

Module 5

**DIAGNOSING
PROFITABILITY,
RISK, AND GROWTH**

Background

- If higher sales and profits are achieved by a firm due to a larger balance sheet, that means that more capital is used to finance the firm's activities
 - Because capital is costly, what we really need to know is whether profits per dollar of assets employed have increased
- Alternatively, a drop in profits with a rise in interest expenses does not necessarily mean that it was borrowing that impaired the firm's profitability
- An increase or a decrease in profits is not, by itself, a good indicator of a firm's financial performance
- This Module presents an integrated approach to profitability analysis

Background

- After reading this Module, students should understand:
 - How to measure a firm's profitability
 - The key drivers of profitability
 - How to analyze the structure of a firm's overall profitability
 - How business risk and the use of debt financing affect profitability
 - How to assess a firm's capacity to finance its expected growth in sales

Measures Of Profitability

- Managers adopt measures of profitability depending on their areas of responsibility
 - Sales manager would look at **return on sales (ROS)**
 - Manager of an operating unit would choose **return on assets (ROA)**
 - Chief executive would pay attention primarily to **return on equity (ROE)**

Return On Equity

- Return on equity (ROE) is the most comprehensive indicator of profitability
 - Considers the operating and investing decisions as well as the financing and tax-related decisions
- ROE measures the firm's profitability from the perspective of the owners whose reward is the firm's net profit
 - $ROE = \text{Earnings after tax} \div \text{Owners' equity}$

EXHIBIT 5.1a:

OS Distributors' Balance Sheets.

Figures in millions of dollars.

	DEC. 31, 1998	DEC. 31, 1999	DEC. 31, 2000
<u>ASSETS</u>			
<i>CURRENT ASSETS</i>	\$104.0	\$119.0	\$137.0
Cash ¹	\$6.0	\$12.0	\$8.0
Accounts receivable	44.0	48.0	56.0
Inventories	52.0	57.0	72.0
Prepaid expenses	2.0	2.0	1.0
<i>NONCURRENT ASSETS</i>	56.0	51.0	53.0
Financial assets & intangibles	0.0	0.0	0.0
Property, plant, & equip. (net)	56.0	51.0	53.0
Gross value	\$90.0	\$90.0	\$93.0
Accumulated depreciation	(34.0)	(39.0)	(40.0)
TOTAL ASSETS	<u>\$160.0</u>	<u>\$170.0</u>	<u>\$190.0</u>

EXHIBIT 5.1b:

OS Distributors' Balance Sheets.

Figures in millions of dollars

	DEC. 31, 1998	DEC. 31, 1999	DEC. 31, 2000
<u>LIABILITIES AND OWNERS' EQUITY</u>			
<i>CURRENT LIABILITIES</i>	54.0	66.0	75.0
Short-term debt	\$15.0	\$22.0	\$23.0
Owed to banks	\$7.0	\$14.0	\$15.0
Current portion of long-term debt	8.0	8.0	8.0
Accounts payable	37.0	40.0	48.0
Accrued expenses	2.0	4.0	4.0
<i>NONCURRENT LIABILITIES</i>	42.0	34.0	38.0
Long-term debt	42.0	34.0	38.0
<i>Owners' equity</i>	64.0 64.0	70.0 70.0	77.0 77.0
TOTAL LIABILITIES AND OWNERS' EQUITY	<u>160.0</u>	<u>170.0</u>	<u>190.0</u>

EXHIBIT 5.2: OS Distributors' Income Statements.

Figures in millions of dollars

	1998	1999	2000
Net Sales	\$390.0	\$420.0	\$480.0
Cost of goods sold	(\$328.0)	(\$353.0)	(\$400.0)
Gross profit	62.0	67.0	80.0
Selling, general, & administrative expenses	(39.8)	(43.7)	(48.0)
Depreciation expenses	(5.0)	(5.0)	(8.0)
Operating profit	17.2	18.3	24.0
Extraordinary items	0	0	0
Earnings before interest & tax (EBIT)	17.2	18.3	24.0
Net interest expenses	(5.5)	(5.0)	(7.0)
Earnings before tax (EBT)	11.7	13.3	17.0
Income tax expense	(4.7)	(5.3)	(6.8)
Earnings after tax (EAT)	\$7.0	\$8.0	\$10.2
Dividends	\$2.0	\$2.0	\$3.2
Retained earnings	\$5.0	\$6.0	\$7.0

The Impact Of Operating Decisions On Return On Equity

- Operating decisions involve the acquisition and disposal of fixed assets and the management of the firm's operating assets
 - Net profit, however, is obtained after deducting interest expenses—the outcome of financing decisions
 - Therefore, ROS and ROA do not reflect only operating decisions

Return on Invested Capital (ROIC)

- A relevant measure of operating profitability is return on invested capital or ROIC
 - $ROIC = EBIT \div \text{Invested Capital}$
 - ROIC is the same as return on net assets (RONA) and return on capital employed (ROCE)
 - OS Distributors' ROIC is shown in the last column of [Exhibit 5.4](#)
 - ROIC can also be measured after tax by using EBIT (1 – tax rate)
 - Also called net operating profit after tax or NOPAT
- Other measures of operating profitability include
 - Return on business assets (ROBA)
 - Return on total assets (ROTA)

EXHIBIT 5.3:

OS Distributors' Managerial Balance Sheets.

All data from the balance sheets in Exhibit 5.1; figures in millions of dollars

	DEC. 31, 1998	DEC. 31, 1999	DEC. 31, 2000
<u>INVESTED CAPITAL OR NET ASSETS</u>			
• Cash	\$ 6.0	\$ 12.0	\$ 8.0
• Working capital requirement (WCR) ¹	59.0	63.0	77.0
• Net fixed assets	56.0	51.0	53.0
<i>TOTAL INVESTED CAPITAL OR NET ASSETS</i>	<u>\$121.0</u>	<u>\$126.0</u>	<u>\$138.0</u>
<u>CAPITAL EMPLOYED</u>			
• Short-term debt	\$ 15.0	\$ 22.0	\$ 23.0
• Long-term financing	106.0	104.0	115.0
Long-term debt	\$42.0	\$34.0	\$38.0
Owners' equity	64.0	70.0	77.0
<i>TOTAL CAPITAL EMPLOYED</i>	<u>\$121.0</u>	<u>\$126.0</u>	<u>\$138.0</u>

¹ WCR = (Accounts receivable + Inventories + Prepaid expenses) – (Accounts payable + Accrued expenses). These amounts are given in Exhibit 5.1.

EXHIBIT 5.4:

The Structure of OS Distributors' Return on Invested Capital.

All data from the income statements in Exhibit 5.2 and the balance sheets in Exhibit 5.3; figures in millions of dollars

YEAR	OPERATING PROFIT MARGIN		CAPITAL TURNOVER ¹		RETURN ON INVESTED CAPITAL ³	
	$\frac{\text{EBIT}}{\text{SALES}}$	×	$\frac{\text{SALES}}{\text{INVESTED CAPITAL}^2}$	=	$\frac{\text{EBIT}}{\text{INVESTED CAPITAL}}$	
	$\frac{\$17.2}{\$390}$	×	$\frac{\$390}{\$121}$	=	$\frac{\$17.2}{\$121}$	
1998	4.4%	×	3.2	=	14.2%	
	$\frac{\$18.3}{\$420}$	×	$\frac{\$420}{\$126}$	=	$\frac{\$18.3}{\$126}$	
1999	4.4%	×	3.3	=	14.5%	
	$\frac{\$24}{\$480}$	×	$\frac{\$480}{\$138}$	=	$\frac{\$24}{\$138}$	
2000	5.0%	×	3.5	=	17.4%	

¹Capital turnover is the same as net asset turnover (see Note 2 below).

²Invested capital (same as net assets) = Cash + Working capital requirement + Net fixed assets.

³Return on invested capital (ROIC) = Return on net assets (RONA).

The Drivers of Operating Profitability

- Any improvement in ROIC must be the outcome of a higher operating profit margin or a higher capital turnover

$$\text{ROIC} = \frac{\text{EBIT}}{\text{Invested Capital}} = \frac{\text{EBIT}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Invested Capital}}$$

- A higher operating profit margin is achieved by
 - Increasing sales through higher prices and/or higher volume—at a higher rate than operating expenses
 - Reducing operating expenses at a higher rate than sales
- A higher capital turnover is achieved through a better use of the firm's assets
- The link between return on equity and operating profitability
 - If a firm does not borrow, its ROIC (*i.e.* operating profitability) is equal to its pretax return on equity

The Impact Of Financing Decisions On Return On Equity

- When a firm does not borrow, its ROIC and ROE are the same
 - Thus, any difference between them must be due to the use of debt
- There is a financial cost effect that reduces ROE and a simultaneous financial structure effect that increases ROE
 - Thus, cannot predict how financial leverage affects ROE

The Impact Of Financing Decisions On Return On Equity

- Financial cost ratio (FCR)
 - $\text{FCR} = \text{Earnings before tax} \div \text{EBIT}$
- Times-interest-earned (TIE), or interest coverage, ratio
 - $\text{TIE} = \text{EBIT} \div \text{Interest expenses}$
- Financial structure ratio or equity multiplier
 - $\text{FSR} = \text{Invested capital or net assets} \div \text{Owners' equity}$
- Other measures of financial leverage
 - Debt-to-equity ratio
 - Debt-to-invested capital ratio

The Incidence Of Taxation On Return On Equity

- Third determinant of a firm's ROE
 - Incidence of corporate taxation
 - Relevant tax rate is the **effective tax rate**, not the **statutory tax rate**

$$\begin{aligned}\text{Tax effect ratio} &= \frac{\text{EAT}}{\text{EBT}} = \frac{\text{EBT}(1 - \text{effective tax rate})}{\text{EBT}} \\ &= 1 - \text{effective tax rate}\end{aligned}$$

EXHIBIT 5.6:

Comparison of Effective Tax Rates in 1999.

Figures in thousands of dollars

Firm	EBT	EAT	Equity	Pre-Tax ROE	Tax-effect Ratio	After-tax ROE	Effective Tax Rate
HP	\$4,194	\$3,104	\$18,295	22.9%	74.0%	17.0%	26.0%
IBM	\$11,757	\$7,712	\$20,511	57.3%	65.6%	37.6%	34.4%

Exhibit 5.6
illustrates the point
that a firm should
plan to minimize its
tax liabilities.

Putting It All Together: The Structure Of A Firm's Profitability

- ROE is the product of five ratios
 - Operating profit margin
 - Capital turnover
 - Financial cost ratio
 - Financial structure ratio
 - Tax effect ratio

$$\text{ROE} = \underbrace{\frac{\text{EBIT}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Invested capital}}}_{\text{Capture the impact of the firm's investing and operating decisions}} \times \underbrace{\frac{\text{EBT}}{\text{EBIT}} \times \frac{\text{Invested capital}}{\text{Owners' equity}}}_{\text{Reflect the impact of the financial policy on the firm's overall profitability. Their product is called the financial leverage multiplier.}} \times \frac{\text{EAT}}{\text{EBT}}$$

Capture the impact of the firm's investing and operating decisions

Reflect the impact of the financial policy on the firm's overall profitability. Their product is called the financial leverage multiplier.

EXHIBIT 5.7: The Drivers of Return on Equity.

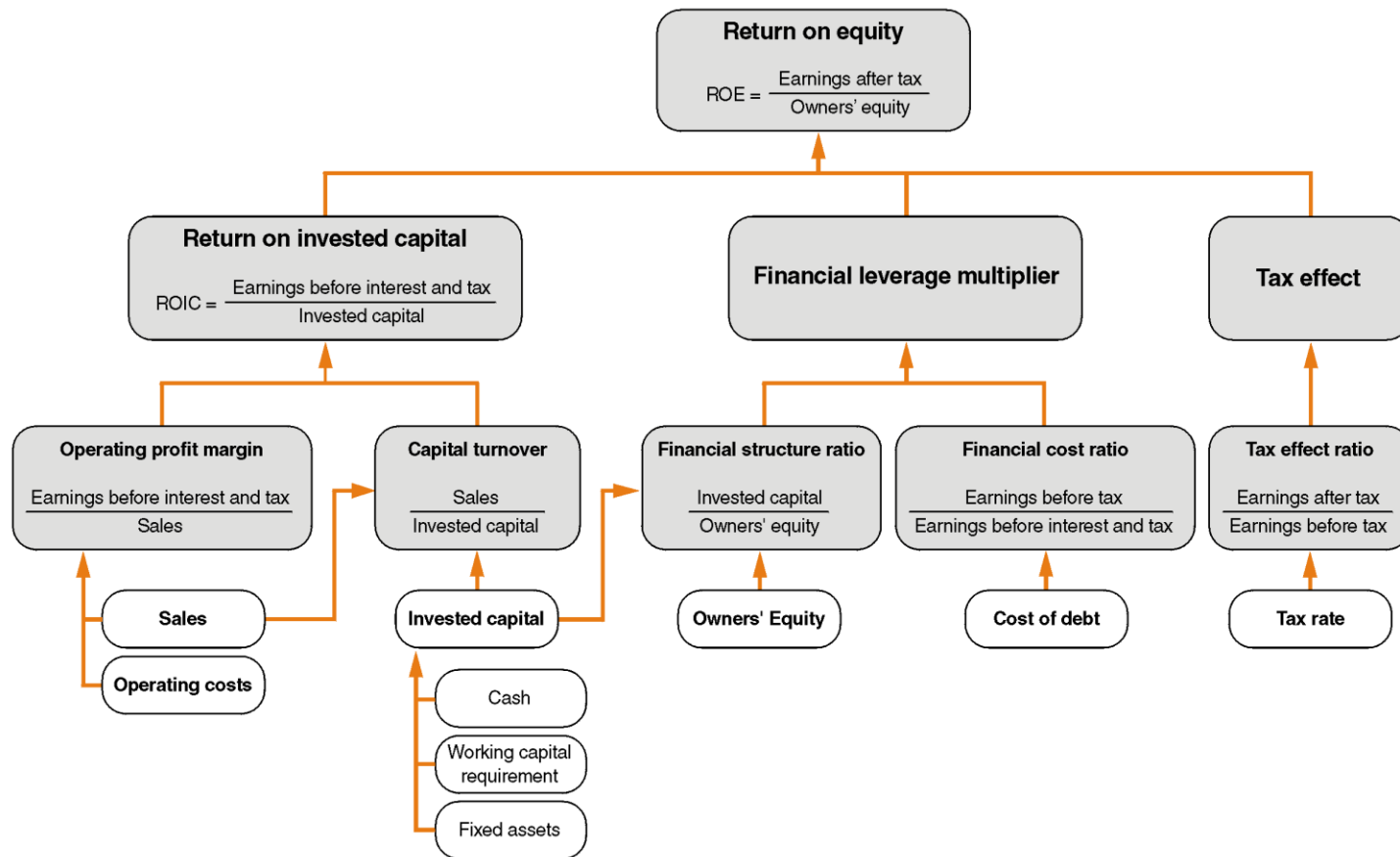


EXHIBIT 5.8:

The Structure of Return on Equity for Five Firms in Different Sectors (1999).¹

Firm ²	Operating Profit Margin ³ (1)	Capital Turnover ⁴ (2)	Return on Invested Capital ⁵ (3) = (1) x (2)	Financial Leverage Multiplier ⁶ (4)	Pretax Return on Equity ⁷ (5) = (3)x(4)	Tax Effect ⁸ (6)	Return on Equity ⁹ (7)=(5)x(6)
1	19.7%	1.13	22.3%	2.30	51.9%	69.9%	36.3%
2	24.0%	1.10	26.4%	2.47	65.1%	68.3%	44.5%
3	6.1%	3.35	20.4%	1.64	33.5%	59.2%	19.8%
4	13.2%	0.94	12.3%	2.11	26%	64.6%	16.8%
5	29.5%	0.24	7.1%	3.49	24.8%	69.9%	17.3%

¹ Compiled by the authors with accounting data from the firms' annual reports.

² See text for names of companies.

³ Operating profit margin = Earnings before interest and tax/Sales.

⁴ Capital turnover = Sales/Invested capital, where invested capital = Cash + Working capital requirement + Net fixed assets.

⁵ Return on invested capital = Earnings before interest and tax/Invested capital.

⁶ Financial leverage multiplier = Pretax return on equity/Return on invested capital.

⁷ Pretax return on equity = Earnings before tax/Owners' equity.

⁸ Tax effect = Earnings after tax/Earnings before tax = (1 – effective tax rate).

⁹ Return on equity = Earnings after tax/Owners' equity.

Other Measures Of Profitability

- The following are a few ratios that combine financial accounting data with financial market data
 - **Earnings per share (EPS)**
 - $\text{EPS} = \text{Earnings after tax} \div \# \text{ of shares outstanding}$
 - **Price-to-earnings ratio (P/E)**
 - $\text{P/E} = \text{Share price} \div \text{EPS}$
 - **Market-to-book ratio (MBR)**
 - $\text{MBR} = \text{Share price} \div \text{Book value per share}$

Financial Leverage And Risk

- Two firms with identical net assets are considered
 - The only difference between them is their financing strategy
 - One firm is financed exclusively with equity, while the other finances half of its net assets with borrowed funds
 - The two firms are assumed to face the same **business risk**, *i.e.* the same changes in EBIT

EXHIBIT 5.9: Effect of Financing on Profitability for Different Levels of EBIT.

ALTERNATIVE LEVELS OF PRETAX OPERATING PROFIT	PROFITABILITY OF THE FIRM WITH 100% EQUITY FINANCING		PROFITABILITY OF THE FIRM WITH 50% EQUITY FINANCING	
	EBIT	ROIC	ROE	ROIC
\$14 million	14%	14%	14%	18%
\$10 million	10%	10%	10%	10%
\$8 million	8%	8%	8%	6%

- Levered firm's ROE varies more widely than that for the unlevered firm
 - Financial leverage magnifies a firm's business risk
 - In other words, borrowing at a fixed interest rate adds **financial risk** to the firm's existing business risk
- The levered firm is riskier and its risk increases with rising levels of borrowing

How Does Financial Leverage Work?

- A firm seeking to enhance its ROE should borrow as long as its ROIC exceeds its cost of debt
 - Should refrain from borrowing whenever its ROIC is lower than its cost of debt

$$\text{ROE} = \text{ROIC}(1 - t) + [\text{ROIC} - \text{Cost of debt}](1 - t) \times \frac{\text{Debt}}{\text{Owners' equity}}$$

Two Related Caveats: Risk And The Ability To Create Value

- The above conclusion suggesting that financial leverage enhances the firm's overall profitability (its ROE) as long as the firm achieves ROIC that exceeds the borrowing rate has two caveats
 - Managers do not know their firm's future ROIC
 - High expected ROE does not necessarily mean that the firm is creating value for its owners

Self-Sustainable Growth

- As sales increase, the related growth in assets will have to be financed with
 - Debt
 - Equity
 - A combination of these two sources of funds
- Self-sustainable growth rate (SSGR)
 - Maximum rate of growth in sales a firm can achieve without issuing new shares or changing either its operating or its financing policy
 - $SSGR = \text{Retention rate} \times ROE$
- If the five factors comprising ROE stay fixed, a firm cannot grow its sales faster than its self-sustainable growth rate unless it issues new shares

EXHIBIT 5.10:

OS Distributors' Self-Sustainable Growth Rate Compared to Growth in Sales.

YEAR	RETENTION RATE	RETURN ON EQUITY	SELF-SUSTAINABLE GROWTH RATE	GROWTH IN SALES
2000	$\frac{7.0}{10.2} = 0.69$	$\frac{10.2}{70.0} = 14.6\%$	$0.69 \times 14.6\% = 10\%$	14.3%
1999	$\frac{6.0}{8.0} = 0.75$	$\frac{8.0}{64.0} = 12.5\%$	$0.75 \times 12.5\% = 9.4\%$	7.7%

Exhibit 5.10 shows OS Distributors' self-sustainable growth rate computed as a product of its retention rate and return on equity.

Self-Sustainable Growth

- Firms with sales growing faster than their self-sustainable growth rate will eventually experience a funding problem
 - While firms with sales growing slower than their self-sustainable growth rate will eventually face an investment problem
- Given the constraints, the firm's self-sustainable growth rate can only be increased through an improvement in the firm's operating profitability

EXHIBIT 5.11: Sales Growth and Cash Condition.

