Introduction to Finance

by George Blazenko

Chapter 2

Financial-Analysis with Financial-Statement and Financial-Market Info

"**My problem lies in reconciling my gross habits with my net income**." *Errol Flynn*: Australian-American actor (1909–1959)

"The average parent may, for example, plant an artist or fertilize a ballet dancer and end up with a certified public accountant." *Ellen Goodman* (b. 1941): U.S. journalist. "Goodman's Victory Garden," Close to Home, Simon & Schuster (1979)

"It sounds extraordinary but it's a fact that balance sheets can make fascinating reading." *Mary Archer*. Read more at: https://www.brainyquote.com/quotes/mary_archer_197626 **Dame Mary Doreen Archer**, DBE (*née* **Weeden**; born 22 December 1944), commonly known as **Mary Archer**, is a British scientist specializing in solar power conversion.

"There's no business like show business…but there are several businesses like accounting." *David Letterman* (More from David Letterman on Accounting and Accountants)

"You can't connect the dots looking forward; you can only connect them looking backwards. You have to trust that the dots connect to your future." *Steve Jobs*

"Sharing necessitates accounting." *Professor Blazenko*

"There's no accounting for the weather." *Professor Blazenko*

In Chapter Two We Learn:

1. **Financial-statement limitations for financial analysis?**
2. **Primary financial asset-holders of a firm?**
3. **Measure business expenditure (investment)?**
4. **Measure two business returns: the Rate of Return on Invested Capital (ROIC, after-tax, after depreciation) and the Rate of Return on Equity (ROE)?**
5. **Do ROIC and ROE relate to one another? Yes, they do!**
6. **Forecast ROIC with financial statement information and financial market forecasts? Yes, we can!**
7. **Measure Free Cash Flow (FCF)?**
8. **FCF economic determinants?**
9. **Forecast FCF with forward ROIC and forward growth!**
10. **Calculate the business-investment opportunity cost rate of return (the cost of capital) with forward ROIC, forward growth, and asset market/book. (Yes, we can!)**
11. **Constant growth implied cost of capital limitations? Yes, there are!**

Chapter Two Contents

(2.1) Introduction

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Financial accounting is the process of producing and disseminating information on the economic activities of a firm. Many groups require information from financial statements, including shareholders, creditors, employees, suppliers, government, and social interest groups. For at least two reasons communication is weaker between professional accountants and financial statement users than between other professionals and their clients (like, doctors and lawyers, for example). First, accounting principles and the requirements of regulatory agencies tightly constrain the content and format of financial statements (especially for publicly traded corporations). They presume the information requirements of users without recognizing differences in information needs. Second, users of financial statements have little opportunity to make direct requests of accountants for individual treatment. They share general statements despite diverse interests. Perhaps because of this diversity, accountants take pains to ensure accuracy of financial statements but they provide little/no guidance on their use. In this chapter, we study how *investors* use financial statements to analyze business and financial investments.

We integrate ratio calculations into financial analysis, which we know from Chapter 1 answers four questions, including — is this good business investment? This perspective has its origins in the investment industry, which is that of financial analysts who use financial ratios/measures for investment decisions.

In your financial accounting studies, you have undoubtedly calculated financial ratios from financial statements. So, we will not calculate all possible financial ratios in this chapter. Rather, we focus on measures/ratios most important to help answer the four questions of financial analysis from chapter 1. Almost surely, many (most?) of the measures in the current chapter you have not seen before. Remember that we are financial statement users rather than producers. To help us ask and answer the questions of financial analysis we slice and dice and rearrange financial statements in ways that might make a financial accountant cringe. However, our purpose is to use financial statements for financial analysis, whatever that requires.

(2.2) Recognize the Limitations of Financial Ratios

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Limitations of Ratios: 36 minutes

Before we begin financial analysis in earnest, you should be aware of financial statements/ratios limitations for this purpose.

First, and possibly most importantly, there is no objective standard for most ratios. What constitutes a high/low value is often a matter of business-judgment rather than business-theory. Financial ratios measure business performance, efficiency, and risk. If used carefully, ratios can be valuable tools to assess the financial health of a firm. However, for most ratios it is difficult to determine whether the numeric-value is high, low, good, or bad. The reason for this ambiguity is that the "theory of business" is not sufficiently strong to offer absolute standards (benchmarks) for most ratios. (The theory of business is all of the business courses you study in a typical business program.) Until we have a more complete theoretic picture, we often resort to relative rather than absolute comparisons, like, trend analysis or industry averages. In trend analysis, we determine whether a ratio is improving or deteriorating, not good or bad. In an industry comparison, we determine whether a ratio is better or worse than the industry, not good or bad.

There is one exception to the general rule that the theory of business is not sufficiently strong to give us absolute benchmarks. The exception is business *returns* and the theory of Finance, where we benchmark returns against an opportunity cost rate of return from financial markets. This opportunity cost rate of return is a number and, thus, an absolute standard. Beginning in this chapter, we illustrate how, with a number of measures from financial markets, with some guiding financial theory, and with some simplifying assumptions, we can calculate a firm's *cost of capital*:

the opportunity cost rate of return for business investment. By benchmarking business return (of a particular type) with the cost of capital, we can answer the question of whether a firm makes (or prospectively makes) "good" business investments for its financial asset-holders and shareholders, specifically.

An example of an absolute standard for a business return is our first numerical example from Chapter 1. A firm invests $300,000 today to generate (forecast) $400,000 in one year. Business return is the IRR, which equals 33.3%. We said (without giving details) that the opportunity cost rate of return from financial markets is 7%, which is an absolute standard with which we can benchmark the 33.3% business return. Because the 33.3% is greater than the 7% we can say that this is a "good" investment and creates wealth for financial asset-holders and shareholders in particular. In this case, the theory of finance is sufficiently strong to give us an absolute benchmark so that we can conclude that the business return is "good."

We can benchmark any return, like, for example, those that we calculate in this chapter (the rate of return on invested capital, ROIC, and the rate of return on equity, ROE) against financial market opportunity cost rates of return. Alternatively, we could benchmark a firm's ROIC or ROE against industry averages or past values of these return ratios. But, an opportunity cost rate of return is typically more informative for investors than a relative benchmark.

Industry comparison is a narrow perspective on corporate benchmarking. Remember that the objective of a firm is to maximize shareholder wealth. You, as an employee of your firm, for example, may be interested in how your firm performs relative to competitors. While shareholders share this interest, they also have a broader perspective. Shareholders are restricted neither to investing in any one firm, nor any one industry. Every firm competes globally for the financial resources of dispassionate investors who choose to invest where they like in many different firms and in many different industries. If your objective is to maximize shareholder wealth, then you, like your shareholders, must adopt a broader perspective on corporate performance than simple industry ratio comparison. To recognize a broader investor perspective, we benchmark returns against financial market returns of about the same risk as the business investment under study.

This benchmark has a broader perspective because investors invest where they like in a broad range of different firms and industries to determine opportunity cost rates of return.

Second, financial statements are *historical* but our theory of value (that is, NPV) has a future (forward) orientation. We know from Chapter 1 that we determine whether an investment is "good" based on whether NPV is positive or not. The NPV cash-flows that we discount are *predicted future* cash flows (without giving the details). Financial statements recognize only transactions that have taken place in the past. However, in this chapter, to help us answer the question whether or not a firm makes "good" business investments for its financial asset-holders and shareholders in particular, we use measures from financial markets along with financial statements to help us forecast both business returns (ROIC and ROE) and cash-flows. In other words, despite their historical orientation, we can use the structure of financial statements to help us answer all financial-analysis questions.

Third, differences between firms' accounting methods limit the comparability of ratios. Therefore, where there is a choice as to measure, seek to use ratios that are unaffected by arbitrary accounting choices.

Fourth, different financial analysts calculate some ratios in different ways, even those that share the same name: one can include/exclude different accounts and/or employ broader/narrower interpretations. Because business theory is not generally strong enough to tell us exactly what to measure and how, then naturally, different analysts calculate ratios in different ways.

In this book, we use discounted cash flow analysis (DCF) as our theory of value and financial statements and financial market data as inputs to answer the questions of financial analysis. The broad outline goes like this. Forecast prospective corporate business returns for all financial asset-holders and shareholders in particular. Compare prospective business returns to objective opportunity cost rates of return from financial markets. We need firm-specific information from financial statements to help us forecast business returns and we need financial market measures to calculate investor opportunity cost rates of return. Think of our numerical example from Chapter 1 for guidance. In practice, we might use financial statement data to help us predict the rate of return on business investment as 33% per annum. On the other hand, we use financial markets to

help us determine that the opportunity cost for this business investment is 7% per annum. Both components of this analysis are crucial to making an informed business decision.

Yes, things are complicated but in learning this perspective, you will understand more about financial markets than most of the world's population including many who claim to be financial experts. It is my belief that with this perspective you will become a good "investor" for the business investments of your firm and, also, a good financial investor/advisor. Without this perspective, you will neither be a great business person nor a good financial-asset investor. So, that is my challenge to you in reading this e-book and in your financial studies.

Despite the limitations above, benchmarking financial ratios, even with relative benchmarks, is invaluable for business analysis. Suppose for example, that you forecast operating results for a new business venture. If forecast financial ratios diverge far from industry or historic corporate experience, then you have grounds to reconsider assumptions. This reflection imposes a discipline on business planning.

(2.3) A Spreadsheet Template for Financial Analysis

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The worksheet embedded below calculates all ratios we discuss in this chapter (and others) for Telus (TELUS). TELUS is a national Canadian telecommunications company providing internet access, entertainment, healthcare, video, and IPTV television. The company is based in greater Vancouver (Burnaby). It is a public company with common shares traded on both the Toronto Stock Exchange (TSX) and the New York Stock Exchange (NYSE).

Telus Corporation

The *TELUS* workbook above serves as a template for financial analysis of other firms. Required inputs are the income statement and the balance sheet. The spreadsheet then automatically calculates each performance measure we develop in this chapter.

We retrieve TELUS financial statement data from a database called *COMPUSTAT* which is a product of Standard and Poor's Corporation (S&P). This database provides financial statement information on over 10,000 publicly traded US and Canadian firms. S&P adjusts financial statements to standardized accounting conventions and uses common line items for both income statements and balance sheets for all companies, which enhances ratio comparability across companies. Because of this line item standardization, we can cut and paste from one company to another for financial analysis with the TELUS workbook above.

The graphical user interface for COMPUSTAT is called COMPUSTAT – CAPITAL IQ, which is available to SFU students indirectly through the SFU library website via Wharton School of Business (WRDS: Wharton Research Data Services). Use your SFU email user name with @sfu.ca extension to identify yourself as an SFU student. The below video illustrates how to access annual financial statement data going back many years for thousands of North American (CAN and US) publicly traded companies. COMPUSTAT – IQ "TOOLS" allows you to download complete financial statement data in an EXCEL spreadsheet. You can over-write the data in the TELUS work-book above to automatically calculate the financial measures we study in this chapter for any company that you might be interested in.

Financial Statements:
Compustat Capital - IQ

(2.4) Invested Capital Measures Expenditure

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Returns are critically important in financial analysis. We are working toward calculating the equivalent of the 33.3% business return from Chapter 1. If a firm invests $300,000 to generate $400,000 in one year, the business return is 33.3% per annum. If we want a good return-measure, we need a good expenditure measure, which is the equivalent of the $300,000. Expenditure is one of the fundamental questions of financial analysis that we identify in Chapter 1. Financial statements and a balance sheet in particular are not designed to answer the expenditure question. So, in this section, we rearrange a balance sheet to calculate expenditure as *Invested Capital*, which we can measure from either the corporate perspective (business investment) or from the financial asset-holder perspective (shareholders and creditors as primary financial investors). So, there are two calculations for invested capital: the financial and the operating. Even though the operating calculation is more important for our financial analysis purposes, we begin with the financial calculation because *Invested Capital* originates in the investment industry.

2.4.1 The Financial Definition of Invested Capital

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The total of all funds that have been invested by financial asset-holders in a firm is "invested capital." The term "invested" is used because these funds are associated with identifiable financial assets sold by the firm. Invested capital is a measure of expenditure by financial asset-holders rather than a measure of the value of these financial assets. All accounts on the financial side of the balance sheet that are associated with financial investing are included in the calculation of invested capital. Invested capital is a commonly used measure in the investment industry because it provides a good organizing framework for analysis. It helps to separate the two sides of the "coin" which is the corporation, the operating and the financial side. The following table contains the balance sheet for TELUS for a number of years.

Exhibit 2-1
Telus Corporation
(in millions of $US)

Fiscal Year:	2014	2015	2016	2017
(FYR Ending):	(31DEC2014)	(31DEC2015)	(31DEC2016)	(31DEC2017)
ASSETS				
Cash & Equivalents	60.000	223.000	432.000	509.000
Receivables - Total (Net)	1,580.000	1,429.000	1,480.000	1,719.000
Inventories – Total	320.000	360.000	318.000	378.000
Prepaid Expenses	199.000	213.000	233.000	260.000
Current Assets – Other	27.000	106.000	11.000	18.000
Current Assets – Total	2,186.000	2,331.000	2,474.000	2,884.000
Plant, Property & Equip (Gross)	30,938.000	31,626.000	32,906.000	33,599.000
Accumulated Depreciation	21,815.000	21,890.000	22,442.000	22,231.000
Plant, Property & Equip (Net)	9,123.000	9,736.000	10,464.000	11,368.000
Investments at Equity	39.000	28.000	51.000	62.000
Investments and Advances – Other	49.000	69.000	62.000	41.000
Intangibles	11,554.000	13,746.000	14,151.000	14,875.000
Deferred Charges	.000	.000	62.000	57.000
Assets – Other	266.000	496.000	465.000	261.000
TOTAL ASSETS	23,217.000	26,406.000	27,729.000	29,548.000
LIABILITIES				
Accounts Payable	458.000	476.000	578.000	717.000
Notes Payable	100.000	100.000	100.000	100.000
Accrued Expenses	1,439.000	1,456.000	1,697.000	1,677.000
Taxes Payable	2.000	108.000	37.000	34.000
Debt (Long-Term) Due In One Year	255.000	856.000	1,327.000	1,404.000
Other Current Liabilities	1,245.000	1,280.000	1,212.000	1,258.000
Total Current Liabilities	3,499.000	4,276.000	4,951.000	5,190.000
Long Term Debt	9,055.000	11,182.000	11,604.000	12,256.000
Deferred Taxes (Balance Sheet)	1,936.000	2,155.000	2,107.000	2,500.000
Investment Tax Credit	.000	.000	.000	.000
Liabilities – Other	1,273.000	1,121.000	1,131.000	1,339.000
Noncontrolling Interest – Redeemable	.000	.000	.000	.000
TOTAL LIABILITIES	15,763.000	18,734.000	19,793.000	21,285.000
SHAREHOLDERS' EQUITY				
Preferred Stock	.000	.000	.000	.000
Common Stock	5,175.000	5,050.000	5,029.000	5,205.000
Capital Surplus	141.000	135.000	372.000	370.000
Retained Earnings (Net Other)	2,138.000	2,487.000	2,516.000	2,646.000
Less: Treasury Stock	.000	.000	.000	.000
Shareholders Equity – Parent	7,454.000	7,672.000	7,917.000	8,221.000
Noncontrolling Interest – Nonredeemable	.000	.000	19.000	42.000
TOTAL SHAREHOLDERS EQUITY	7,454.000	7,672.000	7,936.000	8,263.000
TOTAL LIABILITIES AND EQUITY	23,217.000	26,406.000	27,729.000	29,548.000

Exhibit 2-2 below table gives one definition of Invested Capital in common use by investors applied to TELUS for 2016. You will see shortly why we use 2016 rather than 2017. Numbers in Exhibit 2-2 below are taken from Exhibit 2-1 above. This table tells us that at the end of 2016, the financial asset-holders of TELUS (creditors and common shareholders) have invested over 24 billion dollars in TELUS financial assets ("ST" is short-term and "LT" is long-term).

Exhibit 2-2 Financial Definition of Invested Capital: TELUS 2016 (in $US millions)	
Notes Payable plus other ST Debt plus Current Portion of LT Debt	$100 + $1,327
LT Debt and other LT Liabilities	$11,604 + $1,131
Preferred Shares	0
Deferred Income Taxes	$2,107
Total Shareholder Equity	$7,936
Other Financial Assets	0
Invested Capital in the Financial Calculation	**$24,186**

To summarize financial expenditure (invested capital) even further than Exhibit 2-2, let us define "debt" as short-term debt plus long-term debt plus other long-term liabilities. Thus, at year-end 2016, TELUS's debt is $100 + $1,327 + $11,604 + $1,131 = $14,162. Let us define "Equity" (that is, book equity) as the sum of Total Shareholder Equity[1] plus Deferred Income Taxes.[2] At the end of 2016, TELUS's equity is $7,917 +2,107 = $10,024. Note carefully that these are expenditure calculations. The value of TELUS financial assets may have increased or decreased since the original investment by financial asset-holders: Invested Capital is an expenditure calculation and not a value calculation.

[1] Less "Non-Controlling Interest – Non-Redeemable."

[2] The principal reason for the existence of deferred income taxes is a difference between depreciation for financial reporting and for income tax purposes. Generally, governments are generous in tax deductions for depreciation. So depreciation for income tax purposes often exceeds depreciation for financial reporting. If depreciation for reporting represents the economics of the situation (possibly accountants' best forecast of maintenance capital expenditure to offset economic depreciation), then governments routinely give businesses a tax subsidy for depreciation (possibly to encourage depreciable asset investment). This tax subsidy accumulates on the balance sheet as deferred income tax (DIT). Since tax-subsidies accrue mainly to shareholders, financial analysts often treat DIT as an "equity" for the purpose of financial analysis even though it commonly appears in the liability section of an accounting balance sheet. For stylized companies in end-of-chapter problems, quizzes, midterms, and finals (associated with study/reference materials), we presume that depreciation for tax and financial statement purposes is the same and, thus, there is no deferred income tax in those questions.

At year-end 2016, TELUS's Invested Capital in the financial calculation is the sum of debt and equity: $14,162 + $10,024 = $24,186. You can see these numbers in the column for 2016 in Exhibit 2-3 below.

2.4.2 The Operating Definition of Invested Capital

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If invested capital in the financial calculation measures the amount that financial asset-holders have invested in the financial assets of a firm, then the other side of the coin (the corporation) measures business investment by the corporation for the benefit of all financial asset-holders (generally creditors and common shareholders). This is the *operating* definition of invested capital.

Firms make two general types of business investments. First, firms invest in what might be termed their "trading" function. Firms make trades associated with the two components of the income statement, revenues and expenses. Sales represent trades that firms make with their customers. Expenses represent trades that the firm makes with their suppliers, employees, landlords, and the government. Firms must make an investment into short-term assets in order to support this trading function. For example, accounts receivable are held to support credit sales. Inventories are held to ensure that sales can take place when requested by customers. Some of these short-term investments can be financed with deferred payments associated with trades that the firm makes with product and service suppliers. These deferred payments are measured on the accounting balance sheet as, for example, "accounts payable," "wages payable," and "income taxes payable." Income taxes payable can be thought of as a deferred payment for the infrastructure services provided by the government. The net amount which firms must hold to support the trading function associated with their operations is referred to as "trade capital." Sometimes, companies have such great economic power over their supplies that they can defer payments to suppliers for inordinate periods of time with the result that trade capital can be negative. We will see shortly that this is often the case for TELUS.

Trade capital equals current assets minus current liabilities on the balance sheet but excluding from current liabilities those accounts that are purely financial in nature. The excluded accounts are related to financial asset investing and are not operational in nature (that is, they exist for financial investors to earn a rate of return, which is not the case, for example, for accounts payable). Accounts that reasonably can be excluded are dividends payable, short-term debt, and the current portion of long-term debt.

Trade capital is similar to *net working capital*. Net working capital is current assets less current liabilities. The difference between trade capital and net working capital is that trade capital excludes any current liability that is financial and exists because an investor is looking to earn a rate of return. For 2016, we calculate Telus's Trade Capital as all of their Current Assets less Accounts Payable less Accrued Expenses less Taxes Payable less other current liabilities:[3] TC_{16} = \$2,474-\$578-\$1,697-\$37-\$1,212 = -\$1,050. Trade capital is not often negative but it is possible. Negative trade capital means that a firm's suppliers are helping finance (pay for) their business investments (in part). Exhibit 2-3 below gives this number as part of *Invested Capital* for TELUS in the operating calculation for year-end 2016.

The second business investment that firms make is net fixed assets (plus other long-term business investments). This investment is required to support the long-term production and commercial activities of the firm. Net Fixed Assets (NFA) equal the cost basis of fixed assets, net of accumulated depreciation. For TELUS we measure long term business investment as *Plant, Property, and Equipment* (Net of Accumulated Depreciation) plus Other Long Term Assets[4] (including, *Investments at Equity*, Investments and Advances, *Intangibles, Deferred Charges* and *Other Assets*). So, for year-end 2016 for TELUS their long-term business investments equal: \$10,464+\$51+\$62+\$14,151+\$62+\$465-\$19 = \$25,236.

[3] We do not know what "other current liabilities" are, but because they are short-term, they are more likely to be operating than financial.

[4] Net of "Non-Controlling Interest Non-Redeemable."

The sum of trade capital and net fixed assets (and other long-term assets) equals invested capital. In the table below, *Invested Capital* for TELUS at year-end 2016 is: IC_{16} = -$1,050+$25,236 = $24,186. So, at year-end 2016, the total business investment of TELUS, short-term and long-term, is over 24 billion dollars.

2.4.3 The Invested Capital Balance Sheet

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The amount financial asset-holders have invested in a firm's financial assets must equal the equal the firm's business investments. The below *Invested Capital Balance Sheet*, summarizes financial asset-holder investments (IC_{fin}) and business investment (IC_{op}). These investments equal one another for each year 2010-2017. Our invested capital balance sheet balances!

Exhibit 2-3
Invested Capital: TELUS
($US millions, other than rates)

	2010	2011	2012	2013	2014	2015	2016	2017
Trade Capital (TC)	-1,816	-324	-363	-570	-958	-989	-1,050	-802
Net Fixed Assets + other (NFA)	18,187	17,880	18,235	19,237	21,031	24,075	25,236	26,622
Invested Capital (Operating)	16,371	17,556	17,872	18,667	20,073	23,086	24,186	25,820
Debt	6,694	8,443	8,562	8,761	10,683	13,259	14,162	15,099
Equity	9,677	9,113	9,310	9,906	9,390	9,827	10,024	10,721
Invested Capital (Financial)	16,371	17,556	17,872	18,667	20,073	23,086	24,186	25,820
Effective Tax Rate	0.240	0.236	0.257	0.268	0.260	0.275	0.256	0.272
EBITDA (+other)	3,564	3,771	3,995	3,951	4,206	4,321	4,263	4,780
ROIC (BOP)		0.092	0.090	0.088	0.094	0.087	0.071	0.078
ROE (BOP)		0.126	0.145	0.139	0.144	0.147	0.123	0.144
Effective interest rate		0.051	0.041	0.043	0.045	0.042	0.040	0.039
after tax interest rate on debt		0.039	0.031	0.031	0.033	0.030	0.029	0.028

In Exhibit 2-3, we calculate the "Effective interest rate" as *Interest* from a income statement year in Exhibit 2-4 (below) divided by average debt: debt at year-beginning plus debt at year-end divided by two. We use average debt because an interest rate calculation is sensitive to debt-balance *changes* over a year. For example, there is a large debt balance increase for TELUS from 2013 to 2014 (almost 3 $US billion). If we calculate TELUS's interest rate based on the year-

beginning balance, then we overstate the interest *rate* because we miss the increase in debt-principal over 2014 that generates some of 2014 *Interest*.

(2.5) Business Returns

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We design and calculate the invested capital balance sheet above because we need a good expenditure measure for a good business-return measure. Returns are critically important in financial analysis. In our first numerical example of this book, a firm invests $300,000 to generate $400,000 in one year. If the opportunity cost rate of return from financial markets is 7% per annum, the NPV (wealth creation) for financial asset-holders and shareholders in particular is $73,832. Because this number exceeds zero, we conclude in chapter 1 that this is a "good" business investment and should be undertaken by the firm. However, it is hard to assess, without further analysis, whether this amount is exceptionally good or only marginally good. Because we all have a basic understanding of what constitutes a good or a bad rate of return from financial markets (in fact, the 7% in the above example give us this understanding), if we can calculate business returns then we can assess whether this investment is exceptionally good or only marginally good.

There are two principal business returns and, further, they relate to each other. The first is the rate of return that a firm earns on its business investments: the rate of return on invested capital (ROIC), which we typically calculate after depreciation and after tax. In addition, because financial asset-holders finance business investments, we sometimes referred to this return as the rate of return that a firm earns for all financial asset-holders (generally, creditors and common shareholders).

Second, we have a special interest in shareholders because of our presumption that the primary objective of managers in operating a business is to maximize shareholders' wealth. So, our second business-return measures the return a business earns for shareholders, specifically. We call this business-return the rate of return on equity (ROE). In the following sections, we investigate these

two business returns and how they relate to one another. This relation means that one business return is a relative benchmark for the other and vice versa. We also answer the question why both ROIC and ROE are IRRs.

The principal determinants of business returns and opportunity cost rates of return are very different. The determinants of opportunity cost rates of return are interest rates in the economy and risk because investors determine opportunity cost rates in financial-market trading/investing and their primary concerns are interest rates and risk. On the other hand, business investments do not generally trade in organized markets and, thus, investors typically have no occasion to influence their values. The principal determinant of business returns (both ROIC and ROE) is corporate profitability. Don't confuse business returns with opportunity cost rates of return.

2.5.1 The Rate of Return on Invested Capital (ROIC)

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The rate of return on invested capital is the rate of return on a firm's business investments for all financial asset-holders. It is not a rate of return on market-value (like a share price, for example) but a rate of return on expended funds (expenditure):

$$ROIC(\text{ after- tax and after depreciation}) = \frac{(1-t)*(EBITDA+ \text{ other income} - \text{deprec})}{IC_{BOP}}$$

where "*t*" is the corporate tax rate and "deprec" is depreciation. *EBITDA* is earnings before interest, tax, depreciation, and amortization.

ROIC recognizes not only forecast replacement of deteriorating assets (with depreciation) but also taxes arising from business investment and deductibility of depreciation for tax. In ROIC, you may or may not include "other income," depending upon your preference as a financial analyst but I tend to include it because ROE invariably includes it. So, consistency requires its inclusion in ROIC. To calculate ROIC, we need several measures off the income statement, which we report for TELUS for a number of years in Exhibit 2-4 below.

BOP in ROIC (above) stands for "beginning of period." Financial analysts don't always use BOP. Sometimes they use EOP (end of period) or even average investment, (BOP+EOP)/2. While it is not always appropriate, my preference is for BOP because it is more natural for a return calculation. In any return, we need expenditure at the beginning of a period and that generates a return over the course of that period. For example, below, TELUS's business investment at the beginning of 2017 (end of 2016) was $24,186. Over the course of 2017, they earn EBITDA after depreciation and after tax.

In the financial calculation, *EBITDA* (earnings before interest, tax, depreciation, and amortization) is *SALES* less *Cost of Goods Sold* less *General and Administrative Expenses* (G&A). TELUS does not report G&A separately from Cost of Goods Sold. So, for TELUS for 2017, *EBITDA* is the same as *GROSS PROFIT* = $4,805. 2017 depreciation is $2,182. *Other Income* and *Special Items* are $88 - $113 = -$25. The "effective" tax rate from the income statement in Exhibit 2-4 is *Income Tax Expense* divided by *Income before Tax*. For TELUS for 2017 their effective tax rate is 27.2%. Since year-beginning for 2017 is year-end for 2016, we measure IC_{BOP} with IC_{16} from the invested capital balance sheet in Exhibit 2-3: $24,186.

So, TELUS's ROIC after-tax and after depreciation for 2017 with year-beginning IC is,

$$ROIC_{17} = \frac{(4{,}805-25-2{,}182)*(1-0.272)}{24{,}186} = 7.82\%$$

You can see this 2017 calculation and for a number of earlier years summarized in Exhibit 2-3. A simple trend analysis tells us that TELUS's $ROIC_{17}$ is lower than earlier in this decade. However, we do not know whether this rate is high or low until we do some benchmarking with financial market opportunity cost rates of return.

Exhibit 2-4
Telus Income Statement
(in millions of $US)

INCOME STATEMENT

Fiscal Year:	**2014**	**2015**	**2016**	**2017**
(FYR Ending):	(31DEC2014)	(31DEC2015)	(31DEC2016)	(31DEC2017)
Sales (Net)	11,927.000	12,430.000	12,725.000	13,202.000
Cost of Goods Sold	7,714.000	8,041.000	8,097.000	8,397.000
Gross Profit	4,213.000	4,389.000	4,628.000	4,805.000
Selling, General, & Admin Expenses				
Operating Income Before Depreciation	4,213.000	4,389.000	4,628.000	4,805.000
Depreciation, Depletion, & Amortiz	1,842.000	1,912.000	2,059.000	2,182.000
Operating Income After Depreciation	2,371.000	2,477.000	2,569.000	2,623.000
Interest Expense	438.000	503.000	542.000	566.000
Non-Operating Income/Expense	81.000	167.000	99.000	88.000
Special Items	-88.000	-235.000	-464.000	-113.000
Pretax Income	1,926.000	1,906.000	1,662.000	2,032.000
Income Taxes – Total	501.000	524.000	426.000	553.000
Minority Interest	.000	.000	13.000	19.000
Income Before EI&DO	1,425.000	1,382.000	1,223.000	1,460.000
Extraordinary Items	.000	.000	.000	.000
Discontinued Operations	.000	.000	.000	.000
Net Income (Loss)	1,425.000	1,382.000	1,223.000	1,460.000
Income Before EI&DO	1,425.000	1,382.000	1,223.000	1,460.000
Preferred Dividends	.000	.000	.000	.000
Available for Common Before EI&DO	1,425.000	1,382.000	1,223.000	1,460.000
Common Stock Equivalents – Savings	.000	.000	.000	.000
Adjusted Available for Common	1,425.000	1,382.000	1,223.000	1,460.000

STATEMENT OF RETAINED EARNINGS

Fiscal Year:	**2014**	**2015**	**2016**	**2017**
Cash Dividends	913.000	992.000	1,070.000	1,082.000

2.5.2 Industry ROIC

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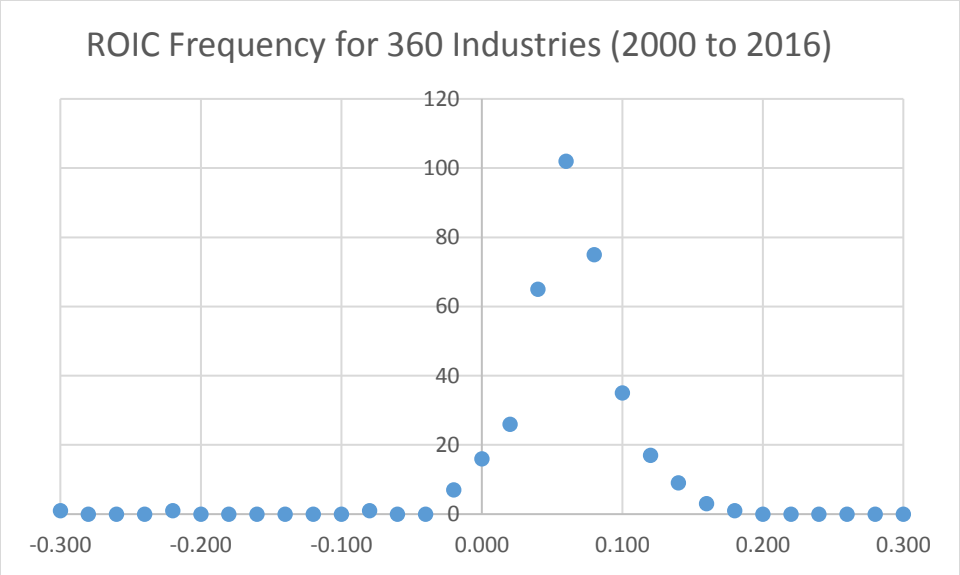
If you wish to benchmark a business by its industry, industry-ROIC will be of interest to you. The chart below plots average realized ROIC after tax and after depreciation (from 2000 to 2016) for 360 US and Canadian industries. ROIC for individual industries is in the spreadsheet that follows the chart. The lowest average industry-ROIC is about -30% and the highest is about 30%. The mean average industry ROIC is 5.2%.



ROIC After Tax and After Depreciation for
360 US and Canadian Industries

2.5.3 The Rate of Return on Equity (ROE)

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ROE: 7 Minutes

If the primary objective of managers is to maximize shareholders' wealth, then an important corporate performance measure is business return for shareholders; the rate of return on equity (ROE) equals net income divided by "book equity."

$$ROE = \frac{\text{Net Income available to common}}{\text{Book Equity (b.o.p.)}}$$

From Exhibit 2-4, net income for 2017 for *TELUS* is \$1,441[5] and book equity in our *Invested Capital* balance sheet in Exhibit 2-3 above for 2016 is \$10,024. Thus, 2017 ROE for *TELUS* is,

$$ROE = \frac{1{,}441}{10{,}024} = 14.4\%$$

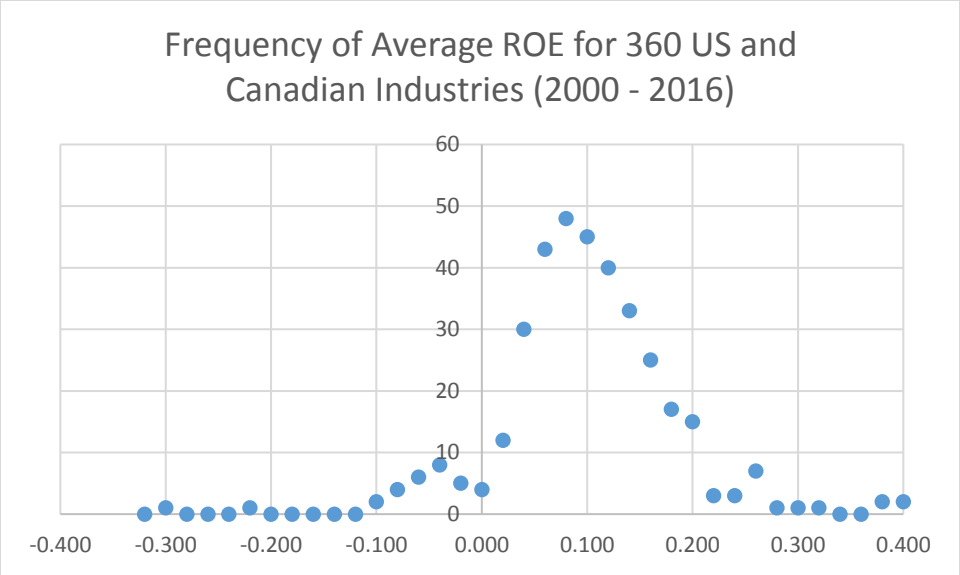
We have three observations about this return. First, like our discussion above for ROIC we do not know immediately whether 14.4% is high or low. However, because ROE is a return, ultimately, we can benchmark it with an absolute standard: a financial market opportunity cost.

Second, notice that ROE_{17} = 14.4% > $ROIC_{17}$ = 7.82%. There are two primary reasons why ROE>ROIC. We identify these reasons in end-of-chapter question #5.

Third, ROE and ROIC are relative benchmarks for one another. When one is high, they are both high and, then, ROE>ROIC. When one is low, they are both low and, then, ROE<ROIC. These statements indicate that ROIC and ROE are related to one another. The reason they are related is the primary determinant of both is corporate profitability. So, if you find ROE>ROIC, then it has been a relative good year for corporate profitability and vice-versa. We investigate the relation between ROIC and ROE more formally in the next subsection.

The chart below plots the frequency of average realized ROE (from 2000 to 2016) for 360 US and Canadian industries. ROE for individual industries is in the spreadsheet that follows the chart. The lowest average industry ROIC is about -32% and the highest is about 126%. The average industry-ROE is 9.2%.

[5] Net of "Minority Interest."



ROE for 360 US and Canadian Industries

2.5.4 The Relation Between ROIC and ROE

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The Relation Between ROIC and ROE: 19 Minutes

ROE and ROIC move in tandem with one another. That is, if ROIC is great, then ROE is great as well. Remember that the primary determinant of either is corporate profitability. So, if corporate profitability is high, then both are high.

The following equation gives the relation between ROIC (after tax/after depreciation) and ROE,

$$ROIC = (1-t) * r_D * \frac{Debt}{IC} + ROE * \frac{BVE}{IC} \qquad (2.1)$$

where t is the corporate tax rate, r_D is the interest rate that a firm pays on its debt, *Debt* is debt outstanding on the invested capital balance sheet, *BVE* is the book value of equity on the invested capital balance sheet, and *IC* is invested capital.

In business analysis, the "short-term" is generally up to one year hence. In the above relation, we presume that most corporate characteristics are constant in the short-term (that is, r_D, t, and $Debt / IC$). However, in business analysis we cannot assume *SALES* to be constant in the short-term or long-term. Since corporate profitability depends upon *SALES* and business returns depend upon corporate profitability, we cannot presume ROIC or ROE to be constant in either the short-term or long-term. Rather, ROE and ROIC move in tandem with one another according to the above relation. When one is great the other is great and vice versa.

For chapter-end problem #39, you calculate ROIC in two ways. First, as

$$ROIC = \frac{(\text{EBITDA} - \text{deprec}) * (1-\text{t})}{IC}, \qquad (2.2)$$

and, second, as the right of,

$$ROIC = (1-t) * r_D * \frac{Debt}{IC} + ROE * \frac{BVE}{IC}.$$

Of course, if you do the question correctly, the two methods give you the same value. As we will see in this chapter, having two different ways to calculate the same thing is sometimes invaluable in financial analysis. If there is a problem with one methodology, then the other might work for us. We will encounter this case for McDonalds below.

Depending upon corporate profitability in any particular year, sometimes ROIC>ROE and sometimes ROIC<ROE. So, it is possible in a particular time period (although not likely) that ROIC and ROE exactly equal one another. In this case, set ROIC=ROE in the above formula and do a little algebra. In particular, because $\frac{Debt}{IC} = 1 - \frac{BVE}{IC}$ (that is, Debt+BVE=IC), $ROIC = ROE = (1-t) * r_D$. This result represents a financial break-even for shareholders with respect to debt use. If a firm makes business investments at the same rate that it borrows (after corporate tax), then ROIC and ROE equal one another and both equal the after-tax interest rate on debt. Thus, we can make the following statement. Profitability for a business in a particular year is *relatively* good if ROIC exceeds the after tax cost interest rate on debt and, in addition, in this case, *ROE* exceeds *ROIC*. The vice versa is also true. Profitability for a business in a particular year is relatively bad if ROIC is below the after tax cost interest rate on debt and, in addition, *ROIC* exceeds *ROE*. We can also say that if ROE>ROIC, then corporate profitability is relatively good for that firm in that year.

Notice in Exhibit 2-3 for TELUS, both ROIC and ROE exceed the after-tax interest rate on debt for each of the years 2011-2017. Thus, in each of these years ROE exceeds ROIC, as well.

End of chapter problems give numerous opportunities for you to test your understanding of the above relation between ROIC, ROE, and other financial variables.

Don't make the mistake of concluding from our discussion that if a firm makes business investments at a return above the after-tax interest rate on its debt that debt-financing for business investments is preferable for shareholder wealth maximization compared to equity financing. That conclusion is unjustified for reasons not immediately obvious. You need to take advanced finance courses if you want to study questions of that nature in detail. Also, recognize that ROIC and ROE are relative and not absolute benchmarks for one another. If a firm makes business investments at a return above the after-tax interest rate on its debt, these business investments do not necessarily create wealth for financial asset holders and shareholders specifically. The after-tax interest rate on debt is not risk-adjusted so that it does not allow for an "apples to apples and oranges to oranges" comparison with respect to risk for business investments versus financial asset investing.

There are some timing issues that are important in the above relation between ROIC and ROE. If a firm borrows incrementally or repays principal at year-end, then *Debt*, *BVE*, and *IC* must be beginning-of-period (BOP) in the above relation. If a firm borrows incrementally or repays principal at beginning of year, then *Debt*, *BVE*, and *IC* must be end of year (EOP). Last, if a firm borrows incrementally or repays principal exactly at mid-year, then *Debt*, *BVE*, and *IC* must be BOP plus EOP divided by two (that is, average expenditure). The reason for these slight differences in the above relation is that $INTEREST that a firm pays during a year depends upon whether they borrow incrementally (or repay) BOP, EOP, or mid-year.

2.5.5 Why are ROIC and ROE both IRRs?

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I have a confession to make. The numerical example that we present in chapter 1, a firm invests $300,000 to generate $400,000 in one year, is not a typical business investment. Most business investments have no predefined termination or maturity date. I think we should focus on typical rather than atypical things. But be careful, sometimes business investment can be atypical!

Let's consider a typical business investment that has no predefined termination. Suppose a business plans an investment for which the required expenditure today (that is, the investment) is $I. The "benefit" of this business investment is cash flow of $c per annum *indefinitely* starting in one year (free cash flow in the upcoming section). The opportunity cost rate of return from financial markets for financial investments of about the same risk as this business investment is r% per annum (the *cost of capital*).

For this typical business investment, NPV is,

$$NPV = PV - I = \frac{c}{r} - I$$

Net Present Value (NPV) is always Present Value (PV) less expenditure (I). Notice in PV above, we divide by "r" rather than "1+r." In the numerical example of chapter 1, for a similar term, we divided by "1+r," so what is the difference?

The "one" in "1+r" indicates we (as the business investor) want one dollar back (in one period, typically one year) per one dollar of business investment. Plus, we want (really we want for shareholders) compensation for time (one year) and risk. The opportunity cost rate of return "r" embeds a financial market compensation for time and risk. So, rather, when we divide by "r" in PV above, we are anticipating (it might not always be true) that this is a "good" business investment (NPV>0) and we will commence the business investment today. Now, if this is a good business investment today and if the business environment does not unduly deteriorate in a year or the following year or the following year, etc., then, this will *always* be a good business investment and, thus, we never want to terminate it. If we anticipate never wanting to terminate this business investment, we never want the dollar of original business investment back. Terminating the business destroys what we believe to be a "good" business investment. Thus, in the PV above, we divide by "r" rather than "1+r." We want compensation for time and risk for our shareholders but we never want back the dollars of original business investment.

If we never get capital back (original business investment), how can our business have value? After the business investment the value of the business has nothing to do with capital but, alternatively, with *future* cash-flow that that capital generates. Remember that our theory of value is future (forward) not past oriented. The value of the business after the business investment is PV=c/r and expenditure on business capital (I) does not appear in this calculation. We could prove these statements mathematically (I don't think you want me to do this) but this is the business-explanation of PV above.

Any IRR is the "hypothetical" opportunity cost rate of return that makes NPV equal zero. So, for a typical business investment, we find the IRR from,

$$NPV = \frac{c}{IRR} - I = 0$$

Solve this equation to find that the IRR for a typical business investment is,

$$IRR = \frac{c}{I}$$

Notice that in the first year of our business investment, expenditure = $I, is at the beginning of the year and the cash flow $c is at year-end for all years including the first. So, that is why my preference is for using BOP (beginning of period) for business returns like, ROIC and ROE, above. IRR for a typical business investment presumes year-beginning expenditure.

So, now we can investigate why ROIC and ROE are both IRRs.

For ROIC, c = (EBITDA-deprec)*(1-t) and I = IC, and, thus, ROIC is an IRR. Similarly, for ROE, c = NI (net income) and I = BVE (book value of equity) and, thus, ROE is also an IRR. Both ROIC and ROE are special cases of IRRs.

When we use ROIC and ROE as business returns, not only are they IRRs, but they also presume the pattern of cash-flows we describe above: the business investment ($I today) generates $c per annum indefinitely starting in one year. Notice that this cash-flow pattern has no growth expectation. Thus, we presume no-growth for a typical business investment. This does not mean that businesses do not grow. Of course, they do (generally) as they make incremental expansion investments none of which we expect to grow individually. Further, not all business investments are typical. In chapter 6, we learn how to calculate the return on a business investment regardless of the pattern its forecast future cash-flows might take.

2.5.6 Components of ROIC

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EBITDA Margin: 18 Minutes

Gross profit less selling, general, and administrative expenses (before depreciation and amortization) equals earnings before interest, tax, depreciation and amortization which is often abbreviated as EBITDA[6]. EBITDA measures profitability of a firm's operations, net of both production and commercial expenses. Financial analysts calculate net operating margin (also referred to as the EBITDA margin) as EBITDA divided by sales.

$$EBITDA\ Margin = \frac{EBITDA}{Sales} = \frac{\$4{,}805}{\$13{,}202} = 36.4\%$$

for *TELUS* in 2017.

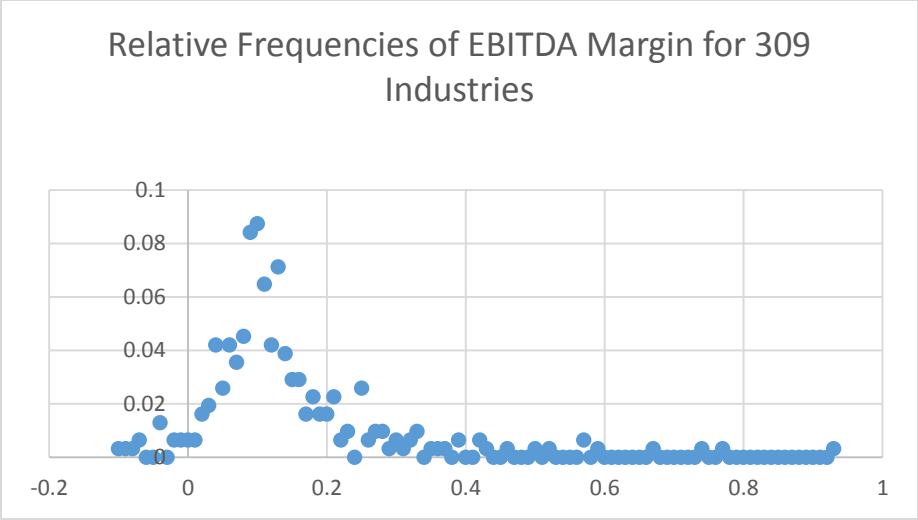
The EBITDA margin is a measure of operating efficiency. It measures the fraction of $1 of sales, which goes to the "bottom" line after production and commercial expenses (that is, to EBITDA). In later chapters, we will see that the EBITDA margin is also a measure of "operating risk."

The spreadsheet below calculates the EBITDA margin for 309 US and Canadian industries for 2016 (data is from the COMPUSTAT database).

Industry EBITDA Margins for 2016

The average EBITDA margin over industries is about 12.7%. This value is useful for benchmarking US and Canadian firms with respect to operating efficiency and operating risk. The below chart plots the relative frequencies of the EBITDA margin by industry. Notice that most EBITDA margins are positive, but some are negative, and some are exceptional high near 100%.

[6] EBITDA is also typically calculated before the line items "other income" and "extraordinary income" (or loss). Each of these amounts is either non-recurring or outside the firm's normal business practice. Therefore, EBITDA as described in the text above is sometimes referred to as "EBITDA from core operations." For simplicity, unless otherwise stated in this book, when we use the term "EBITDA," we really mean EBITDA from core operations.



What question of financial analysis are we investigating with the EBITDA margin? The answer is the EBITDA margin is a component of return; it is not a return itself. However, when multiplied by the invested-capital turnover ratio, you get ROIC before tax and before depreciation and, of course, business returns are very important in financial analysis.

IC Turnover: 7 ½ Minutes

Invested capital turnover is a measure of the ability of a business to generate sales from business investment. Other things equal, firms that can increase sales without an increase in invested capital are more efficient. Below we calculate invested-capital turnover[7] as sales for the period divided by invested capital (b.o.p.),

[7]Rather than invested capital turnover, accountants tend to use asset-turnover, which is yearly sales divided by the book-value of all of a firm's assets.

$$\textit{Invested Capital Turnover} = \frac{\textit{Sales}}{\textit{Invested Capital (b.o.p.)}}$$

The 2017 invested capital turnover ratio for *TELUS* is $13,202/24,186=0.546.

Invested capital turnover is an inverse measure of "capital intensity." Firms that require great business investments to generate a dollar of sales are said to be capital intense. Firms that require large fixed asset investment, which often have payoffs over many years (for example, utilities), have low invested-capital turnover. While firms have some influence over their invested-capital turnovers (for example, revenues depend upon product pricing), the example of utilities highlights the fact that invested capital turnover is, in large part, based on the technology of the industry in which a firm operates.

For US and Canadian firms, the average and median invested-capital turnover ratio across 432 industries is 1.45 and 1.04, respectively (from 2000 to 2016). See the below spreadsheet for IC-turnover ratios for individual industries.

IC-Turnover for 432 US and Canadian Industries 2000 to 2016

Using the definitions of EBITDA margin and invested capital turnover, you can illustrate that the rate of return on invested capital before depreciation and before tax is the product of the EBITDA margin and invested capital turnover.

$$\textbf{ROIC} = \textit{EBITDA Margin} \times \textit{Invested Capital Turnover}$$

$$\textbf{ROIC} = \frac{\textit{EBITDA}}{\textit{Sales}} \times \frac{\textit{Sales}}{\textit{Invested Capital (b.o.p.)}}$$

$$\textbf{ROIC} = \frac{\textit{EBITDA}}{\textit{Invested Capital (b.o.p.)}}$$

ROIC Components: 10 Minutes

EBITDA margin and invested capital turnover are related to each other. Industries with low invested capital turnover tend to have high EBITDA margins and vice-vera.

Why does there exist an inverse relationship between invested capital turnover and the EBITDA margin? Firms with low invested-capital turnover are capital intense and have large depreciable asset investments, like, for example, the locomotives, box-cars, and rails of TELUS. These large depreciable-asset investments are an entry barrier for potential competitors. Thus, capital intense business face relatively less competition and consequently their EBITDA margins tend to be higher than those of less capital intense businesses. So, even capital intense businesses that make long-term depreciable asset investments and have modest SALES per dollar of business investment (IC) can earn an adequate rate of return (ROIC) for their financial asset-holders.

(2.6) Free Cash Flow

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FCF: 3 Minutes

Cash flow is the lifeblood of any firm. Firms with abundant cash flow thrive and grow; firms strangled by insufficient cash flow wither and die. Even short periods of inadequate cash flow

have traumatic effects on firms and their employees. It is critically important, therefore, that you be able to trace and evaluate the flow of cash through your firm. Cash flow is investigated in this subsection using the concept of *free cash flow*. Free cash flow (FCF) plays a very important role in financial analysis. In later chapters of this book, predicted future free cash flow is the foundation of *corporate valuation*, the method we use for setting the value of a firm's assets in place. Likewise, predicted incremental free cash flow from a new business venture is central to the evaluation of prospective business investments that we analyze in chapter 9. Because of these important uses of free cash flow, it is essential to develop this concept early in our study of corporate financial analysis.

For a typical business investment (see above), $NPV = \frac{C}{r} - I$. In this equation, "c" is FCF. So, FCF (generally in the operating calculation below) is what we discount in NPV analysis as financial analysts to establish the value to shareholders of business investments. Since FCF is paid out to financial asset holders (the financial calculation of FCF below), it is the source of value of all the financial assets of a business for creditors and shareholders.

Let us begin with a casual and intuitive description of free cash flow. Free cash flow is the net amount of cash that flows into a firm as the result of operations. Inflows arise from past business investments. In the current period, the firm bears the "fruit" of past investment. In addition, the firm might make additional business investments. These investments are composed of both short and long-term business investments. The difference between these two cash flows (the first is typically an inflow and the second is typically an outflow) is free cash flow. The adjective "free" refers to the fact that this net cash flow is available (i.e., free) and is distributed in one way or the other to financial asset holders. This relationship between cash flow arising from operations and distributions to financial asset holders implies that there is both a financial and an operating definition of free cash flow.

2.6.1 The Operating Definition of Free Cash Flow

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FCF$_{OP}$: 28 Minutes

We can calculate Free Cash Flow (FCF) as *Funds From Operations* (FFO) less incremental investment:

Free Cash Flow = FFO - Incremental Investment

FFO is the "benefit" of past business investment.

FFO (bottom up)[8] *= Net Income + Depreciation + other non-cash charges +After-Tax Interest*

FFO = 1,460 +2,182+566(1-0.272)* = $4,054 (in $US millions)

(2017 net income is $1,460, deprec is $2,182, dollar interest is $566, effective tax rate is 27.2%).

Now, let's calculate incremental business investment for 2017 for TELUS. We know from our discussion of invested capital that businesses make two primary business investments. The short-term investment is Trade Capital (TC) and the long-term business investment is Net Fixed Assets (NFA). Incremental business investment for a period is incremental trade capital plus incremental depreciable asset investment (plus other long-term business investments) that we measure as Capital Expenditure (CAPX).

[8] "Bottom up" means begin with "net income" and then work your way to the top of the income statement by adding back non-cash charges and after-tax interest. The "Top Down" FFO calculation, alternatively, (ignoring other income) is FFO=(1-t)*(EBITDA-deprec)+deprec, presuming depreciation for reporting and for tax purposes is the same.

The IC balance sheet in above (Exhibit 2-3) has Trade Capital as a component. The symbol Δ represents change over a period (end of period EOP minus beginning of period BOP).

$$\Delta TC = TC_{EOP} - TC_{BOP} = TC_{17} - TC_{16}$$=-802-(-1,050)=$248 ($US millions)

Incremental short-term business investment for TELUS in 2017 is $248.

We can rearrange an accounting calculation to determine CAPX.

$$NFA_{EOP} = NFA_{BOP} + CAPX - deprec.$$

So,

$$CAPX = \Delta NFA + deprec$$

The IC balance sheet above has NFA (plus other long-term investments) for TELUS. In addition, depreciation for 2017 for TELUS is $661. So, for TELUS for 2017,

$$CAPX_{17}$$ =26,622-25,236+2,182 = $3,568 ($US millions)

So, let's put this all together. FCF (operating) is FFO less incremental business investment:

$$FCF = FFO - \Delta TC - CAPX$$

For TELUS for 2017,

$$FCF_{17}$$= $4,054 - $248 - $3,568 = $238 ($US millions)

Because this amount is positive, *TELUS* has a Free Cash Flow surplus. On the other hand, firms that have negative FCF have a Free Cash Flow deficit. Zero is a benchmark for FCF. However, for any firm at any time, positive or negative FCF is not necessarily good or bad. An investigation of why a firm has negative or positive FCF might lead to a conclusion on whether these amounts are good or bad. The best we can do is identify the common characteristics of firms with negative FCF (and vice versa for positive FCF firms).

FCF Deficit/Surplus: 7 Minutes

Firms with a FCF Deficit Have the Following Common Characteristics

1.	Growth Oriented with Large Business Investments
2.	New Ventures that have Not Yet Completed Business Investments for their Start-up Phase
3.	Low Profitability

In order to survive in the long term firms eventually must have positive FCF. However, FCF deficits in the near term are not necessarily bad. A FCF deficit indicates that a firm is investing more in new business investments than it can "finance" from its operations. Therefore, it must sell new financial assets to investors to makeup this deficit. As long as these investments are productive – that is, they are positive NPV and create wealth, they should be made by the firm. As financial analysts, we expect that eventually when anticipated FFO benefits of these new investments begin to accrue and/or incremental investment slows down, FCF will turn positive.

2.6.2 The Financial Definition of Free Cash Flow

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For our purposes, the operating definition of FCF is more important than is the financial calculation. However, there is information content in the financial calculation, which measures the sum of all net out flows *from* a firm to financial asset-holders. If FCF is negative then the net flow is from financial asset-holders to the firm.

Free Cash Flow =

After Corporate Tax Net Distributions to Debt-holders

plus

Net Distributions to Shareholders

Each of these distributions represents the flow of cash *from* the firm to financial asset holders.

2.6.3 After Tax Distributions to Creditors

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FCF_{FIN} Creditors: 7 Minutes

Net distributions to debtholders is after-tax interest plus principal repayments less the sale of new debt over the period in question.

After-corporate-tax interest rather than interest itself is used in this calculation for two reasons. First, interest is tax deductible for the firm, and therefore, the actual cost to the firm of making a

dollar of interest payment is lesser by the rate of taxation (presuming the firm is in a tax-paying position). Second, in financial analysis, it is conceptually important to separate the operating activities of a firm from its financing activities. Because the benefit of interest deductibility to a firm arises from a financial activity (i.e., borrowing), this benefit should be attributed to this financing activity in the free cash flow calculation. In other words, from the firm's perspective, the "cost" of making interest payments to debtholders is less because of this benefit.

During 2017 TELUS paid interest of $491 (see Exhibit 2-4 above). Their effective tax rate for 2017 is 3.7%. So, the after-tax cost of their dollar interest payment is (other than some rounding),

$$\textit{After Tax Cost of Dollar Interest} = 566*(1\text{-}0.272) = \boxed{\$412}$$

Net new borrowing, which is the difference between the sale of new debt and principal repayments can be found by taking the difference between end-of-period and beginning-of-period debt (both short-term and long-term) on the invested capital balance sheet.

$$\Delta Debt = DEBT_{EOP} - DEBT_{BOP}$$

$$= DEBT_{17} - DEBT_{16}$$

$$=\$15{,}099\text{-}\$14{,}162 = \$937$$

The fact that this number is negative indicates that *TELUS* has done borrowed incrementally during 2017. Paying down debt is a payment out from TELUS to a financial asset-holder and thus has a positive sign in the FCF_{FIN} calculation. In this case, borrowing is a flow in to a firm from a financial asset-holder and, thus, has a negative sign in the FCF financial calculation.

$$\textit{Principal Repayment} \text{ (Borrowing)} = -\boxed{\$937}$$

2.6.4 Net Distributions to Shareholders

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FCF_{FIN} Shareholders: 20 Minutes

Net distributions to shareholders equal the sum of dividends plus any share repurchases less new issues of shares.

In Exhibit 2-4, in 2017, we see that TELUS paid shareholder dividends of $1,082 ($US millions).

$$Dividends = \boxed{\$1,082}$$

Of course, dividends flow out from TELUS to a financial asset-holder and, thus, dividends have a positive sign in the FCF_{FIN} calculation.

Finally, TELUS might have either sold new shares to shareholder or repurchased shares from their existing shareholders. To find out whether TELUS did either of these two things, recall that book equity is the sum of share capital and retained earnings. EQ stands for book value of equity,

$$EQ_{END}=EQ_{BEG} + NI - DIV + NEW\ ISSUE - REPURCHASE\ OF\ SHARES$$

NI stands for Net Income and DIV stands for Dividends. For *TELUS* in 2017 (see Exhibit 2-3 and Exhibit 2-4, above),

$$EQ_{17} = EQ_{16} + NI - DIV - NETrepurhase$$

$$\$10,721 = \$10,024 + \$1,460 - \$1,082 - NETrepurchase$$

Rearrange to find,

$$NETrepurchase = -\$319$$

Because this number is negative, in 2017, *TELUS* on net sold new common shares. This net sale is a flow in to TELUS from a financial asset-holder and, thus, has a negative sign in FCF_{FIN}. On the other hand, if this amount had been positive, it would be a net repurchase of shares, which requires cash from Telus and, thus, has a positive sign in FCF_{FIN}.

The financial definition of FCF applied to TELUS for 2017 is

After Tax Interest	$412
Debt Repayment (borrowing)	-$937
Dividends	$1,082
Net Share Repurchase (new issue)	-$319
Free Cash Flow (Financial)	**$238**

FCF in the financial definition in the above table equals FCF in the operating calculation as it should. The financial definition of FCF tells us how a firm has distributed a FCF surplus to its financial asset holders or how it has financed a FCF deficit from financial asset holders. In 2017, *TELUS* distributed to financial-asset holders a FCF surplus, 238 $US million.

FCF Discussion: 3 ½ Minutes

2.6.5 Trend Analysis for TELUS' FCF

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Exhibit 2.5 below reports TELUS's FCF in the operating and financial calculations 2011-2017. This table is one of the spreadsheets in the TELUS workbook that begins section 2.3 above. Notice that there is no obvious trend for TELUS's FCF: sometimes it is high, sometimes it is low, and sometimes it is negative but, generally, Telus has positive FCF because as we will learn shortly, it is not a high growth company. This simple trend analysis is consistent with our observations above that neither positive nor negative FCF is necessarily bad or good.

Exhibit 2-5
Telus Free Cash Flow
(in millions of $US)

	2011	2012	2013	2014	2015	2016	2017
FFO (bottom up)	3,308	3,448	3,377	3,591	3,659	3,685	4,054
ΔTC	1,492	-39	-207	-388	-31	-61	248
CAPX	1,488	2,225	2,813	3,636	4,956	3,220	3,568
FCF (OP)	328	1,262	771	343	-1,266	526	238
After Tax Interest	294	260	272	324	365	403	412
Debt Repay	-1,749	-119	-199	-1,922	-2,576	-903	-937
Dividends (total)	642	774	852	913	992	1,070	1,082
Repur	1,141	347	-154	1,028	-47	-44	-319
FCF (fin)	328	1,262	771	343	-1,266	526	238

(2.7) The Cost of Capital

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In this E-Finance book, we use discounted cash flow analysis (DCF) as our theory of value and financial statements and financial market data as inputs to answer the questions of financial analysis we identified in chapter 1. We forecast prospective corporate business returns for all

financial asset-holders and shareholders in particular, which we then benchmark with objective opportunity cost rates of return from financial markets. We need firm-specific information from financial statements to forecast business returns and financial market measures to calculate investor opportunity cost rates of return. For the purpose of this analysis, with some simplifying assumptions (that might not be appropriate for all firms), in this section, we illustrate how to calculate a firm's *cost of capital* to help answer the question whether or not a firm makes "good" business investments for financial asset-holders and shareholders in particular. The cost of capital is the opportunity cost rate of return for a firm's business investments.

To begin our journey, in the next sub-section, we investigate the economic determinants of FCF. This analysis tells us that we need ROIC and corporate growth forecasts to forecast FCF. Next, we forecast ROIC from ROE. We put these analysis-components together with the *consensus analysts' growth forecast* (from the investment industry), to forecast future FCF.

2.7.1 ECONOMIC DETERMINANTS OF FCF

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There are two primary economic determinants of FCF: corporate profitability and growth.

In addition to the bottom-up calculation (above), there is also a "top down" calculation for FFO.

$$\text{FFO (top down)} = (1\text{-}t)*(\text{EBITDA-deprec}) + \text{deprec}$$

where "t" is the corporate tax rate and "deprec" is depreciation for both tax purposes and for financial reporting (we presume). With this presumption, one can prove (but we will not), that FFO in the top-down calculation equals FFO in the bottom-up calculation. These are two ways of calculating the same thing.

Corporations make two types of capital expenditures: to maintain the quality of existing depreciable assets to prevent economic deterioration (like changing the roofing of an apartment

building to prevent leakages) and for growth (like adding a building to existing buildings of a real estate company). Let's use the acronym MCAPX to describe a firm's maintenance capital expenditure (also called "sustaining" capital expenditures) and GCAPX to describe growth capital expenditures. The sum of maintenance and growth capital expenditures equals total capital expenditures,

$$CAPX = MCAPX + GCAPX$$

With this notation and the top down calculation for FFO, write FCF_{op} as:

$$FCF_{OP} = FFO - \Delta TC - CAPX$$

$$= (1\text{-}t)*(EBITDA\text{-}deprec) + deprec - \Delta TC - MCAPX - GCAPX$$

Now, suppose that accounting depreciation is an economic forecast of MCAPX. Then, deprec = MCAPX. So, simplify the above,

$$FCF_{OP} = (1\text{-}t)*(EBITDA\text{-}deprec) - \Delta TC - GCAPX$$

Suppose now that a business grows at g% per annum. This growth requires incrementing both trade capital, TC, and depreciable asset investment, NFA, by g% per annum. Thus,

$$\Delta TC = g * TC$$

where TC is trade capital at year-beginning. And,

$$GCAPX = g * NFA$$

where NFA is net fixed assets at the beginning of the year.

Add these amounts,

$$\Delta TC + \text{GCAPX} = g * TC + g * NFA = g * (TC + NFA) = g * IC,$$

(since, IC = TC + NFA). With this expression for growth investment (that is, $g * IC$),

$$\text{FCF}_{\text{OP}} = (1\text{-t})*(\text{EBITDA-deprec}) - g * IC.$$

Recall (equation 2.2) that the rate of return on invested capital after tax and after depreciation is,

$$ROIC = \frac{(1-t) * (EBITDA - deprec)}{IC}$$

So, we can write FCF_{OP} as,

$$\text{FCF}_{\text{OP}} = ROIC * IC - g * IC = (ROIC - g) * IC \qquad (2.3)$$

This FCF_{OP} expression illustrates two things. First, when profitability of a business, as measured by the rate of return on invested capital after tax and after deprecation, increases (other things equal), operating free cash flow also increases. Second, high growth companies (that is, companies with high "g"), have low operating free cash flow (and, possibly even negative). Of course, these businesses make investments to increase future profitability (EBITDA) and free cash flow for the benefit of all financial asset-holders and shareholders in particular.

Just to put some numbers on the above operating FCF formula, suppose that a firm has invested capital of 10 million dollars, a rate of return on invested capital after tax and after depreciation of

20% per annum, and growth investments of 5% per year. Then, we can forecast operating free cash flow as,

$$(0.20 - 0.05) * 10 = 1.5 \text{ million dollars.}$$

Of course, as this business grows with growth investments, we expect FCF to grow in the future as well (at 5% per annum).

Below is a sample problem with solution that illustrates the primary economic determinants of FCF in the operating calculation are business return and corporate growth.

Value of a growing business we measured by PV (after business investment) as,

$$PV = \frac{FCF}{r-g},$$

where FCF is operating free cash flow forecast in one year, *r* is the opportunity cost rate of return, and g is the per annum rate of corporate growth. The opportunity cost rate of return for business investment is called the *cost of capital*.

PROBLEM: Today, ABC Company is planning a business investment. ABC is a start-up firm and, therefore, it has no investments or assets (for example, ABC has no cash balance). Also, ABC has no other business investments planned or contemplated other than the one described in this problem. For an investment (expenditure) of $I today, the expected cash flow (free cash flow) to ABC at the end of the current year is $C which then grows at the rate g% per annum indefinitely. That is, each cash flow after the first is 1+g greater than the previous. Currently, ABC has no debt in its financial structure and its book equity is zero. Book equity is the sum of share-capital and retained earnings. In order to undertake its investment, ABC needs to do some financing. They plan to sell new shares to new shareholders in the amount of $I to finance their business investment. The financial market opportunity cost (expressed as a rate of return) facing the shareholders of ABC for this business investment is 12% per annum. ABC's market to book ratio for equity immediately after the share issue and the capital expenditure for assets to start the business is 2.5. The IRR on the business investment (rate of return on invested capital after tax and after depreciation) is 20% per annum.

Required: Find g, the percentage growth in per annum cash flows.

Solution	**FCF Operating**

2.7.2 FORWARD ROIC

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Since (equation 2.3 above),

$$\text{FCF}_{\text{OP}} = (ROIC - g) * IC,$$

we can forecast FCF for the upcoming period (year, generally) with a ROIC forecast and a growth forecast. Also, since (equation 2.1 above),

$$ROIC = (1-t) * r_D * \frac{Debt}{IC} + ROE * \frac{BVE}{IC}$$

we can forecast ROIC by forecasting (or measuring) the components of the right-hand-side of this equation. Let us begin by forecasting ROE.

Let P/E be the price to forward earnings ratio (forecast earnings). Forward earnings (per share) might be your earnings forecast, but for our analysis we use what is called the *consensus earnings forecast* (for approximately one year hence) for a public company by financial analysts from around the world who monitor and investigate the company of our study (for their clients). The consensus earnings forecast is the average forecast of financial analysts. A number of financial

information firms, like, for example, Standard and Poors (S&P) continuously collect, average, and report consensus forecasts for a multitude of public companies. "Price" is share-price today. Next, let P/B be the market to book ratio for the equity of a company (price to book). "P" is share price today and "B" is book value of equity per share.

Then, we can forecast ROE (forward ROE) as

$$\frac{P/B}{P/E} = \frac{E}{B} = ROE_{FOR}$$

Click on the below icon to see how I collect share price, # shares outstanding, the price to forward earnings ratio, and financial analysts' consensus growth forecast from www.yahoofinance.com on November 26, 2018 to forecast ROE.

Forecasting ROE

So, at November 26, 2018 for TELUS, #shares outstanding = 598 (million), share price = 35.91, the price to forward earnings ratio = 15.55, and the consensus analyst growth forecast = 4.7% per annum. In addition, from Exhibit 2-3, for year-end 2017 for TELUS, IC=25,820 (almost 26 billion dollars), BVE=10,721 (over 10 billion dollars), and BVD (book value of debt) = 15,099 (over 15 billion). The market value of all of TELUS's common shares is the market value of equity (market capitalization). With these numbers,

$$\frac{P}{B} = \frac{MVE}{BVE} = \frac{598*35.91}{10{,}721} = \frac{21{,}474}{10{,}721} = 2.003$$

Thus, forecast ROE as,

$$ROE_{FOR} = \frac{P/B}{P/E} = \frac{2.003}{15.51} = 12.9\% \text{ / annum.}$$

So, our forecast ROE is less than realized 2017 ROE, 12.9% < 14.4%.

Now that we have an ROE forecast, we can forecast *ROIC* with (equation 2.1 above)

$$ROIC = (1-t) * r_D * \frac{Debt}{IC} + ROE * \frac{BVE}{IC}$$

by completing the measures on the right-hand-side. For this purpose, let us use amounts from the Invested Capital Balance sheet for year-end 2017 from Exhibit 2-3 above (if you don't like these numbers as forecasts, you can use your own),

$$ROIC = (1 - 0.272) * 0.039 * \frac{15,099}{25,820} + 0.129 * \frac{10,721}{25,820} = 0.07.$$

So, our ROIC forecast for TELUS is 7.0% per annum for both existing business investments and future growth investments (we presume). Notice from Exhibit 2-3 our *ROIC* forecast is less than realized *ROIC* for 2011-2017.

2.7.3 FORWARD ROIC for McDonalds

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Forecasting ROIC with the right-hand-side of equation (2.1), like we have just done for TELUS, is problematic if book-equity (BVE) is negative or close to zero. In this case, ROE is either undefined or economically unrealistic. Further, there is a tendency for this phenomenon to arise more frequently recently even for some very profitable and large US public companies, like, for example, McDonalds. Rather than with dividends, because of favorable personal tax treatment of capital-gains in the US tax-code, there is a tendency for US corporations to distribute the benefit of their profitability to shareholders with share-repurchase programs, which, other thing equal, decreases book-equity. Dividends also reduce book-equity but, as a rule, companies pay dividends out of permanent rather than transitory earnings. So, US firms use share-repurchase programs to

make large (often temporary and transitory) distributions to shareholders as share-repurchases. The phenomenon is not as pronounced in Canada because of a personal-tax preference for dividends over capital gains in the Canadian tax-code. So, we have the peculiar phenomenon for our financial analysis that some very profitable US companies have negative book-equity. In the below embedded spread-sheet, you can see in the "IC" tab, that McDonalds book-equity has fallen from \$15.967B at year-end 2010 to -\$2.149B at year-end 2017 even though invested-capital has increased from \$29.059B to \$30.913B.[9]

McDonalds

We can deal with the negative BVE phenomenon in our financial analysis by forecasting ROIC directly with equation (2.2) rather than indirectly with equation (2.1). Recall that there are two ways to calculate ROIC and, thus, there are also two ways to forecast ROIC. In particular, we can forecast ROIC with an adjusted EPS forecast. Most importantly, any earnings calculation subtracts \$INT (after tax), and, thus, to eliminate \$INT for an *operating* measure of business-return we add back forecast after-tax \$INT,

$$\begin{aligned} \text{NI} + (1-\text{t}) * \$\text{INT} &= (1-\text{t}) * (\text{EBITDA} - \text{deprec} - \$\text{INT}) + (1-\text{t}) * \$\text{INT} \\ &= (1-\text{t}) * (\text{EBITDA} - \text{deprec}) \end{aligned}$$

which is the numerator of ROIC (after tax and after depreciation).

Let EPS = forecast earnings per share approximately but at least one year hence, N = # shares outstanding, t = forecast corporate tax rate, \$INT = forecast dollar interest in the upcoming year. Then, we can forecast ROIC as,

[9] Despite high profitability, IC of McDonalds has not increased substantially over this period because of large share-repurchases (see the FCF tab in the McDonalds embedded spreadsheet).

$$ROIC = \frac{N * EPS + (1 - t) * \$INT}{IC}$$

This forecast presumes that financial statement depreciation forecasts capital expenditures that maintain the quality of existing depreciable assets (MCAPX) to prevent economic depreciation. For McDonalds, MCAPX is largely (most likely) modernizing renovations for restaurant locations.

For McDonalds (Nov 29, 2018) from either www.yahoofinance.com or the above embedded spreadsheet: EPS = \$8.23 (year-end 2019, see the "Analysis" tab for MCD at www.yahoofinance.com), N = 770.91 (million shares), \$INT = r_D * $DEBT_{2017}$ = 0.03 * 33,062 = 991.86 (\$US million), t = 0.394, IC_{2017} = \$30,913 (\$US millions).

Thus, our 2019 ROIC forecast for McDonalds is,

$$ROIC_{2019} = \frac{770.71*8.23+(1-0.394)*991.86}{30,913} = \frac{6,944.01}{30,913} = 22.46\%$$

A simple trend analysis from the above embedded McDonalds spreadsheet illustrates that this forecast is not greatly different from realized ROIC for recent years. McDonalds is indeed a very profitable company.[10]

2.7.4 Forecasting \$FCF, generally

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For TELUS, we now we have forward ROIC (ROIC=7.0% per annum), a growth forecast (consensus analysts' growth forecast, g=4.7% per annum from above the "Analysis" tab for ticker symbol TL at www.yahoofinance.com), and IC_{17} = 25,820 (Exhibit 2-3). So, we can forecast TELUS's FCF_{18} with equation (2.3) above,

[10] For McDonalds, if one uses the indirect method (equation 2.1) to forecast ROIC even though ROE and P/BVE are economically unrealistic, the forecast of ROIC, nonetheless, is very similar to that which we have just calculated (22.46%) with the direct method (equation 2.2).

$FCF_{CPR,2018} = (ROIC - g) * IC = (0.07 - 0.047) * 25{,}820 = 596$ ($US millions)

So, we forecast positive FCF for TELUS in the upcoming year.

2.7.5 The Constant Growth Cost of Capital

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Suppose a company makes year-end growth investments equal g% of beginning of year invested capital, indefinitely. This presumption means that our analysis is appropriate only for firms for which we can presume constant indefinite growth. Constant growth companies have a number of common features: they are mature rather than new ventures, they are profitable, and, they are relatively large (because they have undertaken successful past business endeavors). In addition, to access public financial analysts' forecasts, we also restrict our analysis to public rather than private firms. Last, generally, although not always, the firms we investigate often pay shareholder dividends currently over a regular interval (like, for example, quarterly). While our analysis is strictly only appropriate for this class of corporation, this class represents most of the largest and most important economic businesses in our world economy.

We can observe (or calculate) a firm's asset market-to-book ratio from financial market information sources. In addition, discounting forecast future FCF at the cost of capital and dividing by invested capital gives us a theoretic asset market-to-book ratio. Setting the observed ratio equal its theoretic DCF equivalent, we can work backwards to calculate a firm's cost of capital: the business-investment opportunity cost rate of return implied by the observed asset market/book ratio and constant growth DCF. Thus, we call this amount the *constant growth implied cost of capital*. We illustrate these methods for TELUS.

First, a common way to calculate a firm's MVA ─ Market Value of Assets (Enterprise Value) ─ is Market Value of Equity (MVE) plus book-value of debt (BVD). BVD is an approximation to market value of debt (MVD), which is generally appropriate because most corporations use short-term rather than long-term debt. In refinancing debt in short-term sequences, market values never

diverge far from borrowed values – book value. As we learn in chapter 7, alternatively, long-term corporate bonds that have fixed coupon rates (interest rates) that differ significantly from yields (the opportunity cost rate of return for a bond) can have market values that differ greatly from book-values (so called, par-value of a corporate bond).

For TELUS for Nov 26, 2018,

$$\text{MVA (Enterprise Value)} = \text{MVE} + \text{BVD} = \$21{,}474 + \$15{,}099 = \$36{,}573$$

(over 36 billion $US)

So, at Nov 26, 2018, TELUS's observed asset market/book ratio is:

$$\frac{MVA}{IC} = \frac{36{,}573}{25{,}820} = 1.416$$

Second, let's calculate the asset market/book ratio from a theoretic DCF perspective. In DCF, MVA is discounted growing predicted future FCF. Recall we forecast FCF in one year as

$$\text{FCF}=[\text{ROIC}-g]*\text{IC}.$$

Recall that for a growing business, value (MVA), measured by PV (after business investment), is

$$\text{MVA} = \text{PV} = \frac{FCF}{r-g},$$

where FCF is operating free cash flow forecast in one year, *r* is the opportunity cost rate of return for business investment – the cost of capital – and g is corporate growth.

Substitute the FCF expression into the numerator of the above, to find,

$$MVA = \frac{[ROIC-g]*IC}{r-g}.$$

Divide both sides by IC to find the DCF representation of the asset market to book ratio,

$$\frac{MVA}{IC} = \frac{[ROIC-g]}{r-g} \tag{2.4}$$

Now we have an observed asset market-to-book value from financial markets and a theoretic asset market-to-book from DCF. Set these two market/book measures equal to one another. In this equality, we presume that financial markets use the same theory of value as you and I, DCF,

$$\frac{MVA}{IC} = 1.416 = \frac{[ROIC - g]}{r - g}$$

Now, complete the right-hand-side equation (2.4) with our ROIC forecast from above and the consensus analyst growth forecast we collected from financial markets information sources,

$$\frac{MVA}{IC} = 1.416 = \frac{[0.07-0.047]}{r-0.047} \tag{2.5}$$

Solve this equation to find the cost of capital implied by this observed asset market/book ratio and constant growth DCF. So, the constant growth implied cost of capital ─ the opportunity cost rate of return for TELUS's business investments ─ is, r = 6.3%.

Notice that in calculating TELUS's cost of capital, we have not used financial market measures related to shareholder dividend payment, like, for example, dividend yield. So, while TELUS pays shareholder-dividends, not all companies do. We can, nonetheless, apply this constant growth implied cost of capital methodology to non-dividend paying firms.

Exhibit 2-6 below, summarizes our results, not only for TELUS, but, also, for a number of additional US and Canadian companies using a similar methodology. Notice that the constant growth cost of capital varies from a low of 6.1% for TransCanada Corp (pipelines and energy) to a high of 22.7% for Costco (household and food retail). Analysts' expectation of growth is highest (24%) for Costco and Premium Brands (food processing and distribution) and lowest (-1.2%) for Macy's (consumer retail).

Exhibit 2-6
Constant Growth Cost of Capital
(November 2018)

Company	Asset Market/Book	ROIC Forward	Analysts' Growth Forecast	Constant Growth Cost of Capital
TransCanada Corp	1.076	0.061	0.058	0.061
Telus	1.416	0.070	0.047	0.063
Premium Brands	2.628	0.136	0.240	0.200
Canadian Pacific Railway	2.068	0.120	0.124	0.122
Costco	5.047	0.173	0.240	0.227
Macy's	1.246	0.100	-0.012	0.078
Verizon	1.765	0.121	0.059	0.094
Paypal	5.407	0.183	0.2051	0.201
Walmart	2.530	0.117	0.042	0.071
McDonalds	5.77	0.225	0.093	0.117

We have been somewhat indiscriminant in our application of the constant growth presumption in Exhibit 2-6. The cost of capital exceeds forward ROIC for Premium Brands, CPR, Costco, and Paypal, which is rather troubling for high growth companies. With companies for which analysts' long-term growth forecast exceeds forward ROIC (negative FCF firms), we might, alternatively, use some type of multi-stage growth modeling that incorporates expectations for when FCF will become positive. Corporate profitability might not justify high growth rates, indefinitely. In lieu of this modeling, we should use cost-of-capital calculations in Exhibit 2-6 with caution. On the other hand, in Chapter 8 we find that forward ROE exceeds shareholders' opportunity cost rate of return for all of these firms, which suggests that growth is an appropriate corporate objective and that the constant growth presumption might not be amiss.

2.7.6 Financial Analysis and the Cost of Capital

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So, now that we have calculated TELUS's cost of capital as 6.3% per annum, how is that number useful for financial analysis?

Remember from Chapter 1 that we benchmark corporate performance with the opportunity cost rate of return for business investment, which is the cost of capital. With this number, we can investigate the principal question of financial analysis: does TELUS create wealth for financial asset-holders and shareholders, specifically, with its business investments?

Wealth creation by firms is inextricably bound to the workings of financial markets. Business asset-values depend on investors' opportunity costs rates of return, which, in turn, represent return expected from alternative *financial* investments. Shareholders who believe that a firm will not earn the opportunity cost of capital sell their shares. If many shareholders share a negative opinion, share prices fall until the market price reflects a fair rate of return. Falling share prices reduce capital available to managers. In this way, markets work to reallocate capital, increasing the resources available to managers who succeed to earn at least the opportunity cost of capital and decreasing the resources available to unsuccessful managers.

So, what about TELUS, specifically?

Recognize that our analysis and presumptions are sufficiently crude that any amount we calculate should not interpreted as being unduly exact. So, with a forward ROIC for business investment of 7% and a cost of capital of 6.3%, it is reasonable to conclude that TELUS's corporate performance is just meeting the expectations of financial investors.

Also recognize that a forward ROIC of 7% per annum represents an average of all of TELUS's business investments, some that are likely more profitable with IRRs greater than this amount and some that are likely less profitable with IRRs less than this amount. So, by selling/disposing/liquidating some operations TELUS might be able to increase shareholders' wealth (by eliminating negative NPV investments). Remember that we presume that the objective of managers in operating a business is to maximize shareholders' wealth. So, if TELUS can increase shareholders' wealth by curtailing and/or selling some value destroying operations, then it should do so. Since, TELUS is a public company, by eliminating negative NPV investments share price should increase to the immediate benefit of shareholders. However, be careful, TELUS operates in a regulated telecommunications. Some of their operations that may not enhance shareholder wealth but they serve a broader national purpose mandated by government.

Recall in our analysis that we benchmark business returns against financial market returns of about the same risk as the business investment under study. For TELUS, specifically, how can we be sure that its 6.3% cost of capital (above) represents the rate of return on a portfolio of financial assets of about the same *risk* as TELUS's business investments? The answer to this question is that financial markets have determined (according to our calculations) that business investments of TELUS have a value of $36.,573 $US billion dollars and an asset market/book ratio of 1.416. In arriving at these values, financial markets employ a cost of capital (conceptually) like you and I with the same DCF theory of value as you and I. If the risk of TELUS's business investments was greater, then these values would be lower (and the cost of capital that we calculate would be greater). Similarly, if the risk of TELUS's business investments was lesser, then these values would be higher. Presumably, financial markets use a cost of capital that represents the expected rate of return on a portfolio of financial assets of about the same risk as TELUS's business investments. In working backwards from financial market forecasts and observables in equation (2.5), we uncover the cost of capital that financial markets use with this equivalent risk property. Whenever use financial market determined values (prices) to calculate an IRR (which is what we have done with the TELUS cost of capital calculation above), then the IRR is risk-adjusted. For example, in chapter 7 we study bonds (publicly traded debt): a bond yield has this risk-adjusted feature.

(2.8) Summary

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Financial accounting is the process of producing and disseminating information about the economic activities of a firm. Annual and quarterly reports, and more specifically financial statements, transmit this information to interested individuals and groups. Users of financial statement information include shareholders, creditors, employees, suppliers, government, and social interest groups. Financial statements are *general*-purpose summaries of economic activity because user groups have diverse interests. A goal of this E-Finance book is, therefore, to describe how investors can use financial statement information to analyze a firm for potential investment.

We use discounted cash flow analysis (DCF) as our theory of value with financial statements and financial market data as inputs to answer the primary question of financial analysis: does the firm under investigation make good business investments for its financial asset holders and its shareholders in particular. We forecast prospective corporate business returns and, then, benchmark these with objective financial market opportunity cost rates of return. We need firm-specific information from financial statements to forecast business returns and financial market measures to calculate investor opportunity cost rates of return. We calculate a firm's cost of capital implied by an observed asset market/book ratio (from financial markets) and constant growth DCF presumption.

(2.9) Suggested Readings

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(2.10) Problems

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1. ***Financial Statements and Free Cash Flow*.**

Based on the following information for ABC Ltd., prepare an income statement for 1999 and balance sheets for 1998 and 1999. Assume a flat 40% tax rate throughout. Next, for 1999, calculate Funds From Operations, Change in Invested Capital, and Free Cash Flow. Find net distributions to debtholders and net distributions to shareholders. Verify that free cash flow is equal to the sum of net after corporate tax distributions to debtholders and net distributions to shareholders. There is no deferred tax in this problem, so you can reasonably assume that financial statement depreciation and depreciation for tax are equal.

Selected Information for ABC, Ltd
(All figures in thousands)

	1998	1999
Sales	$3,790	$3,990
Production Costs	2,043	2,137
Depreciation	975	1,018
Interest	225	267
Dividends	200	205
Current Assets	2,140	2,346
Net Fixed Assets	6,770	7,087
Accounts Payable	994	1,126
Long-term Debt	2,869	2,956

Solution

2. ***Invested Capital, ROIC, Trade-Capital, Free Cash Flow.***
ABC Co. Ltd. has the following year-end accounting balance sheet.

Current Assets	$500,000	Accounts Payable	$200,000
Net Fixed Assets	$1,500,000	Short-Term Debt	400,000
		Equity	1,400,000

Equity on the balance sheet represents the sum of all the accounting "equity" accounts. Expected sales for the upcoming year are $4,500,000. Costs of goods sold are 65% of sales and other operating expenses are $850,000. The interest rate on ABC's short-term debt is 10% per annum. ABC's tax-rate is 23%. ABC expects to maintain the level of its short-term debt into the indefinite future.

a) Calculate ABC's invested capital turnover, EBITDA margin, and rate of return on invested capital (before tax, no depreciation in this problem).
b) ABC anticipates no capital expenditure in the upcoming year. ABC expects to pay dividends equal to net income. Find free cash flow, net after corporate tax distributions to debtholders and net distributions to shareholders. Does ABC have a free cash flow surplus or deficit? If ABC has a free cash flow deficit, how is it financed? If ABC has a free cash flow surplus, how is it distributed?
c) ABC intends to expand its operations. Sales are expected to increase by $1,000,000 per annum. In addition, "other" operating expenses will increase by $200,000 per annum. Costs of goods sold, as a fraction of sales is not expected to change. This expansion requires a one-time incremental investment of $400,000 in trade capital and a capital expenditure in the amount of $300,000. ABC intends to finance these expenditures with long-term debt. Does ABC's before tax rate of return on invested capital (for the entire firm) increase or decrease as the result of the expansion?
d) What is the after tax IRR on the business expansion?

Solution

3. ***Rate of Return on Assets and Rate of Return on Invested Capital.***
Compare and contrast the rate of return on "invested capital" and the rate of return on "assets" as measures of corporate performance for evaluating the financial health of a firm.

Solution

4. ***The EBITDA Margin.***
The range for EBITDA margin for industries in the US and Canadian economy is from approximately zero to about 60%. What characteristics of industries lead to high or low EBITDA margin? Explain and discuss.

Solution

5. ***ROA versus ROIC***

This question is adapted from *Analysis for Financial Management* by Robert C. Higgins, fifth ed. Chicago: Irwin, 1998.

The rate of return on assets is a commonly used ratio that is calculated as net income divided by the accounting definition of assets. The purpose of this question is to illustrate that the rate of return on invested capital is a better measure of the rate of return on business investment. In this question, invested capital and "assets" are the same. Ignore depreciation in this problem.

You have the following information for ABC Co. Ltd.

Earnings before interest and tax	$100
Interest Expense	5
Earnings before tax	95
Tax at (30%)	28.5
Earnings after tax	66.5
Assets = Invested Capital = $500,	Equity = $450

a) Calculate ABC's ROE, ROA, and ROIC times one minus the tax-rate.

b) Suppose that ABC *recapitalizes* by selling $200 million in debt at 10% per annum. ABC uses the proceeds of this financial-asset sale to repurchase $200 million of its common shares. Presume that this recapitalization has no effect on ABC's operating performance (in other words, ROIC is not expected to change after the recapitalization). Calculate ABC's ROE, ROA, and ROIC times one minus the tax rate. Explain why ROA is an inadequate measure of the rate of return to business investment.

c) Give two reasons for the increase in ROE after the recapitalization. Discuss some of the advantages and disadvantages of debt use by firms.

Solution

6. ***The EBITDA Margin.***
Explain the significance of EBITDA margin in financial analysis.

Solution

7. ***Free cash flow and net distributions to financial asset-holders.***
ABC is a non-growing firm: it retains no earnings and pays all residual cash flows after interest and tax to shareholders as dividends. ABC is financed with common shares and short-term debt. ABC's trade capital equals inventory plus accounts receivable less accounts payable. Ignore depreciation for reporting and tax in this problem.
ABC sells widgets. Projected sales are 1,000,000 units per annum into the future. Product price is $2.80 per unit. Costs of goods sold equal 60% of Sales. General and administrative expenses are $100,000 per annum. ABC's accounts receivable turnover is 6.5. Inventory turnover is 5.5. Accounts payable turnover is 4.0.
ABC's past expenditure into capital assets is $2,225,000. ABC has financed its operations (in part) with $1,000,000 in short-term debt that pays interest at a rate of 12% per annum (paid annually). ABC's only other financial asset is common equity. ABC anticipates to make no additional expenditures in the foreseeable future on capital assets. ABC pays annual dividends equal to Net Income, and therefore, ABC is a non-growing firm. The corporate tax rate is 35%. There are 1,000,000 shares of ABC stock, which trade on the Newton stock exchange.
   a) Find the rate of return on equity for ABC.
   b) Decompose ABC's rate of return on equity into the product of net profit margin, asset-turnover, and the asset to equity ratio. In these calculations, use invested-capital as your definition of assets.
   c) ABC is contemplating a change in its product pricing policy, which may require changes in its trade-capital investment. If ABC reduces its product price to $2.70 per unit it anticipates an increase in per unit sales to 1,200,000 units per annum. As the result of increase in per annum dollar sales, what will be the new level of trade capital for ABC? Accounts receivable turnover, inventory turnover, and accounts payable turnover are not expected to change.
   The remaining parts of this problem relate to the policy change described in (c).

d) ABC repurchases no shares over the year. In addition, they sell no new shares. ABC will use short-term debt for any required financing (at the end of the year). How much will ABC need to borrow at the end of the year?
e) Find Funds from operations for ABC. Find incremental business investment. Find Free Cash Flow.
f) Find Net Distributions to Shareholders. Find Net Distributions to Debtholders.

Solution

8. ***ROE***

Consider the following invested capital balance sheet for ABC Company for year-end 1994.

Trade Capital	3,200,000	s.t. debt	1,900,000
		Common Equity	600,000
Net Fixed Assets	800,000	Retained Earnings	1,500,000

ABC has a contribution margin per dollar sales of 20%. (Contribution margin is defined as unit product/service price minus unit variable cost dividend by unit price). Fixed costs per annum (before depreciation) are $200,000. Dollar sales for the upcoming year are expected to be $3,000,000. The interest rate on short-term debt is 10% per annum. ABC expects no incremental business investment for the year. ABC's tax-rate is 35%. Depreciation for tax and reporting is 15% per annum.

a) Find expected net income for the upcoming year.
b) Find after-tax expected funds from operations.
c) Calculate the rate of return on equity.

Solution

9. ***The Current Ratio.***

A firm has current assets of $500,000. What is the change in the current ratio (now equal to 2.0) if the following actions are taken *independently*? In other words, you should have five separate responses for the five parts of this problem below. Other than the common

information given on current assets and the current ratio, information from no one part of the question should be used in any other part.

a) pays $77,500 of accounts payable with cash.
b) collects $43,000 in accounts receivable.
c) purchases merchandise worth $51,300 on account.
d) Sells production machinery for $90,000.
e) Sells merchandise on account that cost $53,500. Gross profit margin is 33%.

Solution

10. ***Financial Analysis*.**

There are three principal questions a financial analyst or investor must investigate for any investment. Identify these questions. Suppose you are a financial analyst who is charged with evaluating the performance of a corporation over the recent past. Discuss the measures and ratios that you might calculate to answer or investigate these questions for the firm under consideration.

Solution

11. ***Ratio Analysis in EXCEL.***

Below is an embedded "workbook" composed of three worksheets. The first worksheet is an income statement and the second is a balance sheet. In the third worksheet, calculate the indicated financial ratios for each of the years 1990-1993. In every cell of this solution template, you should replace the "X" cell identifier with a spreadsheet *formula* that uses inputs from the first two worksheets to calculate the indicated ratio. The tax rate for the firm

in this problem is 36%. A suggested solution is contained in the second embedded workbook entitled "Solution".

Template **Solution**

12. ***Calculate Free Cash Flow.***

The following information is available on the financial accounts of ABC Corporation.

	1999
Sales	1,600
Cost of Goods Sold	800
General and Administrative Expenses	250
Interest	50
Depreciation	40
tax at 40%	184

	1998	1999
Accounts Receivable	150	?
Inventory	200	?
Net Fixed Assets	?	?
Short Term Debt	500	?
Accounts Payable	100	?
Equity	?	?

NOTE: "Equity" represents the sum of all of the accounting equity accounts.

The following additional financial information is available for ABC.

The rate of return on invested capital (b.o.p.) after tax and after depreciation for 1999 is 15.3%. This return is calculated as EBITDA less depreciation times one minus the tax rate divided by beginning of period invested capital. Dividends for 1999 are $85. ABC paid off its short-term debt in 1999 and sold additional common shares. In 1999, inventory turnover was 4.0, the accounts payable deferral period was 40 days, and the cash conversion cycle was 60 days. The component ratios of the cash conversion cycle are calculated using 365 days in a year. In addition, these ratios use only the 1999 financial statements (i.e., not beginning of period balance sheet amounts). Capital expenditure in 1999 was $135.

Required : Based on the information at hand, find free cash flow using *both* the operational and the financial definitions for 1999.

Solution

13. ***Calculate Free Cash Flow.***

The following information is available on the financial accounts of ABC Corporation.

	1999
Sales	?
Cost of Goods Sold	?
General and Administrative Expenses	250
Interest	50
Depreciation	40
tax at 40%	274

	1998	1999
Accounts Receivable	150	200
Inventory	?	?
Net Fixed Assets	?	3056
Short Term Debt	500	?
Accounts Payable	?	100
Equity	?	?

NOTE: "Equity" represents the sum of all of the accounting equity accounts.

The following additional financial information is available for ABC.

The rate of return on invested capital (b.o.p.) after tax and after depreciation for 1999 is 15.0%. This return is calculated as EBITDA less depreciation times one minus the tax rate divided by beginning of period invested capital. Dividends for 1999 are $95. ABC incremented the level of its short-term debt by $300 in 1999. ABC repurchased $200 of its outstanding shares in 1999. Incremental investment in trade capital in 1999 was $145. In 1999, inventory turnover was 4.0, the accounts receivable collection period was 40 days. The accounts receivable collection period is calculated using 365 days in a year. In addition, inventory turnover and the accounts receivable collection period use only the 1999 financial statements (i.e., not beginning of period balance sheet amounts).

***Required*:** Based on the information at hand, find free cash flow using *both* the operational and the financial definitions for 1999.

Solution

14. ***Free Cash Flow and the Invested Capital Balance Sheet.***

The following information is available on the financial accounts of ABC Corporation.

	1996
Sales	2,000
Cost of Goods Sold	1,400

General and Administrative Expenses	200
Interest	60
depreciation (which equals depreciation for tax)	35
corporate tax rate	?

	1995	1996
Accounts Receivable	268	?
Inventory	100	?
Net Fixed Assets	3000	
Short Term Debt	600	?
Accounts Payable	200	?
Equity	?	2,517

NOTE: "Equity" represents the sum of all of the accounting equity accounts.

The following additional financial information is available for ABC.

ABC has a trade capital to sales ratio of 10% (i.e., trade capital for the end of the fiscal year divided by sales for that same year). ABC has financed its operations with short-term debt and with common equity. Dividends for 1996 are $95. ABC borrowed additional short-term debt in 1996. They also repurchased $200 of shares in 1996. Free cash flow in 1996 was $25.

Required: Based on the information at hand, and the definition(s) of free cash flow, determine the invested capital balance sheet for ABC for both 1995 and 1996. For each year find trade capital, net fixed assets, short-term debt and "equity." What was ABC's corporate tax rate in 1996? What was ABC's expenditure for plant property and equipment for 1996 (i.e., capital expenditure)? Find free cash flow for 1996 using the operating definition.

Solution

15. ***Optimal Trade Capital.***

Comment on the following assertion. "If a firm can reduce its trade capital usage, then it should definitely do so."

Solution

16. ***Cash Flow.***

ABC has a contribution margin of 20% and fixed costs of $450,000 per annum. Their

corporate tax rate is 40%. For financial statement purposes, ABC takes depreciation charges on its net fixed assets at the rate of 5% per annum on the declining balance. Capital cost allowance is the same as financial statement depreciation. As of December 31, 1996, ABC has financed its business investment with short-term debt and with common equity. ABC has a trade capital to sales ratio of 12%. This ratio is calculated as trade capital at the end of the year divided by yearly sales for the associated year (for example trade capital at December 31, 1996 divided by yearly sales ended December 31, 1996). This ratio is not expected to change in the foreseeable future. ABC has net fixed assets of $250,000 at December 31, 1996.

ABC is doing some short term financial planning. They predict sales, for the year ending December 31, 1997, of $3,000,000. Their invested capital turnover based on *this prediction* and December 31, 1996 invested capital is 3.0 (i.e., predicted 1997 sales divided by year-end 1996 invested capital is 3.0). If ABC requires any financing to accommodate their 1997 sales, they plan to increment (or decrement) their short term borrowing. If ABC borrows, or repays existing short-term debt, they plan to do so at the end of 1997. The interest rate on short-term debt is 10% per annum. ABC's predicted 1997 net income is $42,000. ABC expects to pay no dividends to their shareholders in 1997. ABC expects no capital expenditures or asset sales in 1997. ABC expects no share repurchases or new share issues in 1997.

a) (10 marks) Use 1997 predicted net income to help you determine short-term debt at December 31, 1996. What is invested capital at December 31, 1996? Calculate ABC's predicted 1997 rate return on equity (using beginning of period equity).
b) (10 marks) Does it appear that ABC will need incremental short-term borrowing (at the end of 1997) or can they pay down some of their short-term debt? What is the most likely reason for the change in ABC's debt use?
c) (10 marks) For 1997, calculate ABC's free cash flow using both the operating and the financial definitions.
d) (10 marks) Without doing any numerical calculations, do you believe that ABC's operating leverage has increased or decreased between 1996 and 1997? Explain.

Solution

17. ***Free Cash Flow and the Rate of Return on Invested Capital.***

The following information is available on the financial accounts of ABC Corporation.

	1997
Sales	?
Cost of Goods Sold	?
General and Administrative Expenses	?
Interest	35
Depreciation (which equals depreciation for tax)	100

Corporate tax (at 40%)	?
Net Income	?

	1996	1997
Accounts Receivable	250	275
Inventory	150	175
Net Fixed Assets	?	?
Short Term Debt	?	400
Accounts Payable	200	225
Equity	?	?

NOTE: "Equity" represents the sum of all of the accounting equity accounts.

The following additional financial information is available for ABC:

For both 1996 and 1997, ABC had a trade capital to invested capital ratio of 25% (trade capital at the end of the year divided by invested capital at the end of the year). ABC has financed its operations with short-term debt and with common equity. ABC undertakes borrowing or repayment of debt at the *end of the year*. Therefore, ABC's interest charge on its income statement is equal to outstanding short-term debt at the beginning of 1997 (end of 1996) times the interest rate on this debt which is 7% per annum. Dividends for 1997 are $95. ABC issued shares for $200 in 1997.

Required: Based on the information at hand, and the definition(s) of free cash flow *developed in class*, find free cash flow for 1997 using both the operating and the financial definitions. Find ABC's 1997 rate of return on invested capital, after tax and after depreciation, using beginning of period invested capital.

Solution

18. ***Free Cash Flow and the Rate of Return Equity.***

The following information is available on the financial accounts of ABC Corporation.

	1998
Depreciation	$30
Interest	10

	1997	1998
Trade Capital	150	?
Short-term Debt	?	250
Net Fixed Assets	300	?
Equity	350	?

NOTES: "Equity" is the sum of all of the accounting equity accounts (e.g., share-capital plus retained earnings). You can presume that depreciation for tax and for financial statement purposes is the same and, therefore, there is no deferred income tax in this problem.

Any incremental short-term borrowing undertaken by ABC during 1998 was at the end of the year. Therefore, ABC's interest expense for 1998 is the interest rate on short-term debt times short-term debt at the *beginning* of 1998 (end of 1997). Alternatively, if instead, ABC paid down any short-term debt during 1998, this was also done at the end of 1998. ABC has financed its business activity with short-term debt and with common equity. In 1998, ABC's rate of return on equity (ROE) was 20%. ROE is calculated with equity at the end of 1998. ABC paid dividends of $26 during 1998. ABC had no share issues or share repurchases during 1998. Also in 1998, ABC's EBITDA margin was 25%. Their trade capital to sales ratio was 30%, both trade capital and sales are measured at the end of 1998. ABC's tax rate is 40%.

Required: Using both the operating and the financial definitions, find ABC's FCF for 1998.

Solution

19. ***Ratios.***

Discuss briefly how each of the following five ratios is calculated and what each is intended to measure:

(a) EBITDA margin,
(b) debt to assets,
(c) times interest earned,
(d) quick ratio (acid test ratio),
(e) asset turnover.

Solution

20. ***Incremental Business Return***

Generally, ABC Company Ltd. has been a non-growing firm. Per annum sales have been $8,000,000. However, as the result of a favourable international trade agreement between Canada and the United States, in the upcoming year, sales are expected to increase to $10,000,000 per annum and remain at this higher level indefinitely into the future.

ABC has a trade capital to sales ratio of 20% and an invested-capital turnover ratio of 1.25. Trade capital to sales is calculated as trade capital at the beginning of the year divided by sales for the upcoming year. Invested-capital turnover is calculated as sales for the upcoming year divided by invested-capital at the beginning of the year. ABC's depreciation is 5% of net fixed assets at the beginning of any year. Subsequent to the change in sales, these ratios and rates are expected to remain unchanged. Depreciation for tax equals financial statement depreciation. ABC makes maintenance capital expenditures at year-end equal to financial statement depreciation. Maintenance capital expenditures "maintain" the quality of ABC's assets and prevent revenue deterioration.

Generally, other than in the upcoming year, ABC makes no capital expenditures for the purpose of growth. However, at the beginning of the upcoming year, to accommodate the increased level of permanent sales, incremental trade capital assets and additional depreciable assets will be needed. In addition, as the result of the increase in depreciable assets, per annum year-end maintenance capital expenditures will also increase. Thereafter, because ABC will be once more a non-growing firm (that is, trade capital will not increase and capital expenditure for the purpose of growth will again be zero).

ABC's contribution margin per dollar sales is 25%. The tax-rate is 40%. Find the rate of return on ABC's incremental business investment after tax and after depreciation (equivalently, after tax and after additional maintenance capital expenditures) arising from the greater expected level of dollar sales.

Solution

21. ***Free Cash Flow, Invested Capital, Financial Statements***

The following information is available on the financial accounts of ABC Corporation.

	1999
EBITDA	?
Depreciation	?
Interest	?

	1998	1999
Trade Capital	?	200
Short-term Debt	?	?
Net Fixed Assets	?	?
Equity	?	520
Invested Capital	500	850

NOTES: "Equity" represents the sum of all of the accounting equity accounts (e.g., share-capital plus retained earnings). You can presume that depreciation for tax and for financial statement purposes is the same, and therefore, there is no deferred income tax in this problem .

ABC's net *incremental* borrowing for 1999 was $120. Because this borrowing was at the end of 1999, ABC's interest expense for 1999 is the interest rate on short-term debt times short-term debt at the *beginning* of 1999 (end of 1998). The interest rate on ABC's short-term debt is 10% per annum. ABC made net capital expenditures of $365 at the end of 1999. Because these capital expenditures were at the end of 1999, ABC's depreciation expense for 1999 (also depreciation for tax) is a rate for depreciation times net fixed assets at the beginning of 1999 (end of 1998) *prior to the capital expenditure*. The depreciation rate is 5% per annum. ABC paid dividends to shareholders of $50 during 1999. ABC's tax rate is 40%. ABC had a free cash flow *deficit* of $100 for 1999.

Required: Find ABC's rate of return on invested capital for 1999, *before* tax and *before* depreciation, using beginning of period invested capital. Was ABC a net seller of common shares or a net repurchaser of its common shares in 1999?

Solution

22. The Relation Between ROIC and ROE

Today, ABC has invested capital of $4,000,000. Trade capital and net fixed assets are 34% and 66% of invested capital respectively. Invested capital has been financed with short-term debt and with common equity. The interest rate on short-term debt is 10% per annum. ABC's tax rate is 40%. Depreciation is 5% of beginning-of-period net fixed assets. No capital expenditures are required for the upcoming year. Based on predicted sales in the upcoming year, ABC's EBITDA is $1,000,000. Other things equal, ABC's rate of return on equity (using beginning of period equity) at predicted sales for the upcoming year, is equal to their predicted rate of return on invested capital after tax and after depreciation (using beginning of period invested capital) plus 10%. That is at predicted sales, ROE=ROIC+0.10.

Required: What is ABC's beginning of period (i.e., today) debt to equity ratio?

Solution

23. The Relation Between ROIC and ROE

The following information is available on the financial accounts of ABC Corporation.

	2013
EBITDA	?
Depreciation	?

Interest	?

	2013
Trade Capital	200
Short-term Debt	?
Net Fixed Assets	800
Equity	?
Invested Capital	1,000

NOTES: "Equity" represents the sum of all of the accounting equity accounts (e.g., share-capital plus retained earnings). You can presume that depreciation for tax and for financial statement purposes is the same, and therefore, there is no deferred income tax in this problem .
ABC neither borrowed incrementally nor repaid short-term debt during 2013, and therefore, its interest expense for 2013 is the opening balance for 2013 (same as the closing balance) times the interest rate on its short-term debt, which is 6.25% per annum. ABC's tax rate is 40%.
ABC's rate of return on invested capital for 2013, *after* tax and *after* depreciation, using end of period invested capital is 27%. ABC's ROE for 2013 using end of period book equity is 42.5%.
Required: Find ABC's debt to equity ratio for 2013.

Solution

24. ROA and ROE.
ABC has return on equity (ROE) of 24 percent and a return on assets (ROA) of 16%.

Required: Find ABC's debt to equity ratio.

Solution

25. Relation Between ROIC and ROE

The following information is available on the financial accounts of ABC Corporation.

	2013
EBITDA	?
Depreciation	?
Interest	?

	2013
Trade Capital	?
Short-term Debt	400
Net Fixed Assets	800
Equity	?
Invested Capital	?

NOTES: "Equity" represents the sum of all of the accounting equity accounts (e.g., share-capital plus retained earnings). You can presume that depreciation for tax and for financial statement purposes is the same, and therefore, there is no deferred income tax in this problem .

The interest rate on ABC's short-term debt is 8% per annum. ABC's tax rate is 40%. ABC's rate of return on equity (ROE) for 2013 using end of period book equity is 16.8%. Their rate of return on invested capital for 2013, *after* tax and *after* depreciation, using end of period invested capital, is 12%.
Required: Find ABC's 2013 year-end invested capital.

Solution

26. ROA, ROE, and Net Profit Margin

ABC company limited has a 4 percent net profit margin, a return on equity (ROE) of 32 percent, a return on assets (ROA) of 16 percent.
Required:

(a) Find ABC's asset turnover ratio.
(b) Find ABC's debt to equity ratio.

Solution

27. ROIC and ROE

The following information is available on the financial accounts of ABC Corporation.

	2008
EBITDA	400
Depreciation	25
Interest	?

	2008
Trade Capital	?
Short-term Debt	?
Net Fixed Assets	?
Equity	600
Invested Capital	?

NOTES: "Equity" represents the sum of all of the accounting equity accounts (e.g., share-capital plus retained earnings). You can presume that depreciation for tax and for financial statement purposes is the same, and therefore, there is no deferred income tax in this problem .
ABC neither borrowed incrementally nor repaid short-term debt during 2008, and therefore, its interest expense for 2008 is the opening balance for 2008 (same as the closing balance) times the interest rate on its short-term debt, which is 8% per annum. ABC's tax rate is 40%.
ABC's rate of return on invested capital for 2008, *after* tax and *after* depreciation, using end of period invested capital equals its 2008 ROE using end of period equity.
Required: Find ABC's 2008 interest expense (in dollars).

Solution

28. ROIC Versus ROE

The following information is available on the financial accounts of ABC Corporation.

	2008
EBITDA	600
Depreciation	40
Interest	

	2008
Trade Capital	?
Short-term Debt	?
Net Fixed Assets	?
Equity	?

Invested Capital	?

NOTES: "Equity" represents the sum of all of the accounting equity accounts (e.g., share-capital plus retained earnings). You can presume that depreciation for tax and for financial statement purposes is the same, and therefore, there is no deferred income tax in this problem .
The interest rate on ABC's short-term debt is 9% per annum. ABC paid down no debt during 2008, and therefore, their opening debt balance for 2008 equals their closing 2008 debt balance.
ABC's tax rate is 40%.
ABC's rate of return on equity (ROE) for 2008 using end of period book equity is 20%. Their year-end 2008 debt to invested capital ratio is 25%.
Required: Find ABC's 2008 Invested Capital.

Solution

29. ROIC

Comment on the following assertion. "A primary determinant of a firm's rate of return on invested capital (after tax and after depreciation) is corporate debt use." Use no numerical examples in your response. A complete response is required for full marks.

Solution

30. ROIC Versus ROE

The following information is available on the financial accounts of ABC Corporation.

	2008
EBITDA	700
Depreciation	520
Interest	100

	2008
Trade Capital	?
Short-term Debt	?
Net Fixed Assets	?
Equity	?
Invested Capital	?

NOTES: "Equity" is the sum of all of the accounting equity accounts (e.g., share-capital plus retained earnings). You can presume that depreciation for tax and for financial statement purposes is the same, and therefore, there is no deferred income tax in this problem .
ABC paid down no debt during 2008, and therefore, their opening debt balance for 2008 equals their closing 2008 debt balance. ABC's tax rate is 40%. ABC's 2008 rate of return on equity (with 2008 year-end book equity) equals their 2008 rate of return on invested capital (after tax, after depreciation, with 2008 year-end invested capital).
Required: Find ABC's year-end 2008 equity to invested capital ratio (2008 year-end equity divided by 2008 year-end invested capital).

Solution

31. ROIC Versus ROE

The following information is available on the financial accounts of ABC Corporation.

	2008
EBITDA	?
Depreciation	400
Interest	?

	2008
Trade Capital	?
Short-term Debt	900
Net Fixed Assets	?
Equity	?
Invested Capital	?

NOTES: "Equity" is the sum of all of the accounting equity accounts (e.g., share-capital plus retained earnings). You can presume that depreciation for tax and for financial statement purposes is the same, and therefore, there is no deferred income tax in this problem .

ABC neither borrowed incrementally nor repaid short-term debt during 2008, and therefore, its interest expense for 2008 is the opening balance for 2008 (same as the closing balance) times the interest rate on its short-term debt, which is 10% per annum. ABC's tax rate is 40%. ABC's rate of return on invested capital for 2008, *after* tax and *after* depreciation, using end of period invested capital is 20%. ABC's 2008 ROE using end of period equity is 26%.

Required:

(a) Find ABC's 2008 year-end Invested Capital.

(b) Find ABC's 2008 EBITDA.

Solution

32. **ROIC Versus ROE**

Comment on the following assertion. "When a firm does well on its business investments, that is, EBITDA is high, the rate of return on invested capital (ROIC) is correspondingly high and exceeds the rate of return on equity (ROE). On the other hand, when a firm does poorly on its business investments, ROIC is low and is below ROE." State whether or not you agree with the assertion and then explain why. Use no numerical examples in your response. A complete response is required for full marks.

Solution

33. Free Cash Flow

The following information is available on the financial accounts of ABC Corporation.

	1999
EBITDA	?
Depreciation	20
Interest	25

	1998	1999
Trade Capital	?	?
Short-term Debt	?	300
Net Fixed Assets	?	?
Equity	520	?
Invested Capital	?	850

NOTES: "Equity" represents the sum of all of the accounting equity accounts (e.g., share-capital plus retained earnings). You can presume that depreciation for tax and for financial statement purposes is the same, and therefore, there is no deferred income tax in this problem .

ABC's did some *incremental* borrowing during 1999. Because this borrowing was at the end of 1999, ABC's interest expense for 1999 is the interest rate on short-term debt times short-term

debt at the *beginning* of 1999 (end of 1998). The interest rate on ABC's short-term debt is 10% per annum. ABC made net capital expenditures (e.g. net of disposals) of $165 at the end of 1999. Because these capital expenditures were at the end of 1999, ABC's depreciation expense for 1999 (also depreciation for tax) is a rate for depreciation times net fixed assets at the beginning of 1999 (end of 1998) *prior to the capital expenditure*. The depreciation rate is 5% per annum. ABC paid dividends to shareholders of $50 during 1999. ABC's tax rate is 40%. ABC had a free cash flow *surplus* of $100 for 1999.

Required: Find ABC's rate of return on invested capital for 1999, *after* tax and *after* depreciation, using beginning of period invested capital. Was ABC a net purchaser or seller of its own common shares in 1999? What was is the amount of shares sold or repurchased?

Solution

34. **Free Cash Flow**

The following information is available on the financial accounts of ABC Corporation.

	1999
EBITDA	?
Depreciation	?
Interest	25

	1998	1999
Trade Capital	180	200
Short-term Debt	?	?
Net Fixed Assets	?	?
Equity	?	520
Invested Capital	850	?

NOTES: "Equity" represents the sum of all of the accounting equity accounts (e.g., share-capital plus retained earnings). You can presume that depreciation for tax and for financial statement purposes is the same, and therefore, there is no deferred income tax in this problem .

ABC's did some *incremental* borrowing during 1999. Because this borrowing was at the end of 1999, ABC's interest expense for 1999 is the interest rate on short-term debt times short-term debt at the *beginning* of 1999 (end of 1998). The interest rate on ABC's short-term debt is 8% per annum. ABC made net capital expenditures (e.g. net of disposals) of $365 at the end of 1999. Because these capital expenditures were at the end of 1999, ABC's depreciation expense for 1999 (also depreciation for tax) is a rate for depreciation times net fixed assets at the beginning of 1999 (end of 1998) *prior to the capital expenditure*. The depreciation rate is 5% per annum. ABC paid dividends to shareholders of $50 during 1999. ABC's tax rate is 40%. ABC had a free cash flow *deficit* of $100 for 1999.

Required: Find ABC's rate of return on invested capital for 1999, *after* tax and *after* depreciation, using beginning of period invested capital. Was ABC a net seller of its common shares or a net purchaser of its common shares in 1999? What is the dollar amount of shares sold or repurchased?

Solution

35. Free Cash Flow

The following information is available on the financial accounts of ABC Corporation.

	2003
EBITDA	450
Depreciation	?
Interest	?

	2002	2003
Trade Capital	550	?
Short-Term Debt	?	?
Net Fixed Assets	?	745
Equity		800
Invested Capital	?	?

NOTES: "Equity" represents the sum of all of the accounting equity accounts (that is, share-capital plus retained earnings). You can presume that depreciation for tax and for financial statement purposes is the same, and therefore, there is no deferred income tax or future income tax liability in this problem .

ABC repaid $200 of their short-term debt at year-end 2003. Therefore, ABC's 2003 interest expense is the interest rate on short-term debt times short-term debt at the *beginning* of 2003 (year-end 2002). The interest rate on ABC's short-term debt is 8% per annum. ABC made capital expenditures of $365 at year-end 2003. Because these capital expenditures were at year-end, ABC's 2003 depreciation expense (also depreciation for tax) is a rate for depreciation times Net Fixed Assets at the beginning of 2003 (year-end 2002). The depreciation rate is 5% per annum. ABC paid dividends to shareholders of $X during 2003. ABC's tax rate is 40%. Also, during 2003, ABC sold new shares to new shareholders in the amount of $125 (no shares were repurchased). ABC's 2003 free cash flow was $253.

Required: How much did ABC pay in dividends (in total rather than per share) to shareholders during 2003?

Solution

36. **Free Cash Flow**

The following information is available on the financial accounts of ABC Corporation.

	2003
EBITDA	450
Depreciation	?
Interest	?

	2002	2003
Trade Capital	?	?
Short-Term Debt	?	?
Net Fixed Assets	300	630
Equity	517	700
Invested Capital		?

NOTES: "Equity" represents the sum of all of the accounting equity accounts (that is, share-capital plus retained earnings). You can presume that depreciation for tax and for financial statement purposes is the same, and therefore, there is no deferred income tax or future income tax liability in this problem .

ABC's 2003 interest expense is the interest rate on short-term debt times short-term debt at the *beginning* of 2003 (year-end 2002). The interest rate on ABC's short-term debt is 8% per annum. ABC made capital expenditures of $365 at year-end 2003. Because these capital expenditures were at year-end, ABC's 2003 depreciation expense (also depreciation for tax) is a rate for depreciation times Net Fixed Assets at the beginning of 2003 (year-end 2002). ABC paid dividends to shareholders of $50 during 2003. ABC's tax rate is 40%. Also, during 2003, ABC sold new shares to new shareholders in the amount of $100 (no shares were repurchased). ABC's 2003 free cash flow was $253.

Required: Determine the amount of ABC's short-term debt repayment or the increment to short-term debt borrowing at year-end 2003.

Solution

37. **Free Cash Flow**

The following information is available on the financial accounts of ABC Corporation.

	2008
EBITDA	?
Depreciation	?
Interest	35

	2013	2008
Trade Capital	650	?
Short-Term Debt	?	?
Net Fixed Assets	?	860
Equity		900
Invested Capital	?	?

NOTES: "Equity" represents the sum of all of the accounting equity accounts (that is, share-capital plus retained earnings). You can presume that depreciation for tax and for financial statement purposes is the same, and therefore, there is no deferred income tax or future income tax liability in this problem .

ABC repaid $200 of their short-term debt at year-end 2008. The interest rate on ABC's debt is 10% per annum. ABC made capital expenditures of $385 at year-end 2008. Because these capital expenditures were at year-end, ABC's 2008 depreciation expense (also depreciation for tax) is a rate for depreciation times Net Fixed Assets at the beginning of 2008 (year-end 2013). The depreciation rate is 5% per annum. ABC paid dividends to shareholders of $X during 2008. ABC's tax rate is 40%. Also, during 2008, ABC sold new shares to new shareholders in the amount of $125 (no shares were repurchased). ABC's 2008 free cash flow was $353.

Required:

(a) Determine ABC's 2008 dividend payment, $X.

(b) Determine ABC's 2008 rate of return on invested capital, after tax and after depreciation, using beginning of period invested capital.

Solution

38. **Free Cash Flow**

The following information is available on the financial accounts of ABC Corporation.

	2008
EBITDA	?
Depreciation	?
Interest	?

	2013	2008
Trade Capital		845
Short-Term Debt	540	480
Net Fixed Assets	640	?
Equity	?	?
Invested Capital	?	?

NOTES: "Equity" represents the sum of all of the accounting equity accounts (that is, share-capital plus retained earnings). You can presume that depreciation for tax and for financial statement purposes is the same, and therefore, there is no deferred income tax or future income tax liability in this problem .

ABC repaid some of their short-term debt at year-end 2008. The interest rate on ABC's debt is 10% per annum. ABC made capital expenditures of $105 at year-end 2008. Because these capital expenditures were at year-end, ABC's 2008 depreciation expense (also depreciation for tax) is a rate for depreciation times Net Fixed Assets at the beginning of 2008 (year-end 2013). The depreciation rate is 5% per annum. ABC paid dividends to shareholders of $55 during 2008 (in total rather than per share). ABC's tax rate is 40%. ABC's 2008 free cash flow was $283. *Required:* Determine ABC's 2008 rate of return on invested capital after tax and after depreciation using beginning of period invested capital.

Solution

39. ***ROIC and ROE***:

The following information is available on the financial accounts of ABC Ltd.

	2006
EBITDA	400
Depreciation	40
Interest	60

	2006
Trade Capital	200
Short-term Debt	600
Net Fixed Assets	800
Equity	400
Invested Capital	?

NOTES: "Equity" represents the sum of all of the accounting equity accounts (e.g., share-capital plus retained earnings). You can presume that depreciation for tax and for financial statement purposes is the same, and therefore, there is no deferred income tax in this problem .

The interest rate on ABC's short-term debt is 10% per annum. ABC's tax rate is 40%.

a). Find ABC's rate of return on invested capital for 2006, *after* tax and *after* depreciation, using end of period invested capital.
b). Find ABC's ROE for 2006 using end of period book equity.
c). Show that the ROIC from part "a" of this question can also be calculated as the after corporate tax interest rate on debt times the debt to invested capital ratio plus the ROE from part "b" of this question times the equity to invested capital ratio. That is:

$$ROIC = (1-t)*r*\frac{Debt}{Invested\ Capital} + ROE*\frac{Equity}{Invested\ Capital},$$

where "r" is the interest rate on debt and "t" is the corporate tax rate. This relation says that the firm's ROIC, the rate of return that the firm earns for all financial asset-holders, is a weighted average of the rates of return that the firm earns for the specific financial asset-holders (in this problem, the creditors and the common shareholders).

Solution

40. **A Benchmark for ROIC and ROE**

ABC Company has debt and common equity in its financial structure. The interest rate on ABC Company's debt is 10% per annum. The corporate tax rate is 40%. In 2006, ABC's ROIC (after tax and after depreciation) equals ROE. For 2006 what was ABC's ROIC?

Solution

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