Limited.

The Limited appeals to a larger target audience and therefore sells lower priced items (that carry lower profit margins). Its operating expenses are low as it provides limited service to its customers. Ann Taylor aims for the higher end of the market and charges higher prices, resulting in higher gross margins. Operating expense is high, reflecting services expected by customers for high price clothing. However, this strategy involves a lower volume of sales as evidenced by the sales turnover. Overall, based on ROA, the Limited's (Company 2) strategy was more profitable for the year (ending January 2000) shown.

18. {M}a.

	1997	1998	1999
Income/equity	\$2,664/\$12,766	\$603/\$11,833	\$1,177/\$12,042
= ROE	= 20.87%	= 5.10%	= 9.77%

b.

		1997	1998	1999
Operating margin	EBIT/sales	8.51%	3.64%	5.96%
X Interest burden	EBT/EBIT	0.86	0.62	0.85
X Tax burden	Net income/EBT	0.80	0.86	0.66
X Asset turnover	Sales/assets	1.53	1.08	1.21
X Leverage	Assets/equity	2.32	2.41	2.41
= ROE		20.78%	5.05%	9.75%

Note that, due to rounding errors, the ROEs calculated above are slightly lower than ROE calculated directly as net income/ending equity.

Operating margin, and asset turnover are the prime factors responsible for the changes in ROE. The interest burden contributed somewhat to the drop in ROE in 1998. Leverage (assets/equity) and the tax burden are relatively constant over the three years.

c. Operating leverage effect (OLE) =
 % change in EBIT / % change in sales.
 For 1998 = $[(\$1,124 - \$3,847)/\$3,847] / [(\$30,910 - \$45,187)/\$45,187] = \mathbf{2.24}$

For 1999 (relative to 1997) = $[(\$2,083 - \$3,847)/\$3,847] / [(\$34,975 - \$45,187)/\$45,187] = \mathbf{2.03}$

OLE is similar for both years.

d. OLE reflects the impact of fixed costs on profits as a result of changes in volume. Thus, for companies such as Texaco with high OLE, sales volume decreases impact profit margin percentages. Thus, the activity component and the operating margin component (for companies with high fixed costs) are not distinct.

19.{L}a.

	1998	1999
Activity ratios		
A/R turnover	7.9	8.2
Inventory turnover	3.1	2.3
Asset turnover	1.1	0.9
Liquidity ratios		
<i>Operating & cash cycle</i>		
# of days receivables	46.4	44.4
# of days inventory	<u>116.6</u>	<u>155.9</u>
Operating cycle	163.1	200.3
# of days payables	<u>(99.5)</u>	<u>(120.2)</u>
Cash cycle	63.5	80.1
Current ratio	1.04	1.36
Quick ratio	0.44	0.45
Solvency ratios		
Debt to equity	0.76	2.37
Interest coverage	1.35	2.84
Profitability ratios		
Operating margin	4.4%	10.9%
Profit margin	0.7%	4.6%
EBIT/Average assets	5.0%	10.1%
ROE	1.1%	8.6%

The financial statements and ratios send mixed signals. While there are warning signs, the ratios do not uniformly indicate that the company is facing bankruptcy. Sales grew at a rate of 8% whereas profits increased by more than 600%! Accordingly, all the profitability ratios improved considerably.

The ratios and financial data do however point out some concerns:

- (1) *Activity*: Inventory turnover declined sharply, despite the sales increase. Asset turnover also fell. The 1999 increase in Warnaco's inventories and assets greatly exceeded the sales increase.

- (2) *Liquidity*: The operating and cash cycles are high and increasing. The primary factor is the number of days of inventory (see activity analysis above), partly offset by the increase in the number of days of payables. However, the latter may not be a positive development. That increase as well as the increase in short-term debt and the longer operating cycle may all be symptoms of a firm having trouble meeting its obligations. The increase in number of days payables results in a misleading view of the cash cycle; if the company is in financial distress, suppliers will reduce the flexibility given to the company. We should expect the number of days payables to decline and the cash cycle to lengthen. The higher current ratio, which reflects higher inventories, may also be a sign of difficulty rather than of financial strength.
- (3) *Solvency*: Although, interest coverage improved (as a result of higher profits) the debt-to-equity ratio increased three-fold as the company added debt in 1999 and short-term debt increased almost 400%.
- (4) *Rapid Growth*: Finally, it should be noted that during 1999, the company's fixed assets, inventory and debt all increased substantially. All of the above are indicative of rapid expansion that may lead to cash flow shortages.

Ratio analysis is incomplete without cash flow data. Such data may shed some light on the issues raised above.

- b. (1) COGS is the same for 1998 and 1999 even though sales increased substantially.
- (2) The allowance for doubtful accounts declined although gross receivables increased 47%. This raises the question of whether the company's provision for doubtful accounts is sufficient.
- (3) Interest expense rose 28% although total debt tripled, indicating that most of increase took place late in 1999. Interest coverage for 2000 should decline even if operating income is unchanged.

- c. The increase in the provision for bad debts may indicate that the company may have used "aggressive" estimates, indicating low quality of earnings. Note that, even after restatement, the 1999 provision is still much lower relative to gross receivables than the 1998 and 1997 levels. The other revisions are also troublesome, although insufficient information is presented in the problem to evaluate them. Given the high debt level, the reduction in equity increases the reported financial leverage even further.

22.{M}a. As there is no debt, ROA and ROE are identical at 10%.

- b. $ROE = ROA + D/E [ROA - \text{cost of debt}]$ where cost of debt is measured on an after-tax basis. This formula is used to prepare the following table showing the expected ROE at each level of debt:

	{A} Debt/ Equity	{B} Pretax Interest	{C} = .80 x {B} Aftertax Interest	{D} = 10% + [{A} (10% - {C})] ROE
(1)	0.25X	6.0%	4.8%	11.3%
(2)	0.50	8.0	6.4	11.8
(3)	1.00	10.0	8.0	12.0
(4)	1.50	12.0	9.6	10.6
(5)	2.00	15.0	12.0	6.0

- c. Detailed calculations for cases (1) and (5):

Case Number	(1)	(5)
Debt	\$200,000	\$666,667
Equity	800,000	333,333
Income before interest and taxes	\$125,000	\$125,000
Interest expense	(12,000)	(100,000)
Income before tax	<u>\$113,000</u>	<u>\$ 25,000</u>
Tax expense	(22,600)	(5,000)
Net income	<u>\$ 90,400</u>	<u>\$ 20,000</u>
ROE	$\frac{\$ 90,400}{\$800,000} = 11.3\%$	$\frac{\$ 20,000}{\$333,333} = 6.0\%$

- d. Leverage works up to a point. As a firm takes on more debt the interest rate tends to rise (riskiness of debt increases). When the interest rate exceeds the firm's ROA then the benefits of leverage are lost. This trend is accelerated when ROA declines with increasing amounts of investment as more attractive (higher ROA) investments are made first.

In theory, the firm should borrow as long as the expected ROA exceeds the cost of debt. In practice, firms place their "hurdle rate" for new investments above the cost of capital to allow for risk. Many investments fail to achieve their expected ROA. When the realized ROA falls short of the cost of debt, the investment reduces ROE.

23.{L} In this problem the debt/equity ratios and cost of debt have to be adjusted to include all the debt (even that which is non-interest bearing).

- a. The D/E ratio without any bank borrowing is $\$200,000/\$800,000 = .25$
Therefore $ROE = 10\% + .25[10\% - 0] = 12.5\%$
- b. Calculations for the table that follows can be illustrated using case (1) with a D/E ratio of 25% and interest rate of 6%.

Total assets are \$1,000,000 and trade payables equal \$200,000. That leaves \$800,000 to be divided between bank debt and equity. A D/E ratio of 25% implies bank debt of \$160,000 and equity of \$640,000.

The actual D/E ratio (including trade payables) is therefore: $\$360,000/\$640,000 = 0.56$.

Interest (on bank debt only) at 6% = \$9,600. The interest rate on total debt of \$360,000 (bank debt + trade payables) can be computed as:

$$\$9,600/\$360,000 = 2.67\%$$

Therefore, $ROE = ROA + D/E [ROA - (1 - \text{tax rate}) \text{cost of debt}] = 10\% + .56 [10\% - .8 \times 2.67\%] = 14.4\%$

Data for all five cases follows:

	Stated D/E Ratio	Stated Interest Rate	Bank Loan Amount	Actual D/E Ratio	Actual Interest Rate	ROE
(1)	0.25	6.0%	\$160,000	0.56	2.67%	14.4%
(2)	0.50	8.0	266,667	0.88	4.57	15.6
(3)	1.00	10.0	400,000	1.50	6.67	17.0
(4)	1.50	12.0	480,000	2.13	8.47	16.9
(5)	2.00	15.0	533,333	2.75	10.91	13.5

c.

Case Number	(1)	(5)
Debt	\$160,000	\$533,333
Equity	640,000	266,667
Income before interest and taxes	\$125,000	\$125,000
Interest expense	<u>(9,600)</u>	<u>(80,000)</u>
Income before tax	\$115,400	\$ 45,000
Tax expense	<u>(23,080)</u>	<u>(9,000)</u>
Net income	<u>\$ 92,320</u>	<u>\$ 36,000</u>
ROE	$\frac{\$ 92,320}{\$640,000} = 14.4\%$	$\frac{\$ 36,000}{\$266,667} = 13.5\%$

- d. Trade debt appears to be interest free credit (in fact the cost of credit is often included in the price of the goods sold). The result of such debt is a higher return on equity as the same return is earned on a smaller investment. While the numbers change from problem 13, the conclusion is the same. Leverage enhances returns only when the cost of credit is less than the return on assets. As in problem 13, the highest ROE is earned at a debt/equity ratio of 1.

24. {M}a. and b The following liquidity, solvency, and profitability ratios can be used to support the conclusions reached in Problem 6 of Chapter 3:

	1996	1997	1998	1999	2000
M COMPANY					
Turnover Ratios:					
Inventory	3.60	3.43	3.27	3.17	2.96
Receivables	3.34	3.22	3.09	3.24	3.25
Payables	7.87	7.47	7.76	10.85	12.79
Number of days:					
Inventory	101.29	106.51	111.54	115.02	123.33
Receivables	109.20	113.25	118.00	112.70	112.00
Payables	<u>(46.40)</u>	<u>(48.90)</u>	<u>(47.00)</u>	<u>(33.60)</u>	<u>(28.50)</u>
Cash cycle	164.09	170.86	182.54	194.12	206.83
Current ratio	1.71	1.57	1.75	1.55	1.60
Quick ratio	1.09	0.99	1.11	0.91	0.93
Debt-to-equity	0.78	0.97	1.17	1.60	2.14
Interest coverage	6.33	4.84	4.94	4.00	1.35
Return on equity	0.14	0.13	0.11	0.11	0.03
G COMPANY					
Turnover ratios:					
Inventory	3.43	3.84	3.87	3.84	4.73
Receivables	5.38	6.07	6.11	6.07	6.10
Payables	10.19	10.61	10.52	10.34	12.47
Number of days:					
Inventory	106	95	94	95	77
Receivables	68	60	60	60	60
Payables	<u>(36)</u>	<u>(34)</u>	<u>(35)</u>	<u>(35)</u>	<u>(29)</u>
Cash cycle	138	121	119	120	108
Current ratio	2.23	2.13	1.95	2.29	2.30
Quick ratio	1.07	1.01	0.92	1.08	1.05
Debt-to-equity	0.38	0.49	0.63	0.71	0.74
Interest coverage	4.27	5.77	4.70	4.62	4.27
Return on equity	0.05	0.09	0.11	0.12	0.12

c. The deterioration in M company's liquidity and financial position can be seen from the cash cycle, which increased to 207 days in 2000 from 164 days in 1996. Also see the decline in the current and the quick ratios. M company's debt-to-equity ratio has more than doubled from 0.78 to 2.14, accompanied by a decline in interest coverage from 6.33x to 1.35x. That decline resulted from both the increasing leverage and the decreasing ROE (from .14 in 1996 to .03 in 2000).

G company's cash cycle has declined (improved) and its liquidity ratios remained steady. The problem here is the higher leverage and low interest coverage (albeit, a steady 4.27 with modest change during the five years shown). Profitability (ROE) increased from .05 to .12. The substantial growth has been managed well so far but it remains to be seen whether the firm can manage future growth as well.

25{L} a. Five-component duPont model:

ROE Component	Description	1986	1987	1988	1989	1990
x EBIT/sales	Operations	5.7%	8.2%	9.3%	9.0%	8.6%
x EBT/EBIT	Financing	0.44	0.55	0.65	0.75	0.85
x Net income/EBT	Tax burden	0.59	0.57	0.59	0.62	0.61
= Net income/sales	Profitability	1.5%	2.6%	3.6%	4.1%	4.4%
x Sales/assets	Activity	1.34	1.94	1.94	2.03	2.20
x Assets/equity	Solvency	14.34	7.95	4.24	2.81	2.21
= ROE		27.9%	39.7%	29.4%	23.5%	21.6%

The ratios used in the above are based on income before extraordinary items and discontinued operations. We start from 1986 as average balances can only be calculated from that point forward

b. The interesting overall result shown by the disaggregation is that ROE declined sharply at the same time that profit margins (net income/sales) and activity ratios were rising. The steady decline in equity turnover explains this apparent contradiction. Equity grew from a nominal amount in 1985 (4% of assets) to nearly half of total assets by the end of 1990. Not only did Harley pay nominal if any dividends

to stockholders but the firm sold equity as well. (Net income was about \$120 million over the 1986-1990 period while equity increased by \$194 million.)

Harley is a classic case of deleveraging. Total debt (current + long-term) declined by \$138 million, from about \$210 million at the end of 1986 to barely \$72 million four years later. Thus more than 70% ($\$138/\194) of the equity increase over the 1986-1990 period was used for debt reduction rather than for investment purposes. The firm's 21.6% return on equity in 1990, while very respectable, is far below what it would have been if Harley had remained highly leveraged.

When we analyze the components that lead to the increase in the overall profit margin, we find that the greatest contributor is the financing component (EBT/EBIT). This, of course, is a direct result of the deleveraging as interest expense was reduced dramatically as debt was paid off.

Thus, the question remains - did the drive to "world-class management techniques" improve Harley's operations or is the improvement solely do to financing effects. The answer can be found by focusing on the operating component of profitability and on sales turnover - the components that make up ROA on a pre tax basis.

ROA (pretax)	Description	1986	1987	1988	1989	1990
EBIT/Sales	Operations	5.7%	8.2%	9.3%	9.0%	8.6%
x Sales/Assets	Activity	<u>1.34</u>	<u>1.94</u>	<u>1.94</u>	<u>2.03</u>	<u>2.2</u>
= ROA (pretax)		7.6%	15.9%	18.0%	18.3%	18.9%

ROA (as noted in the text) is designed to focus on a firm's operations. Harley's ROA did increase almost threefold over the 1986-1990 period. The improvement came first from operating profitability which increased substantially from 1986 to 1988 but subsequently tapered off. Improvements in the period 1988-1990 came from asset turnover.

26. {S}a. Basic EPS =

$$\frac{\text{Earnings available to common shareholders}}{\text{Weighted average number of common shares outstanding}}$$

$$= \frac{\text{Net income less preferred dividends}}{\text{Weighted average number of common shares outstanding}}$$

$$= \frac{\$10.5 \text{ million} - (\$.40 \times 5 \text{ million})}{20 \text{ million} + (.75 \times 6 \text{ million})}$$

$$= \$8.5 \text{ million} / 24.5 \text{ million} = \mathbf{\$0.35 \text{ per share}}$$

b. DEPS = $\frac{\text{Adjusted income available for common shares}}{\text{Weighted average common and potential common shares}}$

$$= \frac{\$10.5 \text{ million}}{24.5 \text{ million} + 7.5 \text{ million}}$$

$$= \mathbf{.33 \text{ per share}}$$

Adjusted income is net income before preferred dividends as the preferred shares are assumed to be converted.

The number of shares is increased by the number of common shares into which the preferred shares are assumed converted.

c. Book value per share =

$$\frac{\text{Common shareholders' equity}}{\text{Common shares outstanding}}$$

$$= (\$100 \text{ million} - \$25 \text{ million}) / 26 \text{ million}$$

$$= \mathbf{\$2.88 \text{ per share}}$$

d. The preferred shares are assumed to be converted; the numerator reverts to \$100 million and the denominator is now (26 million + 7.5 million) = 33.5 million. Book value per share is now (\$100/33.5) = **\$2.98 per share.**

e. Given the profitability of the company, it is likely that the preferred shares will be converted at some point (the market price of the common and the stated conversion terms would be useful indicators of the likelihood of conversion). Thus the company should be valued assuming conversion.

27.{S}

a. Basic EPS =
$$\frac{\text{Earnings available for common}}{\text{Average common shares}}$$
$$= \frac{\$50 \text{ million} - \$5 \text{ million}}{50 \text{ million} + (\frac{1}{2} \times 20 \text{ million})}$$
$$= \$.75$$

Earnings available for common must be reduced by preferred dividends. The shares issued on June 30 are outstanding for one-half year.

b. Diluted EPS =
$$\frac{\text{Adjusted income available for common}}{\text{Weighted average common and potential common shares}}$$
$$= \frac{\$50 \text{ million} + (\$100 \text{ million} \times 6.5\% \times 60\%)}{(60 + 8 + 10 + 5) \text{ million}}$$
$$= \$.65$$

As the diluted calculation assumes that both the preferred shares and the convertible bonds are converted into common, the numerator excludes the preferred dividends and is increased by the (after-tax) bond interest. The denominator must be increased to reflect the shares issued on conversion of the preferred shares (4 million x 2), the convertible bonds (\$100 million/\$10) and exercise of the options. The treasury stock method calculates the additional option shares as:

$$\frac{(\$12 - \$9.60) \times 25 \text{ million}}{\$12} = 5 \text{ million}$$

Note: Under SFAS 128, the treasury stock method uses the average market price for the period. The standard permits the use of the closing market price if the price is stable and the method is applied consistently. As only the closing price was provided in the problem, it is used to compute the answer here.

c. Stated book value per share

$$= \frac{\$500 \text{ million} - \$100 \text{ million}}{70 \text{ million}}$$

$$= \$5.71$$

Total equity must be reduced by the redemption value of the preferred shares. The denominator is the year-end number of shares outstanding.

d. Diluted book value per share

$$= \frac{\$500 \text{ million} + \$100 \text{ million}}{(70 + 8 + 10 + 5) \text{ million}}$$

$$= \$6.45$$

Book value must be increased by the face amount of convertible bonds that are now assumed to be converted into common shares. The denominator is increased by the shares resulting from conversion of the preferred shares and convertible bonds and exercise of the options (see part b for calculations).

e. The diluted calculations reflect the conversion of the preferred shares and convertible bonds and the exercise of options. As all of these are likely to take place, given the stock price, valuation should be based on the diluted earnings and book value amounts. Note that the diluted book value per share is above the stated amount. This increase is due to assumed conversion of the convertible bonds.