

# ANALYSIS OF FINANCIAL STATEMENTS

Study Session 8

## EXAM FOCUS

Financial statement analysis uses ratios calculated from a company's income statement and balance sheet to evaluate the company. These ratios are compared to ratios from previous years to assess trends in the performance of the company. Ratios are also compared to those of other firms, the overall industry, and economy-wide averages to assess the relative performance of the company. You should memorize all of the ratios discussed in this review and be ready to

calculate and interpret them when analyzing a company's financial statements. You should be prepared to see ratio questions not only as part of the financial statement analysis curriculum but in other parts of the CFA® curriculum as well, such as equity analysis. Also be prepared for questions concerning DuPont analysis and questions about a company's sustainable growth rate and its implications for the company.

LOS 38.a: Interpret common-size balance sheets and common-size income statements, and discuss the circumstances under which the use of common-size financial statements is appropriate.

Common-size statements normalize balance sheets and income statements and allow the analyst to more easily compare performance across firms and for a single firm over time.

- A common-size balance sheet expresses all balance sheet accounts as a percentage of total assets.
- A common-size income statement expresses all income statement items as a percentage of sales.

In addition to the comparison of financial data across firms and time, common-size analysis is appropriate for quickly viewing certain financial ratios. For example, the gross profit margin, operating profit margin, and net profit margin are all clearly indicated within a common-size income statement.

- Common-size income statement ratios are especially useful in studying trends in costs and profit margins.

$$\text{common-size income statement ratios} = \frac{\text{income statement account}}{\text{sales}}$$

- Balance sheet accounts can also be converted to common-size ratios by dividing each balance sheet item by total assets.

$$\text{common-size balance-sheet ratios} = \frac{\text{balance sheet account}}{\text{total assets}}$$

### Example: Constructing common-size statements

The common-size statements in Figure 1 show balance sheet items as percentages of assets, and income statement items as percentages of sales.

- You can convert all asset and liability amounts to their actual values by multiplying the percentages listed below by their total assets of \$57,100; \$55,798; and \$52,071, respectively for 2006, 2005, and 2004 (data is USD millions).

- Also, all income statement items can be converted to their actual values by multiplying the given percentages by total sales, which were \$29,723; \$29,234; and \$22,922, respectively, for 2006, 2005, and 2004.

Figure 1: Common-Size Balance Sheet and Income Statement

<i>Balance Sheet Fiscal year end</i>	2006	2005	2004
<b>Assets</b>			
Cash & cash equivalents	0.38%	0.29%	0.37%
Accounts receivable	5.46%	5.61%	6.20%
Inventories	5.92%	5.42%	5.84%
Deferred income taxes	0.89%	0.84%	0.97%
Other current assets	0.41%	0.40%	0.36%
<b>Total current assets</b>	<b>13.06%</b>	<b>12.56%</b>	<b>13.74%</b>
Gross fixed assets	25.31%	23.79%	25.05%
Accumulated depreciation	8.57%	7.46%	6.98%
<b>Net gross fixed assets</b>	<b>16.74%</b>	<b>16.32%</b>	<b>18.06%</b>
Other long term assets	70.20%	71.12%	68.20%
<b>Total assets</b>	<b>100.00%</b>	<b>100.00%</b>	<b>100.00%</b>
<b>Liabilities</b>			
Accounts payable	3.40%	3.40%	3.79%
Short term debt	1.00%	2.19%	1.65%
Other current liabilities	8.16%	10.32%	9.14%
<b>Total current liabilities</b>	<b>12.56%</b>	<b>15.91%</b>	<b>14.58%</b>
Long term debt	18.24%	14.58%	5.18%
Other long term liabilities	23.96%	27.44%	53.27%
<b>Total liabilities</b>	<b>54.76%</b>	<b>57.92%</b>	<b>73.02%</b>
Preferred equity	0.00%	0.00%	0.00%
Common equity	45.24%	42.08%	26.98%
<b>Total liabilities &amp; equity</b>	<b>100.00%</b>	<b>100.00%</b>	<b>100.00%</b>
<i>Income Statement Fiscal year end</i>	2006	2005	2004
<b>Revenues</b>	<b>100.00%</b>	<b>100.00%</b>	<b>100.00%</b>
CGS	59.62%	60.09%	60.90%
Gross profit	40.38%	39.91%	39.10%
Selling, general & administrative	16.82%	17.34%	17.84%
Depreciation	2.39%	2.33%	2.18%
Amortization	0.02%	3.29%	2.33%
Other operating expenses	0.58%	0.25%	-0.75%
Operating income	20.57%	16.71%	17.50%
Interest and other debt expense	2.85%	4.92%	2.60%
Income before taxes	17.72%	11.79%	14.90%
Provision for income taxes	6.30%	5.35%	6.17%
<b>Net income</b>	<b>11.42%</b>	<b>6.44%</b>	<b>8.73%</b>

**LOS 38.b:** Discuss the purposes and limitations of financial ratios and why it is important to examine a company's performance relative to the economy and its industry.

### Limitations of Financial Ratios

You must be aware of the **limitations of financial ratios**. Ratios are used for internal comparisons and comparisons across firms. They are often most useful in identifying questions that need to be answered rather than for answering questions directly. Other limitations are:

- Financial ratios are not useful when viewed in isolation. They are only valid when compared to those of other firms or to the company's historical performance.
- Comparisons with other companies are made more difficult because of different accounting treatments. This is particularly important when analyzing non-U.S. firms.
- It is difficult to find comparable industry ratios when analyzing companies that operate in multiple industries.
- Conclusions cannot be made from viewing one set of ratios. All ratios must be viewed relative to one another.
- Determining the target or comparison value for a ratio is difficult—requiring some range of acceptable values.
- In conducting your analysis, you must always be aware of the limitations of ratios. Ask yourself these questions:
  - ♦ Do the firms being compared have similar accounting practices?
  - ♦ When comparing divisions within a firm, are the ratios comparable?
  - ♦ Do the ratios being used give consistent readings?
  - ♦ Do the ratios yield a reasonable figure for the industry?

### A Company's Financial Ratios Relative to Its Industry, to the Aggregate Economy, and to the Company's Own Performance

The value of a single financial ratio is not meaningful by itself but must be interpreted relative to one of three factors: industry norms, overall economy norms, and the company's own historical performance.

- Comparison to industry norms is the most common type of comparison. Industry comparisons are particularly valid when the products generated by the industry are similar.

Primarily, comparisons are made to industry averages. However, if there are wide variations within the industry, it may be more appropriate to use medians instead of means for the purposes of comparison (recall from the quantitative methods material that significant outliers can distort the mean).

Moreover, it may be better not to use all of the firms in the industry but to use only a subset of firms with similar characteristics, including size.

For firms that operate in multiple industries, the analyst can use cross-sectional analysis to find a group of firms that are involved in a similar mix of industries. Alternatively, the analyst can calculate composite industry averages by using a weighted average based on the proportion of the company's sales in each industry segment.

- Comparing a company to the overall economy is particularly important when overall business conditions are changing. For example, a stable profit margin might be considered good if the economy is in recession and the economy-wide average profit margin is declining. On the other hand, it might be considered problematic if a stable profit margin occurs during an economic expansion, and overall average profit margins are increasing.

- Comparing a firm with its history is very common. Analysts often conduct *time-series analysis*, which considers the trend in a ratio. Indeed, it is problematic to simply consider long-term averages of ratios without taking their trend into account.

In most ratio comparisons it is considered desirable to be near the industry (or economy) average. For example, in all turnover ratios, a value could be considered too high or too low if it differs widely from the industry average. However, for some ratios, simply being high is considered good, even if it deviates from the industry average. This is true for most ratios involving income or cash flow. For example, most analysts would agree that having a high return on assets or high profit margin is good. An analyst would not suggest that a company with a return on assets of 15% when the industry average was 10% had an ROA that was *too high*.

Sometimes the *goodness* of a ratio depends on the context. A high ROE that results from high profit margins or asset turnover is typically looked upon favorably. However, high ROEs that result from high levels of leverage are viewed more skeptically because of the additional risk of higher leverage.

LOS 38.c: Calculate, interpret and discuss the uses of measures of a company's internal liquidity, operating performance (i.e., operating efficiency and operating profitability), risk analysis, and growth potential.

Ratios can be used to evaluate four different facets of a company's performance and condition: (1) internal liquidity, (2) operating performance, (3) risk profile, and (4) growth potential.

**Evaluating internal liquidity.** Liquidity ratios are employed by analysts to determine the firm's ability to pay its short-term liabilities.

- The *current ratio* is the best-known measure of liquidity:

$$\text{current ratio} = \frac{\text{current assets}}{\text{current liabilities}}$$

The higher the current ratio, the more likely it is that the company will be able to pay its short-term bills. A current ratio of less than one means that the company has negative working capital and is probably facing a liquidity crisis. Working capital equals current assets minus the current liabilities.

- The *quick ratio* is a more stringent measure of liquidity because it does not include inventories and other assets that might not be very liquid:

$$\text{quick ratio} = \frac{\text{cash} + \text{marketable securities} + \text{receivables}}{\text{current liabilities}}$$

The higher the quick ratio, the more likely it is that the company will be able to pay its short-term bills.

- The most conservative liquidity measure is the *cash ratio*:

$$\text{cash ratio} = \frac{\text{cash} + \text{marketable securities}}{\text{current liabilities}}$$

The higher the cash ratio, the more likely it is that the company will be able to pay its short-term bills.

The current, quick, and cash ratios differ only in the assumed liquidity of the current assets that the analyst projects will be used to pay off current liabilities.

- A measure of accounts receivable liquidity is the *receivables turnover*:

$$\text{receivables turnover} = \frac{\text{net annual sales}}{\text{average receivables}}$$

*Professor's Note: In most cases when a ratio compares a balance sheet account (such as receivables) with an income or cash flow item (such as sales), the balance sheet item will be the average of the account instead of simply the end-of-year balance. Averages are calculated by adding the beginning-of-year account value and the end-of-year account value, then dividing the sum by two.*

It is considered desirable to have a receivables turnover figure close to the industry norm.

- The inverse of the receivables turnover times 365 is the *average collection period*, which is the average number of days it takes for the company's customers to pay their bills:

$$\text{average receivables collection period} = \frac{365}{\text{receivables turnover}}$$

It is considered desirable to have a collection period (and receivables turnover) close to the industry norm. The firm's credit terms are another important benchmark used to interpret this ratio. A collection period that is too high might mean that customers are too slow in paying their bills, which means too much capital is tied up in assets. A collection period that is too low might indicate that the firm's credit policy is too rigorous, which might be hampering sales.

- A measure of a firm's efficiency with respect to its processing and inventory management is the *inventory turnover*:

$$\text{inventory turnover} = \frac{\text{cost of goods sold}}{\text{average inventory}}$$

*Professor's Note: Pay careful attention to the numerator in the turnover ratios. For inventory turnover, be sure to use cost of goods sold, not sales.*

- The inverse of the inventory turnover times 365 is the *average inventory processing period*:

$$\text{average inventory processing period} = \frac{365}{\text{inventory turnover}}$$

As is the case with accounts receivable, it is considered desirable to have an inventory processing period (and inventory turnover) close to the industry norm. A processing period that is too high might mean that too much capital is tied up in inventory and could mean that the inventory is obsolete. A processing period that is too low might indicate that the firm has inadequate stock on hand, which could adversely impact sales.

- A measure of the use of trade credit by the firm is the *payables turnover ratio*:

$$\text{payables turnover ratio} = \frac{\text{cost of goods sold}}{\text{average trade payables}}$$

- The inverse of the payables turnover ratio multiplied by 365 is the *payables payment period*, which is the average amount of time it takes the company to pay its bills:

$$\text{payables payment period} = \frac{365}{\text{payables turnover ratio}}$$

- The *cash conversion cycle* is the length of time it takes to turn the firm's cash investment in inventory back into cash, in the form of collections from the sales of that inventory. The cash conversion cycle is computed from average receivables collection period, average inventory processing period, and the payables payment period.

$$\text{cash conversion cycle} = \left( \frac{\text{average receivables}}{\text{collection period}} \right) + \left( \frac{\text{average inventory}}{\text{processing period}} \right) - \left( \frac{\text{payables payment}}{\text{period}} \right)$$

High cash conversion cycles are considered undesirable. A conversion cycle that is too high implies that the company has an excessive amount of capital investment in the sales process.

**Evaluating operating performance.** Performance ratios help determine how well management operates the business. They can be divided into two categories: operating efficiency ratios and operating profitability ratios. Operating efficiency ratios are comprised of the total asset turnover, net fixed asset turnover, and equity turnover ratios. These are the first three ratios presented. All of these ratios take some asset or equity account and divide it into sales to determine how efficiently the company uses assets and capital.

Operating profitability ratios include the gross profit margin, operating profit margin, net profit margin, common-size income statement, return on total capital, and return on total equity. Operating ratios compare the top of the income statement (sales) to profits. Remember that net sales is just sales net of returns, and the term 'sales' is often used to mean the same thing.

- The effectiveness of the firm's use of its total assets to create revenue is measured by the *total asset turnover*:

$$\text{total asset turnover} = \frac{\text{net sales}}{\text{average total net assets}}$$

Different types of industries might have considerably different turnover ratios. Manufacturing businesses that are capital-intensive might have asset turnover ratios near one, while retail businesses might have turnover ratios near 10. As was the case with the current asset turnover ratios discussed previously in this topic review, it is desirable for an asset turnover to be close to the industry norm. Low asset turnover ratios might mean that the company has too much capital tied up in its asset base. A turnover ratio that is too high might imply that the firm has too few assets for potential sales or that the asset base is outdated.

- The utilization of fixed assets is measured by the *net fixed asset turnover*:

$$\text{fixed asset turnover} = \frac{\text{net sales}}{\text{average net fixed assets}}$$

As was the case with the total asset turnover ratio, it is desirable to have a fixed asset turnover close to the industry norm. Low fixed asset turnover might mean that the company has too much capital tied up in its asset base. A turnover ratio that is too high might imply that the firm has obsolete equipment, or at a minimum, the firm will probably have to incur capital expenditures in the near future to increase capacity to support growing revenues.

- The *equity turnover* is a measure of the employment of owners' capital:

$$\text{equity turnover} = \frac{\text{net sales}}{\text{average equity}}$$

For this ratio, equity capital includes all preferred and common stock, paid-in capital, and retained earnings, although some analysts use only common equity, which excludes preferred stock. Analysts need to consider the capital structure of the company in evaluating this ratio because a company can increase this ratio without increasing profitability simply by using more debt financing.

*Operating profitability ratios* look at how good management is at turning their efforts into profits. Operating ratios compare the top of the income statement (sales) to profits. The different ratios are designed to isolate specific costs.

*Know these terms:*

Gross profits	= Net sales – COGS
Operating profits	= Earnings before interest and taxes = EBIT
Net income	= Earnings after taxes but before dividends
Total capital	= Long-term debt + short-term debt + common and preferred equity
Total capital	= Total assets

*How they relate in the income statement:*

	Net sales
–	Cost of goods sold
	Gross profit
–	Operating expenses
	Operating profit (EBIT)
–	Interest
	Earnings before taxes (EBT)
–	Taxes
	Earnings after taxes (EAT)

The *gross profit margin* is the ratio of gross profit (sales less cost of goods sold) to sales:

$$\text{gross profit margin} = \frac{\text{gross profit}}{\text{net sales}}$$

An analyst should be concerned if this ratio is too low.

- The *operating profit margin* is the ratio of operating profit (gross profit less sales, general, and administrative expenses) to sales. Operating profit is also referred to as earnings before interest and taxes (EBIT):

$$\text{operating profit margin} = \frac{\text{operating profit}}{\text{net sales}} = \frac{\text{EBIT}}{\text{net sales}}$$

Analysts should be concerned if this ratio is too low. Some analysts prefer to calculate the operating profit margin by adding back depreciation expense to arrive at earnings before interest, taxes, depreciation, and amortization (EBITDA).

- The *net profit margin* is the ratio of net income to sales:

$$\text{net profit margin} = \frac{\text{net income}}{\text{net sales}}$$

Analysts should be concerned if this ratio is too low. The net profit margin should be based on net income from continuing operations, because analysts should be primarily concerned about future expectations, and “below the line” items, such as discontinued operations, will not impact the company in the future.

- The *return on total capital* (ROTC) is the ratio of net income before interest expense to total capital:

$$\text{return on total capital} = \frac{\text{net income} + \text{interest expense}}{\text{average total capital}}$$

Analysts should be concerned if this ratio is too low. Total capital is the same as total assets. The interest expense that should be added back is gross interest expense, not net interest expense (which is gross interest expense less interest income).

An alternative method for computing ROTC is to include the present value of operating leases on the balance sheet as a fixed asset and as a long-term liability. This adjustment is especially important for firms that are dependent on operating leases as a major form of financing. Calculations related to leasing are discussed later in the accounting material.

- The *return on total equity* is the ratio of net income to total equity (including preferred stock):

$$\text{return on total equity} = \frac{\text{net income}}{\text{average total equity}}$$

Analysts should be concerned if this ratio is too low.

- A similar ratio to the return on total equity is the *return on owner's equity*:

$$\text{return on common equity} = \frac{\text{net income} - \text{preferred dividends}}{\text{average common equity}} = \frac{\text{net income available to common}}{\text{average common equity}}$$

This ratio differs from the return on total equity in that it only measures the accounting profits available to, and the capital invested by, common stockholders, instead of common and preferred stockholders. That is why preferred dividends are deducted from net income in the numerator. Analysts should be concerned if this ratio is too low.

The return on common equity is often more thoroughly analyzed using the DuPont decomposition, which is described later in this topic review.

**Risk analysis.** Risk analysis calculations measure the uncertainty of the firm's income flows. They can be divided into two groups, those that measure business risk and those that measure financial risk.

*Business risk* is the uncertainty regarding the operating income of a company and is a result of the variability of sales and production costs. The three calculations that measure business risk are business risk, sales volatility, and operating leverage.



- *Financial risk* is the additional volatility of equity returns caused by the firm's use of debt. Financial risk can be measured using balance sheet ratios, which include the debt-to-equity ratio, the long-term debt-to-total capital ratio, and the total debt ratio; or earnings and cash flow ratios, which include the interest coverage ratio, the fixed financial charge ratio, the total fixed charge coverage ratio, the cash flow-to-interest expense ratio, the cash flow coverage ratio, the cash flow-to-long-term debt ratio, and the cash flow-to-total debt ratio.
- A general way of measuring risk of any data series is the *coefficient of variation*, which is the standard deviation of a data series divided by its mean. The calculation of *business risk* is the coefficient of variation of a company's operating income over several years:

$$\text{business risk} = \frac{\sigma \text{ of operating income}}{\text{mean operating income}} = \frac{\text{std. deviation of EBIT}}{\text{mean EBIT}}$$

Between five and ten years of data should be used to calculate the coefficient of variation, because using less data does not yield much statistical reliability and data more than ten years old is likely not relevant to the company's present situation. Analysts should be concerned if this calculation is too high.

*Professor's Note: We reviewed the coefficient of variation in the quantitative methods material.*

- One of the contributing sources of earnings variability is sales variability. Sales variability is the coefficient of variation of sales over several years:

$$\text{sales variability} = \left[ \frac{\sigma \text{ of sales}}{\text{mean sales}} \right]$$

As was the case for business risk, between five and ten years of data should be used in this calculation. Analysts should be concerned if this calculation is too high.

- Another source of the variability of operating earnings is the firm's operating leverage, which measures how much of the company's production costs are fixed (as opposed to variable). The greater the use of fixed costs, the greater the impact of a change in sales on the operating income of a company, and, consequently, the greater the risk. The actual measurement of *operating leverage* is complex. For a given set of years, the percent change in operating earnings (%ΔOE) and the percent change in sales (%ΔS) from the previous year are calculated. Then, the average value of the absolute value of the ratio will be calculated:

$$\text{operating leverage} = \text{mean} \left[ \text{absolute value} \left( \frac{\% \Delta \text{OE}}{\% \Delta \text{Sales}} \right) \right]$$

Later we will see the concept of degree of operating leverage (DOL) defined as  $\frac{\% \Delta \text{EBIT}}{\% \Delta \text{Sales}}$

- A measure of the firm's use of fixed-cost financing sources is the *debt-to-equity ratio*:

$$\text{debt-to-equity ratio} = \frac{\text{total long-term debt}}{\text{total equity}} = \frac{\text{long-term liabilities} + \text{deferred taxes} + \left( \text{present value of lease obligations} \right)}{\text{common} + \text{preferred equity}}$$

Some analysts exclude preferred stock and only use owner's equity. Increases and decreases in this ratio suggest a greater or lesser reliance on debt as a source of financing.

Note that for all ratios in which debt is part of the equation, the analyst has a choice of whether to include deferred taxes as part of debt. If deferred taxes are mainly a result of accelerated and straight-line depreciation differences, then the amount will likely not reverse if capital expenditures continue to grow and should not be included as part of long-term debt. The creation and analytic treatment of a deferred tax liability is covered in detail later in the financial statement analysis material.

- Another way of looking at the usage of debt is the *long-term debt-to-total capital ratio*:

$$\text{long-term debt-to-total long-term capital} = \frac{\text{total long-term debt}}{\text{total long-term capital}}$$

Total long-term capital equals all long-term debt plus preferred stock and equity. Increases and decreases in this ratio suggest a greater or lesser reliance on debt as a source of financing.

*Professor's Note: Don't get confused by the apparent multitude of definitions for "total capital." In our discussion of the return on total capital above, we said that total capital equaled total assets. This statement is particularly true for companies that employ a significant amount of short-term liabilities in their capital structure. We could have just as easily analyzed the return on long-term capital, which would define total long-term capital as long-term debt plus equity (both preferred and common). On the exam, watch out for the language that is used in the question. I'm confident that CFA Institute understands this potential discrepancy and will clearly state "total capital" (which you should interpret as total assets) and "total long-term capital" (which should be interpreted as long-term debt plus equity).*

- A slightly different way of analyzing debt utilization is the *total debt ratio*, which includes current liabilities in both the numerator and the denominator:

$$\text{total debt ratio} = \frac{\text{current liabilities} + \text{total long-term debt}}{\text{total debt} + \text{total equity}}$$

Total debt plus total equity is also known as total capital. As discussed in the section on the debt-to-equity ratio, total capital may or may not include deferred taxes. Increases and decreases in this ratio suggest a greater or lesser reliance on debt as a source of financing. Please note that total debt includes all liabilities—even accounts payable and deferred taxes, which are noninterest bearing accounts.

- Often, only interest bearing debt and equity are considered to be long-term capital. A further refinement excludes accounts payable and accrued expenses, which may be considered part of the firm's working capital, to get the following relationship:

$$\left( \frac{\text{total interest-bearing debt}}{\text{total funded capital}} \right) = \frac{\text{total interest-bearing debt}}{\text{total capital} - \text{noninterest bearing liabilities}}$$

- The remaining risk ratios help determine the firm's ability to repay its debt obligations. The first of these is the *interest coverage ratio*:

$$\text{interest coverage} = \frac{\text{earnings before interest and taxes}}{\text{interest expense}}$$

The lower this ratio, the more likely it is that the firm will have difficulty meeting its debt payments.

- A slight variation on the interest coverage ratio is to recognize that firms that use leased facilities are in essence borrowing the capital to utilize those facilities. These lease payments are accounted for in the *fixed financial cost ratio*:

$$\text{fixed financial cost ratio} = \frac{\text{EBIT} + \text{ELIE}}{\text{gross interest expense} + \text{ELIE}}$$

where:

ELIE = estimated lease interest expense

This ratio is interpreted in the same manner as the earlier version. Higher coverage ratios suggest the firm is better able to manage its current debt levels or that the firm has unused borrowing capacity.

- A different type of variation in the coverage ratio is to use cash flow instead of income in the numerator. The basis of the cash flow measure is cash flow from operations (CFO) found in the financial statements. In this form, the cash flow measure includes depreciation expense, deferred taxes, and the impact of changes in net working capital. This version of the coverage ratio is defined as:

$$\text{cash flow coverage of fixed financial costs} = \frac{\text{CFO} + \text{interest expense} + \text{ELIE}}{\text{interest expense} + \text{ELIE}}$$

- A different way of determining the ability of a company to meet its debt obligations is to compare cash flow to the amount of long-term debt. This yields the *cash flow-to-long-term debt ratio*:

$$\text{cash flow to long-term debt} = \frac{\text{CFO}}{\text{BV of long-term debt} + \text{PV of operating leases}}$$

where:

BV of long-term debt = the book value of long-term debt

PV of operating leases = the present value of operating leases

Remember that the denominator can be computed either with or without deferred taxes. The lower this ratio, the more likely it is that the firm will have difficulty meeting its long-term debt payments.

- A slight variation on the cash flow-to-long-term debt ratio is the *cash flow-to-total debt ratio*:

$$\left( \frac{\text{cash flow to}}{\text{total interest-bearing debt}} \right) = \frac{\text{CFO}}{\text{total long-term debt} + \text{current interest-bearing liabilities}}$$

The lower this ratio, the more likely it is that the firm will have difficulty meeting its debt payments.

**Growth analysis.** Owners and creditors are interested in the firm's growth potential. Owners pay attention to growth because stock valuation is dependent on the future growth rate of the firm. The analysis of growth potential is important to the creditors because the firm's future prospects are crucial to its ability to pay existing debt obligations. If the company doesn't grow, it stands a much greater chance of defaulting on its loans. In theory, the growth rate of a firm is a function of the rate of return earned on its resources and the amount of resources (profits) retained and reinvested.

To calculate the sustainable growth rate for a firm, the rate of return on resources is measured as the return on equity capital, or the ROE. The proportion of earnings reinvested is known as the retention rate (RR).

- The formula for the *sustainable growth rate*, which is how fast the firm can grow without additional external equity issues while holding leverage constant, is:

$$g = RR \times ROE$$

- The calculation of the *retention rate* is:

$$\text{retention rate} = \left( 1 - \frac{\text{dividends declared}}{\text{operating income after taxes}} \right)$$

where :

$$\frac{\text{dividends declared}}{\text{operating income after taxes}} = \text{dividend payout ratio}$$

### Example: Calculating sustainable growth

Figure 2 provides data for three companies.

Figure 2: Growth Analysis Data

Company	A	B	C
Earnings per share	\$3.00	\$4.00	\$5.00
Dividends per share	1.50	1.00	2.00
Return on equity	14%	12%	10%

Calculate the sustainable growth rate for each company.

Answer:

$$RR = 1 - (\text{dividends} / \text{earnings})$$

$$\text{Company A: } RR = 1 - (1.50 / 3.00) = 0.500$$

$$\text{Company B: } RR = 1 - (1.00 / 4.00) = 0.750$$

$$\text{Company C: } RR = 1 - (2.00 / 5.00) = 0.600$$

$$g = RR \times ROE$$

$$\text{Company A: } g = 0.500 \times 14\% = 7.0\%$$

$$\text{Company B: } g = 0.750 \times 12\% = 9.0\%$$

$$\text{Company C: } g = 0.600 \times 10\% = 6.0\%$$

LOS 38.d: Calculate and interpret the various components of the company's return on equity using the original and extended DuPont systems and a company's financial ratios relative to its industry, to the aggregate economy, and to the company's own performance over time.

The DuPont system of analysis is an approach that can be used to analyze return on equity (ROE). It uses basic algebra to breakdown ROE into a function of different ratios, so an analyst can see the impact of leverage, profit margins, and turnover on shareholder returns. There are two variants of the DuPont system: the original three-part approach and the extended five-part system.

For the original approach, start with ROE defined as:

$$\text{return on equity} = \left( \frac{\text{net income}}{\text{equity}} \right)$$

Note that there are two subtle differences between this ROE measure and the ROE defined previously. First, the numerator does not subtract preferred dividends as our review did when ROE was first defined. Second, the common equity figure that is typically used is not average equity, but simply end-of-year equity.

Multiplying ROE by sales/sales and rearranging terms produces:

$$\text{return on equity} = \left( \frac{\text{net income}}{\text{sales}} \right) \left( \frac{\text{sales}}{\text{equity}} \right)$$

The first term is the profit margin and the second term is the equity turnover:

$$\text{return on equity} = \left( \frac{\text{net profit}}{\text{margin}} \right) \left( \frac{\text{equity}}{\text{turnover}} \right)$$

We can expand this further by multiplying these terms by assets/assets, and rearranging terms:

$$\text{return on equity} = \left( \frac{\text{net income}}{\text{sales}} \right) \left( \frac{\text{sales}}{\text{assets}} \right) \left( \frac{\text{assets}}{\text{equity}} \right)$$

*Professor's Note:* For the exam, remember that  $(\text{net income} / \text{sales}) \times (\text{sales} / \text{assets}) = \text{return on assets (ROA)}$ .

The first term is still the profit margin, the second term is now asset turnover, and the third term is now an equity multiplier that will increase as the use of debt financing increases:

$$\text{return on equity} = \left( \frac{\text{net profit}}{\text{margin}} \right) \left( \frac{\text{asset}}{\text{turnover}} \right) \left( \frac{\text{equity}}{\text{multiplier}} \right)$$

This is the original DuPont equation. It is arguably the most important equation in ratio analysis, since it breaks down a very important ratio (ROE) into three key components. If ROE is relatively low, it must be that at least one of the following is true: the company has a poor profit margin, the company has poor asset turnover, or the firm has too little leverage.

*Professor's Note:* Often candidates get confused and think that the DuPont method is a way to calculate ROE. While you can calculate ROE given the components of either the original or extended DuPont equations, this isn't necessary if you have the financial statements. If you have net income and equity, you can calculate ROE. The DuPont method is a way to decompose ROE to better see what changes are driving the changes in ROE.

**Example: Decomposition of ROE with original DuPont**

Staret Inc. has maintained a stable and relatively high ROE of approximately 18% over the last 3 years. Use traditional DuPont analysis to decompose this ROE into its three components and comment on trends in company performance.

<i>Staret Inc. Selected Balance Sheet and Income Statement Items (Millions)</i>			
Year	2003	2004	2005
Net Income	21.5	22.3	21.9
Sales	305	350	410
Equity	119	124	126
Assets	230	290	350

**Answer:**

$$\text{ROE 2003: } \frac{21.5}{119} = 18.1\%; \text{ 2004: } \frac{22.3}{124} = 18\%; \text{ 2005: } \frac{21.9}{126} = 17.4\%$$

$$\text{DuPont 2003: } 7\% \times 1.32 \times 1.93$$

$$\text{2004: } 6.4\% \times 1.21 \times 2.34$$

$$\text{2005: } 5.3\% \times 1.17 \times 2.78$$

(some rounding in values)

While the ROE has dropped only slightly, both the total asset turnover and the net profit margin have declined. The effects of declining net margins and turnover on ROE have been offset by a significant increase in leverage. The analyst should be concerned about the net margin and find out what combination of pricing pressure and/or increasing expenses have caused this. Also, the analyst must note that the company has become more risky due to increased debt financing.

**Example: Computing ROE using original DuPont**

A company has a net profit margin of 4%, asset turnover of 2.0, and a debt-to-assets ratio of 60%. What is the ROE?

**Answer:**

Debt-to-assets = 60%, which means equity to assets is 40%; this implies assets over equity of  $1 / 0.4 = 2.5$

$$\text{ROE} = \left( \frac{\text{net profit}}{\text{margin}} \right) \left( \frac{\text{total asset}}{\text{turnover}} \right) \left( \frac{\text{assets}}{\text{equity}} \right) = (0.04)(2.00)(2.50) = 0.20, \text{ or } 20\%$$

The **extended DuPont equation** takes the net profit margin and breaks it down further. The numerator of the net profit margin is net income. Since net income is equal to earnings before taxes multiplied by 1 minus the tax rate  $(1 - t)$ , the DuPont equation can be written as:

$$ROE = \left( \frac{\text{earnings before tax}}{\text{sales}} \right) \left( \frac{\text{sales}}{\text{assets}} \right) \left( \frac{\text{assets}}{\text{equity}} \right) (1 - t)$$

Earnings before tax is simply EBIT minus interest expense. If this substitution is made, the equation becomes:

$$ROE = \left[ \left( \frac{EBIT}{\text{sales}} \right) \left( \frac{\text{sales}}{\text{assets}} \right) - \left( \frac{\text{interest expense}}{\text{assets}} \right) \right] \left( \frac{\text{assets}}{\text{equity}} \right) (1 - t)$$

The first term is the operating profit margin. The second term is the asset turnover. The third term is new and is called the interest expense rate. The fourth term is the same leverage multiplier defined in the traditional DuPont equation, and the fifth term,  $(1 - t)$ , is called the tax retention rate. The equation can now be stated as:

$$ROE = \left[ \left( \frac{\text{operating profit margin}}{\text{margin}} \right) \left( \frac{\text{total asset turnover}}{\text{turnover}} \right) - \left( \frac{\text{interest expense rate}}{\text{rate}} \right) \right] \left( \frac{\text{financial leverage multiplier}}{\text{multiplier}} \right) \left( \frac{\text{tax retention rate}}{\text{rate}} \right)$$

Note that in general, high profit margins, leverage, and asset turnover will lead to high levels of ROE. However, this version of the formula shows that more leverage *does not always* lead to higher ROE. As leverage rises, so does the interest expense rate. Hence, the positive effects of leverage can be offset by the higher interest payments that accompany more debt. Note that higher taxes will always lead to lower levels of ROE.

#### Example: Extended DuPont analysis

An analyst has gathered data from two companies in the same industry. Calculate the ROE for both companies and use the extended DuPont analysis to explain the critical factors that account for the differences in the two companies' ROEs.

Figure 3: Selected Income and Balance Sheet Data

	Company A	Company B
Revenues	\$500	\$900
Operating income	35	100
Interest expense	5	0
Income before taxes	30	100
Taxes	10	40
Net income	20	60
Total assets	250	300
Total debt	100	50
Owners' equity	\$150	\$250

Answer:

Operating margin = operating income / sales

Company A: operating margin =  $35 / 500 = 7.0\%$ Company B: operating margin =  $100 / 900 = 11.1\%$ 

Asset turnover = sales / assets

Company A: asset turnover =  $500 / 250 = 2.0$ Company B: asset turnover =  $900 / 300 = 3.0$ 

Interest expense rate = interest expense / assets

Company A: interest expense rate =  $5 / 250 = 2.0\%$ Company B: interest expense rate =  $0 / 300 = 0\%$ 

Financial leverage = assets / equity

Company A: financial leverage =  $250 / 150 = 1.67$ Company B: financial leverage =  $300 / 250 = 1.2$ 

Income tax rate = taxes / pretax income

Company A: income tax rate =  $10 / 30 = 33.3\%$ Company B: income tax rate =  $40 / 100 = 40.0\%$ 

$$\text{ROE} = \left[ \left( \begin{array}{c} \text{operating} \\ \text{profit} \\ \text{margin} \end{array} \right) \left( \begin{array}{c} \text{total} \\ \text{asset} \\ \text{turnover} \end{array} \right) - \left( \begin{array}{c} \text{interest} \\ \text{expense} \\ \text{rate} \end{array} \right) \right] \left( \begin{array}{c} \text{financial} \\ \text{leverage} \\ \text{multiplier} \end{array} \right) \left( \begin{array}{c} \text{tax} \\ \text{retention} \\ \text{rate} \end{array} \right)$$

- Company A:  $\text{ROE} = (7.0\% \times 2.0 - 2.0\%) \times 1.67 \times (1 - 33.3\%) = 13.4\%$

- Company B:  $\text{ROE} = (11.1\% \times 3.0 - 0\%) \times 1.2 \times (1 - 40\%) = 24.0\%$

Asset turnover for Company B is much higher, which is the main reason that its ROE is higher. Profit margin is also a contributing factor. Company B's ROE is higher despite the fact that it is using less leverage.

*Professor's Note: There are other variants of the DuPont system. Candidates would be wise to forget about them for testing purposes. The two variants presented here are the equations that candidates will be expected to remember for the exam.*

#### Example: Ratio computation and analysis

Figure 4 shows a balance sheet for a company for this year and the previous year. Figure 5 shows its income statement for the current year.



Figure 4: Sample Balance Sheet

Year	Current year	Previous year
<b>Assets</b>		
Cash	\$105	\$95
Receivables	205	195
Inventories	310	290
<b>Total current assets</b>	<b>620</b>	<b>580</b>
Gross property, plant, and equipment	\$1,800	\$1,700
Accumulated depreciation	360	340
Net property, plant, and equipment	1,440	1,360
<b>Total assets</b>	<b>\$2,060</b>	<b>\$1,940</b>
<b>Liabilities</b>		
Payables	\$110	\$90
Short-term debt	160	140
Current portion of long-term debt	55	45
<b>Current liabilities</b>	<b>\$325</b>	<b>\$275</b>
Long-term debt	\$610	\$690
Deferred taxes	105	95
Common stock	300	300
Additional paid in capital	400	400
Retained earnings	320	180
Common shareholders equity	1,020	880
<b>Total liabilities and equity</b>	<b>\$2,060</b>	<b>\$1,940</b>

Figure 5: Sample Income Statement

Year	Current year
<b>Sales</b>	<b>\$4,000</b>
Cost of goods sold	3,000
Gross profit	\$1,000
Operating expenses	650
Operating profit	350
Interest expense	50
Earnings before taxes	300
Taxes	100
Net income	200
Common dividends	\$60

Using the company information in Figures 4, 5, and 6, calculate the current year ratios. Discuss how these ratios compare with the company's performance last year and with the industry's performance.

Figure 6: Financial Ratio Template

	Current Year	Last Year	Industry
Current ratio		2.1	1.5
Quick ratio		1.1	0.9
Receivables collection period		18.9	18.0
Inventory turnover		10.7	12.0
Total asset turnover		2.3	2.4
Equity turnover		4.8	4.0
Gross profit margin		27.4%	29.3%
Net profit margin		5.8%	6.5%
Return on capital		13.3%	15.6%
Return on common equity		24.1%	19.8%
Debt-to-equity		78.4%	35.7%
Interest coverage		5.9	9.2
Cash flow-to-long-term debt		35.1%	45.3%
Retention rate		50.0%	43.6%
Sustainable growth rate		12.0%	8.6%

Answer:

- Current ratio =  $\frac{\text{current assets}}{\text{current liabilities}}$

$$\text{current ratio} = \frac{620}{325} = 1.9$$

The current ratio indicates lower liquidity levels when compared to last year and more liquidity than the industry average.

- Quick ratio =  $\frac{\text{cash} + \text{receivables}}{\text{current liabilities}}$

$$\text{quick ratio} = \frac{(105 + 205)}{325} = 0.95$$

The quick ratio is lower than last year and is in line with the industry average.

- Average collection period =  $\frac{365}{\text{sales} / \text{average receivables}}$

$$\text{average collection period} = \frac{365}{4,000 / [(205 + 195) / 2]} = 18.25$$

The average collection period is a bit lower relative to the company's past performance but slightly higher than the industry average.

- Inventory turnover =  $\frac{\text{cost of goods sold}}{\text{average inventories}}$

$$\text{inventory turnover} = \frac{3,000}{(310 + 290) / 2} = 10.0$$

The inventory turnover is much lower than last year and the industry average. This suggests that the company is not managing inventory efficiently and may have obsolete stock.

- Total asset turnover =  $\frac{\text{sales}}{\text{average assets}}$

$$\text{total asset turnover} = \frac{4,000}{(2,060 + 1,940) / 2} = 2.0$$

The total asset turnover is slightly lower than last year and the industry average.

- Equity turnover =  $\frac{\text{sales}}{\text{average equity}}$

$$\text{equity turnover} = \frac{4,000}{(1,020 + 880) / 2} = 4.2$$

The equity turnover is lower than last year, but still above the industry average.

- Gross profit margin =  $\frac{\text{gross profit}}{\text{net sales}}$

$$\text{gross profit margin} = \frac{1,000}{4,000} = 25.0\%$$

The gross profit margin is lower than last year and much lower than the industry average.

- Net profit margin =  $\frac{\text{net income}}{\text{net sales}}$

$$\text{net profit margin} = \frac{200}{4,000} = 5.0\%$$

The net profit margin is lower than last year and much lower than the industry average.

- Return on capital =  $\frac{\text{net income} + \text{interest expense}}{\text{average total capital}}$

$$\text{return on capital} = \frac{200 + 50}{(2,060 + 1,940) / 2} = 12.5\%$$

The return on capital is below last year and below the industry average. This suggests a problem stemming from the low asset turnover and low profit margin.

- Return on common equity =  $\frac{\text{net income} - \text{preferred dividends}}{\text{average owners' equity}}$

$$\text{return on common equity} = \frac{200}{(1,020 + 880) / 2} = 21.1\%$$

The return on equity is lower than last year but better than the industry average. The reason it is higher than the industry average is probably because of greater use of leverage.

- Debt-to-equity ratio =  $\frac{\text{long-term debt (not including deferred taxes)}}{\text{total equity}}$

$$\text{debt-to-equity ratio} = \frac{610}{1,020} = 59.8\%$$

Note that this calculation assumes that deferred taxes are not part of long-term debt.

The debt-to-equity ratio is lower than last year but still much higher than the industry average. This suggests the company is trying to get its debt level more in line with the industry.

- Interest coverage =  $\frac{\text{net income} + \text{income taxes} + \text{interest expense}}{\text{interest expense}}$

$$\text{interest coverage} = \frac{200 + 100 + 50}{50} = 7.0$$

The interest coverage is better than last year but still worse than the industry average. This, along with the slip in profit margin and return on assets, might cause some concern.

- Cash flow-to-long-term debt =

$$\frac{\left( \begin{array}{c} \text{net} \\ \text{income} \end{array} \right) + \text{depreciation} + \left( \begin{array}{c} \text{increase in} \\ \text{deferred taxes} \end{array} \right) - \left( \begin{array}{c} \text{increase in} \\ \text{receivables} \end{array} \right) - \left( \begin{array}{c} \text{increase in} \\ \text{inventories} \end{array} \right) + \left( \begin{array}{c} \text{increase in} \\ \text{payables} \end{array} \right)}{\text{long-term debt (not including deferred taxes)}}$$

$$\text{cash flow-to-long-term debt} = \frac{200 + 20 + 10 - 10 - 20 + 20}{610} = 36.1\%$$

The cash flow to long-term debt ratio is better than last year but much worse than the industry average. This should concern an analyst.

- Retention rate =  $1 - \frac{\text{dividends}}{\text{earnings}}$

$$\text{retention rate} = 1 - \frac{60}{200} = 70\%$$

The retention rate is much higher than last year and much higher than the industry. This might suggest that the company is aware of its cash flow and earnings issues and is reinvesting cash into the company to improve the ratios.

- $ROE = \frac{\text{net income}}{\text{equity}}$

$$ROE = \frac{200}{1,020} = 0.196, \text{ or } 19.6\%$$

- Sustainable growth rate,  $g = \text{retention rate} \times ROE$

$$\text{sustainable growth rate} = 0.7 \times 0.196 = 0.137, \text{ or } 13.7\%$$

With the high retention rate and good ROE, the company is positioned to grow at a faster rate than last year and faster than the rest of the industry.

*Summary:* The company has average liquidity. However, performance figures suggest that earnings have declined, and turnover has worsened. Coverage ratios have slipped a bit, which might cause some concern, particularly for lenders.

*Professor's Note:* We used the end-of-year equity to calculate ROE when calculating the sustainable growth rate. Be aware that the ROE is calculated by different analysts and for different purposes using NI divided by beginning, ending, or average equity. On the CFA exam you will likely be given guidance on which to use if the choice affects the answer.

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## KEY CONCEPTS

1. A common-size balance sheet expresses all balance sheet accounts as a percentage of total assets. A common-size income statement expresses all income statement items as a percentage of sales.
2. Ratios are valid only in a relative context—when compared to other firms, industry averages, economic averages, or the firm's ratios from prior periods.
3. Ratios can be divided into four types—internal liquidity, operating performance, risk analysis, and growth potential.
  - Internal liquidity ratios indicate the company's ability to pay its short-term obligations. An average amount for balance sheet accounts is used in the denominator.
  - Operating performance ratios include two categories: operating efficiency ratios (various turnover ratios) and operating profitability (various margin ratios).
  - Risk analysis ratios address two types of risk: business risk (resulting from variability in sales and operating costs) and financial risk (volatility resulting from the use of debt).
  - Growth analysis ratios indicate the company's ability to pay future obligations. The calculation of the sustainable growth rate is  $g = RR \times ROE$ , where  $RR = \text{retention rate} = 1 - (\text{dividends declared} / \text{after-tax operating income})$  and ROE is return on equity.
4. The original DuPont equation is:

$$\text{return on equity} = \left( \frac{\text{net income}}{\text{sales}} \right) \left( \frac{\text{sales}}{\text{assets}} \right) \left( \frac{\text{assets}}{\text{equity}} \right)$$

The extended DuPont equation is:

$$ROE = \left[ \left( \frac{EBIT}{\text{sales}} \right) \left( \frac{\text{sales}}{\text{assets}} \right) - \left( \frac{\text{interest expense}}{\text{assets}} \right) \right] \left( \frac{\text{assets}}{\text{equity}} \right) (1 - t)$$

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**CONCEPT CHECKERS: ANALYSIS OF FINANCIAL STATEMENTS**


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1. To study trends in a firm's cost of goods sold (COGS), the analyst should standardize the cost of goods sold numbers to a common-sized basis by dividing COGS by:
  - A. assets.
  - B. sales.
  - C. net income.
  - D. the prior year's COGS.
  
2. A company's current ratio is 1.9. If some of the accounts payable are paid off from the cash account, the:
  - A. numerator and the current ratio would remain unchanged.
  - B. numerator would decrease more than the denominator, resulting in a lower current ratio.
  - C. denominator would decrease more than the numerator, resulting in a higher current ratio.
  - D. numerator and denominator would decrease proportionally, leaving the current ratio unchanged.
  
3. A company's quick ratio is 1.2. If inventory were purchased for cash, the:
  - A. numerator and the quick ratio would remain unchanged.
  - B. numerator would decrease more than the denominator, resulting in a lower quick ratio.
  - C. denominator would decrease more than the numerator, resulting in a higher quick current ratio.
  - D. numerator and denominator would decrease proportionally, leaving the current ratio unchanged.
  
4. All other things held constant, which of the following transactions will *increase* a firm's current ratio if the ratio is greater than one?
  - A. Accounts receivable are collected and the funds received are deposited in the firm's cash account.
  - B. Fixed assets are purchased from the cash account.
  - C. Accounts payable are paid with funds from the cash account.
  - D. Inventory is purchased on account.
  
5. RGB, Inc.'s income statement indicates cost of goods sold of \$100,000. The balance sheet shows an average accounts payable balance of \$12,000. What is RGB's payables payment period?
  - A. 28 days.
  - B. 37 days.
  - C. 44 days.
  - D. 52 days.
  
6. RGB, Inc. has a gross profit of \$45,000 on sales of \$150,000. The balance sheet shows average total assets of \$75,000 with an average inventory balance of \$15,000. What are RGB's total asset turnover and inventory turnover?
 

<u>Asset Turnover</u>	<u>Inventory Turnover</u>
A. 7.00 times	2.00 times
B. 2.00 times	7.00 times
C. 0.50 times	0.33 times
D. 10.00 times	0.60 times
  
7. If RGB, Inc. has annual sales of \$100,000, average accounts payable of \$30,000, and average accounts receivable of \$25,000, what is RGB's receivables turnover and average collection period?
 

<u>Receivables Turnover</u>	<u>Average Collection Period</u>
A. 1.8 times	203 days
B. 2.1 times	174 days
C. 3.3 times	111 days
D. 4.0 times	91 days

8. RGB, Inc.'s receivable turnover is 10 times, the inventory turnover is 5 times, and the payables turnover is 9 times. RGB's cash conversion cycle is:
- A. 69 days.
  - B. 104 days.
  - C. 150 days.
  - D. 170 days.
9. RGB, Inc.'s income statement shows sales of \$1,000, cost of goods sold of \$400, pre-interest operating expense of \$300, and interest expense of \$100. RGB's interest coverage ratio is:
- A. 1 times.
  - B. 2 times.
  - C. 3 times.
  - D. 4 times.
10. Return on equity using the traditional DuPont formula equals:
- A. (net profit margin) (interest component) (solvency ratio).
  - B. (net profit margin) (total asset turnover) (tax retention rate).
  - C. (net profit margin) (total asset turnover) (financial leverage multiplier).
  - D. (tax rate) (interest expense rate) (financial leverage multiplier).
11. RGB, Inc. has a net profit margin of 12%, a total asset turnover of 1.2 times, and a financial leverage multiplier of 1.2 times. RGB's return on equity is:
- A. 12.0%.
  - B. 14.2%.
  - C. 17.3%.
  - D. 18.9%.
12. Use the following information for RGB, Inc.:
- EBIT/sales = 10%
  - Tax retention rate = 60%
  - Sales/assets = 1.8 times
  - Current ratio = 2 times
  - Interest/assets = 2%
  - Assets/equity = 1.9 times
- What is RGB, Inc.'s return on equity?
- A. 10.50%.
  - B. 11.32%.
  - C. 12.16%.
  - D. 18.24%.
13. All of the following equations represent return on equity EXCEPT:
- A. (net profit margin)(equity turnover).
  - B. (net profit margin)(total asset turnover)(assets/equity).
  - C. (ROA)(interest burden)(tax retention rate).
  - D. [(operating profit margin)(total asset turnover) – interest expense rate] (financial leverage multiplier)(tax retention rate).

14. The percentage change in operating earnings divided by the percentage change in sales is referred to as the:
- coefficient of variation of operating income.
  - coefficient of variation of sales.
  - operating leverage.
  - gross profit margin.
15. A firm has a dividend payout ratio of 40%, a net profit margin of 10%, an asset turnover of 0.9 times, and a financial leverage multiplier of 1.2 times. The firm's sustainable growth rate is *closest* to:
- 5.5%.
  - 6.5%.
  - 7.5%.
  - 8.0%.

Use the following data to answer Questions 16 through 22. (Answers may be rounded off.)

*Alpha Company*

Sales	\$5,000
Cost of goods sold	2,500
Average	
Inventories	\$600
Accounts receivable	450
Working capital	750
Cash	200
Accounts payable	500
Fixed assets	4,750
Total assets	\$6,000
Annual purchases	\$2,400

16. Alpha's inventory turnover is:
- 3.1 times.
  - 4.2 times.
  - 6.3 times.
  - 8.4 times.
17. Alpha's average inventory processing period is:
- 37 days.
  - 44 days.
  - 65 days.
  - 88 days.
18. Alpha's receivables turnover is:
- 11.11 times.
  - 12.12 times.
  - 13.50 times.
  - 15.00 times.



19. Alpha's average collection period:  
A. 25 days.  
B. 30 days.  
C. 33 days.  
D. 45 days.
20. Alpha's payables turnover is:  
A. 4.0 times.  
B. 4.8 times.  
C. 5.0 times.  
D. 10.0 times.
21. Alpha's average days payable is:  
A. 37 days.  
B. 62 days.  
C. 73 days.  
D. 76 days.
22. Alpha's cash conversion cycle is:  
A. 33 days.  
B. 127 days.  
C. 48 days.  
D. 19 days.

Use the following data to answer Questions 23 through 26.

Beta Co. has a loan covenant requiring it to maintain a current ratio of 1.5 or better. As Beta approaches year-end, current assets are \$20 million (\$1 million in cash, \$9 million in accounts receivable and \$10 million in inventory) and current liabilities are \$13.5 million.

23. Beta's current ratio is *closest* to:  
A. 0.675 times.  
B. 1.480 times.  
C. 1.500 times.  
D. 0.740 times.
24. Beta's quick ratio is *closest* to:  
A. 0.675 times.  
B. 0.740 times.  
C. 0.810 times.  
D. 1.480 times.
25. What can Beta Co. do to meet its loan covenant?  
A. Sell \$1 million in inventory and deposit the proceeds in the company's checking account.  
B. Borrow \$1 million short term and deposit the funds in their checking account.  
C. Sell \$1 million in inventory and pay off some of its short-term creditors.  
D. Do nothing at all.

26. If Beta sells \$2 million in inventory on credit, the current ratio will:
- A. increase, and if Beta sells \$1 million in inventory and pays off accounts payable, the quick ratio will remain the same.
  - B. remain the same, and if Beta sells \$1 million in inventory for cash and uses it to reduce accounts payable, the quick ratio will decrease.
  - C. remain the same, and if Beta sells \$1 million in inventory for cash and uses it to reduce accounts payable, the quick ratio will increase.
  - D. increase, and if Beta sells \$1 million in inventory and pays off accounts payable, the quick ratio will increase.
27. Paragon Co. has an operating profit margin (EBIT/S) of 11%; an asset turnover (S/A) of 1.2; a financial leverage multiplier (A/E) of 1.5 times; an average tax rate of 35%; and an interest expense rate (I/A) of 4%. Which number is *closest* to Paragon's return on equity?
- A. 0.09.
  - B. 0.10.
  - C. 0.11.
  - D. 0.12.
28. Paragon Co. has the following information:
- Interest expense ratio (I/assets) of 10%.
  - Current ratio of 1.8.
  - Tax retention rate ( $1 - t$ ) of 70%.
  - Effective tax rate of 30%; a leverage ratio (A/E) of 2 times.
  - Debt-to-equity ratio of 1.
  - Total asset turnover of 1.2 times.
  - Operating profit margin of 12%.
- What is Paragon's return on equity?
- A. 5.7%.
  - B. 6.2%.
  - C. 6.7%.
  - D. 3.0%.
29. In 1993, RGB, Inc.'s operating profit margin (EBIT/S) was 15%; total asset turnover (S/A) was 1 times; financial leverage multiplier (A/E) was 2 times; tax retention rate was 70%; and interest expense rate (I/A) was 7%. In 2003, RGB's operating profit margin was 10%; total asset turnover was 1.5 times; financial leverage multiplier was 2 times; tax retention rate was 70%; interest expense rate was 7%. Which statement is **TRUE**?
- A. Return on equity increased because the firm's asset turnover increased.
  - B. Return on equity fell because the firm's profit margin fell.
  - C. Return on equity remained constant because the fall in profits offset the increase in sales.
  - D. Return on equity remained constant because the increase in profits offset the decrease in sales.

30. Given the following ten ratios:
- |                     |                       |
|---------------------|-----------------------|
| 1. Debt-to-equity   | 6. Interest-to-assets |
| 2. $1 - t$          | 7. EBT-to-EBIT        |
| 3. EAT-to-EBT       | 8. EBT-to-EAT         |
| 4. CA-to-CL         | 9. EBIT-to-sales      |
| 5. Assets-to-equity | 10. Sales-to-assets   |

Using their corresponding numbers, which combination of five will give the firm's ROE?

- A.  $[(9)(4) + (7)](5)(6)$ .  
B.  $[(1 + 3 + 5)(7)] - (9)$ .  
C.  $[(9)(10) - (6)](5)(2)$ .  
D.  $(3)(5)(6)(9)(10)$ .

## ANSWERS – CONCEPT CHECKERS: ANALYSIS OF FINANCIAL STATEMENTS

1. B With a common-size income statement, all income statement accounts are divided by sales.
2. C  $CR = (\text{cash} + AR + \text{inv}) / AP$ . If cash and AP decrease by the same amount and the CR is  $> 1$ , then the denominator falls faster than the numerator and the current ratio increases.
3. B Quick ratio  $= (\text{cash} + AR) / AP$ . If cash decreases, the quick ratio will also decrease. The denominator is unchanged.
4. C Current ratio  $= \text{current assets} / \text{current liabilities}$ . If CR is  $> 1$ , then if CA and CL both fall, the overall ratio will increase.
5. C Payables turnover  $= (\text{COGS} / \text{avg. AP}) = 100 / 12 = 8.33$ . Payables payment period  $= 365 / 8.33 = 43.8$  days
6. B  $TAT = (\text{sales} / \text{total assets}) = 150 / 75 = 2$  times  
inventory turnover  $= (\text{COGS} / \text{avg. inventory}) = (150 - 45) / 15 = 7$  times
7. D  $RT = (S / \text{avg. AR}) = 100 / 25 = 4$   
 $CP = 365 / 4 = 91.25$  days
8. A  $(365 / 10 + 365 / 5 - 365 / 9) = 69$  days
9. C  $ICR = \text{EBIT} / I = (1000 - 400 - 300) / 100 = 3$  times
10. C This is the correct formula for the three-ratio DuPont model for ROE.
11. C  $\text{return on equity} = \left( \frac{\text{net income}}{\text{sales}} \right) \left( \frac{\text{sales}}{\text{assets}} \right) \left( \frac{\text{assets}}{\text{equity}} \right) = (0.12)(1.2)(1.2) = 0.1728 = 17.28\%$
12. D  $\text{ROE} = [(\text{EBIT} / S)(S / A) - (I / A)](A / \text{EQ})(1 - t) = [(0.1)(1.8) - (0.02)](1.9)(0.6) = 0.1824 = 18.24\%$
13. C (ROA)(interest burden)(tax retention rate) is not one of the DuPont models for calculating ROE.
14. C The percentage change in operating earnings divided by the percentage change in sales is referred to as the operating leverage.
15. B  $g = (\text{retention rate})(\text{ROE})$ , return on equity  $= \left( \frac{\text{net profit}}{\text{margin}} \right) \left( \frac{\text{asset}}{\text{turnover}} \right) \left( \frac{\text{equity}}{\text{multiplier}} \right) = (0.1)(0.9)(1.2) = 0.108$ ,  
 $g = (1 - 0.4)(0.108) = 6.5\%$
16. B inventory turnover  $= \text{COGS} / \text{avg. inventory} = 2500 / 600 = 4.167$  times
17. D average inventory processing period  $= 365 / \text{inventory turnover} = 365 / 4.167 = 87.6$  days
18. A receivables turnover  $= \text{sales} / \text{avg. account receivable} = 5,000 / 450 = 11.11$  times
19. C average collection period  $= 365 / \text{receivables turnover} = 365 / 11.11 = 32.85$  days
20. C payables turnover  $= \text{COGS} / \text{avg. payables} = 2,500 / 500 = 5$  times
21. C average days payable  $= 365 / \text{payables turnover} = 365 / 5 = 73$  days

22. C  $\text{cash conversion cycle} = \left( \frac{\text{average receivables}}{\text{collection period}} \right) + \left( \frac{\text{average inventory}}{\text{processing period}} \right) - \left( \frac{\text{payables payment period}}{\text{period}} \right) = 33 + 88 - 73 = 48 \text{ days}$
23. B  $\text{current ratio} = \frac{\text{current assets}}{\text{current liabilities}} = [(1 + 9 + 10) / 13.5] = 20 / 13.5 = 1.48 \text{ times}$
24. B  $\text{quick ratio} = \frac{\text{cash} + \text{marketable securities} + \text{receivables}}{\text{current liabilities}} = (1 + 9) / 13.5 = 10 / 13.5 = 0.74 \text{ times}$
25. C This transaction would increase the current ratio:  $(20 - 1) / (13.5 - 1) = 19 / 12.5 = 1.52$ . Selling \$1 million in inventory and depositing the proceeds in the company's checking account would leave the ratio unchanged:  $(20 + 1 - 1) / 13.5 = 1.48$ . Borrowing \$1 million short term and depositing the funds in their checking account would decrease the current ratio:  $(20 + 1) / (13.5 + 1) = 21 / 14.5 = 1.45$ .
26. C If inventory goes down and receivables rise by the same amount, the numerator would be unchanged.  $QR = (\text{cash} + AR) / AP$ . AP will decrease without any change to the numerator, thus increasing the overall ratio.
27. A  $ROE = [(EBIT / S)(S / A) - (I / A)](A / E)(1 - t) = [(0.11)(1.2) - (0.04)](1.5)(0.65) = 0.0897$
28. B  $ROE = [(0.12)(1.2) - (0.1)](2)(0.7) = 0.0616 = 6.16\%$
29. C 1993  $ROE = [(0.15)(1) - (0.07)](2)(0.7) = 0.112$  and 2003  $ROE = [(0.10)(1.5) - (0.07)](2)(0.7) = 0.112$
30. C The correct formula for the extended DuPont model for calculating ROE is:  
 $[(EBIT / \text{sales})(\text{sales} / \text{assets}) - (I / \text{assets})](\text{assets} / \text{equity})(1 - t)$

# DILUTIVE SECURITIES AND EARNINGS PER SHARE

Study Session 8

## EXAM FOCUS

The amount of income a company earns for every share of common stock it has outstanding, or EPS, is the standard for reporting company earnings. Companies with a complex capital structure have securities such as warrants or convertible bonds that can increase the number of shares of common stock a firm has outstanding without changing earnings, therefore decreasing, or diluting, EPS. Firms with a complex structure will report both basic EPS, which

does not consider dilutive securities, and diluted EPS, which considers dilutive securities. For the Level 1 exam, prepare for basic and diluted EPS calculations. Know how to compute the weighted average number of common shares outstanding, recognize that stock splits and stock dividends do not change the owner's proportionate claim on earnings, and be able to differentiate between dilutive and antidilutive securities.

LOS 39.a: Differentiate between simple and complex capital structures for purposes of calculating earnings per share (EPS), describe the components of EPS, and calculate a company's EPS in a simple capital structure.

**Earnings per share (EPS)** is one of the most commonly used corporate profitability performance measures for publicly traded firms (nonpublic companies are not required to report EPS data).

EPS is only reported for shares of common stock. The disclosure requirements are set forth in SFAS 128 and SFAS 129. Basically, a company must:

- Report EPS for all components of net income.
- Reconcile basic EPS and diluted EPS numerators and denominators.

A company may have either a simple or complex capital structure:

- A **simple capital structure** is one that contains *no* potentially dilutive securities. A simple capital structure contains only common stock, nonconvertible debt, and preferred stock.
- A **complex capital structure** contains *potentially dilutive securities* such as options, warrants, or convertible securities.

All firms with complex capital structures must report both *basic* and *diluted* EPS. Firms with simple capital structures report only basic EPS.

Companies that report intermediate components of income (e.g., income from continuing operations, income before extraordinary items) must report EPS amounts for these components in either the income statement or in the notes to the financial statements.

## The Components of EPS and Calculating a Company's EPS in a Simple Capital Structure

The basic EPS calculation *does not* consider the effects of any dilutive securities in the computation of EPS.

$$\text{basic EPS} = \frac{\text{net income} - \text{preferred dividends}}{\text{weighted average number of common shares outstanding}}$$

The current year's preferred dividends are subtracted from net income because EPS refers to the per-share earnings *available to common shareholders*. Net income minus preferred dividends is the income available to common stockholders. Common stock dividends are *not* subtracted from net income because they are a part of the net income available to common shareholders.

**LOS 39.b:** Calculate a company's weighted average number of shares outstanding.

The **weighted average number of common shares** is the number of shares outstanding during the year weighted by the portion of the year they were outstanding.

**Example:** Effect of stock dividends

During 2006, R & J, Inc., had net income of \$100,000, paid dividends of \$50,000 to its preferred stockholders, and paid \$30,000 in dividends to its common shareholders. R & J's common stock account showed the following:

01/01/06	Shares issued and outstanding at the beginning of the year	10,000
04/01/06	Shares issued	4,000
07/01/06	10% stock dividend	
09/01/06	Shares repurchased for the treasury	3,000

Compute the weighted average number of common shares outstanding during 2006, and compute EPS.

**Answer:**

*Step 1:* Adjust the number of pre-stock dividend shares to their post-stock dividend units to reflect the 10% stock dividend by multiplying all share numbers prior to the stock dividend by 1.1. Shares issued or retired after the stock dividend are not affected.

01/01/06	Initial shares adjusted for the 10% dividend	11,000
04/01/06	Shares issued adjusted for the 10% dividend	4,400
09/01/06	Shares of treasury stock repurchased (no adjustment)	-3,000

*Step 2:* Compute the weighted average number of post-stock dividend shares:

Initial shares	(11,000)(12 months outstanding)	132,000
Issued shares	(4,400)(9 months outstanding)	39,600
Retired treasury shares	(-3,000)(4 months retired)	-12,000
Total share-month		159,600
Average shares	159,600 / 12	13,300

*Step 3:* Compute basic EPS:

$$\text{basic EPS} = \frac{\text{net income} - \text{pref div}}{\text{wt. avg. shares of common}} = \frac{\$100,000 - \$50,000}{13,300} = \$3.76$$

Things to know about the weighted average shares outstanding:

- The weighting system is days outstanding divided by the number of days in a year, but on the exam the monthly approximation method will probably be used.
- Shares issued enter into the computation from the date of issuance.
- Reacquired shares are excluded from the computation from the date of reacquisition.
- Previously reported EPS data is restated to reflect stock splits and dividends.
- Shares sold or issued in a purchase of assets are included from the date of issuance.

#### Example: Weighted average shares and basic EPS

Johnson Company has net income of \$10,000 and paid \$1,000 cash dividends to its preferred shareholders and \$1,750 cash dividends to its common shareholders. At the beginning of the year, there were 10,000 shares of common stock outstanding. 2,000 new shares were issued on July 1. Assuming a simple capital structure, what is Johnson's basic EPS?

**Answer:**

Calculate Johnson's weighted average number of shares.

$$\text{Shares outstanding all year} = 10,000(12) = 120,000$$

$$\text{Shares outstanding 1/2 year} = 2,000(6) = 12,000$$

$$\text{Weighted average shares} = 132,000 / 12 = 11,000 \text{ shares}$$

$$\text{Basic EPS} = \frac{\text{net income} - \text{pref div}}{\text{wt. avg. shares of common}} = \frac{\$10,000 - \$1,000}{11,000} = \$0.82$$

*Professor's Note:* Remember, the payment of a (cash) common stock dividend is not considered in the calculation of EPS.

**LOS 39.c:** Determine the effect of stock dividends and stock splits on a company's weighted average number of shares outstanding.

A stock dividend is the distribution of additional shares to each shareholder in an amount proportional to their current number of shares. If a 10% stock dividend is paid, the holder of 100 shares of stock would receive 10 additional shares.

A stock split refers to the division of each "old" share into a specific number of "new" (post-split) shares. The holder of 100 shares will have 200 shares after a 2-for-1 split or 150 shares after a 3-for-2 split.



The important thing to remember is that each shareholder's proportional ownership in the company is unchanged by either of these events. Each shareholder has more shares but the same percentage of the total shares outstanding.

The weighted average number of common shares is the number of shares outstanding during the year weighted by the portion of the year they were outstanding.

- In computing weighted average number of shares, stock dividends and stock splits are considered to be changes in the number of common shares outstanding, *not* changes in the ownership of earnings. Stock dividends and splits do not change an owner's proportionate claim on the firm's earnings.
- A stock split or dividend is applied to all shares issued prior to the split and to the beginning of period weighted average shares. The split or dividend is *not* applied to any shares that are issued or repurchased after the dividend or split date. One way to keep this clear is to think about shares before the split or stock dividend as "old" shares and shares issued or repurchased after the split or stock dividend date as "new" shares. Since end-of-period shares for calculation of EPS are "new" shares, the retroactive adjustment of all share numbers prior to the split or stock dividend date is translating numbers of "old" shares into their equivalent number of "new" shares.

LOS 39.d: Distinguish between dilutive and antidilutive securities and calculate a company's basic and diluted EPS in a complex capital structure, and describe and determine the effects of convertible securities, options and warrants on a company's EPS.

Before calculating EPS you need to understand the following terms:

- **Dilutive securities** are stock options, warrants, convertible debt, or convertible preferred stock that would *decrease EPS* if exercised or converted to common stock.
- **Antidilutive securities** are securities that would *increase EPS* if exercised or converted to common stock.

### The Effects of Convertible Securities, Options, and Warrants on a Company's EPS

The numerator of the basic EPS equation contains income available to common shareholders (net income less preferred dividends). In the case of dilutive EPS, if there are dilutive securities (e.g., convertible preferred stock, convertible bonds, or warrants) that will cause the weighted average common shares to change, then the numerator must be adjusted for the following:

- If convertible preferred stock is dilutive (meaning EPS will fall if stock is converted), the convertible preferred dividends must be added back to the previously calculated income from continuing operations less preferred dividends.
- If convertible bonds are dilutive, then the bonds' after-tax interest expense would not be considered as an interest expense for diluted EPS. Hence, interest expense multiplied by  $(1 - \tau)$  must be added back to the numerator.

The denominator contains the number of shares of common stock issued, weighted by the days that the shares have been outstanding. A share outstanding all year is counted as one share. But a share outstanding for only a third of a year is counted as a third of a share.

The basic EPS denominator is the weighted average number of shares. When considering dilutive securities, the denominator is the basic EPS denominator adjusted for the equivalent number of common shares created by the conversion of all outstanding dilutive securities (convertible bonds, convertible preferred shares, warrants, and options). If a dilutive security was issued during the year, the increase in the weighted average number of shares for diluted EPS is based on only the portion of the year the dilutive security was outstanding.

*Dilutive stock options and/or warrants* increase the number of common shares outstanding in the denominator for diluted EPS. There is no adjustment to net income in the numerator.

- Stock options and warrants are dilutive only when their exercise price is less than the average market price of the stock over the year.
- Use the *treasury stock method* (discussion follows) to calculate the adjustment to the number of shares in the denominator.
- If there are restrictions on the proceeds received when warrants are exercised (e.g., must be used to retire debt), then dilutive EPS calculations must reflect the results of those agreements.

### The Treasury Stock Method

- The treasury stock method assumes that the hypothetical funds received by the company from the exercise of the options are used to purchase shares of the company's common stock in the market at the average market price.
- The treasury stock method reduces the total increase in shares created from the hypothetical exercise of the options into common stock.
- The net increase in the number of shares outstanding (the adjustment to the denominator) will be the number of shares created by exercising the options less the number of shares repurchased with the proceeds of exercise.

The **diluted EPS equation** (assuming convertible securities are dilutive) is:

$$\text{diluted EPS} = \frac{\text{adjusted income available for common shares}}{\text{weighted-average common and potential common shares outstanding}}$$

where adjusted income available for common shares is:

$$\begin{aligned} & \text{Net income} - \text{preferred dividends} \\ & + \text{Dividends on convertible preferred stock} \\ & + \text{After-tax interest on convertible debt} \\ & \hline & \text{Adjusted income available for common shares} \end{aligned}$$

Therefore, diluted EPS is:

$$\text{diluted EPS} = \frac{\left[ \begin{array}{c} \text{net income} - \text{preferred} \\ \text{dividends} \end{array} \right] + \left[ \begin{array}{c} \text{convertible} \\ \text{preferred} \\ \text{dividends} \end{array} \right] + \left( \begin{array}{c} \text{convertible} \\ \text{debt} \\ \text{interest} \end{array} \right) (1 - t)}{\left( \begin{array}{c} \text{weighted} \\ \text{average} \\ \text{shares} \end{array} \right) + \left( \begin{array}{c} \text{shares from} \\ \text{conversion of} \\ \text{conv. pfd. shares} \end{array} \right) + \left( \begin{array}{c} \text{shares from} \\ \text{conversion of} \\ \text{conv. debt} \end{array} \right) + \left( \begin{array}{c} \text{shares} \\ \text{issuable from} \\ \text{stock options} \end{array} \right)}$$

Remember, each potentially dilutive security must be examined separately to determine if it is actually dilutive (would reduce EPS if converted to common stock). The effect of conversion to common is only included in the calculation of diluted EPS for a given security if it is in fact dilutive.

Sometimes in an acquisition there will be a provision that the shareholders of the acquired company will receive additional shares of the acquiring firm's stock if certain performance targets are met. These *contingent shares* should be included in the calculation of diluted EPS if the target has been met as of the end of the reporting period.

## Basic and Diluted EPS in a Complex Capital Structure

### Example 1: EPS with convertible debt

During 2006, ZZZ Corp. reported net income of \$115,600 and had 200,000 shares of common stock outstanding for the entire year. ZZZ also had 1,000 shares of 10%, par \$100 preferred stock outstanding during 2006. During 2005, ZZZ issued 600, \$1,000 par, 7% bonds for \$600,000 (issued at par). Each of these bonds is convertible to 100 shares of common stock. The tax rate is 40%. Compute the 2006 basic and diluted EPS.

**Answer:**

*Step 1:* Compute 2006 basic EPS:

$$\text{basic EPS} = \frac{\$115,600 - \$10,000}{200,000} = \$0.53$$

*Step 2:* Calculate diluted EPS:

- Compute the increase in common stock outstanding if the convertible debt is converted to common stock at the beginning of 2006:

$$\text{shares issuable for debt conversion} = (600)(100) = 60,000 \text{ shares}$$

- If the convertible debt is considered converted to common stock at the beginning of 2006, then there would be no interest expense related to the convertible debt. Therefore, it is necessary to increase ZZZ's after-tax net income for the after-tax effect of the decrease in interest expense:

$$\text{increase in income} = [(600)(\$1,000)(0.07)] (1 - 0.40) = \$25,200$$

- Compute diluted EPS as if the convertible debt were common stock:

$$\text{diluted EPS} = \frac{\text{net inc} - \text{pref div} + \text{convert int} (1 - t)}{\text{wt. avg. shares} + \text{convertible debt shares}}$$

$$\text{diluted EPS} = \frac{\$115,600 - \$10,000 + \$25,200}{200,000 + 60,000} = \$0.50$$

- Check to make sure that *diluted EPS is less than basic EPS*. [\$0.50 < \$0.53]. If diluted EPS is more than the basic EPS, the convertible bonds are *antidilutive* and should not be treated as common stock in computing diluted EPS.

A quick way to determine whether the convertible debt is antidilutive is to calculate its per share impact by:

$$\frac{\text{convertible debt interest} (1 - t)}{\text{convertible debt shares}}$$

If this per share amount is greater than basic EPS, the convertible debt is antidilutive and the effects of conversion should not be included when calculating diluted EPS.

If this per share amount is less than basic EPS, the convertible debt is dilutive and the effects of conversion should be included in the calculation of diluted EPS.

For ZZZ:

$$\frac{\$25,200}{60,000} = \$0.42$$

The company's basic EPS is \$0.53, so the convertible debt is dilutive and the effects of conversion should be included in the calculation of diluted EPS.

### Example 2: EPS with convertible preferred stock

During 2006, ZZZ reported net income of \$115,600 and had 200,000 shares of common stock and 1,000 shares of preferred stock outstanding for the entire year. ZZZ's 10%, \$100 par value preferred-stock shares are each *convertible* into 40 shares of common stock. The tax rate is 40%. Compute basic and diluted EPS.

**Answer:**

*Step 1:* Calculate 2006 basic EPS:

$$\text{basic EPS} = \frac{\$115,600 - \$10,000}{200,000} = \$0.53$$

*Step 2:* Calculate diluted EPS:

- Compute the increase in common stock outstanding if the preferred stock is converted to common stock at the beginning of 2006:  $(1,000)(40) = 40,000$  shares.
- If the convertible preferred stock were converted to common stock, there would be no preferred dividends paid. Therefore, you should add back the convertible preferred dividends that had previously been subtracted out.
- Compute diluted EPS as if the convertible preferred stock were converted into common stock:

$$\text{diluted EPS} = \frac{\text{net inc} - \text{pref div} + \text{convert pref dividends}}{\text{wt. avg. shares} + \text{convert pref common shares}}$$

$$\text{diluted EPS} = \frac{\$115,600 - \$10,000 + \$10,000}{200,000 + 40,000} = \$0.48$$

- Check to see if diluted EPS is less than basic EPS ( $\$0.48 < \$0.53$ ). If the answer is yes, the preferred stock is dilutive and must be included in diluted EPS as computed above. If the answer is no, the preferred stock is antidilutive and conversion effects are not included in diluted EPS.

### Example 3: EPS with stock options

During 2006, ZZZ reported net income of \$115,600 and had 200,000 shares of common stock outstanding for the entire year. ZZZ also had 1,000 shares of 10%, par \$100 preferred stock outstanding during 2006. ZZZ has 10,000 stock options (or warrants) outstanding the entire year. Each option allows its holder to purchase 1 share of common stock at \$15 per share. The average market price of ZZZ's common stock during 2006 is \$20 per share. Compute the diluted EPS.

Answer:

Number of common shares created if the options are exercised:	10,000 shares
Cash inflow if the options are exercised (\$15/share)(10,000):	\$150,000
Number of shares that can be purchased with these funds is: \$150,000 / \$20	7,500 shares
Net increase in common shares outstanding from the exercise of the stock options	2,500 shares

$$\text{diluted EPS} = \frac{\$115,600 - \$10,000}{200,000 + 2,500} = \$0.52$$

*Professor's Note:* A quick way to calculate the net increase in common shares from the potential exercise of stock options or warrants when the exercise price is less than the average market price is:

$$\left[ \frac{AMP - EP}{AMP} \right] \times N$$

where :

AMP = average market price over the year

EP = exercise price of the options or warrants

N = number of common shares that the options or warrants can be converted into

$$\text{For ZZZ: } \frac{\$20 - \$15}{\$20} \times 10,000 \text{ shares} = 2,500 \text{ shares}$$

#### Example 4: EPS with convertible bonds, convertible preferred, and options

During 2006, ZZZ reported net income of \$115,600 and had 200,000 shares of common stock outstanding for the entire year. ZZZ had 1,000 shares of 10%, \$100 par convertible preferred convertible into 40 shares each outstanding for the entire year. ZZZ also had 600, 7%, \$1,000 par value convertible bonds, convertible into 100 shares each outstanding for the entire year. Finally, ZZZ had 10,000 stock options outstanding during the year. Each option is convertible into one share of stock at \$15 per share. The average market price of the stock for the year was \$20. What are ZZZ's basic and diluted EPS? (Assume a 40% tax rate.)

Answer:

*Step 1:* From Examples 1, 2, and 3, we know that the convertible preferred stock, convertible bonds, and stock options are all dilutive. Recall that basic EPS was calculated as:

$$\text{basic EPS} = \frac{\$115,600 - \$10,000}{200,000} = \$0.53$$

*Step 2:* Review the number of shares created by converting the convertible securities and options (the denominator):

Converting the convertible preferred shares	40,000 shares
Converting the convertible bonds	60,000 shares
Exercising the options	2,500 shares

*Step 3:* Review the adjustments to net income (the numerator):

Converting the convertible preferred shares	\$10,000
Converting the convertible bonds	\$25,200
Exercising the options	\$0

*Step 4:* Compute ZZZ's diluted EPS:

$$\text{diluted EPS} = \frac{\$115,600 - 10,000 + 10,000 + 25,200}{200,000 + 40,000 + 60,000 + 2,500} = \$0.47$$

#### Example 5: Treasury stock method

Baxter Company has 5,000 shares outstanding all year. Baxter had 2,000 outstanding warrants all year, convertible into one share each at \$20 per share. The year-end price of Baxter stock was \$40, and the average stock price was \$30. If Baxter had net income of \$10,000 of the year, what is Baxter's basic and diluted EPS?

**Answer:**

Calculate the effect of the warrants using the treasury stock method.

$$\left[ \frac{\$30 - \$20}{\$30} \right] \times 2,000 \text{ shares} = 667 \text{ shares}$$

$$\text{Basic EPS} = \$10,000 / 5,000 \text{ shares} = \$2 \text{ per share}$$

$$\text{Diluted EPS} = \$10,000 / (5,000 + 667 \text{ shares}) = \$1.76 \text{ per share}$$

**LOS 39.e:** Compare and contrast the requirements for EPS reporting in simple versus complex capital structures.

With a **simple capital structure**, only basic EPS is reported. If a firm has a **complex capital structure**, it must report both basic EPS and diluted EPS. If the firm is reporting discontinued operations, extraordinary items, or cumulative effects of an accounting change (all reported below the line net of tax), per-share values of these items must be reported as well. The following shows the format for a company with a complex capital structure that reports a loss from discontinued operations.

Basic earnings per share	
Income before discontinued operations	\$2.40
<u>Discontinued operations</u>	<u>0.35</u>
Net income	\$2.05
Diluted earnings per share	
Income before discontinued operations	\$1.95
<u>Discontinued operations</u>	<u>0.28</u>
Net income	\$1.67

## KEY CONCEPTS

1. A simple capital structure is one that contains no potentially dilutive securities, while a complex capital structure contains potentially dilutive securities such as options, warrants, or convertible securities.
2. The basic EPS calculation (the only EPS for firms with a simple capital structure) is:  

$$\text{basic EPS} = \frac{\text{net income} - \text{preferred dividends}}{\text{weighted average number of common shares outstanding}}$$
3. Calculating the weighted average number of common shares outstanding:
  - Stock splits and dividends result in the additional shares being considered outstanding from the beginning of the year for the purpose of this computation.
  - Shares issued enter into the computation from the date of issuance.
  - Reacquired shares are excluded from the computation from the date of reacquisition.
  - Shares sold or issued in a purchase of assets are included from the date of issuance.
4. Dilutive securities are stock options, warrants, convertible debt, or convertible preferred stock that decrease EPS if exercised or converted to common stock. Antidilutive securities are those that would increase EPS if exercised or converted to common stock.
5. Calculating diluted EPS with a complex capital structure:

$$\text{diluted EPS} = \frac{\left[ \text{net income} - \text{preferred dividends} \right] + \left[ \frac{\text{convertible preferred dividends}}{\text{convertible preferred shares}} \right] + \left[ \frac{\text{convertible debt}}{\text{convertible debt interest}} \right] (1 - t)}{\left( \text{weighted average shares} \right) + \left( \frac{\text{shares from conversion of conv. pfd. shares}}{\text{conversion of conv. pfd. shares}} \right) + \left( \frac{\text{shares from conversion of conv. debt}}{\text{conversion of conv. debt}} \right) + \left( \frac{\text{shares issuable from stock options}}{\text{issuable from stock options}} \right)}$$

6. Warrants and options are potentially dilutive; in the diluted EPS calculation, the number of shares is adjusted by adding  $\frac{\text{AMP} - \text{EP}}{\text{AMP}} \times \text{N shares}$  whenever  $\text{AMP} > \text{EP}$ .
7. A company with a complex capital structure must report both basic and diluted EPS.

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**CONCEPT CHECKERS: DILUTIVE SECURITIES AND EARNINGS PER SHARE**


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1. Which of the following securities would NOT be found in a simple capital structure?
  - A. 7%, \$100 par value nonconvertible preferred.
  - B. 8%, \$1,000 par value callable mortgage bond.
  - C. 3%, \$100 par value convertible preferred.
  - D. 6%, \$5,000 par value general obligation bond.
  
2. Which of the following actions requires an adjustment to the number of shares outstanding at the beginning of the year?
  - A. New issuance of common stock for cash.
  - B. Stock repurchases.
  - C. Issuance of common stock in a purchase of assets.
  - D. A stock split.
  
3. Previously reported earnings per share calculations must be restated for which of the following events?
  - A. Conversion of a bond into common stock.
  - B. A stock split.
  - C. Share repurchase.
  - D. Issuance of new common shares.
  
4. At the beginning of this year, Evans Corporation had 400,000 shares of common stock outstanding. Evans paid a 10% stock dividend on March 31 of this year. Evans issued 90,000 new common shares on June 30 of this year and repurchased 12,000 shares on December 1. The number of shares Evans should use in computing basic EPS at the end of the year is:
  - A. 475,000.
  - B. 476,000.
  - C. 484,000.
  - D. 490,500.
  
5. The Hall Corporation had 100,000 shares of common stock outstanding at the beginning of the year. Hall issued 30,000 shares of common on May 1. On July 1, the company issued a 10% stock dividend. On September 1, Hall issued 1,000, 10% bonds, each convertible into 21 shares of stock. What is the weighted average number of shares to be used in computing basic and diluted EPS, assuming the convertible bonds are dilutive?
 

<u>Basic</u>	<u>Dilutive</u>
A. 130,000	132,000
B. 132,000	139,000
C. 132,000	146,000
D. 139,000	146,000

Use the following data to answer Questions 6 through 8.

An analyst gathered the following information about a company:

- Net income was \$800,000 for the year.
- At the beginning of the year, there were 70,000 common shares outstanding.
- There are 30,000 shares of 8%, \$100 par cumulative nonconvertible preferred outstanding.
- In the past year, the company has had the following common stock transactions:
  - March 30: declared a 10% stock dividend.
  - March 31: issued 10,000 shares for cash.



6. How many common shares should be used in computing the company's EPS?  
A. 70,000.  
B. 82,750.  
C. 84,500.  
D. 85,250.
7. The company's capital structure would be classified as:  
A. simple.  
B. complex.  
C. one sided.  
D. limited.
8. What is the company's EPS?  
A. \$4.98.  
B. \$6.63.  
C. \$9.47.  
D. \$11.43.
9. Given the following information, how many shares should be used in computing diluted EPS?
- 300,000 shares outstanding.
  - 100,000 warrants exercisable at \$50 per share.
  - Average share price is \$55.
  - Ending share price is \$60.
- A. 9,091.  
B. 90,909.  
C. 309,091.  
D. 390,909.

Use the following data to answer Questions 10 and 11.

An analyst gathered the following information about a company:

- 2,500,000 shares outstanding at the beginning of the year.
- 2,000,000 weighted average number of shares outstanding for the year.
- \$40 average stock price for the period.
- \$50 ending stock price.
- 1,000,000 warrants outstanding exercisable at \$30 per share.
- 100,000, 7%, \$1,000 par value convertible bonds (conversion ratio 15 to 1) issued two years ago.
- \$5,000,000 net after tax income for the year.
- 30% tax rate.

10. Basic EPS is:  
A. \$2.10.  
B. \$2.22.  
C. \$2.50.  
D. \$2.64.
11. Diluted EPS is:  
A. \$1.33.  
B. \$2.22.  
C. \$2.33.  
D. \$3.64.

12. An analyst gathered the following information about a company:
- 100,000 common shares outstanding all year.
  - Earnings of \$125,000.
  - 1,000, 7% \$1,000 par bonds convertible into 40 shares each outstanding all year.
  - The tax rate is 40%.

What is the company's diluted EPS?

- A. \$1.09.
  - B. \$1.19.
  - C. \$1.23.
  - D. \$1.25.
13. Antidilutive common stock equivalents should:
- A. be used in calculating basic EPS per share but not diluted EPS.
  - B. be used in calculating diluted EPS per share but not basic EPS.
  - C. be used in calculating basic EPS only.
  - D. not be used in calculating diluted EPS.
14. An analyst gathered the following information about a company:
- 100,000 common shares outstanding from the beginning of the year.
  - Earnings of \$125,000.
  - 1,000, 7% \$1,000 par bonds convertible into 25 shares each outstanding as of the beginning of the year.
  - The tax rate is 40%.

What is the company's diluted EPS?

- A. \$1.22.
  - B. \$1.25.
  - C. \$1.34.
  - D. \$1.42.
15. An analyst gathered the following information about a company:
- 50,000 common shares outstanding from the beginning of the year.
  - Warrants outstanding all year on 50,000 shares, exercisable at \$20 per share.
  - Stock is selling at year end for \$15.
  - The average price of the company's stock for the year was \$25.

How many shares should be used in calculating the company's diluted EPS?

- A. 10,000.
- B. 50,000.
- C. 60,000.
- D. 90,000.

16. An analyst has gathered the following information about a company:
- 50,000 common shares outstanding from the beginning of the year.
  - Warrants outstanding all year on 50,000 shares, exercisable at \$20 per share.
  - Stock is selling at year end for \$25.
  - The average price of the company's stock for the year was \$15.

How many shares should be used in calculating the company's diluted EPS?

- A. 16,667.
- B. 33,333.
- C. 50,000.
- D. 66,667.

### COMPREHENSIVE PROBLEMS: DILUTIVE SECURITIES AND EARNINGS PER SHARE

1. The following is the share information for Alcorp Products last year:

1/1	2,400,000 common shares outstanding
4/1	400,000 new shares issued
6/1	3-for-2 stock split
10/1	300,000 shares repurchased

What is the weighted average number of common shares for the year?

2. The capital structure of Beta Corp. for the past year is as follows:

2,500,000	shares common stock
1,000,000	shares 5% preferred stock—par value \$30
500,000	4% convertible preferred—par value \$50, convertible into 500,000 sh. common
\$10,000,000	face value 3.5% bond maturing in 10 years convertible to common stock at 35 sh. per \$1,000 face value
100,000	warrants for 5 shares each with an exercise price of \$22/sh.

- The firm's marginal tax rate is 35%, and its average tax rate is 32%.
- The firm's common stock was valued at \$20/sh at year end and had an average price of \$23 over the year.
- The firm's operating earnings were \$7,200,000, and it had no interest charges other than the outstanding bond.
- The common stock pays a dividend of \$0.40 per share.

A. What are basic earnings per share?

B. What are diluted earnings per share?

ANSWERS – CONCEPT CHECKERS: DILUTIVE SECURITIES AND EARNINGS PER SHARE

1. C The convertible preferred is potentially dilutive and therefore would not be found in a simple capital structure.
2. D A stock split is treated as if it were done at the beginning of the accounting period.
3. B Previously reported EPS must be restated when a stock split occurs so that comparisons of EPS over time are not misleading.
4. C Remember that the effects of stock dividends are applied retroactively to the beginning of the year.

$$\frac{(440,000 \times 12) + (90,000 \times 6) - (12,000 \times 1)}{12} = 484,000$$

5. B The new stock is weighted by 8 / 12. The bonds are weighted by 4 / 12 and are not affected by the stock dividend.

$$[100,000 \times (12 / 12)] + [30,000 \times (8 / 12)] \times 1.10 = 132,000$$

$$132,000 + [21,000 \times (4 / 12)] = 139,000$$

6. C  $70,000 \times 1.1 = 77,000$

$$77,000 + [10,000 \times (9 / 12)] = 84,500$$

7. A Because there are no potentially dilutive securities, the company has a simple capital structure.
8. B Don't forget to subtract the preferred stock dividends!

$$\frac{800,000 - 240,000}{84,500} = \$6.63$$

9. C Since the exercise price of the warrants is less than the average share price, the warrants are dilutive. Using the treasury stock method to determine the denominator impact:

$$\frac{\$55 - \$50}{\$55} \times 100,000 \text{ shares} = 9,091 \text{ shares}$$

Thus, the denominator will increase by 9,091 shares to 309,091 shares. The question asks for the total, not just the impact of the warrants.

10. C  $\$5,000,000 / 2,000,000 = \$2.50$

11. B The warrants are dilutive because the exercise price is less than the average stock price. Next, check if the convertible bonds are dilutive.

$$\text{numerator impact} = [(100,000 \times 1,000 \times 0.07 \times (1 - 0.3))] = \$4,900,000$$

$$\text{denominator impact} = (100,000 \times 15) = 1,500,000$$

$$\text{per share impact} = \$4,900,000 / 1,500,000 = \$3.27$$

Since this is greater than the basic EPS calculated in the previous question, the bonds are antidilutive. Thus, diluted EPS includes only the warrants.

$$\frac{\$40 - \$30}{\$40} \times 1,000,000 \text{ shares} = 250,000 \text{ shares}$$

Thus, the denominator will increase by 250,000 shares to 2,250,000 shares

$$\text{Diluted EPS} = \$5,000,000 / 2,250,000 = \$2.22$$

12. B First calculate basic EPS =  $125,000 / 100,000 = \$1.25$ . Then check to see if the bonds are dilutive.

$$\text{Numerator impact} = [(1,000 \times 1,000 \times 0.07 \times (1.0 - 0.40))] = \$42,000$$

$$\text{Denominator impact} = (1,000 \times 40) = 40,000 \text{ shares.}$$

$$\frac{\$42,000}{40,000} = \$1.05$$

Since this is less than basic EPS, the bonds are dilutive and diluted EPS is  $\$1.19 = \frac{\$125,000 + \$42,000}{100,000 + 40,000}$ .

13. D Antidilutive common stock equivalents should not be used in calculating either basic or diluted EPS.

14. B First, calculate basic EPS =  $\frac{125,000}{100,000} = \$1.25$ . Next, check if the convertible bonds are dilutive:

$$\text{numerator impact} = (1,000 \times 1,000 \times 0.07) \times (1 - 0.4) = \$42,000$$

$$\text{denominator impact} = (1,000 \times 25) = 25,000 \text{ shares}$$

$$\text{per share impact} = \frac{\$42,000}{25,000 \text{ shares}} = \$1.68$$

Since \$1.68 is greater than the basic EPS of \$1.25, the bonds are antidilutive. Thus, diluted EPS = basic EPS = \$1.25.

15. C Since the exercise price of the warrants is less than the average share price, the warrants are dilutive.

$$\left[ \frac{\$25 - \$20}{\$25} \right] \times 50,000 \text{ shares} = 10,000 \text{ shares}$$

Thus, the denominator will increase by 10,000 shares to 60,000 shares.

16. C The warrants in this case are antidilutive. The average price per share of \$15 < strike price \$20. (The year-end price per share is not used.) Don't use the treasury stock method. The denominator consists of only the common stock.

## ANSWERS – COMPREHENSIVE PROBLEMS: DILUTIVE SECURITIES AND EARNINGS PER SHARE

1. First adjust for the stock split and weight by months outstanding:

$$\begin{array}{rclcl}
 2,400,000 & \times & 3/2 & \times & 12 & = & 43,200,000 \\
 + & 400,000 & \times & 3/2 & \times & 9 & = & 5,400,000 \\
 - & 300,000 & & & \times & 3 & = & -900,000 \\
 \hline
 & & & & & & = & 47,700,000
 \end{array}$$

Then divide by 12:  $\frac{47,700,000}{12} = 3,975,000$ .

2. Since EBIT is \$7,200,000 and interest on the bond is \$10,000,000 (0.035) = \$350,000, pre-tax earnings are \$7,200,000 – \$350,000 = \$6,850,000. With an average tax rate of 32%, net income is \$6,850,000 (1 – 0.32) = \$4,658,000.

The dividends on the two preferred stocks are:

$$1,000,000 \times \$30 \times 0.05 = \$1,500,000 \text{ and } 500,000 \times \$50 \times 0.04 = \$1,000,000$$

Net income available to common is \$4,658,000 – \$1,500,000 – \$1,000,000 = \$2,158,000.

$$\text{basic EPS} = \frac{\$2,158,000}{2,500,000} = \$0.86$$

Dividing the total dividends on the convertible preferred by the number of common shares if converted gives us

$$\frac{\$1,000,000}{500,000} = \$2 \text{ sh} > \$0.86. \text{ The convertible preferred is antidilutive.}$$

The after-tax bond interest is \$10,000,000 (0.035) (1 – 0.35) = \$227,500, and the number of shares if converted is 350,000 (note the use of the *marginal* tax rate).

$$\frac{\$227,500}{350,000} = \$0.65 < \$0.86, \text{ so the convertible bonds are dilutive.}$$

The exercise price of the warrants is \$22, which is less than the average price of \$23, and the number of new shares

using the treasury stock method is  $\frac{23 - 22}{23}(100,000)(5) = 21,739 \text{ sh.}$

$$\text{diluted EPS} = \frac{\$2,158,000 + \$227,500}{2,500,000 + 350,000 + 21,739} = \$0.83$$