Study Unit One

Liquidity, Solvency, and Leverage Ratios

1.1	*Common-Size Financial Statements*	*2*
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1.3	*Solvency*	*15*
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This study unit is the **first of three** on **financial statement analysis**. The relative weight assigned to this major topic in Part 2 of the exam is **20%**. The three study units are

- **Study Unit 1: Liquidity, Solvency, and Leverage Ratios**
- Study Unit 2: Profitability and Per-Share Ratios
- Study Unit 3: Activity Ratios and Earnings Quality

This study unit discusses basic financial statement analysis as well as liquidity, solvency, and leverage. Topics covered include

Liquidity Ratios	Solvency Ratios
Current ratio Quick (acid-test) ratio Cash ratio Net working capital ratio	Total debt-to-total-capital ratio Debt to equity ratio Long-term debt to equity ratio Debt to total assets ratio Times interest earned ratio Earnings to fixed charges ratio Cash flow to fixed charges ratio

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1.1 Common-Size Financial Statements

Percentages and Comparability

Financial analysts assess the current financial performance of a company as well as its prospects for growth using the tools of financial statement analysis. Analyzing the financial statements of steadily growing firms and firms of different sizes within an industry presents certain difficulties. To overcome this obstacle, common-size statements restate financial statement line items in terms of a percentage of a given amount, such as total assets for a balance sheet or net sales for an income statement.

Items on common-size financial statements are expressed as percentages of sales (on the income statement) or total assets (on the balance sheet). The base amount is assigned the value of 100%.

- On an income statement, sales is valued at 100%. All other amounts are a percentage of sales.
- On the balance sheet, total assets are 100%, as is the total of liabilities and stockholders' equity. Each line item can be interpreted in terms of its proportion of the baseline figure.

Example 1-1 Income Statement -- 2-Year Analysis

In this example, a common-size income statement has been prepared to analyze the percentage changes of the components of the income statement over a 2-year period. For example, the cost of goods sold was 91.7% of sales in the current year and 95% in the prior year. Gross profit as a percentage of sales increased to 8.3% in the current year from 5% in the prior year.

External reporting format	Current Year	Prior Year
Net sales	$1,800,000	$1,400,000
Cost of goods sold	(1,650,000)	(1,330,000)
Gross profit	150,000	70,000
Selling expenses	(50,000)	(15,000)
General & admin. expenses	(15,000)	(10,000)
Operating income	85,000	45,000
Other revenues and gains	20,000	0
Other expenses and losses	(35,000)	(10,000)
Income before taxes	70,000	35,000
Income taxes (40%)	(28,000)	(14,000)
Net income	**$ 42,000**	**$ 21,000**

Common-size format	Current Year	Prior Year
Net sales	100.0%	100.0%
Cost of goods sold	(91.7%)	(95.0%)
Gross profit	8.3%	5.0%
Selling expenses	(2.8%)	(1.1%)
General & admin. expenses	(0.8%)	(0.7%)
Operating income	4.7%	3.2%
Other revenues and gains	1.1%	0.0%
Other expenses and losses	(1.9%)	(0.7%)
Income before taxes	3.9%	2.5%
Income taxes (40%)	(1.6%)	(1.0%)
Net income	**2.3%**	**1.5%**

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Example 1-2 Balance Sheet -- 2-Year Analysis

In this example, a common-size balance sheet has been prepared to analyze the percentage changes of the components of the balance sheet over a 2-year period. For example, stockholders' equity as a percentage of total assets increased to 44.4% from 40.6%.

External reporting format

Assets:	Current Year End	Prior Year End
Current assets	$ 760,000	$ 635,000
Noncurrent assets	1,040,000	965,000
Total assets	**$1,800,000**	**$1,600,000**
Liabilities & stockholders' equity:		
Current liabilities	$ 390,000	$ 275,000
Noncurrent liabilities	610,000	675,000
Total liabilities	$1,000,000	$ 950,000
Stockholders' equity	800,000	650,000
Total liabilities and stockholders' equity	**$1,800,000**	**$1,600,000**

Common-size format

Assets:	Current Year End	Prior Year End
Current assets	42.2%	39.7%
Noncurrent assets	57.8%	60.3%
Total assets	**100.0%**	**100.0%**
Liabilities & stockholders' equity:		
Current liabilities	21.7%	17.2%
Noncurrent liabilities	33.9%	42.2%
Total liabilities	55.6%	59.4%
Stockholders' equity	44.4%	40.6%
Total liabilities and stockholders' equity	**100.0%**	**100.0%**

Common-size statements simplify analysis of differences among companies of various sizes or comparisons between a similar company and an industry average.

- For example, comparing the efficiency of a company with $1,800,000 of revenues with a company with $44 billion in revenues is difficult unless the numbers are compared using a common denominator.

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Vertical and Horizontal Analysis

The common-size statements provided previously in Examples 1-1 and 1-2 are examples of **vertical analysis** where the percentages are based on numbers above or below in the same column.

Another concept is **horizontal analysis**. It states the amounts for several periods as percentages of a base-year amount. These are often called trend percentages.

- One period is designated the base period, with which the other periods are compared. Each line item of the base period is thus 100%.

Example 1-3 Horizontal Analysis

In this example, the current year is Year 8. Two years prior to the current year is the base period, Year 6. As an example of the analysis, the Year 7 gross profit of $70,000 is 63.6% of the $110,000 gross profit in Year 6. The current Year 8 gross profit of $150,000 is 136.4% of $110,000 gross profit in Year 6.

Income statement
External reporting format

	Year 8	Year 7	Year 6
Net sales	$1,800,000	$1,400,000	$1,500,000
Cost of goods sold	(1,650,000)	(1,330,000)	(1,390,000)
Gross profit	**$ 150,000**	**$ 70,000**	**$ 110,000**

Income statement
Trend analysis

	Year 8	Year 7	Year 6
Net sales	120.0%	93.3%	100.0%
Cost of goods sold	118.7%	95.7%	100.0%
Gross profit	**136.4%**	**63.6%**	**100.0%**

Even though sales and cost of goods sold declined only slightly from the base year to the next year, gross profit plunged (on a percentage basis). By the same token, when sales recovered in the current year, the gain in gross profit was (proportionally) greater than the increases in its two components.

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There is also a form of horizontal analysis that does not use common sizes. This method is used to calculate the growth (or decline) of key financial line items.

- For example, if a company's sales increased from $100,000 to $120,000, there would be a column showing the percentage increase, which was 20% in this case.
- This is another form of **management by exception**. Managers can look at the percentage change column and see which accounts have experienced the most change since the previous period.

Example 1-4 Percentage Change

	Current Year	Prior Year	Dollar Change	Percentage Change
Net sales	$1,800,000	$1,400,000	$400,000	28.6%
Cost of goods sold	1,650,000	1,330,000	320,000	24.1%
Selling expenses	50,000	15,000	35,000	233.3%
General & admin. expenses	15,000	10,000	5,000	50.0%

In this example, managers would want to know why selling expenses increased by 233.3%.

Trend analysis compares financial information for balances and amounts across statement periods. It allows financial analysts to identify patterns in data from year to year and make comparisons with competitors and industry benchmarks.

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1.2 Liquidity

Liquidity is a firm's ability to pay its **current obligations** as they come due and thus remain in business in the short run. Liquidity reflects the ease with which assets can be converted to cash.

- Liquidity ratios measure this ability by relating a firm's liquid assets to its current liabilities. The figure below is a representation of a company's resources (assets) and its capital structure (liabilities and equity). Liquidity analysis will use current assets and current liabilities.

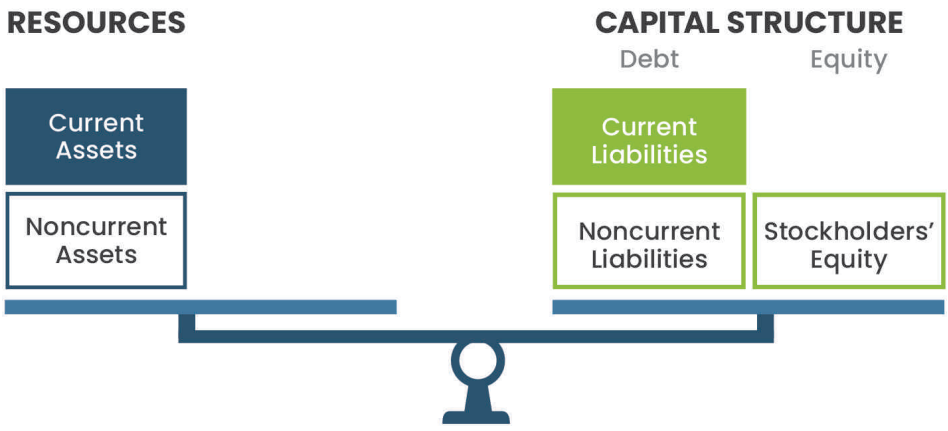


Figure 1-1

Example 1-5 Balance Sheet

RESOURCES			FINANCING		
CURRENT ASSETS:	**Current Year End**	**Prior Year End**	**CURRENT LIABILITIES:**	**Current Year End**	**Prior Year End**
Cash and equivalents	$ 325,000	$ 275,000	Accounts payable	$ 150,000	$ 75,000
Available-for-sale securities	165,000	145,000	Notes payable	50,000	50,000
Accounts receivable (net)	120,000	115,000	Accrued interest on note	5,000	5,000
Notes receivable	55,000	40,000	Current maturities of L.T. debt	100,000	100,000
Inventories	85,000	55,000	Accrued salaries and wages	15,000	10,000
Prepaid expenses	10,000	5,000	Income taxes payable	70,000	35,000
Total current assets	**$ 760,000**	**$ 635,000**	**Total current liabilities**	**$ 390,000**	**$ 275,000**
NONCURRENT ASSETS:			**NONCURRENT LIABILITIES:**		
Equity-method investments	$ 120,000	$ 115,000	Bonds payable	$ 500,000	$ 600,000
Property, plant, & equipment	1,000,000	900,000	Long-term notes payable	90,000	60,000
Less: Accum. depreciation	(85,000)	(55,000)	Employee-related obligations	15,000	10,000
Goodwill	5,000	5,000	Deferred income taxes	5,000	5,000
Total noncurrent assets	**$1,040,000**	**$ 965,000**	**Total noncurrent liabilities**	**$ 610,000**	**$ 675,000**
			Total liabilities	**$1,000,000**	**$ 950,000**
			STOCKHOLDERS' EQUITY:		
			Preferred stock, $50 par	$ 120,000	$ 0
			Common stock, $1 par	500,000	500,000
			Additional paid-in capital	110,000	100,000
			Retained earnings	70,000	50,000
			Total stockholders' equity	**$ 800,000**	**$ 650,000**
Total assets	**$1,800,000**	**$1,600,000**	**Total liabilities and stockholders' equity**	**$1,800,000**	**$1,600,000**

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Example 1-6 Income Statement

	Current Year	Prior Year
Net sales	$1,800,000	$1,400,000
Cost of goods sold	(1,450,000)	(1,170,000)
Gross profit	$ 350,000	$ 230,000
SG&A expenses	(160,000)	(80,000)
Operating income	$ 190,000	$ 150,000
Other revenues and losses	(40,000)	(25,000)
Earnings before interest and taxes	$ 150,000	$ 125,000
Interest expense	(15,000)	(10,000)
Earnings before taxes	$ 135,000	$ 115,000
Income taxes (40%)	(54,000)	(46,000)
Net income	**$ 81,000**	**$ 69,000**



Author's Note

The balance sheet and income statement above and on the previous page provide inputs for the examples throughout this study unit.

Current assets are the most liquid. They are expected to be converted to cash, sold, or consumed within 1 year or the operating cycle, whichever is longer. The operating cycle is the average time to purchase inventory, sell the inventory, and receive payment for the sale. Study Unit 3, Subunit 1, has a more detailed explanation. Ratios involving current assets thus measure a firm's ability to continue operating in the short run.

- Current assets include, in descending order of liquidity, cash and equivalents; marketable securities; receivables (net of allowance for credit losses); inventories; and prepaid items.

Current liabilities are the liabilities that must be settled the soonest. Specifically, they are expected to be settled or converted to other liabilities within 1 year or the operating cycle, whichever is longer.

- Current liabilities include accounts payable, notes payable, current maturities of long-term debt, unearned revenues, taxes payable, wages payable, and other accruals.

Net working capital reports the resources the company would have to continue operating in the short run if it had to settle all of its current liabilities at once.

Net working capital = Current assets – Current liabilities

Example 1-7 Change in Working Capital

Current Year: $760,000 – $390,000 = $370,000
Prior Year: $635,000 – $275,000 = $360,000

Although the company's current liabilities increased, its current assets increased by $10,000 more. This is why the current year net working capital is more than the prior year working capital.

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Current Ratio

The current ratio is the most common measure of liquidity.

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

Example 1-8 Current Ratio

Current Year: $760,000 ÷ $390,000 = 1.949
Prior Year: $635,000 ÷ $275,000 = 2.309

Although working capital increased in absolute terms ($10,000), current assets now provide less proportional coverage of current liabilities than in the prior year.

- The normal range for a healthy current ratio is between 1.0 and 3.0.
- A current ratio of 1.0 means the current assets and current liabilities are exactly the same. A current ratio less than 1.0 indicates a potential liquidity issue.
- An overly high ratio indicates that management may not be investing idle assets productively.
- The quality of accounts receivable and merchandise inventory should be considered before evaluating the current ratio.
  - Obsolete or overvalued inventory or receivables can artificially inflate the current ratio.
- The general principle is that the current ratio should be proportional to the operating cycle. Thus, a shorter cycle may justify a lower ratio.
  - For example, a grocery store has a short operating cycle and can survive with a lower current ratio than could a gold mining company, which has a much longer operating cycle.

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Quick Ratio

The quick ratio excludes inventories and prepaids from the numerator, recognizing that those assets are difficult to liquidate at their stated values. The quick ratio is thus a more conservative measure than the basic current ratio.

- The quick ratio may also be referred to as the acid-test ratio.

$$\text{Quick (acid-test) ratio} = \frac{\text{Cash + Marketable securities + Net receivables}}{\text{Current liabilities}}$$

- This ratio measures the firm's ability to easily pay its short-term debts and avoids the problem of inventory valuation.
- The quick ratio should normally be 1.0 or higher. A quick ratio of 1.0 means that the company could exactly cover all of the current liabilities using only the quick assets.
- A quick ratio of less than 1.0 indicates a liquidity issue in that the company may struggle to pay short-term debts as they come due.

Example 1-9 Quick (Acid-Test) Ratio

Current Year: ($325,000 + $165,000 + $120,000 + $55,000) ÷ $390,000 = 1.705
Prior Year: ($275,000 + $145,000 + $115,000 + $40,000) ÷ $275,000 = 2.091

In spite of its increase in total working capital, the company's position in its most liquid assets deteriorated significantly. The quick ratio still exceeds 1.0, but the company will want to continue to monitor this liquidity measure to ensure it does not continue to decline over time.

	Current Ratio	Quick Ratio
Type	Liquidity ratio	Liquidity ratio
Formula	$\frac{\text{Current assets}}{\text{Current liabilities}}$	$\frac{\text{Cash + Marketable securities + Net receivables}}{\text{Current liabilities}}$
Focus	Measures ability to pay current liabilities using current assets	More conservative than current ratio since it measures ability to pay current liabilities without selling inventory

Figure 1-2

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Other Liquidity Ratios

The **cash ratio** is an even more conservative variation of the quick ratio. A normal range for the cash ratio is 0.5-1.0. When the ratio is less than 1.0, it indicates that the company would need to sell inventory or collect on accounts receivable to have enough cash to pay current debts. However, if this ratio is too high, it indicates inefficient cash management as the company could be holding too much cash and losing out on other investment opportunities.

$$\text{Cash ratio} = \frac{\text{Cash + Marketable securities}}{\text{Current liabilities}}$$

Example 1-10 Cash Ratio

Current Year: ($325,000 + $165,000) ÷ $390,000 = 1.256
Prior Year: ($275,000 + $145,000) ÷ $275,000 = 1.527

In this working capital measure, the company's position declined, but the ratio is still greater than 1. Because the ratio is more than 1.0 in the current year, the company should review investment opportunities and consider investing idle cash.

The **cash flow ratio** reflects the significance of cash flow for settling obligations as they become due. A ratio of 1.0 or higher signifies that the company generates enough cash flow from operations to pay current liabilities. A ratio of less than 1.0 could be a signal for liquidity issues as this means the company did not generate enough operating cash flows to pay current liabilities.

$$\text{Cash flow ratio} = \frac{\text{Cash flow from operations}}{\text{Current liabilities}}$$

Example 1-11 Cash Flow Ratio

The company's cash flows from operations for the two most recent years were $382,000 and $291,000, respectively. This information would be found on the company's statement of cash flows.

Current Year: $382,000 ÷ $390,000 = 0.979
Prior Year: $291,000 ÷ $275,000 = 1.058

Unlike the prior year, the cash flows generated by the company in the most recent year were not sufficient to cover current liabilities.

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The **net working capital ratio** is the most conservative of the working capital ratios.

$$\text{Net working capital ratio} = \frac{\text{Current assets} - \text{Current liabilities}}{\text{Total assets}}$$

Example 1-12 Net Working Capital Ratio

Current Year: ($760,000 – $390,000) ÷ $1,800,000 = 0.206
Prior Year: ($635,000 – $275,000) ÷ $1,600,000 = 0.225

Current liabilities are taking a bigger “bite” out of working capital than in the prior year.

Liquidity of Current Liabilities

The liquidity of current liabilities is the ease with which a firm can issue new debt or raise new structured funds.

- The liquidity of current liabilities indicates the ease of funding or availability of sources of funding. A firm’s ability to borrow in the financial markets is generally a function of its size, reputation, creditworthiness, and capital levels.
- Raising liquidity during an adverse situation often requires a combination of both asset liquidity and liability liquidity.

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Effects of Transactions

If a ratio is less than 1.0, the numerator is lower than the denominator.

- A transaction that causes equal changes in the numerator and denominator has a proportionally greater effect on the numerator, resulting in a change in the ratio in the same direction.
  - If the current (or quick) ratio is less than 1.0, paying a current liability with current (or quick) assets decreases the numerator and denominator by the same amount. The effect is a **decrease** in the ratio, which means less liquidity.

$$\text{EXAMPLE:} \quad \frac{3-1}{4-1} = \frac{2}{3} \quad \text{and} \quad \frac{3}{4} > \frac{2}{3}$$

If a ratio is equal to 1.0, the numerator and denominator are the same.

- A transaction that causes equal changes in the numerator and denominator does not affect the ratio, which does not affect liquidity.

$$\text{EXAMPLE:} \quad \frac{4-1}{4-1} = \frac{3}{3} \quad \text{and} \quad \frac{4}{4} = \frac{3}{3}$$

If a ratio is greater than 1.0, the numerator is higher than the denominator.

- A transaction that causes equal changes in the numerator and denominator has a proportionally greater effect on the denominator, resulting in a change in the ratio in the opposite direction.
  - If the current (or quick) ratio is greater than 1.0, paying a current liability with current (or quick) assets decreases the numerator and denominator by the same amount. The effect is an **increase** in the ratio, which means the firm is more liquid.

$$\text{EXAMPLE:} \quad \frac{4-1}{3-1} = \frac{3}{2} \quad \text{and} \quad \frac{4}{3} < \frac{3}{2}$$

Ratio range	Effect on ratio of equal increase of numerator and denominator	Effect on ratio of equal decrease of numerator and denominator
< 1.0	Increase	Decrease
= 1.0	No effect	No effect
> 1.0	Decrease	Increase



Author's Note

In order to determine the effect of a transaction on the ratio numerator and denominator, CMA candidates need to understand financial accounting basics. This is one reason why candidates may find it necessary to review CMA Part 1's material on external financial reporting to prepare for these types of CMA Part 2 questions.

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Due to the dual nature of transaction analysis, each transaction will impact two accounts.

Common types of transactions and their impact on the financial statement elements follow:

Transaction	Impact	Impact
Purchase inventory on account	Increase inventory (current asset)	Increase accounts payable (current liability)
Payment on accounts payable	Decrease cash (current asset)	Decrease accounts payable (current liability)
Sale on account to customer	Increase accounts receivable (current asset)	Increase sales revenue
Receive payment from customer on account	Increase cash (current asset)	Decrease accounts receivable (current asset)
Refinancing long-term debt with short-term debt	Increase current liabilities	Decrease long-term liabilities
Refinancing short-term loan with long-term loan	Increase long-term liabilities	Decrease current liabilities
Purchase long-term asset with cash	Increase long-term assets	Decrease cash (current asset)
Purchase long-term asset with long-term note	Increase long-term assets	Increase long-term liabilities
Issue stock for cash	Increase cash (current asset)	Increase common stock
Write off uncollectible accounts receivable	Decrease accounts receivable (current asset)	Decrease allowance for credit losses (contra current asset)
Declare a dividend	Increase dividend payable (current liability)	Decrease equity
Pay a previously declared dividend	Decrease cash (current asset)	Decrease dividend payable (current liability)

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Example 1-13 Effects of Transactions -- Current Ratio

From Example 1-8 on page 8, the current ratio for the current year is 1.949 ($760,000 ÷ $390,000).

Consider the following independent scenarios:

- If the company were to refinance the $90,000 long-term notes payable with a short-term note, the current ratio would **decrease**. While there is no change to the $760,000 current assets, the current liabilities would increase to $480,000.

  New current ratio: $760,000 ÷ $480,000 = 1.583

- If the company purchased an additional $50,000 in inventory on account, the current ratio would **decrease**. Current assets would increase to $810,000 and current liabilities would increase to $440,000.

  New current ratio: $810,000 ÷ $440,000 = 1.841

- If the company decided to pay off 50% of the accounts payable with cash, the current ratio would **increase**. 50% of accounts payable is $75,000. Current assets would decrease to $685,000 and current liabilities would decrease to $315,000.

  New current ratio: $685,000 ÷ $315,000 = 2.175

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1.3 Solvency

Solvency is the ability of a business to meet its long-term obligations. This ability is related to the relative extent of use of debt and equity financing. Solvency is a function of capital structure and degree of leverage (covered in Subunit 1.4).

A firm's **capital structure** includes its sources of financing, both long- and short-term. These sources may be in the form of debt (external sources) or equity (internal sources), shown in Figure 1-3 below.

- Capital structure decisions affect the **risk profile** of a firm.
  - A company with a higher percentage of debt is riskier than a firm with a higher percentage of equity because debt must be paid regardless of whether the company is profitable. Equity investors will demand a higher rate of return compared with other providers of capital to compensate for the risk related to a higher use of financial leverage.
  - A company with a high level of equity will be able to borrow at lower rates. Debtholders will accept lower interest in exchange for the lower risk because of the equity cushion.

Debt is the creditor interest in the firm.

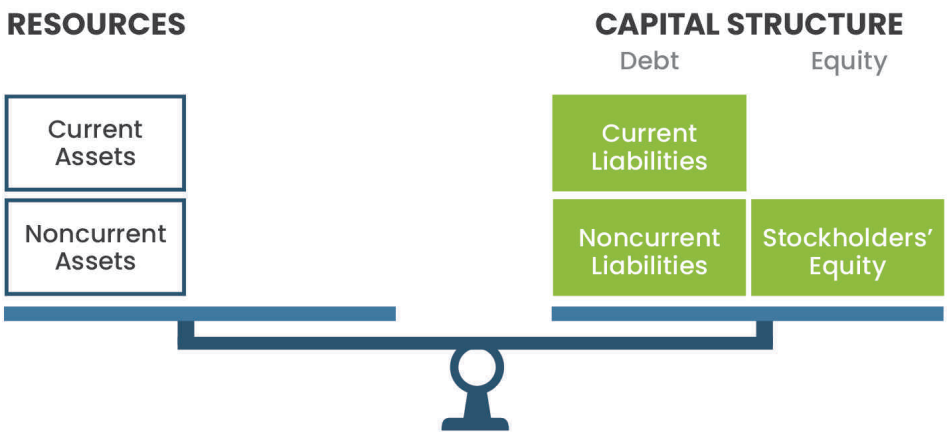


Figure 1-3

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The following are **advantages** of debt to the issuer:

- Interest paid on debt is tax deductible.
- Control of the firm is not shared with debtholders.
- When the return on debt exceeds the amount of interest paid, debt financing is advantageous.

The following are **disadvantages** of debt to the issuer:

- Unlike returns on equity investments, the payment of interest and principal on debt is a legal obligation. If cash flow is insufficient, the firm could become insolvent.
- The legal requirement to pay interest and principal increases a firm's risk and reduces its retained earnings. Because shareholders demand increased retained earnings, they are less likely to invest in the firm, thus decreasing the share price.
- Debt may require collateral, specific property pledged to a lender in case of default.
- The amount of debt financing available to the individual firm is limited. Generally accepted standards of the investment community usually require a certain debt to equity ratio. Beyond this limit, the cost of debt may rise rapidly or debt may not be available. (The debt to equity ratio is discussed later in this subunit.)

Equity is the ownership interest in the firm.

- Equity is the permanent capital of an enterprise, contributed by the firm's owners (shareholders) to obtain a return.
- A return on equity is uncertain because it is a residual interest in the firm's assets, i.e., the claim left after all debt has been satisfied.
- Periodic returns to owners of excess earnings are dividends. The firm may be contractually obligated to pay dividends to preferred shareholders but not to common shareholders.

The following are **advantages** of equity to the corporation:

- ✓ Common stock does not require a fixed dividend. Dividends are paid from profits when available.
- ✓ Common stock has no fixed maturity date for repayment of capital.
- ✓ The sale of common stock increases the creditworthiness of the firm by providing more capital (or money) for the corporation.

The following are **disadvantages** of equity to the corporation:

- ⊘ Cash dividends on common stock are not tax-deductible and are paid from after-tax profits.
- ⊘ New common stock sales dilute earnings per share (EPS) available to current shareholders.
- ⊘ Underwriting costs (e.g., fees to issue new common stock) typically are higher for common stock than for debt.
- ⊘ Too much equity may raise the average cost of capital of the firm above its optimal level.

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	Debt	Equity
Advantages to Issuer	✓ Interest paid is tax deductible. ✓ Control of firm is not shared with debtholders.	✓ Common stock does not require a fixed dividend. ✓ No fixed maturity date. ✓ Sale of common stock increases creditworthiness.
Disadvantages to Issuer	✗ Payment of interest and principal is legal obligation. ✗ May require collateral. ✗ Amount of debt financing is limited.	✗ Cash dividends are not tax-deductible. ✗ New common stock sales dilute EPS. ✗ Underwriting costs are higher.

Figure 1-4

Capital adequacy is a term normally used in connection with financial institutions. A bank must be able to pay depositors who demand their money on a given day and still be able to make new loans. Capital adequacy may be discussed in terms of

- Solvency (the ability to pay long-term obligations as they mature)
- Liquidity (the ability to pay for day-to-day ongoing operations)
- Reserves (the specific amount a bank must have available to pay depositors)
- Sufficient capital

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Capital Structure Ratios

Capital structure ratios report the relative proportions of debt and equity in a firm's capital structure at a given reporting date.

The **total debt-to-total-capital ratio** measures the percentage of the capital structure provided by creditors. Normal ranges for this ratio vary by industry.

$$\text{Total debt-to-total-capital ratio} = \frac{\text{Total debt}}{\text{Total capital}}$$

- When total debt to total capital is low, the firm's capital is supplied by the shareholders. Thus, creditors prefer this ratio to be low as a cushion against losses.

Example 1-14 Total Debt-to-Total-Capital Ratio

Current Year: $1,000,000 ÷ $1,800,000 = 0.556
Prior Year: $ 950,000 ÷ $1,600,000 = 0.594

The company became slightly less reliant on debt in its capital structure during the current year. Although total debt rose, equity rose by a greater percentage. The company is less leveraged than before.

The **debt to equity ratio** is a direct comparison of the firm's debt load versus its equity stake. Normal ranges for this ratio vary by industry.

$$\text{Debt to equity ratio} = \frac{\text{Total debt}}{\text{Stockholders' equity}}$$

- Like the total debt-to-total-capital ratio, the debt to equity ratio reflects long-term debt-payment ability. Again, a low ratio means a lower relative debt burden and thus better chances of repayment of creditors.

Example 1-15 Debt to Equity Ratio

Current Year: $1,000,000 ÷ $800,000 = 1.25
Prior Year: $ 950,000 ÷ $650,000 = 1.46

The amount by which the company's debts exceed its equity stake declined in the current year.

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The **long-term debt to equity ratio** reports the long-term debt burden carried by a company per dollar of equity. Normal ranges for this ratio vary by industry.

$$\text{Long-term debt to equity ratio} = \frac{\text{Long-term debt}}{\text{Stockholders' equity}}$$

- A low ratio means a firm will have an easier time raising new debt (since its low current debt load makes it a good credit risk).

Example 1-16 Long-Term Debt to Equity Ratio

Current Year: $610,000 ÷ $800,000 = 0.763
Prior Year: $675,000 ÷ $650,000 = 1.038

The company has greatly improved its long-term debt burden. It now carries less than one dollar of long-term debt for every dollar of equity.

The **debt to total assets ratio** (also called the debt ratio) reports the total debt burden carried by a company per dollar of assets. Normal ranges for this ratio vary by industry.

$$\text{Debt to total assets ratio} = \frac{\text{Total liabilities}}{\text{Total assets}}$$

- Numerically, this ratio is identical to the total debt-to-total-capital ratio.

Example 1-17 Debt to Total Assets Ratio

Current Year: $1,000,000 ÷ $1,800,000 = 0.556
Prior Year: $ 950,000 ÷ $1,600,000 = 0.594

Although total liabilities increased in absolute terms, this ratio improved because total assets increased even more.

	Total Debt-to-Total-Capital Ratio	Debt to Equity Ratio	Long-term Debt to Equity Ratio	Debt to Total Assets Ratio
Type	Solvency ratio	Solvency ratio	Solvency ratio	Solvency ratio
Formula	Total debt / Total capital	Total debt / Stockholders' equity	Long-term debt / Stockholders' equity	Total liabilities / Total assets
Focus	Measures percentage of the capital structure provided by creditors	Reflects the long-term debt paying ability	Reports the long-term debt burden carried by a company per dollar of equity	Measures the total debt burden carried by a company per dollar of assets

Figure 1-5

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Earnings Coverage Ratios

Earnings coverage ratios are a creditor's best measure of a firm's ongoing ability to generate the earnings that will allow it to service debt.

The **times interest earned ratio** is an income statement approach to evaluating a firm's ongoing ability to meet the interest payments on its debt obligations.

$$\text{Times interest earned ratio} = \frac{\text{Earnings before interest and taxes}}{\text{Interest expense}}$$

- For the ratio to be meaningful, net income cannot be used in the numerator. Since what is being measured is the ability to pay interest, earnings before interest and taxes (EBIT) is appropriate.
- The most accurate calculation of the numerator includes only earnings expected to recur. Consequently, unusual or infrequent items, discontinued operations, and the effects of accounting changes should be excluded.
- Acceptable times interest earned ratios are generally above 3.0 with ratios exceeding 5.0 considered strong.
- The denominator should include capitalized interest.
  - This ratio is also referred to as the interest coverage ratio or interest charged ratio.

Example 1-18 Times Interest Earned Ratio

Current Year: $150,000 ÷ $15,000 = 10.00 times
Prior Year: $125,000 ÷ $10,000 = 12.50 times

The company is less able to comfortably pay interest expense. In the prior year, EBIT was 12.5 times interest expense, but in the current year, it is only 10 times.

The **earnings to fixed charges ratio** (also called the fixed charge coverage ratio) extends the times interest earned ratio to include the interest portion associated with long-term lease obligations.

$$\text{Earnings to fixed charges ratio} = \frac{\text{Earnings before fixed charges and taxes}}{\text{Fixed charges}}$$

- Fixed charges include interest, required principal repayments, and leases.
- This is a more conservative ratio since it measures the coverage of earnings over all fixed charges, not just interest expense.
- A fixed charges ratio greater than 1.0 indicates that the company has sufficient earnings to cover its fixed charges. This would allow the company to take on more debt. A ratio less than 1.0 indicates that fixed charges exceed earnings, causing the company to be unable to pay interest on any new and outstanding debt.

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The **cash flow to fixed charges ratio** removes the difficulties of comparing amounts prepared on an accrual basis.

$$\text{Cash flow to fixed charges ratio} = \frac{\text{Cash from operations} + \text{Fixed charges} + \text{Tax payments}}{\text{Fixed charges}}$$

- Cash from operations is after-tax.

	Times Interest Earned Ratio	Earnings to Fixed Charges Ratio	Cash Flow to Fixed Charges Ratio
Type	Solvency ratio	Solvency ratio	Solvency ratio
Formula	$\frac{\text{Earnings before interest and taxes}}{\text{Interest expense}}$	$\frac{\text{Earnings before fixed charges and taxes}}{\text{Fixed charges}}$	$\frac{\text{Cash from operations + Fixed charges + Tax payments}}{\text{Fixed charges}}$
Focus	Measures firm's ongoing ability to meet interest payments on debt obligations	Extension of times interest earned ratio to include the interest portion associated with long-term obligations	Measures ability to meet interest payments on a cash basis

Figure 1-6

1.4 Leverage

Success Tip

For the purpose of the CMA exam, be sure that you understand and can calculate both leverage ratios. However, calculating these ratios is just one aspect of how you could be tested on this topic. Candidates should be fully prepared to apply these calculations and demonstrate an understanding through multiple-choice or case-based questions of how changes in cost structure may affect these ratios. Ensure that you understand what risks and advantages are associated with high operating or financial leverage.

Leverage in finance refers to the use of debt to amplify potential returns from an investment or project. By leveraging, a company can invest more capital with less equity financing, aiming to increase the potential returns for its shareholders.

- For example, if a company uses borrowed money to help finance its operations, the profits generated could pay off the interest costs of the debt, leading to higher returns for the equity owners where the equity owners do not have to share these profits with more equity owners.

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Types of Leverage

Leverage is the relative amount of fixed cost in a firm's overall cost structure. Leverage creates risk because fixed costs must be covered, regardless of the level of sales.

- **Operating leverage** arises from the use of a high level of plant and machinery in the production process, revealed through charges for depreciation, property taxes, etc.
- **Financial leverage** arises from the use of a high level of debt in the firm's financing structure, revealed through amounts paid out for interest.

Although leverage arises from items on the balance sheet, it is measured by examining its effects on the income statement. A general statement of leverage is

$$\text{Degree of leverage} = \frac{\text{Pre-fixed-cost income amount}}{\text{Post-fixed-cost income amount}}$$

Degree of Operating Leverage (DOL)

Calculation of the DOL requires financial information prepared on the variable-costing basis, since variable costing isolates the use of fixed costs in the firm's ongoing operations.

- The contribution margin formatted income statement categorizes expenses by cost behaviors.

$$\text{DOL (single period)} = \frac{\text{Contribution margin}}{\text{Operating income or earnings before interest and taxes (EBIT)}}$$

Example 1-19 DOL -- Single Period

A firm's DOL varies with the level of sales, as shown below:

Degree of Operating Leverage at Various Levels of Sales

Sales volume:	**100 Units**	**250 Units**	**500 Units**	**750 Units**	**1,000 Units**
Net sales ($1,000 per unit)	$ 100,000	$ 250,000	$ 500,000	$ 750,000	$1,000,000
Variable costs ($800 per unit)	(80,000)	(200,000)	(400,000)	(600,000)	(800,000)
Contribution margin	$ 20,000	$ 50,000	$ 100,000	$ 150,000	$ 200,000
Fixed costs	(100,000)	(100,000)	(100,000)	(100,000)	(100,000)
Operating income (loss)	**$ (80,000)**	**$ (50,000)**	**$ 0**	**$ 50,000**	**$ 100,000**
Degree of operating leverage	**(0.25)**	**(1.00)**	**Undef.**	**3.00**	**2.00**

This firm breaks even at sales of 500 units. As the example demonstrates, DOL is not a meaningful measure when the firm incurs an operating loss.

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The more a firm relies on fixed costs, the higher the DOL.

- The higher the DOL, the more sensitive the firm's operating income is to change when the level of sales changes.
- The DOL can be used to predict the percentage change in operating income. For example, if the DOL is 3.0 and the company's sales are projected to increase 10%, the increase in operating income will be 30% (3.0 × 10%).

Two versions of DOL are in common use.

1. The version shown on the previous page compares contribution margin and variable-basis operating income in a single reporting period.
2. The percentage-change version of DOL measures the changes in income statement amounts from one period to another.

$$\text{DOL (\%}\Delta\text{)} = \frac{\%\Delta \text{ in operating income or EBIT}}{\%\Delta \text{ in sales}}$$

   - Note that, in this version, the numerator and denominator are different from those in the single-period version.

Example 1-20 DOL -- Percentage Change

Degree of Operating Leverage
Period-to-Period Percentage Change

	Current Year	Prior Year
Net sales	**$1,800,000**	**$1,400,000**
Cost of goods sold	(1,450,000)	(1,170,000)
Gross margin	$ 350,000	$ 230,000
SG&A expenses	(160,000)	(80,000)
Operating income	$ 190,000	$ 150,000
Other income and loss	(40,000)	(25,000)
EBIT	**$ 150,000**	**$ 125,000**
Interest expense	(15,000)	(10,000)
Earnings before taxes	$ 135,000	$ 115,000
Income taxes (40%)	(54,000)	(46,000)
Net income	**$ 81,000**	**$ 69,000**

Numerator: %Δ in EBIT = ($150,000 – $125,000) ÷ $125,000 = 20.00%
Denominator: %Δ in sales = ($1,800,000 – $1,400,000) ÷ $1,400,000 = 28.57%

Degree of operating leverage = 20.00% ÷ 28.57% = 0.7

Every 1% change in sales generates a 0.7% change in EBIT.

A firm with high operating leverage necessarily carries a greater degree of risk because fixed costs must be covered regardless of the level of sales. However, such a firm is also able to expand production rapidly in times of higher product demand. Thus, the more leveraged a firm is in its operations, the more sensitive operating income is to changes in sales volume.

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Degree of Financial Leverage (DFL)

The DFL also results from a pre-fixed-cost income to post-fixed-cost income comparison, this time on the firm's financing structure.

$$\text{DFL (single period)} = \frac{\text{EBIT}}{\text{Earnings before taxes (EBT)}}$$

- This formula isolates the effects of interest as the only truly fixed financing cost.

Example 1-21 DFL -- Single Period

Degree of Financial Leverage
Single-Period Version

	Current Year	Prior Year
Net sales	$1,800,000	$1,400,000
Cost of goods sold	(1,450,000)	(1,170,000)
Gross margin	$ 350,000	$ 230,000
SG&A expenses	(160,000)	(80,000)
Operating income	$ 190,000	$ 150,000
Other income and loss	(40,000)	(25,000)
EBIT	**$ 150,000**	**$ 125,000**
Interest expense	(15,000)	(10,000)
Earnings before taxes	**$ 135,000**	**$ 115,000**
Income taxes (40%)	(54,000)	(46,000)
Net income	**$ 81,000**	**$ 69,000**

Degree of financial leverage	
Current year:	$150,000 ÷ $135,000 = $1.11
Prior year:	$125,000 ÷ $115,000 = $1.09

The company needs $1.11 of EBIT to generate $1.00 of EBT. Last year, only $1.09 of EBIT was needed to generate $1.00 of EBT.

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Two versions of DFL are in common use.

1. The version shown on the previous page compares EBIT and EBT from a single reporting period.
2. The percentage-change version examines the changes in income statement amounts over two periods.

$$\text{DFL (\%}\Delta\text{)} = \frac{\%\Delta \text{ in net income}}{\%\Delta \text{ in EBIT}}$$

- Note that in the percentage-change version, the numerator and denominator are different from those in the single-period version.

Example 1-22 DFL -- Percentage Change

Numerator: %Δ in net income = ($81,000 – $69,000) ÷ $69,000 = 17.39%
Denominator: %Δ in EBIT = ($150,000 – $125,000) ÷ $125,000 = 20.00%

Degree of financial leverage = 17.39% ÷ 20.00% = 0.8695

Every 1% change in EBIT generates a 0.87% change in net income.

A firm with high financial leverage necessarily carries a greater degree of risk because debt must be serviced regardless of the level of earnings. However, if such a firm is profitable, there is more residual profit for the shareholders after debt service (interest on debt is tax-deductible), reflected in higher earnings per share. Furthermore, debt financing permits the current equity holders to retain control.

	Degree of Operating Leverage	Degree of Financial Leverage
Type	Leverage ratio	Leverage ratio
Formula	Contribution margin / Operating income or earnings before interest and taxes (EBIT)	EBIT / Earnings before taxes (EBT)
Focus	Measures how sensitive operating income (or EBIT) is to a change in sales volume	Measures how sensitive EBT is to changes in operating income (or EBIT)

Figure 1-7

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