

## MARKET-BASED VALUATION: PRICE AND ENTERPRISE VALUE MULTIPLES

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### LEARNING OUTCOMES

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*After completing this chapter, you will be able to do the following:*

- distinguish between the method of comparables and the method based on forecasted fundamentals as approaches to using price multiples in valuation, and explain economic rationales for each approach;
- calculate and interpret a justified price multiple;
- describe rationales for and possible drawbacks to using alternative price multiples and dividend yield in valuation;
- calculate and interpret alternative price multiples and dividend yield;
- calculate and interpret underlying earnings, explain methods of normalizing earnings per share (EPS), and calculate normalized EPS;
- explain and justify the use of earnings yield (E/P);
- describe fundamental factors that influence alternative price multiples and dividend yield;
- calculate and interpret the justified price-to-earnings ratio (P/E), price-to-book ratio (P/B), and price-to-sales ratio (P/S) for a stock, based on forecasted fundamentals;
- calculate and interpret a predicted P/E, given a cross-sectional regression on fundamentals, and explain limitations to the cross-sectional regression methodology;

The data and examples for this reading were updated in 2014 by Professor Stephen Wilcox, CFA.

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- evaluate a stock by the method of comparables and explain the importance of fundamentals in using the method of comparables;
- calculate and interpret the P/E-to-growth ratio (PEG) and explain its use in relative valuation;
- calculate and explain the use of price multiples in determining terminal value in a multistage discounted cash flow (DCF) model;
- explain alternative definitions of cash flow used in price and enterprise value (EV) multiples and describe limitations of each definition;
- calculate and interpret EV multiples and evaluate the use of EV/EBITDA;
- explain sources of differences in cross-border valuation comparisons;
- describe momentum indicators and their use in valuation;
- explain the use of the arithmetic mean, the harmonic mean, the weighted harmonic mean, and the median to describe the central tendency of a group of multiples;
- evaluate whether a stock is overvalued, fairly valued, or undervalued based on comparisons of multiples.

## 1. INTRODUCTION

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Among the most familiar and widely used valuation tools are price and enterprise value multiples. **Price multiples** are ratios of a stock's market price to some measure of fundamental value per share. **Enterprise value multiples**, by contrast, relate the total market value of all sources of a company's capital to a measure of fundamental value for the entire company.

The intuition behind price multiples is that investors evaluate the price of a share of stock—judge whether it is fairly valued, overvalued, or undervalued—by considering what a share buys in terms of per share earnings, net assets, cash flow, or some other measure of value (stated on a per share basis). The intuition behind enterprise value multiples is similar; investors evaluate the market value of an entire enterprise relative to the amount of earnings before interest, taxes, depreciation, and amortization (EBITDA), sales, or operating cash flow it generates. As valuation indicators (measures or indicators of value), multiples have the appealing qualities of simplicity in use and ease in communication. A multiple summarizes in a single number the relationship between the market value of a company's stock (or of its total capital) and some fundamental quantity, such as earnings, sales, or **book value** (owners' equity based on accounting values).

Among the questions we will study in this reading for answers that will help in making correct use of multiples as valuation tools are the following:

- What accounting issues affect particular price and enterprise value multiples, and how can analysts address them?
- How do price multiples relate to fundamentals, such as earnings growth rates, and how can analysts use this information when making valuation comparisons among stocks?
- For which types of valuation problems is a particular price or enterprise value multiple appropriate or inappropriate?
- What challenges arise in applying price and enterprise value multiples internationally?

Multiples may be viewed as valuation indicators relating to individual securities. Another type of valuation indicator used in securities selection is **momentum indicators**. They typically relate either price or a fundamental (such as earnings) to the time series of its own past values or, in some cases, to its expected value. The logic behind the use of momentum indicators is

that such indicators may provide information on future patterns of returns over some time horizon. Because the purpose of momentum indicators is to identify potentially rewarding investment opportunities, they can be viewed as a class of valuation indicators with a focus that is different from and complementary to the focus of price and enterprise value multiples.

This reading is organized as follows. In Section 2, we put the use of price and enterprise value multiples in an economic context and present certain themes common to the use of any price or enterprise value multiple. Section 3 presents price multiples; a subsection is devoted to each multiple. The treatment of each multiple follows a common format: usage considerations, the relationship of the multiple to investors' expectations about fundamentals, and using the multiple in valuation based on comparables. Section 4 presents enterprise value multiples and is organized similarly to Section 3. Section 5 presents international considerations in using multiples. A treatment of momentum indicators follows in Section 6. Section 7 discusses several practical issues that arise in using valuation indicators. We then summarize the reading, and the reading concludes with practice problems.

## 2. PRICE AND ENTERPRISE VALUE MULTIPLES IN VALUATION

In practice, two methods underpin analysts' use of price and enterprise value multiples: the method of comparables and the method based on forecasted fundamentals. Each of these methods relates to a definite economic rationale. In this section, we introduce the two methods and their associated economic rationales.

### 2.1. The Method of Comparables

The **method of comparables** refers to the valuation of an asset based on multiples of comparable (similar) assets—that is, valuation based on multiples benchmarked to the multiples of similar assets. The similar assets may be referred to as the **comparables**, the **comps**, or the **guideline assets** (or in the case of equity valuation, **guideline companies**). For example, multiplying a benchmark value of the price-to-earnings (P/E) multiple by an estimate of a company's earnings per share (EPS) provides a quick estimate of the value of the company's stock that can be compared with the stock's market price. Equivalently, comparing a stock's actual price multiple with a relevant benchmark multiple should lead the analyst to the same conclusion on whether the stock is relatively fairly valued, relatively undervalued, or relatively overvalued.

The idea behind price multiples is that a stock's price cannot be evaluated in isolation. Rather, it needs to be evaluated in relation to what it buys in terms of earnings, net assets, or some other measure of value. Obtained by dividing price by a measure of value per share, a price multiple gives the price to purchase one unit of value in whatever way value is measured. For example, a P/E of 20 means that it takes 20 units of currency (for example, €20) to buy one unit of earnings (for example, €1 of earnings). This scaling of price per share by value per share also makes possible comparisons among various stocks. For example, an investor pays more for a unit of earnings for a stock with a P/E of 25 than for another stock with a P/E of 20. Applying the method of comparables, the analyst would reason that if the securities are otherwise closely similar (if they have similar risk, profit margins, and growth prospects, for example), the security with the P/E of 20 is undervalued relative to the one with the P/E of 25.

The word *relative* is necessary. An asset may be undervalued relative to a comparison asset or group of assets, and an analyst may thus expect the asset to outperform the comparison asset or assets on a relative basis. If the comparison asset or assets themselves are not efficiently

priced, however, the stock may not be undervalued—it could be fairly valued or even overvalued (on an absolute basis, i.e., in relation to its intrinsic value). Example 1 presents the method of comparables in its simplest application.

#### EXAMPLE 1 The Method of Comparables at Its Simplest

Company A's EPS is \$1.50. Its closest competitor, Company B, is trading at a P/E of 22. Assume the companies have a similar operating and financial profile.

1. If Company A's stock is trading at \$37.50, what does that indicate about its value relative to Company B?
2. If we assume that Company A's stock should trade at about the same P/E as Company B's stock, what will we estimate as an appropriate price for Company A's stock?

*Solution to 1:* If Company A's stock is trading at \$37.50, its P/E will be 25 (\$37.50 divided by \$1.50). If the companies are similar, this P/E would indicate that Company A is overvalued relative to Company B.

*Solution to 2:* If we assume that Company A's stock should trade at about the same P/E as Company B's stock, we will estimate that an appropriate price for Company A's stock is \$33 (\$1.50 times 22).

The method of comparables applies also to enterprise value multiples. In this application, we would evaluate the market value of an entire company in relation to some measure of value relevant to all providers of capital, not only providers of equity capital. For example, multiplying a benchmark multiple of enterprise value (EV) to earnings before interest, taxes, depreciation, and amortization (EBITDA) times an estimate of a company's EBITDA provides a quick estimate of the value of the entire company. Similarly, comparing a company's actual enterprise value multiple with a relevant benchmark multiple allows an assessment of whether the company is relatively fairly valued, relatively undervalued, or relatively overvalued.

Many choices for the benchmark value of a multiple have appeared in valuation methodologies, including the multiple of a closely matched individual stock and the average or median value of the multiple for the stock's industry peer group. The economic rationale underlying the method of comparables is the **law of one price**—the economic principle that two identical assets should sell at the same price.<sup>1</sup> The method of comparables is perhaps the most widely used approach for analysts *reporting* valuation judgments on the basis of price multiples. For this reason, the use of multiples in valuation is sometimes viewed solely as a type of relative-valuation approach; however, multiples can also be derived from, and expressed in terms of, fundamentals, as discussed in the next section.

<sup>1</sup>In practice, analysts can match characteristics among companies or across time only approximately. Nevertheless, the law of one price is the idea driving the method of comparables. To keep our classification simple, we will discuss comparisons with a market index or with historical values of a stock's multiple under the rubric of the method of comparables.

## 2.2. The Method Based on Forecasted Fundamentals

The **method based on forecasted fundamentals**<sup>2</sup> refers to the use of multiples that are derived from forecasted fundamentals—characteristics of a business related to profitability, growth, or financial strength. Fundamentals drive cash flows, and we can relate multiples to company fundamentals through a discounted cash flow (DCF) model. Algebraic expressions of price multiples in terms of fundamentals facilitate an examination of how valuation differences among stocks relate to different expectations for those fundamentals. We illustrated this concept in the reading on discounted dividend valuation, where we explained P/E in terms of perhaps the simplest DCF model, the Gordon growth dividend discount model, in an expression that includes (among other variables) the expected dividend growth rate.

One process for relating multiples to forecasted fundamentals begins with a valuation based on a DCF model. Recall that DCF models estimate the intrinsic value of a firm or its equity as the present value of expected cash flows, and that fundamentals drive cash flows. Multiples are stated with respect to a single value of a fundamental, but any price or enterprise value multiple relates to the entire future stream of expected cash flows through its DCF value.

We can illustrate this concept by first taking the present value of the stream of expected future cash flows and then expressing the result relative to a forecasted fundamental. For example, if the DCF value of a UK stock is £10.20 and its forecasted EPS is £1.2, the forward P/E multiple consistent with the DCF value is  $£10.20/£1.2 = 8.5$ . (The term **forward P/E** refers to a P/E calculated on the basis of a forecast of EPS and is discussed in further detail later in this reading.) This exercise of relating a valuation to a price multiple applies to any definition of price multiple and any DCF model or residual income model.<sup>3</sup>

In summary, we can approach valuation by using multiples from two perspectives. First, we can use the method of comparables, which involves comparing an asset's multiple to a standard of comparison. Similar assets should sell at similar prices. Second, we can use the method based on forecasted fundamentals, which involves forecasting the company's fundamentals rather than making comparisons with other companies. The price multiple of an asset should be related to its expected future cash flows. We can also incorporate the insights from the method based on forecasted fundamentals in explaining valuation differences based on comparables, because we seldom (if ever) find exact comparables. In the sections covering each multiple, we will present the method based on forecasted fundamentals first so we can refer to it when using the method of comparables.

Using either method, how can an analyst communicate a view about the value of a stock? Of course, the analyst can offer simply a qualitative judgment about whether the stock appears to be fairly valued, overvalued, or undervalued (and offer specific reasons for the view). The analyst may also be more precise by communicating a **justified price multiple** for the stock. The justified price multiple is the estimated fair value of that multiple, which can be justified on the basis of the method of comparables or the method of forecasted fundamentals.

For an example of a justified multiple based on the method of comparables, suppose we use the price-to-book (P/B) multiple in a valuation and find that the median P/B for the

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<sup>2</sup>For brevity, we sometimes use the phrase “based on fundamentals” in describing multiples derived using this approach.

<sup>3</sup>Recall that residual income models estimate the intrinsic value of a share of common stock as the sum of book value per share and the present value of expected future per-share residual income. Residual income equals net income minus a deduction for the cost of equity capital.

company's peer group, which would be the standard of comparison, is 2.2.<sup>4</sup> The stock's justified P/B based on the method of comparables is 2.2 (without making any adjustments for differences in fundamentals). We can compare the justified P/B with the actual P/B based on market price to form an opinion about value. If the justified P/B is larger (smaller) than the actual P/B, the stock may be undervalued (overvalued). We can also, on the assumption that the comparison assets are fairly priced, translate the justified P/B based on comparables into an estimate of absolute fair value of the stock. If the current book value per share is \$23, then the fair value of the stock is  $2.2 \times \$23 = \$50.60$ , which can be compared with its market price.

For an example of a justified multiple based on fundamentals, suppose that we are using a residual income model and estimate that the value of the stock is \$46. Then, the justified P/B based on forecasted fundamentals is  $\$46/\$23 = 2.0$ , which we can again compare with the actual value of the stock's P/B. We can also state our estimate of the stock's absolute fair value as  $2 \times \$23 = \$46$ . (Note that the analyst could report valuation judgments related to a DCF model in terms of the DCF value directly; price multiples are a familiar form, however, in which to state valuations.) Furthermore, we can incorporate the insights from the method based on fundamentals to explain differences from results based on comparables.

In the next section, we begin a discussion of specific price and enterprise value multiples used in valuation.

### 3. PRICE MULTIPLES

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In this section, we first discuss the most familiar price multiple, the price-to-earnings ratio. In the context of that discussion, we introduce a variety of practical issues that have counterparts for most other multiples. These issues include analyst adjustments to the denominator of the ratio for accuracy and comparability and the use of inverse price multiples. Then, we discuss four other major price multiples from the same practical perspective.

#### 3.1. Price to Earnings

In the first edition of *Security Analysis* (Graham and Dodd, 1934, p. 351), Benjamin Graham and David L. Dodd described common stock valuation based on P/Es as the standard method of that era, and the P/E is still the most familiar valuation measure today.

We begin our discussion with rationales offered by analysts for the use of P/E and with the possible drawbacks of its use. We then define the two chief variations of the P/E: the trailing P/E and the forward P/E (also called the "leading P/E"). The multiple's numerator, market price, is (as in other multiples) definitely determinable; it presents no special problems of interpretation. But the denominator, EPS, is based on the complex rules of accrual accounting and presents significant interpretation issues. We discuss those issues and the adjustments analysts can make to obtain more-meaningful P/Es. Finally, we conclude the section by examining how analysts use P/Es to value a stock using the method of forecasted fundamentals and the method of comparables. As mentioned earlier, we discuss fundamentals first so that we can draw insights from that discussion when using comparables.

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<sup>4</sup>Note we are using the median, rather than the mean, value of the peer group's multiple to avoid distortions by outliers. This issue is often important when dealing with peer groups because they frequently consist of a small number of companies. An alternative is to use the harmonic mean, which we describe and illustrate in a later section.

Several rationales support the use of P/E multiples in valuation:

- Earning power is a chief driver of investment value, and EPS, the denominator in the P/E ratio, is perhaps the chief focus of security analysts' attention.<sup>5</sup> In a 2007 survey of CFA Institute members, P/E ranked first among price multiples used in market-based valuation.<sup>6</sup> According to the 2012 BofA Merrill Lynch Institutional Factor Survey, 81 percent of respondents considered P/E when making investment decisions, making it the most popular valuation metric surveyed.
- The P/E ratio is widely recognized and used by investors.
- Differences in stocks' P/Es may be related to differences in long-run average returns on investments in those stocks, according to empirical research.<sup>7</sup>

Potential drawbacks to using P/Es derive from the characteristics of EPS:

- EPS can be zero, negative, or insignificantly small relative to price, and P/E does not make economic sense with a zero, negative, or insignificantly small denominator.
- The ongoing or recurring components of earnings that are most important in determining intrinsic value can be practically difficult to distinguish from transient components.
- The application of accounting standards requires corporate managers to choose among acceptable alternatives and to use estimates in reporting. In making such choices and estimates, managers may distort EPS as an accurate reflection of economic performance. Such distortions may affect the comparability of P/Es among companies.

Methods to address these potential drawbacks will be discussed later in the reading. In the next section, we discuss alternative definitions of P/E based on alternative specifications of earnings.

### 3.1.1. Alternative Definitions of P/E

In calculating a P/E, the numerator most commonly used is the current price of the common stock, which is generally easily obtained and unambiguous for publicly traded companies. Selecting the appropriate EPS figure to be used in the denominator is not as straightforward. The following two issues must be considered:

- the time horizon over which earnings are measured, which results in alternative definitions of P/E, and
- adjustments to accounting earnings that the analyst may make so that P/Es for various companies can be compared.

<sup>5</sup>US-based empirical research tends to show that valuations derived from earnings-based multiples are closer to actual market prices than valuations derived from multiples based on other fundamentals (Liu, Nissim, and Thomas 2002, 2007). If shares are efficiently priced on average, such findings support the importance of earnings in the pricing of common shares.

<sup>6</sup>See Pinto, Robinson, and Stowe (2015) for more details.

<sup>7</sup>Chan and Lakonishok (2004) summarize and update academic empirical evidence of superior returns to value investing—that is, investing focused on stocks with low price multiples (e.g., P/E)—in most of the 13 countries they examined. O'Shaughnessy (2005) provides empirical evidence of superior returns to long-term value investing in the US market since 1951, although returns to a low-P/E strategy were dominated by returns to low-P/B, low price-to-sales, and low price-to-cash-flow strategies. In general, debate continues about whether long-run average superior returns to value investing are attributable to higher risk in value than in growth stocks and about other elements in the interpretation of the evidence.

Common alternative definitions of P/E are trailing P/E and forward P/E.

- A stock's **trailing P/E** (sometimes referred to as a current P/E)<sup>8</sup> is its current market price divided by the most recent four quarters' EPS. In such calculations, EPS is sometimes referred to as "trailing 12 month (TTM) EPS."
- The **forward P/E** (also called the **leading P/E** or **prospective P/E**) is a stock's current price divided by next year's expected earnings. Trailing P/E is the P/E usually presented first in stock profiles that appear in financial databases, but most databases also provide the forward P/E. In practice, the forward P/E has a number of important variations that depend on how "next year" is defined, as discussed in Section 3.1.3.

Other names and time-horizon definitions for P/E exist. For example, Thomson First Call<sup>9</sup> provides various P/Es, including ratios that have as the denominator a stock's trailing twelve months EPS, last reported annual EPS, and EPS forecasted for one year to three years ahead. Another example is Value Line's company reports, which display a median P/E, which is a rounded average of the four middle values of the range of annual average P/Es over the past 10 years.

In using the P/E, an analyst should apply the same definition to all companies and time periods under examination. Otherwise, the P/Es are not comparable, for a given company over time or for various companies at a specific point in time. One reason is that the differences in P/Es calculated by different methods may be systematic (as opposed to random). For example, for companies with rising earnings, the forward P/E will be smaller than the trailing P/E because the denominator in the forward P/E calculation will be larger.

Valuation is a forward-looking process, so analysts usually focus on the forward P/E when earnings forecasts are available. For large public companies, an analyst can develop earnings forecasts and/or obtain consensus earnings forecasts from a commercial database. When earnings are not readily predictable, however, a trailing P/E (or another valuation metric) may be more appropriate than forward P/E. Furthermore, logic sometimes indicates that a particular definition of the P/E is not relevant. For example, a major acquisition or divestiture or a significant change in financial leverage may change a company's operating or financial risk so much that the trailing P/E based on past EPS is not informative about the future and thus not relevant to a valuation. In such a case, the forward P/E is the appropriate measure. In the following sections, we address issues that arise in calculating trailing and forward P/Es.

Trailing P/Es and forward P/Es are based on a single year's EPS. If that number is negative or viewed as unrepresentative of a company's earning power, however, an analyst may base the P/E calculation on a longer run expected average EPS value. P/Es based on such normalized EPS data may be called **normalized P/Es**. Because the denominators in normalized P/Es are typically based on historical information, they are covered in the next section on calculating the trailing P/E.

<sup>8</sup>However, *The Value Line Investment Survey* uses "current P/E" to mean a P/E based on EPS for the most recent six months plus the projected EPS for the coming six months. That calculation blends historical and forward looking elements.

<sup>9</sup>Thomson First Call is now part of Reuters; the Reuters and Thomson First Call databases are separate, however, so these estimates continue to be referred to as Thomson First Call estimates.



### 3.1.2. Calculating the Trailing P/E

When using trailing earnings to calculate a P/E, the analyst must take care in determining the EPS to be used in the denominator. The analyst must consider the following:

- potential dilution of EPS;<sup>10</sup>
- transitory, nonrecurring components of earnings that are company specific;
- transitory components of earnings ascribable to cyclical (business or industry cyclical); and
- differences in accounting methods (when different companies' stocks are being compared).

Among the considerations mentioned, potential dilution of EPS generally makes the least demands on analysts' accounting expertise because companies are themselves required to present both basic EPS and diluted EPS. **Basic earnings per share** data reflect total earnings divided by the weighted average number of shares actually outstanding during the period. **Diluted earnings per share** reflects division by the number of shares that would be outstanding if holders of securities such as executive stock options, equity warrants, and convertible bonds exercised their options to obtain common stock. The diluted EPS measure also reflects the effect of such conversion on the numerator, earnings.<sup>11</sup> Because companies present both EPS numbers, the analyst does not need to make the computation. Companies also typically report details of the EPS computation in a footnote to the financial statements. Example 2, illustrating the first bullet point, shows the typical case in which the P/E based on diluted EPS is higher than the P/E based on basic EPS.

#### EXAMPLE 2 Basic versus Diluted EPS

For the fiscal year ended 31 December 2012, WPP Group PLC (London: WPP) reported basic EPS of £66.2 and diluted EPS of £62.8. Based on a closing stock price of £1058.0 on 1 February 2013, the day on which the company issued its earnings press release, WPP's trailing P/E is 16.0 if basic EPS is used and 16.8 if diluted EPS is used.

When comparing companies, analysts generally prefer to use diluted EPS so that the EPS of companies with differing amounts of dilutive securities are on a comparable basis. The other bulleted considerations frequently lead to analyst adjustments to reported earnings numbers and are discussed in order below.

*3.1.2.1. Analyst Adjustments for Nonrecurring Items* Items in earnings that are not expected to recur in the future are generally removed by analysts because valuation concentrates on

<sup>10</sup>**Dilution** refers to a reduction in proportional ownership interest as a result of the issuance of new shares.

<sup>11</sup>For example, conversion of a convertible bond affects both the numerator (earnings) and the denominator (number of shares) in the EPS calculation. If the holder of a convertible bond exercises the option to convert the bond into common shares, the issuer no longer has an obligation to pay interest on the bond, which affects the amount of earnings, and the issuer issues the required number of shares, which, all else being equal, increases the total number of shares outstanding.

future cash flows. The analyst's focus is on estimating **underlying earnings** (other names for this concept include **persistent earnings**, **continuing earnings**, and **core earnings**)—that is, earnings that exclude nonrecurring items. An increase in underlying earnings reflects an increase in earnings that the analyst expects to persist into the future. Companies may disclose adjusted earnings, which may be called non-IFRS earnings (because they differ, as a result of adjustments, from earnings as reportable under International Financial Reporting Standards), non-GAAP earnings (because they differ, as a result of adjustments, from earnings as reportable under US generally accepted accounting principles), pro forma earnings, adjusted earnings, or, as in Example 3, core earnings. All of these terms indicate that the earnings number differs in some way from that presented in conformity with accounting standards. Example 3 shows the calculation of EPS and P/E before and after analyst adjustments for nonrecurring items.

### EXAMPLE 3 Calculating Trailing 12 Months EPS and Adjusting EPS for Nonrecurring Items

You are calculating a trailing P/E for AstraZeneca PLC (NYSE, LSE: AZN) as of 1 April 2013, when the share price closed at \$50.11 in New York (£28.25 in London). In its first quarter of 2013, ended 31 March, AZN reported basic and diluted EPS according to IFRS of \$0.81, which included \$0.34 of restructuring costs and \$0.26 of amortization of intangibles arising from acquisitions. Adjusting for all of these items, AZN reported “core EPS” of \$1.41 for the first quarter of 2013, compared with core EPS of \$1.87 for the first quarter of 2012. Because the core EPS differed from the EPS calculated under IFRS, the company provided a reconciliation of the two EPS figures.

Other data for AZN as of 31 March 2013 are given below. The trailing 12 months diluted EPS for 31 March 2013 includes one quarter in 2013 and three quarters in 2012.

Measure	Full Year 2012 (a)	Less 1st Quarter 2012 (b)	Three Quarters of 2012 (c = a – b)	Plus 1st Quarter 2013 (d)	Trailing 12 Months EPS (e = c + d)
Reported diluted EPS	\$4.98	\$1.27	\$3.71	\$0.81	\$4.52
Core EPS	\$6.41	\$1.81	\$4.60	\$1.41	\$6.01
EPS excluding 2012 legal provisions	\$5.07	\$1.28	\$3.79	\$0.81	\$4.60

Based on the table and information about AZN, address the following:

1. Based on the company's reported EPS, determine the trailing P/E of AZN as of 31 March 2013.
2. Determine the trailing P/E of AZN as of 31 March 2013 using core earnings as determined by AZN.

Suppose you expect the amortization charges to continue for some years and note that, although AZN excluded restructuring charges from its core earnings calculation, AZN has reported restructuring charges in previous years. After reviewing all relevant data, you conclude that, in this instance, only the legal provision related to a previously disclosed legal matter should be viewed as clearly nonrecurring.

3. Determine the trailing P/E based on your adjustment to EPS.

*Solution to 1:* Based on reported EPS and without any adjustments for nonrecurring items, the trailing P/E is  $\$50.11/\$4.52 = 11.1$ .

*Solution to 2:* Using the company's reported core earnings, you find that the trailing EPS would be  $\$6.01$  and the trailing P/E would be  $\$50.11/\$6.01 = 8.3$ .

*Solution to 3:* The trailing EPS excluding only what you consider to be nonrecurring items is  $\$4.60$  and the trailing P/E on that basis is  $\$50.11/\$4.60 = 10.9$ .

Example 3 makes several important points:

- By any of its various names, underlying earnings or core earnings is a non-IFRS concept without prescribed rules for its calculation.
- An analyst's calculation of underlying earnings may well differ from that of the company supplying the earnings numbers. Company-reported core earnings may not be comparable among companies because of differing bases of calculation. Analysts should thus always carefully examine the calculation and, generally, should not rely on such company-reported core earnings numbers.
- In general, the P/E that an analyst uses in valuation should reflect the analyst's judgment about the company's underlying earnings and should be calculated on a consistent basis among all stocks under review.

The identification of nonrecurring items often requires detailed work—in particular, examination of the income statement, the footnotes to the income statement, and the management discussion and analysis section. The analyst cannot rely on income statement classifications alone to identify nonrecurring components of earnings. Nonrecurring items (for example, gains and losses from the sale of assets, asset write-downs, goodwill impairment, provisions for future losses, and changes in accounting estimates) often appear in the income from continuing operations portion of a business's income statement.<sup>12</sup> An analyst may decide not to exclude income/loss from discontinued operations when assets released from discontinued operations are redirected back into the company's earnings base. An analyst who takes income statement classifications at face value may draw incorrect conclusions in a valuation.

<sup>12</sup>An asset **write-down** is a reduction in the value of an asset as stated in the balance sheet. The timing and amount of write-downs often are, at least in part, discretionary. **Accounting estimates** are numerous. Some examples include the useful (depreciable) lives of assets, salvage value of assets, warranty costs, product returns, and the amount of uncollectible receivables.

This discussion does not exhaust the analysis that may be necessary to distinguish earnings components that are expected to persist into the future from those that are not. For example, earnings may be decomposed into cash flow and accrual components.<sup>13</sup> Some research indicates that the cash flow component of earnings should receive a greater weight than the accrual component of earnings in valuation,<sup>14</sup> and analysts may attempt to reflect that conclusion in the earnings used in calculating P/Es.

*3.1.2.2. Analyst Adjustments for Business-Cycle Influences* In addition to company-specific effects, such as restructuring costs, transitory effects on earnings can come from business-cycle or industry-cycle influences. These effects are somewhat different from company-specific effects. Because business cycles repeat, business-cycle effects, although transitory, can be expected to recur in subsequent cycles.

Because of cyclical effects, the most recent four quarters of earnings may not accurately reflect the average or long-term earning power of the business, particularly for **cyclical businesses**—those with high sensitivity to business- or industry-cycle influences, such as automobile and steel manufacturers. Trailing EPS for such stocks are often depressed or negative at the bottom of a cycle and unusually high at the top of a cycle. Empirically, P/Es for cyclical companies are often highly volatile over a cycle, even without any change in business prospects: High P/Es on depressed EPS at the bottom of the cycle and low P/Es on unusually high EPS at the top of the cycle reflect the countercyclical property of P/Es known as the **Molodovsky effect**.<sup>15</sup> Analysts address this problem by normalizing EPS—that is, estimating the level of EPS that the business could be expected to achieve under mid-cyclical conditions (**normalized EPS** or **normal EPS**).<sup>16</sup> Two of several available methods to calculate normalized EPS are as follows:

- The method of *historical average EPS*, in which normalized EPS is calculated as average EPS over the most recent full cycle.
- The method of *average return on equity*, in which normalized EPS is calculated as the average return on equity (ROE) from the most recent full cycle, multiplied by current book value per share.

<sup>13</sup>See Richardson and Tuna (2008) summarizing research by Sloan (1996) and others. The accrual component of earnings is the difference between a cash measure of earnings and a measure of earnings under the relevant set of accounting standards (e.g., IFRS or US GAAP). For example, a cash measure of revenues for a period equals only those amounts collected during the period. In contrast, an accrual measure of revenues includes all revenues earned during the period (both the amounts collected during the period and amounts expected to be collected in future periods, which are, therefore, still in the accounts receivable section at the end of the period). Additionally, accrual revenues are adjusted for estimated returns and allowances, and accounts receivable are adjusted for estimated uncollectibles.

<sup>14</sup>See Richardson and Tuna (2008).

<sup>15</sup>This effect was named after Nicholas Molodovsky, who wrote on this subject in the 1950s and referred to using averaged earnings as a simple starting point for understanding a company's underlying earning power. We can state the Molodovsky effect another way: P/Es may be negatively related to the recent earnings growth rate but positively related to the anticipated future growth rate because of expected rebounds in earnings.

<sup>16</sup>Here, we are using the term “normalized earnings” to refer to earnings adjusted for the effects of a business cycle. Some sources use the term “normalized earnings” also to refer to earnings adjusted for nonrecurring items.

The first method is one of several possible statistical approaches to the problem of cyclical earnings; however, this method does not account for changes in a business's size. The second alternative, by using recent book value per share, reflects more accurately the effect on EPS of growth or shrinkage in the company's size. For that reason, the method of average ROE is sometimes preferred.<sup>17</sup> When reported current book value does not adequately reflect company size in relation to past values (because of items such as large write-downs), the analyst can make appropriate accounting adjustments. The analyst can also estimate normalized earnings by multiplying total assets by an estimate of the long-run return on total assets<sup>18</sup> or by multiplying shareholders' equity by an estimate of the long-run return on total shareholders' equity. These methods are particularly useful for a period in which a cyclical company has reported a loss.

Example 4 illustrates this concept. The example uses data for an **American Depositary Receipt** (ADR) but is applicable to any equity security. An ADR is intended to facilitate US investment in non-US companies. It is a negotiable certificate issued by a depositary bank that represents ownership in a non-US company's deposited equity (i.e., equity held in custody by the depositary bank in the company's home market). One ADR may represent one, more than one, or fewer than one, deposited share. The number of, or fraction of, deposited securities represented by one ADR is referred to as the "ADR ratio."

#### EXAMPLE 4 Normalizing EPS for Business-Cycle Effects

You are researching the valuation of Taiwan Semiconductor Manufacturing Company (NYSE: TSM, TAIEX: 2330), the world's largest dedicated semiconductor foundry (www.tsmc.com). Your research is for a US investor who is interested in the company's ADRs rather than the company's shares listed on the Taiwan Stock Exchange. On 5 July 2013, the closing price of TSM, the NYSE listed ADR, was \$18.21. The semiconductor industry is notably cyclical, so you decide to normalize earnings as part of your analysis. You believe that data from 2006 reasonably captures the beginning of the most recent business cycle, and you want to evaluate a normalized P/E. Exhibit 1 supplies data on EPS (based on Republic of China GAAP) for one TSM ADR, book value per share (BVPS) for one ADR, and the company's ROE.<sup>19</sup>

<sup>17</sup>This approach has appeared in valuation research; for example, Michaud (1999) calculated a normalized earnings yield (that is, EPS divided by price) rather than a normalized P/E.

<sup>18</sup>An example of the application of this method is the study of the intrinsic value of the Dow Jones Industrial Average (the US equities index) by Lee, Myers, and Swaminathan (1999). The authors used 6 percent of total assets as a proxy for normal earnings to estimate a payout ratio for periods in which a company's earnings were negative. According to the authors, the long-run return on total assets in the United States is approximately 6 percent.

<sup>19</sup>This example involves a single company. When the analyst compares multiple companies on the basis of P/Es based on normalized EPS and uses this normalization approach, the analyst should be sure that the ROEs are being calculated consistently by the subject companies. In this example, ROE for each year is being calculated by using ending BVPS and, essentially, trailing earnings are being normalized.

EXHIBIT 1 Taiwan Semiconductor Manufacturing Company (Currency in US Dollars)

Measure	2006	2007	2008	2009	2010	2011	2012
EPS (ADR)	\$0.74	\$0.63	\$0.61	\$0.54	\$1.07	\$0.88	\$1.08
BVPS (ADR)	\$3.00	\$2.93	\$2.85	\$2.99	\$3.80	\$4.03	\$4.82
ROE	24.7%	21.5%	21.4%	18.1%	28.2%	21.8%	22.4%

Source: *The Value Line Investment Survey*.

Using the data in Exhibit 1:

1. Calculate a normalized EPS for TSM by the method of historical average EPS and then calculate the P/E based on that estimate of normalized EPS.
2. Calculate a normalized EPS for TSM by the method of average ROE and the P/E based on that estimate of normalized EPS.
3. Explain the source of the differences in the normalized EPS calculated by the two methods, and contrast the impact on the estimate of a normalized P/E.

*Solution to 1:* Averaging EPS over the 2006–2012 period, you would find it to be  $(\$0.74 + \$0.63 + \$0.61 + \$0.54 + \$1.07 + \$0.88 + \$1.08)/7 = \$0.79$ . Thus, according to the method of historical average EPS, TSM's normalized EPS is \$0.79. The P/E based on this estimate is  $\$18.21/\$0.79 = 23.1$ .

*Solution to 2:* Average ROE over the 2006–2012 period is  $(24.7\% + 21.5\% + 21.4\% + 18.1\% + 28.2\% + 21.8\% + 22.4\%)/7 = 22.6\%$ . Based on the current BVPS of \$4.82, the method of average ROE gives  $0.226 \times \$4.82 = \$1.09$  as normalized EPS. The P/E based on this estimate is  $\$18.21/\$1.09 = 16.7$ .

*Solution to 3:* From 2006 to 2012, BVPS increased from \$3.00 to \$4.82, an increase of about 61 percent. The estimate of normalized EPS of \$1.09 from the average ROE method reflects the use of information on the current size of the company better than does the \$0.79 calculated from the historical average EPS method. Because of that difference, TSM appears more conservatively valued (as indicated by a lower P/E) when the method based on average ROE is used.

**3.1.2.3. Analyst Adjustments for Comparability with Other Companies** Analysts adjust EPS for differences in accounting methods between the company and companies it is being compared with so that the P/Es will be comparable. For example, if an analyst is comparing a company that uses the last-in, first-out (LIFO) method of inventory accounting as permitted by US GAAP (but not by IFRS) with another company that uses the first-in, first-out (FIFO) method, the analyst should adjust earnings to provide comparability in all ratio and valuation analyses. In general, any adjustment made to a company's reported financials for purposes of financial statement analysis should be incorporated into an analysis of P/E and other multiples.

**3.1.2.4. Dealing with Extremely Low, Zero, or Negative Earnings** Having addressed the challenges that arise to calculating P/E because of nonrecurring items, business-cycle influences,

and for comparability among companies, we present in this section the methods analysts have developed for dealing with extremely low, zero, or negative earnings.

Stock selection disciplines that use P/Es or other price multiples often involve ranking stocks from highest value of the multiple to lowest value of the multiple. The security with the lowest positive P/E has the lowest purchase cost per currency unit of earnings among the securities ranked. Zero earnings and negative earnings pose a problem if the analyst wishes to use P/E as the valuation metric. Because division by zero is undefined, P/Es cannot be calculated for zero earnings.

A P/E can technically be calculated in the case of negative earnings. Negative earnings, however, result in a negative P/E. A negative-P/E security will rank below the lowest positive-P/E security but, because earnings are negative, the negative-P/E security is actually the most costly in terms of earnings purchased. Thus, negative P/Es are not meaningful.

In some cases, an analyst might handle negative EPS by using normalized EPS instead. Also, when trailing EPS are negative, the year-ahead EPS and thus the forward P/E may be positive. An argument in favor of either of these approaches based on positive earnings is that if a company is appropriately treated as a going concern, losses cannot be the usual operating result.

If the analyst is interested in a ranking, however, one solution (applicable to any ratio involving a quantity that can be negative or zero) is the use of an **inverse price ratio**—that is, the reciprocal of the original ratio, which places price in the denominator. The use of inverse price multiples addresses the issue of consistent ranking because price is never negative.<sup>20</sup> In the case of the P/E, the inverse price ratio is earnings to price (E/P), known as the **earnings yield**. Ranked by earnings yield from highest to lowest, the securities are correctly ranked from cheapest to most costly in terms of the amount of earnings one unit of currency buys.

Exhibit 2 illustrates these points for a group of beer companies, one of which has a negative EPS. When reporting a P/E based on negative earnings, analysts should report such P/Es as “NM” (not meaningful).

EXHIBIT 2 P/E and E/P for Five Beer Companies (as of 5 September 2013; in US Dollars)

Company	Current Price	Diluted EPS (TTM)	P/E (TTM)	E/P (%)
Molson Coors Brewing Co. (NYSE: TAP)	49.19	3.14	15.7	6.38
Anheuser-Busch Cos. (NYSE: BUD)	94.73	8.04	11.8	8.49
Boston Beer Co. (NYSE: SAM)	223.57	4.73	47.3	2.12
Craft Brew Alliance, Inc. (NASDAQ GM: BREW)	12.30	0.02	615.0	0.16
Mendocino Brewing Company, Inc (OTC Markets: MENB)	0.29	-0.02	NM	-6.90

Source: Yahoo! Finance.

<sup>20</sup>Earnings yield can be based on normalized EPS, expected next-year EPS, or trailing EPS. In these cases also, earnings yield provides a consistent ranking.

In addition to zero and negative earnings, extremely low earnings can pose problems when using P/Es—particularly for evaluating the distribution of P/Es of a group of stocks under review. In this case, again, inverse price ratios can be useful. The P/E of a stock with extremely low earnings may, nevertheless, be extremely high because an earnings rebound is anticipated. An extremely high P/E—an outlier P/E—can overwhelm the effect of the other P/Es in the calculation of the mean P/E. Although the use of median P/Es and other techniques can mitigate the problem of skewness caused by outliers, the distribution of inverse price ratios is inherently less susceptible to outlier-induced skewness.

As mentioned, earnings yield is but one example of an inverse price ratio—that is, the reciprocal of a price ratio. Exhibit 3 summarizes inverse price ratios for all the price ratios we discuss in this reading.

EXHIBIT 3 Summary of Price and Inverse Price Ratios

Price Ratio	Inverse Price Ratio	Comments
Price-to-earnings (P/E)	Earnings yield (E/P)	Both forms commonly used.
Price-to-book (P/B)	Book-to-market (B/P)*	Book value is less commonly negative than EPS. Book-to-market is favored in research but not common in practitioner usage.
Price-to-sales (P/S)	Sales-to-price (S/P)	S/P is rarely used except when all other ratios are being stated in the form of inverse price ratios; sales is not zero or negative in practice for going concerns.
Price-to-cash flow (P/CF)	Cash flow yield (CF/P)	Both forms are commonly used.
Price-to-dividends (P/D)	Dividend yield (D/P)	Dividend yield is much more commonly used because P/D is not calculable for non-dividend-paying stocks, but both D/P and P/D are used in discussing index valuation.

\*“Book-to-market” is probably more common usage than “book-to-price.” Book-to-market is variously abbreviated B/M, BV/MV (for “book value” and “market value”), or B/P.

Note: B, S, CF, and D are in per-share terms.

### 3.1.3. Forward P/E

The forward P/E is a major and logical alternative to the trailing P/E because valuation is naturally forward looking. In the definition of forward P/E, analysts have interpreted “next year’s expected earnings” as expected EPS for:

- the next four quarters;
- the next 12 months; or
- the next fiscal year.

In this section, unless otherwise stated, we use the first definition of forward P/E (i.e., the next four quarters), which is closest to how cash flows are dated in our discussion of DCF valuation.<sup>21</sup> To illustrate the calculation, suppose the current market price of a stock is \$15 as

<sup>21</sup>Analysts have developed DCF expressions that incorporate fractional time periods. In practice, uncertainty in forecasts reduces accuracy more than any other factor in estimating justified P/Es.



of 1 March 2013 and the most recently reported quarterly EPS (for the quarter ended 31 December 2012) is \$0.22. Our forecasts of EPS are as follows:

- \$0.15 for the quarter ending 31 March 2013;
- \$0.18 for the quarter ending 30 June 2013;
- \$0.18 for the quarter ending 30 September 2013; and
- \$0.24 for the quarter ending 31 December 2013.

The sum of the forecasts for the next four quarters is  $\$0.15 + \$0.18 + \$0.18 + \$0.24 = \$0.75$ , and the forward P/E for this stock is  $\$15/\$0.75 = 20.0$ .

Another important concept related to the forward P/E is the next twelve months (NTM) P/E, which corresponds in a forward-looking sense to the TTM P/E concept of trailing P/E. A stock's **NTM P/E** is its current market price divided by an estimated next twelve months EPS, which typically combines the annual EPS estimates from two fiscal years, weighted to reflect the relative proximity of the fiscal year. For example, assume that in August 2013, an analyst is looking at Microsoft Corporation (NASDAQ GS: MSFT). Microsoft has a June fiscal year end, so at the time of the analyst's scrutiny, there were 10 months remaining until the end of the company's 2014 fiscal year (i.e., September 2013 through June 2014, inclusive). The estimated next twelve months EPS for Microsoft would be calculated as  $[(10/12) \times \text{FY14E EPS}] + [(2/12) \times \text{FY15E EPS}]$ . NTM P/E is useful because it facilitates comparison of companies with different fiscal year-ends without the need to use quarterly estimates, which for many companies are not available.

Applying the fiscal-year concept, Thomson First Call reports a stock's "forward P/E" in two ways: first, based on the mean of analysts' *current fiscal year* (FY1 = Fiscal Year 1) forecasts, for which analysts may have actual EPS in hand for some quarters; second, based on analysts' *following fiscal year* (FY2 = Fiscal Year 2) forecasts, which must be based entirely on forecasts. For Thomson First Call, "forward P/E" contrasts with "current P/E," which is based on the last reported annual EPS.

Clearly, analysts must be consistent in the definition of forward P/E when comparing stocks. Examples 5 and 6 illustrate two ways of calculating forward P/E.

#### EXAMPLE 5 Calculating a Forward P/E (1)

A market price for the common stock of IBM (NYSE: IBM) in early-September 2013 was \$184.15. IBM's fiscal year coincides with the calendar year. According to data from Thomson First Call, the consensus EPS forecast for 2013 (FY1) as of September 2013 was \$16.19. The consensus EPS forecast for 2014 (FY2) as of September 2013 was \$18.35.

1. Calculate IBM's forward P/E based on a fiscal-year definition per Thomson First Call and FY1 consensus forecasted EPS.
2. Calculate IBM's forward P/E based on a fiscal-year definition and FY2 consensus forecasted EPS.

*Solution to 1:* IBM's forward P/E is  $\$184.15/\$16.19 = 11.4$  based on FY1 forecasted EPS. Note that this EPS number involves the forecast of two remaining quarters as of early-September 2013.

*Solution to 2:* IBM's forward P/E is  $\$184.15/\$18.35 = 10.0$  based on FY2 forecasted EPS.

In Example 5, the company's EPS was expected to increase by slightly more than 13 percent, so the forward P/Es based on the two different EPS specifications differed from one another somewhat but not dramatically. Example 6 presents the calculation of forward P/Es for a company with volatile earnings.

### EXAMPLE 6 Calculating a Forward P/E (2)

In this example, we use alternative definitions of "forward" to compute forward P/Es. Exhibit 4 presents actual and forecasted EPS for Boyd Gaming Corp. (NYSE: BYD) that owns and operates 21 gaming entertainment properties in Nevada, Mississippi, Illinois, New Jersey, Indiana, Kansas, Iowa, and Louisiana.

EXHIBIT 4 Quarterly EPS for BYD (in US Dollars; Excluding Nonrecurring Items and Discontinued Operations)

Year	31 March	30 June	30 September	31 December	Annual Estimate
2013	0.01	0.00	E(0.01)	E(0.05)	(0.05)
2014	E0.07	E0.08	E0.03	E(0.03)	0.15

Source: *The Value Line Investment Survey*.

On 9 August 2013, BYD closed at \$12.20. BYD's fiscal year ends on 31 December. As of 9 August 2013, solve the following problems by using the information in Exhibit 4:

1. Calculate BYD's forward P/E based on the next four quarters of forecasted EPS.
2. Calculate BYD's NTM P/E.
3. Calculate BYD's forward P/E based on a fiscal-year definition and current fiscal year (2013) forecasted EPS.
4. Calculate BYD's forward P/E based on a fiscal-year definition and next fiscal year (2014) forecasted EPS.

*Solution to 1:* We sum forecasted EPS as follows:

3Q:2013 EPS (estimate)	(\$0.01)
4Q:2013 EPS (estimate)	(\$0.05)
1Q:2014 EPS (estimate)	\$0.07
2Q:2014 EPS (estimate)	\$0.08
Sum	<u>\$0.09</u>

The forward P/E by this definition is  $\$12.20/\$0.09 = 135.6$ .

*Solution to 2:* As of 9 August 2013, approximately five months remained in FY2013. Therefore, the estimated next twelve months EPS for BYD would be based on annual estimates in the last column of Exhibit 4:  $[(5/12) \times \text{FY13E EPS}] + [(7/12) \times \text{FY14E EPS}] = (5/12)(-0.05) + (7/12)(0.15) = 0.067$ . The NTM P/E would be  $\$12.20/\$0.067 = 182.1$ .

*Solution to 3:* We sum EPS as follows:

1Q:2013 EPS (actual)	\$0.01
2Q:2013 EPS (actual)	\$0.00
3Q:2013 EPS (estimate)	(\$0.01)
4Q:2013 EPS (estimate)	(\$0.05)
Sum	<u>(\$0.05)</u>

The forward P/E is  $\$12.20/(\$0.05) = -244.0$ , which is not meaningful.

*Solution to 4:* We sum EPS as follows:

1Q:2014 EPS (estimate)	\$0.07
2Q:2014 EPS (estimate)	\$0.08
3Q:2014 EPS (estimate)	\$0.03
4Q:2014 EPS (estimate)	(\$0.03)
Sum	<u>\$0.15</u>

The forward P/E by this definition is  $\$12.20/\$0.15 = 81.3$ .

As illustrated in Example 6, for companies with volatile earnings, forward P/Es and thus valuations based on forward P/Es can vary dramatically depending on the definition of earnings. The analyst would probably be justified in normalizing EPS for BYD. The gaming industry is highly sensitive to discretionary spending; thus, BYD's earnings are strongly procyclical.

Having explored the issues involved in calculating P/Es, we turn to using them in valuation.

#### 3.1.4. Valuation Based on Forecasted Fundamentals

The analyst who understands DCF valuation models can use them not only in developing an estimate of the justified P/E for a stock but also to gain insight into possible sources of valuation differences when the method of comparables is used. Linking P/Es to a DCF model helps us address what value the market should place on a dollar of EPS when we are given a particular set of expectations about the company's profitability, growth, and cost of capital.

*3.1.4.1. Justified P/E* The simplest of all DCF models is the Gordon (constant) growth form of the dividend discount model (DDM). Presentations of discounted dividend valuation

commonly show that the P/E of a share can be related to the value of a stock as calculated in the Gordon growth model through the expressions

$$\frac{P_0}{E_1} = \frac{D_1/E_1}{r-g} = \frac{1-b}{r-g} \quad (1)$$

for the forward P/E, and for the trailing P/E,

$$\frac{P_0}{E_0} = \frac{D_0(1+g)/E_0}{r-g} = \frac{(1-b)(1+g)}{r-g} \quad (2)$$

where

- $P$  = price
- $E$  = earnings
- $D$  = dividends
- $r$  = required rate of return
- $g$  = dividend growth rate
- $b$  = retention rate

Under the assumption of constant dividend growth, the first expression gives the justified forward P/E, and the second gives the justified trailing P/E. Note that both expressions state P/E as a function of two fundamentals: the stock's required rate of return,  $r$ , which reflects its risk, and the expected (stable) dividend growth rate,  $g$ . The dividend payout ratio,  $1 - b$ , also enters into the expressions.

A particular value of the P/E is associated with a set of forecasts of the fundamentals and the dividend payout ratio. This value is the stock's **justified (fundamental) P/E** based on forecasted fundamentals (that is, the P/E justified by fundamentals). All else being equal, the higher the expected dividend growth rate or the lower the stock's required rate of return, the higher the stock's intrinsic value and the higher its justified P/E.

This intuition carries over to more-complex DCF models. Using any DCF model, all else being equal, justified P/E is:

- inversely related to the stock's required rate of return, and
- positively related to the growth rate(s) of future expected cash flows, however defined.

We illustrate the calculation of a justified forward P/E in Example 7.

#### EXAMPLE 7 Forward P/E Based on Fundamental Forecasts (1)

BP p.l.c. (London: BP) is one of the world's largest integrated oil producers. As of early September 2013, the company continued to deal with litigation concerns surrounding its role in a 2010 drilling rig accident. Jan Unger, an energy analyst, forecasts a long-term earnings retention rate,  $b$ , for BP of 10 percent and a long-term growth rate of 3 percent. Given the significant legal uncertainties still facing BP shareholders, Unger

estimates a required rate of return of 12.5 percent. Based on Unger's forecasts of fundamentals and Equation 1, BP's justified forward P/E is

$$\frac{P_0}{E_1} = \frac{1-b}{r-g} = \frac{1-0.10}{0.125-0.03} = 9.5$$

When using a complex DCF model to value the stock (e.g., a model with varying growth rates and varying assumptions about dividends), the analyst may not be able to express the P/E as a function of fundamental, constant variables. In such cases, the analyst can still calculate a justified P/E by dividing the value per share (that results from a DCF model) by estimated EPS, as illustrated in Example 8. Approaches similar to this one can be used to develop other justified multiples.

#### EXAMPLE 8 Forward P/E Based on Fundamental Forecasts (2)

Toyota Motor Corporation (TYO: 7203; NYSE: TM) is one of the world's largest vehicle manufacturers. The company's most recent fiscal year ended on 31 March 2013. In early September 2013, you are valuing Toyota stock, which closed at ¥6,340 on the previous day. You have used a free cash flow to equity (FCFE) model to value the company stock and have obtained a value of ¥6,722 for the stock. For ease of communication, you want to express your valuation in terms of a forward P/E based on your forecasted fiscal year 2014 EPS of ¥600. Toyota's fiscal year 2014 is from 1 April 2013 through 31 March 2014.

1. What is Toyota's justified P/E based on forecasted fundamentals?
2. Based on a comparison of the current price of ¥6,340 with your estimated intrinsic value of ¥6,722, the stock appears to be undervalued by approximately 6 percent. Use your answer to Part 1 to state this evaluation in terms of P/Es.

*Solution to 1:* Value of the stock derived from FCFE = ¥6,722  
 Forecasted 2014 EPS = ¥600  
 $¥6,722/¥600 = 11.2$  is the justified forward P/E.

*Solution to 2:* The justified P/E of 11.2 is about 6 percent higher than the forward P/E based on current market price,  $¥6,340/¥600 = 10.6$ .

The next section illustrates another, but less commonly used, approach to relating price multiples to fundamentals.

**3.1.4.2. Predicted P/E Based on Cross-Sectional Regression** A predicted P/E, which is conceptually similar to a justified P/E, can be estimated from cross-sectional regressions of P/E on the fundamentals believed to drive security valuation. Kisor and Whitbeck (1963) and Malkiel

and Cragg (1970) pioneered this approach. The studies measured P/Es for a group of stocks and the characteristics thought to determine P/E: growth rate in earnings, payout ratio, and a measure of volatility, such as standard deviation of earnings changes or beta. An analyst can conduct such cross-sectional regressions by using any set of explanatory variables considered to determine investment value; the analyst must bear in mind, however, potential distortions that can be introduced by multicollinearity among independent variables. Example 9 illustrates the prediction of P/E using cross-sectional regression.

### EXAMPLE 9 Predicted P/E Based on a Cross-Sectional Regression

You are valuing a food company with a beta of 0.9, a dividend payout ratio of 0.45, and an earnings growth rate of 0.08. The estimated regression for a group of other stocks in the same industry is

$$\text{Predicted P/E} = 12.12 + (2.25 \times \text{DPR}) - (0.20 \times \text{Beta}) + (14.43 \times \text{EGR})$$

where DPR is the dividend payout ratio and EGR is the five-year earnings growth rate.

1. Based on this cross-sectional regression, what is the predicted P/E for the food company?
2. If the stock's actual trailing P/E is 18, is the stock fairly valued, overvalued, or undervalued?

*Solution to 1:* Predicted P/E =  $12.12 + (2.25 \times 0.45) - (0.20 \times 0.9) + (14.43 \times 0.08) = 14.1$ . The predicted P/E is 14.1.

*Solution to 2:* Because the predicted P/E of 14.1 is less than the actual P/E of 18, the stock appears to be overvalued. That is, it is selling at a higher multiple than is justified by its fundamentals.

A cross-sectional regression summarizes a large amount of data in a single equation and can provide a useful additional perspective on a valuation. It is not frequently used as a main tool, however, because it is subject to at least three limitations:

- The method captures valuation relationships only for the specific stock (or sample of stocks) over a particular time period. The predictive power of the regression for a different stock and different time period is not known.
- The regression coefficients and explanatory power of the regressions tend to change substantially over a number of years. The relationships between P/E and fundamentals may thus change over time. Empirical evidence suggests that the relationships between P/Es and such characteristics as earnings growth, dividend payout, and beta are not stable over time (Damodaran 2012). Furthermore, because distributions of multiples change over time, the predictive power of results from a regression at any point in time can be expected to diminish with the passage of time (Damodaran 2012).

- Because regressions based on this method are prone to the problem of multicollinearity (correlation within linear combinations of the independent variables), interpreting individual regression coefficients is difficult.

Overall, rather than examining the relationship between a stock's P/E multiple and economic variables, the bulk of capital market research examines the relationship between companies' stock prices (and returns on the stock) and explanatory variables, one of which is often earnings (or unexpected earnings). A classic example of such research is the Fama and French (1992) study showing that, used alone, a number of factors explained cross-sectional stock returns in the 1963–1990 period; the factors were E/P, size, leverage, and the book-to-market multiples. When these variables were used in combination, however, size and book-to-market had explanatory power that absorbed the roles of the other variables in explaining cross-sectional stock returns. Research building on that study eventually resulted in the Fama–French three-factor model (with the factors of size, book-to-market, and beta). Another classic academic study providing evidence that accounting variables appear to have predictive power for stock returns is Lakonishok, Shleifer, and Vishny (1994), which also provided evidence that value strategies—buying stocks with low prices relative to earnings, book value, cash flow, and sales growth—produced superior five-year buy-and-hold returns in the 1968–1990 period without involving greater fundamental risk than a strategy of buying growth stocks.

### 3.1.5. Valuation Based on Comparables

The most common application of the P/E approach to valuation is to estimate the value of a company's stock by applying a benchmark multiple to the company's actual or forecasted earnings. An essentially equivalent approach is to compare a stock's actual price multiple with a benchmark value of the multiple. This section explores these comparisons for P/Es. Using any multiple in the method of comparables involves the following steps:

- Select and calculate the price multiple that will be used in the comparison.
- Select the comparison asset or assets and calculate the value of the multiple for the comparison asset(s). For a group of comparison assets, calculate a median or mean value of the multiple for the assets. The result in either case is the **benchmark value of the multiple**.
- Use the benchmark value of the multiple, possibly subjectively adjusted for differences in fundamentals, to estimate the value of a company's stock. (Equivalently, compare the subject stock's actual multiple with the benchmark value.)
- When feasible, assess whether differences between the estimated value of the company's stock and the current price of the company's stock are explained by differences in the fundamental determinants of the price multiple and modify conclusions about relative valuation accordingly. (An essentially equivalent approach is to assess whether differences between a company's actual multiple and the benchmark value of the multiple can be explained by differences in fundamentals.)

These bullet points provide the structure for this reading's presentation of the method of comparables. The first price multiple that will be used in the comparison is the P/E. Practitioners' choices for the comparison assets and the benchmark value of the P/E derived from these assets include the following:

- the average or median value of the P/E for the company's peer group of companies within an industry, including an average past value of the P/E for the stock relative to this peer group;

- the average or median value of the P/E for the company's industry or sector, including an average past value of the P/E for the stock relative to the industry or sector;
- the P/E for a representative equity index, including an average past value of the P/E for the stock relative to the equity index; and
- an average past value of the P/E for the stock.

To illustrate the first bullet point, the company's P/E (say, 15) may be compared to the median P/E for the peer companies currently (say, 10), or the ratio  $15/10 = 1.5$  may be compared to its average past value. The P/E of the most closely matched individual stock can also be used as a benchmark; because of averaging, however, using a group of stocks or an equity index is typically expected to generate less valuation error than using a single stock. In Section 3.3, we illustrate a comparison with a single closely matched individual stock.

Economists and investment analysts have long attempted to group companies by similarities and differences in their business operations. A country's economy overall is typically grouped most broadly into **economic sectors** or large industry groupings. These groupings differ depending on the source of the financial information, and an analyst should be aware of differences among data sources. Classifications often attempt to group companies by what they supply (e.g., energy, consumer goods), by demand characteristics (e.g., consumer discretionary), or by financial market or economic "theme" (e.g., consumer cyclical, consumer noncyclical).

Two classification systems that are widely used in equity analysis are the Global Industry Classification System (GICS) sponsored by Standard & Poor's and MSCI, and the Industrial Classification Benchmark (ICB) originally developed by Dow Jones and FTSE, which in 2006 replaced the FTSE Global Classification System. Many other classification schemes developed by commercial and governmental organizations and by academics are also in use.<sup>22</sup>

The GICS structure assigns each company to one of 154 subindustries, an industry (68 in total), an industry group (24 in total), and an economic sector (10 in total: consumer discretionary, consumer staples, energy, financials, health care, industrials, information technology, materials, telecommunication services, and utilities).<sup>23</sup> The assignment is made by a judgment as to the company's principal business activity, which is based primarily on sales. Because a company is classified on the basis of one business activity, a given company appears in just one group at each level of the classification. A classification ("industrial conglomerates") is available under the capital goods sector of industrials for companies that cannot be assigned to a principal business activity.

The ICB, like GICS, has four levels, but the terminology of ICB uses "sector" and "industry" in nearly opposite senses. At the bottom of the four levels are 114 subsectors, each of which belongs to one of 41 sectors; each sector belongs to one of 19 supersectors; and each supersector belongs to one of 10 industries at the highest level of classification.<sup>24</sup> The industries

<sup>22</sup>The most notable academic industrial classification was developed by Fama and French. Bhojraj, Lee, and Oler (2003) and Chan, Lakonishok, and Swaminathan (2007) provide some information of the relative performance of these various systems in an investments context.

<sup>23</sup>The numbers in the groups are current as of 8 August 2008; changes are made to the classifications from time to time. See [www.gics.standardandpoors.com](http://www.gics.standardandpoors.com) for details.

<sup>24</sup>The numbers in the groups are current as of 8 August 2008; changes are made to the classification from time to time. See [www.icbenchmark.com](http://www.icbenchmark.com) for details.



are oil and gas, basic materials, industrials, consumer goods, health care, consumer services, telecommunications, utilities, financials, and technology.<sup>25</sup>

For these classification systems, analysts often choose the narrowest grouping (i.e., subindustry for GICS and subsector for ICB) as an appropriate starting point for comparison asset identification. For example, the company Continental AG (Xetra Level 1: 543900, also traded as an ADR; OTC Pink: CTTAY), an auto parts manufacturer headquartered in Hanover, Germany, appears in the ICB subsector “tires.” This subsector also includes Michelin (NYSE Euronext Paris: ML), Goodyear Tire & Rubber Company (NYSE: GT), Bridgestone (Tokyo Stock Exchange: 5108; also traded as an ADR with ticker BRDCY), and Cooper Tire and Rubber (NYSE: CTB). One level up, the sector automobiles and parts includes, in addition to tire companies, such disparate companies as automobile manufacturers and their nontire parts suppliers. To narrow the list of comparables in the subsector, an analyst might use information on company size (as measured by revenue or market value of equity) and information on the specific markets served.

Analysts should be aware that, although different organizations often group companies in a broadly similar fashion, sometimes they differ sharply. For example, Reuters Company Research places GATX Corporation (NYSE: GMT), which has several distinct business units, under miscellaneous transportation (within a transportation sector), GICS places it under trading companies and distributors (within its industrials sector), and Yahoo! Finance places it under rental and leasing services (in the services sector); the lists of peer companies or competitors given by each are, as a result, quite distinct.

The comparable companies—selected by using any of the choices described previously—provide the basis for calculating a benchmark value of the multiple. In analyzing differences between the subject company’s multiple and the benchmark value of the multiple, financial ratio analysis serves as a useful tool. Financial ratios can point out:

- a company’s ability to meet short-term financial obligations (liquidity ratios);
- the efficiency with which assets are being used to generate sales (asset turnover ratios);
- the use of debt in financing the business (leverage ratios);
- the degree to which fixed charges, such as interest on debt, are being met by earnings or cash flow (coverage ratios); and
- profitability (profitability ratios).

With this understanding of terms in hand, we turn to using the method of comparables. We begin with cross-sectional P/Es derived from industry peer groups and move to P/Es derived from comparison assets that are progressively less closely matched to the stock. We then turn to using historical P/Es—that is, P/Es derived from the company’s own history. Finally, we sketch how both fundamentals- and comparables-driven models for P/Es can be used to calculate the terminal value in a multistage DCF valuation.

*3.1.5.1. Peer-Company Multiples* Companies operating in the same industry as the subject company (i.e., its peer group) are frequently used as comparison assets. The advantage of using a peer group is that the constituent companies are typically similar in their business mix to the

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<sup>25</sup>One of the chief contrasts between the ICB and GICS systems is that the ICB makes a distinction between goods and services (in GICS, both consumer discretionary and consumer staples include both goods and services components). The two systems also have some similarities that they do not share with other systems—for example, 10 groups at the highest level and an avoidance of a cyclical versus noncyclical distinction in their nomenclature.

company being analyzed. This approach is consistent with the idea underlying the method of comparables—that similar assets should sell at similar prices. The subject stock's P/E is compared with the median or mean P/E for the peer group to arrive at a relative valuation. Equivalently, multiplying the benchmark P/E by the company's EPS provides an estimate of the stock's value that can be compared with the stock's market price. The value estimated in this way represents an estimate of intrinsic value if the comparison assets are efficiently (fairly) priced.

In practice, analysts often find that the stock being valued has some significant differences from the median or mean fundamental characteristics of the comparison assets. In applying the method of comparables, analysts usually attempt to judge whether differences from the benchmark value of the multiple can be explained by differences in the fundamental factors believed to influence the multiple. The following relationships for P/E hold, all else being equal:

- If the subject stock has higher-than-average (or higher-than-median) expected earnings growth, a higher P/E than the benchmark P/E is justified.
- If the subject stock has higher-than-average (or higher-than-median) risk (operating or financial), a lower P/E than the benchmark P/E is justified.

Another perspective on these two points is that for a group of stocks with comparable relative valuations, the stock with the greatest expected growth rate (or the lowest risk) is, all else being equal, the most attractively valued. Example 10 illustrates a simple comparison of a company with its peer group.

### EXAMPLE 10 A Simple Peer-Group Comparison

As a telecommunications industry analyst at a brokerage firm, you are valuing Verizon Communications, Inc. (NYSE: VZ), one of the world's leading telecommunications companies. The valuation metric that you have selected is the trailing P/E. You are evaluating the P/E using the median trailing P/E of peer-group companies as the benchmark value. According to GICS, VZ is in the telecommunications services sector and, within it, the integrated telecommunication services subindustry. Exhibit 5 presents the relevant data. (Note that although BCE Inc. is a Canadian company, it is classified in this peer group.)

EXHIBIT 5 Trailing P/E's of Telecommunications Services Companies (as of 11 September 2013)

Company	Trailing P/E
AT&T (NYSE: T)	25.73
BCE Inc. (NYSE: BCE; TSX: BCE)	14.49
Centurytel (NYSE: CTL)	18.86
Equinix (NASDAQGS: EQIX)	131.28
Frontier Communications Corp. (NASDAQ GS: FTR)	43.30
Verizon Communications (NYSE: VZ)	86.06
Windstream Corp. (NYSE: WIN)	36.91
Mean	50.95
Median	36.91

Source: Thomson Financial.

Based on the data in Exhibit 5, address the following:

1. Given the definition of the benchmark stated above, determine the most appropriate benchmark value of the P/E for VZ.
2. State whether VZ is relatively fairly valued, relatively overvalued, or relatively undervalued, assuming no differences in fundamentals among the peer group companies. Justify your answer.
3. Identify the stocks in this group of telecommunication companies that appear to be relatively undervalued when the median trailing P/E is used as a benchmark. Explain what further analysis might be appropriate to confirm your answer.

*Solution to 1:* As stated earlier, the use of median values mitigates the effect of outliers on the valuation conclusion. In this instance, the P/E for EQIX is clearly an outlier. Therefore, the median trailing P/E for the group, 36.91, is more appropriate than the mean trailing P/E of 50.95 for use as the benchmark value of the P/E. *Note:* When a group includes an odd number of companies, as here, the median value will be the middle value when the values are ranked (in either ascending or descending order). When the group includes an even number of companies, the median value will be the average of the two middle values.

*Solution to 2:* If you assume no differences in fundamentals among the peer group companies, VZ appears to be overvalued because its P/E is greater than the median P/E of 36.91.

*Solution to 3:* T, BCE, and CTL appear to be undervalued relative to their peers because their trailing P/Es are lower than the median P/E. WIN appears to be relatively fairly valued because its P/E equals the median P/E. VZ, FTR, and EQIX appear to be overvalued.

To confirm this valuation conclusion, you should look at other metrics. One issue for this particular industry is that earnings may differ significantly from cash flow. These companies invest considerable amounts of money to build out their networks—whether it be landlines or increasing bandwidth capacity for mobile users. Because telecommunication service providers are frequently required to take large non-cash charges on their infrastructure, reported earnings are typically very volatile and frequently much lower than cash flow.

A metric that appears to address the impact of earnings growth on P/E is the P/E-to-growth (**PEG**) ratio. PEG is calculated as the stock's P/E divided by the expected earnings growth rate (in percentage terms). The ratio, in effect, is a calculation of a stock's P/E per percentage point of expected growth. Stocks with lower PEGs are more attractive than stocks with higher PEGs, all else being equal. Some consider that a PEG ratio less than 1 is an indicator of an attractive value level. PEG is useful but must be used with care for several reasons:

- PEG assumes a linear relationship between P/E and growth. The model for P/E in terms of the DDM shows that, in theory, the relationship is not linear.
- PEG does not factor in differences in risk, an important determinant of P/E.

- PEG does not account for differences in the duration of growth. For example, dividing P/Es by short-term (five-year) growth forecasts may not capture differences in long-term growth prospects.

The way in which fundamentals can add insight to comparables is illustrated in Example 11.

### EXAMPLE 11 A Peer-Group Comparison Modified by Fundamentals

Continuing with the valuation of telecommunication service providers, you gather information on selected fundamentals related to risk (beta), profitability (five-year earnings growth forecast), and valuation (trailing and forward P/Es).<sup>26</sup> These data are reported in Exhibit 6, which lists companies in order of descending earnings growth forecast. The use of forward P/Es recognizes that differences in trailing P/Es could be the result of transitory effects on earnings.

EXHIBIT 6 Valuation Data for Telecommunications Services Companies (as of 11 September 2013)

Company	Trailing P/E	Forward P/E	Five-Year EPS Growth		Beta
			Forecast	Forward PEG	
EQIX	131.28	43.97	25.30%	1.74	1.26
FTR	43.30	18.83	21.80	0.86	0.78
VZ	86.06	14.40	10.22	1.41	0.38
T	25.73	12.62	6.46	1.95	0.40
BCE	14.49	14.12	3.00	4.71	0.76
CTL	18.86	12.04	1.35	8.92	0.89
WIN	36.91	18.66	-11.55	NM	0.89
Mean	50.95	19.23	8.08%	3.27	0.77
Median	36.91	14.40	6.46	1.85	0.78

*Notes:* NM = not meaningful. The five-year EPS growth forecast for WIN is a negative number, which would result in a negative PEG.

*Source:* www.finviz.com.

Based on the data in Exhibit 6, answer the following questions:

1. In Example 10, Part 3, T, BCE, and CTL were identified as possibly relatively undervalued compared with the peer group as a whole, and WIN was identified as relatively fairly valued. What does the additional information in Exhibit 6 relating to profitability and risk suggest about the relative valuation of these stocks?

<sup>26</sup>In comparables work, analysts may also use other measures of risk, such as financial leverage, and of profitability, such as return on assets.

2. T has a consensus year-ahead EPS forecast of \$2.69. Suppose the median P/E of 14.40 for the peer group is subjectively adjusted upward to 15.00 to reflect T's superior profitability and below-average risk. Estimate T's intrinsic value.
3. T's current market price is \$33.99. State whether T appears to be fairly valued, overvalued, or undervalued when compared with the intrinsic value estimated in answer to Part 2 above.

*Solution to 1:* According to the profitability data and PEG given in Exhibit 6, EQIX, FTR, and VZ appear to represent the greatest undervaluation. Of the three stocks, FTR has:

- the second-highest five-year consensus earnings growth forecast, and
- the lowest PEG based on forward P/E.

Of the three stocks, EQIX has the highest beta by far, which is consistent with studies that have shown that growth stocks tend to have higher beta values than those of value stocks. Based on the high trailing and forward P/E ratios, it appears that investors in EQIX have high expectations concerning the company's future earnings potential. However, the high beta value is likely reflective of the uncertainty surrounding the earnings forecast and the possibility that actual future earnings may be less than expected.

Some analysts consider a PEG ratio below 1 to be a signal of undervaluation implying that FTR is attractive when judged by this ratio. However, one limitation of the PEG ratio is that it does not account for the overall growth rate of an industry or the economy as a whole. Hence, it is typically a good idea for an investor to compare a stock's PEG ratio to an average or median PEG ratio for the industry, as well as the entire market, to get an accurate sense of how fairly valued a stock is. The PEG ratio of FTR is not only below 1, but it is significantly lower than the PEG ratios for the other telecommunication companies—further indicating that FTR is relatively undervalued.

*Solution to 2:*  $\$2.69 \times 15.0 = \$40.35$  is an estimate of intrinsic value.

*Solution to 3:* Because the estimated intrinsic value of \$40.35 is greater than the current market price of \$33.99, T appears to be undervalued by the market on an absolute basis.

In Problem 2 of the above example, a peer median P/E of 14.40 was subjectively adjusted upward to 15.00. Depending on the context, the justification for using the specific value of 15.00 as the relevant benchmark rather than some other value, such as 13.75, 14.80, or 15.40, could be raised. To avoid that issue, one way to express the analysis and results would be as follows: Given its similar growth and lower risk, T should trade at a premium to the median P/E (14.40) of its peer group.

Analysts frequently compare a stock's multiple with the median or mean value of the multiple for larger sets of assets than a company's peer group. The next sections examine comparisons with these larger groups.

*3.1.5.2. Industry and Sector Multiples* Median or mean P/Es for industries and for economic sectors are frequently used in relative valuations. Although median P/Es have the advantage

that they are insensitive to outliers, some databases report only mean values of multiples for industries.

The mechanics of using industry multiples are identical to those used for peer-group comparisons. Taking account of relevant fundamental information, we compare a stock's multiple with the median or mean multiple for the company's industry.

Using industry and sector data can help an analyst explore whether the peer-group comparison assets are themselves appropriately priced. Comparisons with broader segments of the economy can potentially provide insight about whether the relative valuation based on comparables accurately reflects intrinsic value. For example, Value Line reports a relative P/E that is calculated as the stock's current P/E divided by the median P/E of all issues under Value Line review. The less closely matched the stock is to the comparison assets, the more dissimilarities are likely to be present to complicate the analyst's interpretation of the data. Arguably, however, the larger the number of comparison assets, the more likely that mispricing of individual assets cancel out. In some cases, we may be able to draw inferences about an industry or sector overall. For example, during the 1998–2000 internet bubble, comparisons of an individual internet stock's value with the overall market would have been more likely to point to overvaluation than comparisons of relative valuation only among internet stocks.

**3.1.5.3. Overall Market Multiple** Although the logic of the comparables approach suggests the use of industry and peer companies as comparison assets, equity market indices also have been used as comparison assets. The mechanics of using the method of comparables do not change in such an approach, although the user should be cognizant of any size differences between the subject stock and the stocks in the selected index.

The question of whether the overall market is fairly priced has captured analyst interest throughout the entire history of investing. We mentioned one approach to market valuation (using a DDM) in an earlier reading.

Example 12 shows a valuation comparison to the broad equity market on the basis of P/E.

#### EXAMPLE 12 Valuation Relative to the Market

You are analyzing three large-cap US stock issues with approximately equal earnings growth prospects and risk. As one step in your analysis, you have decided to check valuations relative to the S&P 500 Composite Index. Exhibit 7 provides the data.

EXHIBIT 7 Comparison with an Index Multiple (Prices and EPS in US Dollars; as of 31 March 2013)

Measure	Stock A	Stock B	Stock C	S&P 500
Current price	23	50	80	1569.19
P/E	12.5	25.5	12.5	17.9
Five-year average P/E (as percent of S&P 500 P/E)	80	120	105	

Source: [www.us.spindices.com](http://www.us.spindices.com) for S&P 500 data.

Based only on the data in Exhibit 7, address the following:

1. Explain which stock appears relatively undervalued when compared with the S&P 500.
2. State the assumption underlying the use of five-year average P/E comparisons.

*Solution to 1:* Stock C appears to be undervalued when compared to the S&P 500. Stock A and Stock C are both trading at a P/E of 12.5 relative to trailing earnings, versus a P/E of 17.9 for the S&P 500. But the last row of Exhibit 7 indicates that Stock A has historically traded at a P/E reflecting a 20 percent discount to the S&P 500 (which, based on the current level of the S&P 500, would imply a P/E of  $0.8 \times 17.9 = 14.3$ ). In contrast, Stock C has usually traded at a premium to the S&P 500 P/E but now trades at a discount to it. Stock B is trading at a high P/E, even higher than its historical relationship to the S&P 500's P/E ( $1.2 \times 17.9 = 21.5$ ).

*Solution to 2:* Using historical relative-value information in investment decisions relies on an assumption of stable underlying economic relationships (that is, that the past is relevant for the future).

Because many equity indices are market-capitalization weighted, financial databases often report the average market P/E with the individual P/Es weighted by the company's market capitalization. As a consequence, the largest constituent stocks heavily influence the calculated P/E. If P/Es differ systematically by market capitalization, however, differences in a company's P/E multiple from the index's multiple may be explained by that effect. Therefore, particularly for stocks in the middle-cap range, the analyst should favor using the median P/E for the index as the benchmark value of the multiple.

As with other comparison assets, the analyst may be interested in whether the equity index itself is efficiently priced. A common comparison is the index's P/E in relation to historical values. Siegel (2002) noted that P/Es in 2001 were more than twice as high as the average P/E for US stocks over a 130-year period (1871–2001) of 14.5. Potential justifications for a higher-than-average P/E include lower-than-average interest rates and/or higher-than-average expected growth rates. An alternative hypothesis in a situation such as that noted by Siegel is that the market as a whole is overvalued (and in 2002 a sharp downturn in US equities did occur) or, alternatively, that earnings are abnormally low.

The time frame for comparing average multiples is important. For example, at the end of the second quarter of 2008, the P/E for the S&P 500, based on 2008 earnings estimates, was 17.6. That value, although higher than the 15.8 historical average since 1935, fell below the historical average for the previous 5-, 10-, and 20-year time periods, when the P/E ranged between 20 and 26. The use of past data relies on the key assumption that the past (sometimes the distant past) is relevant for the future.

We end this section with an introduction to valuation of the equity market itself on the basis of P/E. A well-known comparison is the earnings yield (the E/P) on a group of stocks and the interest yield on a bond. The so-called Fed Model, based on a paper written by three analysts at the US Federal Reserve, predicts the return on the S&P 500 on the basis of the relationship between forecasted earnings yields and yields on bonds (Lander, Orphanides, and Douvogiannis 1997). Example 13 illustrates the Fed Model.

### EXAMPLE 13 The Fed Model

One of the main drivers of P/E for the market as a whole is the level of interest rates. The inverse relationship between value and interest rates can be seen from the expression of P/E in terms of fundamentals, because the risk-free rate is one component of the required rate of return that is inversely related to value. The Fed Model relates the earnings yield on the S&P 500 to the yield to maturity on 10-year US Treasury bonds. As we have defined it, the earnings yield (E/P) is the inverse of the P/E; the Fed Model uses expected earnings for the next 12 months in calculating the ratio.

Based on the premise that the two yields should be closely linked, on average, the trading rule based on the Fed Model considers the stock market to be overvalued when the market's current earnings yield is less than the 10-year Treasury bond (T-bond) yield. The intuition is that when risk-free T-bonds offer a yield that is higher than stocks—which are a riskier investment—stocks are an unattractive investment.

According to the model, the justified or fair-value P/E for the S&P 500 is the reciprocal of the 10-year T-bond yield. As of 11 September 2013, according to the model, with a 10-year T-bond yielding 2.93 percent, the justified P/E on the S&P 500 was  $1/0.0293 = 34.1$ . The forward P/E based on 2014 reported earnings estimates for the S&P 500 as of same date was 16.1.

We previously presented an expression for the justified P/E in terms of the Gordon growth model. That expression indicates that the expected growth rate in dividends or earnings is a variable that enters into the intrinsic value of a stock (or an index of stocks). A concern in considering the Fed Model is that this variable is lacking in the model.<sup>27</sup> Example 14 presents a valuation model for the equity market that incorporates the expected growth rate in earnings.

### EXAMPLE 14 The Yardeni Model

Yardeni (2000) developed a model that incorporates the expected growth rate in earnings—a variable that is missing in the Fed Model.<sup>28</sup> Yardeni's model is

$$\text{CEY} = \text{CBY} - b \times \text{LTEG} + \text{Residual}$$

where CEY is the current earnings yield on the market index, CBY is the current Moody's Investors Service A-rated corporate bond yield, and LTEG is the consensus five-year

<sup>27</sup>The earnings yield is, in fact, the expected rate of return on a no-growth stock (under the assumption that price equals value). With PVGO the present value of growth opportunities and setting price equal to value, we obtain  $P_0 = E_1/r + \text{PVGO}$ . Setting the present value of growth opportunities equal to zero and rearranging, we obtain  $r = E_1/P_0$ .

<sup>28</sup>This model is presented as one example of more-complex models than the Fed Model. Economic analysts at many investment firms have their own models that incorporate growth and historical relationships of market indices with government bonds.



earnings growth rate forecast for the market index. The coefficient  $b$  measures the weight the market gives to five-year earnings projections. (Recall that the expression for P/E in terms of the Gordon growth model is based on the long-term sustainable growth rate and that five-year forecasts of growth may not be sustainable.) Although CBY incorporates a default risk premium relative to T-bonds, it does not incorporate an equity risk premium per se. For example, in the bond yield plus risk premium model for the cost of equity, an analyst typically adds 300–400 basis points to a corporate bond yield.

Yardeni found that, prior to publication of the model in 2000, the coefficient  $b$  had averaged 0.10. In recent years, he has reported valuations based on growth weights of 0.10, 0.20, and 0.25. Noting that CEY is E/P and taking the inverse of both sides of this equation, Yardeni obtained the following expression for the justified P/E on the market:

$$\frac{P}{E} = \frac{1}{\text{CBY} - b \times \text{LTEG}}$$

Consistent with valuation theory, in Yardeni's model, higher current corporate bond yields imply a lower justified P/E and higher expected long-term growth results in a higher justified P/E.

Critics of the Fed Model point out that it ignores the equity risk premium (Stimes and Wilcox 2011). The model also inadequately reflects the effects of inflation and incorrectly incorporates the differential effects of inflation on earnings and interest payments (e.g., Siegel 2002). Some empirical evidence has shown that prediction of future returns based on simple P/E outperforms prediction based on the Fed Model's differential with bond yields (for the US market, see Arnott and Asness 2003; for nine other markets, see Aubert and Giot 2007).

Another drawback to the Fed Model is that the relationship between interest rates and earnings yields is not a linear one. This drawback is most noticeable at low interest rates; Example 13 provided an example of this limitation of the model. Furthermore, small changes in interest rates and/or corporate profits can significantly alter the justified P/E predicted by the model. Overall, an analyst should look to the Fed Model only as one tool for calibrating the overall value of the stock market and should avoid overreliance on the model as a predictive method, particularly in periods of low inflation and low interest rates.

**3.1.5.4. Own Historical P/E** As an alternative to comparing a stock's valuation with that of other stocks, one traditional approach uses past values of the stock's own P/E as a basis for comparison. Underlying this approach is the idea that a stock's P/E may regress to historical average levels.

An analyst can obtain a benchmark value in a variety of ways with this approach. Value Line reports as a "P/E median" a rounded average of four middle values of a stock's average annual P/E for the previous 10 years. The five-year average trailing P/E is another reasonable metric. In general, trailing P/Es are more commonly used than forward P/Es in such computations. In addition to "higher" and "lower" comparisons with this benchmark, justified price based on this approach may be calculated as follows:

$$\begin{aligned} \text{Justified price} = & (\text{Benchmark value of own historical P/Es}) \\ & \times (\text{Most recent EPS}) \end{aligned} \quad (3)$$

Normalized EPS replaces most recent EPS in this equation when EPS is negative and whenever otherwise appropriate.

Example 15 illustrates the use of past values of the stock's own P/E as a basis for reaching a valuation conclusion.

### EXAMPLE 15 Valuation Relative to Own Historical P/Es

As of mid-September 2013, you are valuing Honda Motor Company (TSE: 7267; NYSE ADR: HMC), among the market leaders in Japan's auto manufacturing industry. You are applying the method of comparables using HMC's five-year average P/E as the benchmark value of the multiple. Exhibit 8 presents the data.

EXHIBIT 8 Historical P/Es for HMC

2012	2011	2010	2009	2008	Mean	Median
15.8	23.1	10.0	19.8	35.8	20.9	19.8

Sources: *The Value Line Investment Survey* for average annual P/Es; calculations for mean and median P/Es.

1. State a benchmark value for Honda's P/E.
2. Given EPS for fiscal year 2013 (ended 31 March) of ¥203.71, calculate and interpret a justified price for Honda.
3. Compare the justified price with the stock's recent price of ¥3,815.

*Solution to 1:* From Exhibit 8, the benchmark value based on the median P/E value is 19.8 and based on the mean P/E value is 20.9.

*Solution to 2:* The calculation is  $19.8 \times ¥203.71 = ¥4,033$  when the median-based benchmark P/E is used and  $20.9 \times ¥203.71 = ¥4,258$  when the mean-based benchmark P/E is used.

*Solution to 3:* The stock's recent price is 5.4 percent (calculated as  $3,815/4,033 - 1$ ) less than the justified price of the stock based on median historical P/E but 10.4 percent (calculated as  $3,815/4,258 - 1$ ) less than the justified price of the stock based on mean historical P/Es. The stock may be undervalued, but misvaluation, if present, appears slight. Reaching a conclusion from these results is complicated by the fact that the time period of the analysis reflects the effects of the financial crisis of 2007–2009. Prior to the crisis, the P/E for HMC was much lower than the mean and median values used in this analysis. In particular, history suggests that the P/E ratio of 35.8 in 2008 should be considered an outlier.

In using historical P/Es for comparisons, analysts should be alert to the impact on P/E levels of changes in a company's business mix and leverage over time. If the company's business has changed substantially within the time period being examined, the method based on a company's own past P/Es is prone to error. Shifts in the use of financial leverage may also impair comparability based on average own past P/E.

Changes in the interest rate environment and economic fundamentals over different time periods can be another limitation to using an average past value of P/E for a stock as a

benchmark. A specific caution is that inflation can distort the economic meaning of reported earnings. Consequently, if the inflationary environments reflected in current P/E and average own past P/E are different, a comparison between the two P/Es may be misleading. Changes in a company's ability to pass through cost inflation to higher prices over time may also affect the reliability of such comparisons, as illustrated in Example 16 in the next section.

### 3.1.6. P/Es in Cross-Country Comparisons

When comparing the P/Es of companies in different countries, the analyst should be aware of the following effects that may influence the comparison:

- the effect on EPS of differences in accounting standards. Comparisons (without analyst adjustments) among companies preparing financial statements based on different accounting standards may be distorted. Such distortions may occur when, for example, the accounting standards differ as to permissible recognition of revenues, expenses, or gains.
- the effect on marketwide benchmarks of differences in their macroeconomic contexts. Differences in macroeconomic contexts may distort comparisons of benchmark P/E levels among companies operating in different markets.

A specific case of the second bullet point is differences in inflation rates and in the ability of companies to pass through inflation in their costs in the form of higher prices to their customers. For two companies with the same pass-through ability, the company operating in the environment with higher inflation will have a lower justified P/E; if the inflation rates are equal but pass-through rates differ, the justified P/E should be lower for the company with the lower pass-through rate. Example 16 provides analysis in support of these conclusions.

#### EXAMPLE 16 An Analysis of P/Es and Inflation<sup>29</sup>

Assume a company with no real earnings growth, such that its earnings growth can result only from inflation, will pay out all its earnings as dividends. Based on the Gordon (constant growth) DDM, the value of a share is:

$$P_0 = \frac{E_0(1+I)}{r-I}$$

where:

$P_0$  = current price, which is substituted for the intrinsic value,  $V_0$ , for purposes of analyzing a justified P/E

$E_0$  = current EPS, which is substituted for current dividends per share,  $D_0$ , because the assumption in this example is that all earnings are paid out as dividends

$I$  = rate of inflation, which is substituted for expected growth,  $g$ , because of the assumption in this example that the company's only growth is from inflation

$r$  = required return

<sup>29</sup>This example follows the analysis of Solnik and McLeavey (2004, pp. 289–290).

Suppose the company has the ability to pass on some or all inflation to its customers and let  $\lambda$  represent the percentage of inflation in costs that the company can pass through to revenue. The company's earnings growth may then be expressed as  $\lambda I$  and the equation becomes

$$P_0 = \frac{E_0(1 + \lambda I)}{r - \lambda I} = \frac{E_1}{r - \lambda I}$$

Now, introduce a real rate of return, defined here as  $r$  minus  $I$  and represented as  $\rho$ . The value of a share and the justified forward P/E can now be expressed, respectively, as follows:<sup>30</sup>

$$P_0 = \frac{E_1}{\rho + (1 - \lambda)I}$$

and

$$\frac{P_0}{E_1} = \frac{1}{\rho + (1 - \lambda)I}$$

If a company can pass through all inflation, so that  $\lambda = 1$  (100 percent), then the P/E is equal to  $1/\rho$ . But if the company can pass through no inflation, so that  $\lambda = 0$ , then the P/E is equal to  $1/(\rho + I)$ —that is,  $1/r$ .

You are analyzing two companies, Company M and Company P. The real rate of return required on the shares of Company M and Company P is 3 percent per year. Using the analytic framework provided, address the following:

1. Suppose both Company M and Company P can pass through 75 percent of cost increases. Cost inflation is 6 percent for Company M but only 2 percent for Company P.
  - A. Estimate the justified P/E for each company.
  - B. Interpret your answer to Part A.
2. Suppose both Company M and Company P face 6 percent a year inflation. Company M can pass through 90 percent of cost increases, but Company P can pass through only 70 percent.
  - A. Estimate the justified P/E for each company.
  - B. Interpret your answer to Part A.

*Solution to 1:*

A. For Company M,  $\frac{1}{0.03 + (1 - 0.75)0.06} = 22.2$

For Company P,  $\frac{1}{0.03 + (1 - 0.75)0.02} = 28.6$

<sup>30</sup>The denominator of this equation is derived from the previous equation as follows:  $r - \lambda I = r - I + I - \lambda I = (r - I) + (1 - \lambda)I = \rho + (1 - \lambda)I$ .

- B. With less than 100 percent cost pass-through, the justified P/E is inversely related to the inflation rate.

*Solution to 2:*

A. For Company M,  $\frac{1}{0.03 + (1 - 0.90)0.06} = 27.8$

For Company P,  $\frac{1}{0.03 + (1 - 0.70)0.06} = 20.8$

- B. For equal inflation rates, the company with the higher pass-through rate has a higher justified P/E.

Example 16 illustrates that with less than 100 percent cost pass-through, the justified P/E is inversely related to the inflation rate (with complete cost pass-through, the justified P/E should not be affected by inflation). The higher the inflation rate, the greater the impact of incomplete cost pass-through on P/E. From Example 16, one can also infer that the higher the inflation rate, the more serious the effect on justified P/E of a pass-through rate that is less than 100 percent.

### 3.1.7. Using P/Es to Obtain Terminal Value in Multistage Dividend Discount Models

In using a DDM to value a stock, whether applying a multistage model or modeling within a spreadsheet (forecasting specific cash flows individually up to some horizon), estimation of the terminal value of the stock is important. The key condition that must be satisfied is that terminal value reflects earnings growth that the company can sustain in the long run. Analysts frequently use price multiples—in particular, P/Es and P/Bs—to estimate terminal value. We can call such multiples **terminal price multiples**. Choices for the terminal multiple, with a terminal P/E multiple used as the example, include the following:

*3.1.7.1. Terminal Price Multiple Based on Fundamentals* As illustrated earlier, analysts can restate the Gordon growth model as a multiple by, for example, dividing both sides of the model by EPS. For terminal P/E multiples, dividing both sides of the Gordon growth model by EPS at time  $n$ , where  $n$  is the point in time at which the final stage begins (i.e.,  $E_n$ ), gives a trailing terminal price multiple; dividing both sides by EPS at time  $n + 1$  (i.e.,  $E_{n+1}$ ) gives a leading terminal price multiple. Of course, an analyst can use the Gordon growth model to estimate terminal value and need not go through the process of deriving a terminal price multiple and then multiplying by the same value of the fundamental to estimate terminal value. Because of their familiarity, however, multiples may be useful in communicating an estimate of terminal value.

*3.1.7.2. Terminal Price Multiple Based on Comparables* Analysts have used various choices for the benchmark value, including:

- median industry P/E;
- average industry P/E; and
- average of own past P/Es.

Having selected a terminal multiple, the expression for terminal value when using a terminal P/E multiple is

$$V_n = \text{Benchmark value of trailing terminal P/E} \times E_n$$

or

$$V_n = \text{Benchmark value of forward terminal P/E} \times E_{n+1}$$

where

$$V_n = \text{terminal value at time } n$$

The use of a comparables approach has the strength that it is entirely grounded in market data. In contrast, the Gordon growth model calls for specific estimates (the required rate of return, the dividend payout ratio, and the expected mature growth rate), and the model's output is very sensitive to changes in those estimates. A possible disadvantage to the comparables approach is that when the benchmark value reflects mispricing (over- or undervaluation), so will the estimate of terminal value. Example 17 illustrates the use of P/Es and the Gordon growth model to estimate terminal value.

#### EXAMPLE 17 Using P/Es and the Gordon Growth Model to Value the Mature Growth Phase

As an energy analyst, you are valuing the stock of an oil exploration company. You have projected earnings and dividends three years out (to  $t = 3$ ), and you have gathered the following data and estimates:

- Required rate of return = 0.10.
- Average dividend payout rate for mature companies in the market = 0.45.
- Industry average ROE = 0.13.
- $E_3 = \$3.00$ .
- Industry average P/E = 14.3.

On the basis of this information, carry out the following:

1. Calculate terminal value based on comparables, using your estimated industry average P/E as the benchmark.
2. Contrast your answer in Part 1 to an estimate of terminal value using the Gordon growth model.

*Solution to 1:*  $V_n = \text{Benchmark value of P/E} \times E_n = 14.3 \times \$3.00 = \$42.90$ .

*Solution to 2:* Recall that the Gordon growth model expresses intrinsic value,  $V$ , as the present value of dividends divided by the required rate of return,  $r$ , minus the growth rate,  $g$ :  $V_0 = D_0(1 + g)/(r - g)$ . Here we are estimating terminal value, so the relevant expression is  $V_n = D_n(1 + g)/(r - g)$ . You would estimate that the dividend at  $t = 3$

will equal earnings in Year 3 of \$3.00 times the average payout ratio of 0.45, or  $D_n = \$3.00 \times 0.45 = \$1.35$ . Recall also the sustainable growth rate expression—that is,  $g = b \times \text{ROE}$ , where  $b$  is the retention rate and equivalent to 1 minus the dividend payout ratio. In this example,  $b = (1 - 0.45) = 0.55$ , and you can use  $\text{ROE} = 0.13$  (the industry average). Therefore,  $g = b \times \text{ROE} = 0.55 \times 0.13 = 0.0715$ . Given the required rate of return of 0.10, you obtain the estimate  $V_n = (\$1.35)(1 + 0.0715)/(0.10 - 0.0715) = \$50.76$ . In this example, therefore, the Gordon growth model estimate of terminal value is 18.3 percent higher than the estimate based on comparables calculated in Part 1 (i.e.,  $0.1832 = \$50.76/\$42.90 - 1$ ).

### 3.2. Price to Book Value

The ratio of market price per share to book value per share (P/B), like P/E, has a long history of use in valuation practice (as discussed in Graham and Dodd 1934). According to the 2012 BofA Merrill Lynch Institutional Factor Survey, 53 percent of respondents considered P/B when making investment decisions.

In the P/E multiple, the measure of value (EPS) in the denominator is a flow variable relating to the income statement. In contrast, the measure of value in the P/B's denominator (book value per share) is a stock or level variable coming from the balance sheet. (*Book* refers to the fact that the measurement of value comes from accounting records or books, in contrast to market value.) Intuitively, therefore, we note that book value per share attempts to represent, on a per-share basis, the investment that common shareholders have made in the company. To define book value per share more precisely, we first find **shareholders' equity** (total assets minus total liabilities). Because our purpose is to value common stock, we subtract from shareholders' equity any value attributable to preferred stock to obtain common shareholders' equity, or the **book value of equity** (often called simply **book value**).<sup>31</sup> Dividing book value by the number of common stock shares outstanding, we obtain **book value per share**, the denominator in P/B.

In the balance of this section, we present the reasons analysts have offered for using P/B and possible drawbacks to its use. We then illustrate the calculation of P/B and discuss the fundamental factors that drive P/B. We end the section by showing the use of P/B based on the method of comparables.

Analysts have offered several rationales for the use of P/B; some specifically compare P/B with P/E:

- Because book value is a cumulative balance sheet amount, book value is generally positive even when EPS is zero or negative. An analyst can generally use P/B when EPS is zero or negative, whereas P/E based on a zero or negative EPS is not meaningful.
- Because book value per share is more stable than EPS, P/B may be more meaningful than P/E when EPS is abnormally high or low or is highly variable.
- As a measure of net asset value per share, book value per share has been viewed as appropriate for valuing companies composed chiefly of liquid assets, such as finance, investment, insurance, and banking institutions (Wild, Bernstein, and Subramanyam 2001, p. 233). For such

<sup>31</sup>If we were to value a company as a whole, rather than value only the common stock, we would not exclude the value of preferred stock from the computation.

companies, book values of assets may approximate market values. When information on individual corporate assets is available, analysts may adjust reported book values to market values where they differ.

- Book value has also been used in the valuation of companies that are not expected to continue as a going concern (Martin 1998, p. 22).
- Differences in P/Bs may be related to differences in long-run average returns, according to empirical research.<sup>32</sup>

Possible drawbacks of P/Bs in practice include the following:

- Assets in addition to those recognized in financial statements may be critical operating factors. For example, in many service companies, **human capital**—the value of skills and knowledge possessed by the workforce—is more important than physical capital as an operating factor, but it is not reflected as an asset on the balance sheet. Similarly, the good reputation that a company develops by consistently providing high-quality goods and services is not reflected as an asset on the balance sheet.
- P/B may be misleading as a valuation indicator when the levels of assets used by the companies under examination differ significantly. Such differences may reflect differences in business models.
- Accounting effects on book value may compromise how useful book value is as a measure of the shareholders' investment in the company. In general, intangible assets that are generated internally (as opposed to being acquired) are not shown as assets on a company's balance sheet. For example, companies account for advertising and marketing as expenses, so the value of internally generated brands, which are created and maintained by advertising and marketing activities, do not appear as assets on a company's balance sheet under IFRS or US GAAP. Similarly, when accounting standards require that research and development (R&D) expenditures be treated as expenses, the values of internally developed patents do not appear as assets. Certain R&D expenditures can be capitalized, although rules vary among accounting standards. Accounting effects such as these may impair the comparability of P/B among companies and countries unless appropriate analyst adjustments are made.
- Book value reflects the reported value of assets and liabilities. Some assets and liabilities, such as some financial instruments, may be reported at fair value as of the balance sheet date; other assets, such as property, plant, and equipment, are generally reported at historical cost, net of accumulated depreciation, amortization, depletion, and/or impairment. It is important to examine the notes to the financial statements to identify how assets and liabilities are measured and reported. For assets measured at net historical cost, inflation and technological change can eventually result in significant divergence between the book value and the market value of assets. As a result, book value per share often does not accurately reflect the value of shareholders' investments. When comparing companies, significant differences in the average age of assets may lessen the comparability of P/Bs.
- Share repurchases or issuances may distort historical comparisons.

As an example of the effects of share repurchases, consider Colgate-Palmolive Company (NYSE: CL). As of 13 September 2013, CL's trailing P/E and P/B were, respectively, 24.84 and 36.01. Five years earlier, CL's trailing P/E and P/B were 23.55 and 15.94. In other words, the

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<sup>32</sup>See Bodie, Kane, and Marcus (2008) for a brief summary of the empirical research.



company's P/E widened by 5.5 percent ( $= 24.84/23.55 - 1$ ) while its P/B widened by 125.9 percent ( $= 36.01/15.94 - 1$ ). The majority of the difference in changes in these two multiples can be attributed to the substantial amount of shares that CL repurchased over those five years, as reflected by book value (i.e., total common equity) declining from \$2.48 billion as of 30 June 2008 to \$1.53 billion as of 30 June 2013. Because of those share repurchases, CL's book value declined at an annual rate of 9.2 percent. In summary, when a company repurchases shares at a price higher than the current book value per share, it lowers the overall book value per share for the company. All else being equal, the effect is to make the stock appear more expensive if the current P/B is compared to its historical values.

Example 18 illustrates another potential limitation to using P/B in valuation.

#### EXAMPLE 18 Differences in Business Models Reflected in Differences in P/Bs

As of late 2013, few sectors had a wider range of P/B ratios than the US banking industry. Much of these differences in P/B ratios can be attributed to differences in company-specific business models. Exhibit 9 presents P/B ratios for three major US banks as of 13 September 2013.

EXHIBIT 9 P/B Ratios For Selected US Banks

Entity	P/B
Citigroup, Inc. (NYSE: C)	0.77
Wells Fargo & Company (NYSE: WFC)	1.46
US Bancorp (NYSE: USB)	1.93

Source: S&P Capital IQ

Citigroup's low P/B versus its peers is a reflection of the troubled "one-stop shopping" business model it and some other mega-banks pursued in the 1990s. Citigroup suffered huge losses during the global financial crisis and had to be rescued in November 2008 by the US government.

Wells Fargo derives most of its revenue from loans and service fees. Its business model focuses on cross-selling multiple products, and in 2012 it was responsible for originating close to a third of all US home loans. Wells Fargo is also predominantly a domestic business, whereas other large banks are much more exposed to overseas markets.

US Bancorp's relatively risk-averse business model is focused on consumer and business banking as well as trusts and payment processing. Compared with other mega-banks, US Bancorp has a much smaller presence in investment banking and capital markets. Another reason for the bank's relatively high P/B was its acquisition activity, which has helped it grow its business considerably since the economic downturn.

#### 3.2.1. Determining Book Value

In this section, we illustrate how to calculate book value and how to adjust book value to improve the comparability of P/Bs among companies. To compute book value per share, we

need to refer to the business's balance sheet, which has a shareholders' (or stockholders') equity section. The computation of book value is as follows:

- (Shareholders' equity) – (Total value of equity claims that are senior to common stock) = Common shareholders' equity.
- (Common shareholders' equity)/(Number of common stock shares outstanding) = Book value per share.

Possible claims senior to the claims of common stock, which would be subtracted from shareholders' equity, include the value of preferred stock and the dividends in arrears on preferred stock.<sup>33</sup> Example 19 illustrates the calculation.

### EXAMPLE 19 Computing Book Value per Share

Headquartered in Toronto, Canada, The Toronto-Dominion Bank and its subsidiaries are collectively known as TD Bank Group (TSX: TD and NYSE: TD). With operations organized into four segments (Canadian Personal and Commercial Banking, US Personal and Commercial Banking, Wholesale Banking, and Wealth and Insurance), in 2012 TD provided financial products and services to approximately 22 million customers. Exhibit 10 presents data from the equity section of TD's consolidated balance sheets for the years 2010–2012.

EXHIBIT 10 Equity Data for TD Bank Group (millions of Canadian dollars)

	31 October 2012	31 October 2011	1 November 2010
<b>Equity</b>			
Common shares	CAD18,691	CAD17,491	CAD15,804
Millions of shares issued and outstanding:			
2012: 918.2			
2011: 902.4			
2010: 879.7			
Preferred shares	3,395	3,395	3,395
Millions of shares issued and outstanding:			
2012: 135.8			
2011: 135.8			
2010: 135.8			

<sup>33</sup> Some preferred stock issues have the right to premiums (liquidation premiums) if they are liquidated. If present, these premiums should also be deducted.

## EXHIBIT 10 (Continued)

	31 October 2012	31 October 2011	1 November 2010
Treasury shares-common	(166)	(116)	(91)
Millions of shares held:			
2012: 2.1			
2011: 1.4			
2010: 1.2			
Treasury shares-preferred	(1)	—	(1)
2012: nil			
2011: nil			
2010: nil			
Contributed surplus	196	212	235
Retained earnings	21,763	18,213	14,781
Accumulated and other comprehensive income	3,645	3,326	4,256
	<u>47,523</u>	<u>42,521</u>	<u>38,379</u>
Non-controlling interests in subsidiaries	1,477	1,483	1,493
Total equity	<b>CAD49,000</b>	<b>CAD44,004</b>	<b>CAD39,872</b>

Source: TD Bank Group 2012 annual report.

- Using the data in Exhibit 10, calculate book value per share for 2010, 2011, and 2012.
- Given a closing price of CAD81.23 on 31 October 2012, calculate TD's 2012 P/B ratio.

*Solution to 1:* Because preferred shareholders have a claim on income and assets that is senior to that of the common shareholders, total equity must be adjusted by the value of outstanding and repurchased preferred shares. The divisor is the number of common shares outstanding.

$$2012: \text{Book value per share} = (49,000 - 3,395 + 1) / 918.2 = \text{CAD}49.67$$

$$2011: \text{Book value per share} = (44,004 - 3,395) / 902.4 = \text{CAD}45.00$$

$$2010: \text{Book value per share} = (39,872 - 3,395 + 1) / 879.7 = \text{CAD}41.46.$$

*Solution to 2:*

$$\text{P/B} = \text{CAD}81.23 / \text{CAD}49.67 = 1.64$$

Example 19 illustrated the calculation of book value per share without any adjustments. Adjusting P/B has two purposes: 1) to make the book value per share more accurately reflect the value of shareholders' investment and 2) to make P/B more useful for making comparisons among different stocks. Some adjustments are as follows:

- Some services and analysts report a **tangible book value per share**. Computing tangible book value per share involves subtracting reported intangible assets on the balance sheet from common shareholders' equity. The analyst should be familiar with the calculation. From the viewpoint of financial theory, however, the general exclusion of all intangibles may not be warranted. In the case of individual intangible assets, such as patents, which can be separated from the entity and sold, exclusion may not be justified. Exclusion may be appropriate, however, for goodwill from acquisitions, particularly for comparative purposes. **Goodwill** represents the excess of the purchase price of an acquisition beyond the fair value of acquired tangible assets and specifically identifiable intangible assets. Many analysts believe that goodwill does not represent an asset because it is not separable and may reflect overpayment for an acquisition.
- Certain adjustments may be appropriate for enhancing comparability. For example, one company may use FIFO whereas a peer company uses LIFO, which in an inflationary environment will generally understate inventory values. To accurately assess the relative valuation of the two companies, the analyst should restate the book value of the company using LIFO to what it would be based on FIFO. For a more complete discussion of adjustments to balance sheet amounts, refer to readings on financial statement analysis.
- For book value per share to most accurately reflect current values, the balance sheet should be adjusted for significant off-balance sheet assets and liabilities. An example of an off-balance sheet liability is a guarantee to pay a debt of another company in the event of that company's default. US accounting standards require companies to disclose off-balance sheet liabilities.

Example 20 illustrates adjustments an analyst might make to a financial firm's P/B to obtain an accurate firm value.

#### EXAMPLE 20 Adjusting Book Value

Edward Stavos is a junior analyst at a major US pension fund. Stavos is researching Barclays PLC (LSE: BARC and NYSE: BCS) for his fund's Credit Services Portfolio and is preparing background information prior to an upcoming meeting with the company. Headquartered in London, United Kingdom, Barclays is a major global financial services provider engaged in personal banking, credit cards, corporate and investment banking, and wealth and investment management with an extensive international presence in Europe, the Americas, Africa, and Asia.

Stavos is particularly interested in Barclays' P/B and how adjusting asset and liability accounts to their current fair value impacts the ratio. He gathers the condensed 2012 balance sheet (as of 31 December) and footnote data from Barclay's website as shown in Exhibit 11.

EXHIBIT 11 Barclays PLC 2012 Condensed Consolidated Balance Sheet and Footnote Data (£ in millions)

	2012
<b>Assets</b>	
Cash and balances at central banks	£86,175
Items in the course of collection from other banks	1,456
Trading portfolio assets	145,030
Financial assets designated at fair value	46,061
Derivative financial instruments	469,146
Available for sale investments	75,109
Loans and advances to banks	40,489
Loans and advances to customers	425,729
Reverse repurchase agreements and other similar secured lending	176,956
Prepayments, accrued income, and other assets	4,360
Investments in associates and joint ventures	570
Property, plant, and equipment	5,754
Goodwill and intangible assets	7,915
Current tax assets	252
Deferred tax assets	3,016
Retirement benefit assets	2,303
<b>Total assets</b>	<u>£1,490,321</u>
<b>Liabilities</b>	
Deposits from banks	77,010
Items in the course of collection due to other banks	1,573
Customer accounts	385,707
Repurchase agreements and other similar secured borrowing	217,342
Trading portfolio liabilities	44,794
Financial liabilities designated at fair value	78,280
Derivative financial instruments	462,468
Debt securities in issue	119,581
Subordinated liabilities	24,018
Accruals, deferred income and other liabilities	12,232
Provisions	2,766
Current tax liabilities	621
Deferred tax liabilities	719
Retirement benefit liabilities	253
<b>Total liabilities</b>	<u>1,427,364</u>
<b>Shareholders' equity</b>	
Shareholders' equity excluding non-controlling interests	53,586
Non-controlling interests	9,371
<b>Total shareholders' equity</b>	<u>62,957</u>
<b>Total liabilities and shareholders' equity</b>	<u>£1,490,321</u>

Excerpt from Footnotes to the Barclays Financial Statements  
Financial Assets and Liabilities at Carrying Amount and Fair Value

	2012	
	Carrying Amount	Fair Value
<b>Financial assets</b>		
Loans and advances to banks	£40,489	£40,489
Loans and advances to customers:		
– Home loans	174,988	164,608
– Credit cards, unsecured and other retail lending	66,414	65,357
– Corporate loans	184,327	178,492
Reverse repurchase agreements and other similar secured lending	176,956	176,895
	£643,174	£625,841
<b>Financial liabilities</b>		
Deposits from banks	77,010	77,023
Customer accounts:		
– Current and demand accounts	127,819	127,819
– Savings accounts	99,875	99,875
– Other time deposits	158,013	158,008
Debt securities in issue	119,581	119,725
Repurchase agreements and other similar secured borrowing	217,342	217,342
Subordinated liabilities	24,018	23,467
	£823,658	£823,259

Source: Barclays' 2012 annual report.

The 31 December 2012 share price for Barclays was £2.4239, and the diluted weighted average number of shares was 12,614 million. Stavos computes book value per share initially by dividing total shareholders' equity by the share count and arrives at a book value per share of £4.9910 ( $£62,957/12,614$ ) and a P/B of 0.49 ( $£2.4239/£4.9910$ ).

Stavos then computes tangible book value per share as £4.3636 (calculated as  $£62,957$  minus  $£7,915$  of goodwill and intangible assets, which is then divided by 12,614 shares). The P/B ratio based on tangible book value per share is 0.56 ( $£2.4239/£4.3636$ ).

Stavos then turns to the footnotes to examine the fair value data. He notes the fair value of financial assets is £17,333 million less than their carrying amount ( $£643,174 - £625,841$ ) and the fair value of financial liabilities is £399 million less than their carrying amount ( $£823,658 - £823,259$ ). Including these adjustments to tangible book value results in an adjusted book value per share of £3.0211 [ $(£62,957 - £7,915 - £17,333 + £399)/12,614$ ]. Stavos' adjusted P/B ratio is 0.80 ( $£2.4239/£3.0211$ ).

Stavos is concerned about the wide range in his computed P/B ratios. He knows that if quoted prices are not available for financial assets and liabilities, IAS 39 allows for the use of valuation models to estimate fair value. He decides to question management regarding their use of models to value assets, liabilities, and derivatives and the sensitivity of these accounts to changes in interest rates and currency values.

An analyst should also be aware of differences in accounting standards related to how assets and liabilities are valued in financial statements. Accounting standards currently require companies to report some assets and liabilities at fair value<sup>34</sup> and others at historical cost (with some adjustments).

Financial assets, such as investments in marketable securities, are usually reported at fair value. Investments classified as “held to maturity” and reported on a historical cost basis are an exception. (Instead of the term “held-to-maturity,” IFRS refers to this category of investments as financial assets measured at amortised cost.) Some financial liabilities also are reported at fair value.

Nonfinancial assets, such as land and equipment, are generally reported at their historical acquisition costs, and in the case of equipment, the assets are depreciated over their useful lives. The value of these assets may have increased over time, however, or the value may have decreased more than is reflected in the accumulated depreciation. When the reported amount of an asset—that is, its carrying value—exceeds its recoverable amount, both international accounting (IFRS) and US accounting standards (GAAP) require companies to reduce the reported amount of the asset and show the reduction as an impairment loss.<sup>35</sup> US GAAP, however, prohibit subsequent reversal of impairment losses, whereas IFRS permit subsequent reversals. In addition, as mentioned above, IFRS allow companies to measure fixed assets using either the historical cost model or a revaluation model, under which the assets are reported at their current value. When assets are reported at fair value, P/Bs become more comparable among companies; for this reason, P/Bs are considered to be more comparable for companies with significant amounts of financial assets.

### 3.2.2. Valuation Based on Forecasted Fundamentals

We can use forecasts of a company’s fundamentals to estimate a stock’s justified P/B. For example, assuming the Gordon growth model and using the expression  $g = b \times \text{ROE}$  for the sustainable growth rate, the expression for the justified P/B based on the most recent book value ( $B_0$ ) is<sup>36</sup>

$$\frac{P_0}{B_0} = \frac{\text{ROE} - g}{r - g} \quad (4)$$

<sup>34</sup>**Fair value** is defined as “the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date.” The definition is identical in IFRS and US GAAP.

<sup>35</sup>The two sets of standards differ in the measurement of impairment losses.

<sup>36</sup>According to the Gordon growth model,  $V_0 = E_1 \times (1 - b)/(r - g)$ . Defining ROE as  $E_1/B_0$  so  $E_1 = B_0 \times \text{ROE}$  and substituting for  $E_1$  into the prior expression, we have  $V_0 = B_0 \times \text{ROE} \times (1 - b)/(r - g)$ , giving  $V_0/B_0 = \text{ROE} \times (1 - b)/(r - g)$ . The sustainable growth rate expression is  $g = b \times \text{ROE}$ . Substituting  $b = g/\text{ROE}$  into the expression just given for  $V_0/B_0$ , we have  $V_0/B_0 = (\text{ROE} - g)/(r - g)$ . Because justified price is intrinsic value,  $V_0$ , we obtain Equation 4.

For example, if a business's ROE is 12 percent, its required rate of return is 10 percent, and its expected growth rate is 7 percent, then its justified P/B based on fundamentals is  $(0.12 - 0.07)/(0.10 - 0.07) = 1.67$ .

Equation 4 states that the justified P/B is an increasing function of ROE, all else being equal. Because the numerator and denominator are differences of, respectively, ROE and  $r$  from the same quantity,  $g$ , what determines the justified P/B in Equation 4 is ROE in relation to the required rate of return  $r$ . The larger ROE is in relation to  $r$ , the higher is the justified P/B based on fundamentals.<sup>37</sup>

A practical insight from Equation 4 is that we cannot conclude whether a particular value of the P/B reflects undervaluation without taking into account the business's profitability. Equation 4 also suggests that if we are evaluating two stocks with the same P/B, the one with the higher ROE is relatively undervalued, all else equal. These relationships have been confirmed through cross-sectional regression analyses.<sup>38</sup>

Further insight into P/B comes from the residual income model, which is discussed in detail in another reading. The expression for the justified P/B based on the residual income valuation is<sup>39</sup>

$$\frac{P_0}{B_0} = 1 + \frac{\text{Present value of expected future residual earnings}}{B_0} \quad (5)$$

Equation 5, which makes no special assumptions about growth, states the following:

- If the present value of expected future residual earnings is zero—for example, if the business just earns its required return on investment in every period—the justified P/B is 1.
- If the present value of expected future residual earnings is positive (negative), the justified P/B is greater than (less than) 1.

### 3.2.3. Valuation Based on Comparables

To use the method of comparables for valuing stocks using a P/B, we follow the steps given in Section 3.1.5. In contrast to EPS, however, analysts' forecasts of book value are not aggregated and widely disseminated by financial data vendors; in practice, most analysts use trailing book

<sup>37</sup>This relationship can be seen clearly if we set  $g$  equal to 0 (the no-growth case):  $P_0/B_0 = \text{ROE}/r$ .

<sup>38</sup>Harris and Marston (1994) performed a regression of book value to market value (MV), which is the inverse of P/B, against variables for growth (mean analyst forecasts) and risk (beta) for a large sample of companies over the period July 1982 through December 1989. The estimated regression was  $B/P = 1.172 - 4.15 \times \text{Growth} + 0.093 \times \text{Risk}$  (with  $R^2 = 22.9\%$ ). The coefficient of  $-4.15$  indicates that expected growth was negatively related to B/P and, as a consequence, positively related to P/B. Risk was positively related to B/P and thus negatively related to P/B. Both variables were statistically significant, with growth having the greatest impact. Fairfield (1994) also found that P/Bs are related to future expectations of ROE in the predicted fashion.

<sup>39</sup>Noting that  $(\text{ROE} - r) \times B_0$  would define a level residual income stream, we can show that Equation 4 is consistent with Equation 5 (a general expression) as follows. In  $P_0/B_0 = (\text{ROE} - g)/(r - g)$ , we can successively rewrite the numerator  $(\text{ROE} - g) + r - r = (r - g) + (\text{ROE} - r)$ , so  $P_0/B_0 = [(r - g) + (\text{ROE} - r)]/(r - g) = 1 + (\text{ROE} - r)/(r - g)$ , which can be written  $P_0/B_0 = 1 + [(\text{ROE} - r)/(r - g)] \times B_0/B_0 = 1 + [(\text{ROE} - r) \times B_0/(r - g)]/B_0$ ; the second term in the final expression is the present value of residual income divided by  $B_0$  as in Equation 5.



value in calculating P/Bs.<sup>40</sup> Evaluation of relative P/Bs should consider differences in ROE, risk, and expected earnings growth. The use of P/Bs in the method of comparables is illustrated in Example 21.

### EXAMPLE 21 P/B Comparables Approach

You are working on a project to value an independent securities brokerage firm. You know the industry had a significant decline in valuations during the 2007–2009 financial crisis. You decide to perform a time series analysis on three firms: E\*TRADE Financial Corp. (NASDAQ: ETFC), The Charles Schwab Corporation (NASDAQ: SCHW), and TD Ameritrade Holding Corp. (NYSE: AMTD). Exhibit 12 presents information on these firms.

EXHIBIT 12 Price-to-Book Comparables

Entity	Price-to Book Value Ratio								Mean
	2006	2007	2008	2009	2010	2011	2012	As of 19 July 2013	
ETFC	2.37	2.38	0.68	0.88	0.84	0.74	0.54	0.65	1.14
	Forecasted growth in book value: 1.5%								
	Forecasted growth in revenues: -1.0%								
	Beta: 1.65								
SCHW	4.23	6.69	6.14	3.54	3.15	2.50	1.96	2.31	3.81
	Forecasted growth in book value: 10.5%								
	Forecasted growth in revenues: 5.0%								
	Beta: 1.20								
AMTD	6.96	4.85	3.33	2.60	2.68	2.44	2.20	2.53	3.45
	Forecasted growth in book value: 9.0%								
	Forecasted growth in revenues: 3.5%								
	Beta: 1.10								

Source: *The Value Line Investment Survey*. Price-to-book value ratio is based on average of the annual high and low price and end-of-year book value.

Based only on the information in Exhibit 12, discuss the relative valuation of ETFC relative to the other two companies.

**Solution:** ETFC is currently selling at a P/B that is less than 30 percent of the P/B for either SCHW and AMTD. It is also selling at a P/B that is less than 60 percent of its

<sup>40</sup>Because equity in successive balance sheets is linked by net income from the income statement, however, the analyst could, given dividend forecasts, translate EPS forecasts into corresponding book value forecasts while taking account of any anticipated ownership transactions.

average P/B for the time period noted in the exhibit. The likely explanation for ETFC's low P/B is that its growth forecasts for book value and revenues are lower and its beta higher than for those for SCH and AMTD. In deciding whether ETFC is overvalued or undervalued, an analyst would likely decide how his or her growth forecast and the uncertainty surrounding that forecast compare to the market consensus.

### 3.3. Price to Sales

Certain types of privately held companies, including investment management companies and many types of companies in partnership form, have long been valued by a multiple of annual revenues. In recent decades, the ratio of price to sales has become well known as a valuation indicator for the equity of publicly traded companies as well. Based on US data, O'Shaughnessy (2005) characterized P/S as the best ratio for selecting undervalued stocks.

According to the 2012 BofA *Merrill Lynch Institutional Factor Survey*, about 30 percent of respondents consistently used P/S in their investment process. Analysts have offered the following rationales for using P/S:

- Sales are generally less subject to distortion or manipulation than are other fundamentals, such as EPS or book value. For example, through discretionary accounting decisions about expenses, company managers can distort EPS as a reflection of economic performance. In contrast, total sales, as the top line in the income statement, is prior to any expenses.
- Sales are positive even when EPS is negative. Therefore, analysts can use P/S when EPS is negative, whereas the P/E based on a zero or negative EPS is not meaningful.
- Because sales are generally more stable than EPS, which reflects operating and financial leverage, P/S is generally more stable than P/E. P/S may be more meaningful than P/E when EPS is abnormally high or low.
- P/S has been viewed as appropriate for valuing the stocks of mature, cyclical, and zero-income companies (Martin 1998).
- Differences in P/S multiples may be related to differences in long-run average returns, according to empirical research.<sup>41</sup>

Possible drawbacks of using P/S in practice include the following:

- A business may show high growth in sales even when it is not operating profitably as judged by earnings and cash flow from operations. To have value as a going concern, a business must ultimately generate earnings and cash.
- Share price reflects the effect of debt financing on profitability and risk. In the P/S multiple, however, price is compared with sales, which is a prefinancing income measure—a logical mismatch. For this reason, some experts use a ratio of enterprise value to sales because enterprise value incorporates the value of debt.
- P/S does not reflect differences in cost structures among different companies.
- Although P/S is relatively robust with respect to manipulation, revenue recognition practices have the potential to distort P/S.

<sup>41</sup>Nathan, Sivakumar, and Vijayakumar (2001); O'Shaughnessy (2005); Senchack and Martin (1987).

Despite the contrasts between P/S to P/E, the ratios have a relationship with which analysts should be familiar. The fact that  $(\text{Sales}) \times (\text{Net profit margin}) = \text{Net income}$  means that  $(\text{P/E}) \times (\text{Net profit margin}) = \text{P/S}$ . For two stocks with the same positive P/E, the stock with the higher P/S has a higher (actual or forecasted) net profit margin, calculated as the ratio of P/S to P/E.

### 3.3.1. Determining Sales

P/S is calculated as price per share divided by annual net sales per share (net sales is total sales minus returns and customer discounts). Analysts usually use annual sales from the company's most recent fiscal year in the calculation, as illustrated in Example 22. Because valuation is forward looking in principle, the analyst may also develop and use P/S multiples based on forecasts of next year's sales.

#### EXAMPLE 22 Calculating P/S

Stora Enso Oyj (Helsinki Stock Exchange: STERV) is an integrated paper, packaging, and forest products company headquartered in Finland. In its fiscal year ended 31 December 2012, Stora Enso reported net sales of €10,814.8 million and had 788.6 million shares outstanding. Calculate the P/S for Stora Enso based on a closing price of €6.72 on 16 September 2013.

*Solution:* Sales per share = €10,814.8 million/788.6 million shares = €13.71. So, P/S = €6.72/€13.71 = 0.490.

Although the determination of sales is more straightforward than the determination of earnings, the analyst should evaluate a company's revenue-recognition practices—in particular those tending to speed up the recognition of revenues—before relying on the P/S multiple. An analyst using a P/S approach who does not also assess the quality of accounting for sales may place too high a value on the company's shares. Example 23 illustrates the problem.

#### EXAMPLE 23 Revenue Recognition Practices (1)

Analysts label stock markets “bubbles” when market prices appear to lose contact with intrinsic values. To many analysts, the run-up in the prices of internet stocks in the US market in the 1998–2000 period represented a bubble. During that period, many analysts adopted P/S as a metric for valuing the many internet stocks that had negative earnings and cash flow. Perhaps at least partly as a result of this practice, some internet companies engaged in questionable revenue-recognition practices to justify their high valuations. To increase sales, some companies engaged in bartering website advertising with other internet companies. For example, InternetRevenue.com might barter \$1,000,000 worth of banner advertising with RevenueIsUs.com. Each could then show \$1,000,000 of revenue and \$1,000,000 of expenses. Although neither had any

net income or cash flow, each company's revenue growth and market valuation was enhanced (at least temporarily). In addition, the value placed on the advertising was frequently questionable.

As a result of these and other questionable activities, the US SEC issued a stern warning to companies and formalized revenue recognition practices for barter in Staff Accounting Bulletin No. 101. Similarly, international accounting standard setters issued Standing Interpretations Committee Interpretation 31 to define revenue recognition principles for barter transactions involving advertising services. The analyst should review footnote disclosures to assess whether a company may be recognizing revenue prematurely or otherwise aggressively.

Example 24 illustrates another classic instance in which an analyst should look behind the accounting numbers.

#### EXAMPLE 24 Revenue Recognition Practices (2)

Sales on a **bill-and-hold basis** involve selling products but not delivering those products until a later date.<sup>42</sup> Sales on this basis have the effect of accelerating the recognition of those sales into an earlier reporting period. In its form 10-K filed 30 September 2008, Diebold (NYSE: DBD) provided the following note:

##### **Revenues**

**Bill and Hold**—The largest of the revenue recognition adjustments relates to the Company's previous long-standing method of accounting for bill and hold transactions under Staff Accounting Bulletin 104, Revenue Recognition in Financial Statements (SAB 104), in its North America and International businesses. On January 15, 2008, the Company announced that it had concluded its discussions with the OCA in regard to its practice of recognizing certain revenue on a bill and hold basis in its North America business segment. As a result of those discussions, the Company determined that its previous, long-standing method of accounting for bill and hold transactions was in error, representing a misapplication of GAAP. To correct for this error, the Company announced it would discontinue the use of bill and hold as a method of revenue recognition in its North America and International businesses and restate its financial statements for this change.

The Company completed an analysis of transactions and recorded adjusting journal entries related to revenue and costs recognized previously under a bill and hold basis that is now recognized upon customer acceptance of products at a

<sup>42</sup>For companies whose reports must conform to US SEC accounting regulations, revenue from bill-and-hold sales cannot be reported unless the risk of loss on the products transfers to the buyer and additional criteria are met. (SEC Staff Accounting Bulletin No. 101 specifies the criteria.)

customer location. Within the North America business segment, when the Company is contractually responsible for installation, customer acceptance will be upon completion of the installation of all of the items at a job site and the Company's demonstration that the items are in operable condition. Where items are contractually only delivered to a customer, revenue recognition of these items will continue upon shipment or delivery to a customer location depending on the terms in the contract. Within the International business segment, customer acceptance is upon either delivery or completion of the installation depending on the terms in the contract with the customer. The Company restated for transactions affecting both product revenue for hardware sales and service revenue for installation and other services that had been previously recognized on a bill and hold basis.

**Other Revenue Adjustments**—The Company also adjusted for other specific revenue transactions in both its North America and International businesses related to transactions largely where the Company recognized revenue in incorrect periods. The majority of these adjustments were related to misapplication of GAAP related to revenue recognition requirements as defined within SAB 104. Generally, the Company recorded adjustments for transactions when the Company previously recognized revenue prior to title and/or risk of loss transferring to the customer.

In 2010, DBD agreed to pay \$25 million to settle Securities and Exchange Commission charges that it manipulated its earnings from at least 2002 through 2007. During that period, the company misstated the company's reported pre-tax earnings by at least \$127 million.

According to the SEC, DBD's financial management received reports, sometimes on a daily basis, comparing the company's actual earnings to analyst earnings forecasts. DBD's management would prepare "opportunity lists" of ways to close the gap between the company's actual financial results and analyst forecasts. Many of the methods were fraudulent accounting transactions designed to improperly recognize revenue or otherwise inflate DBD's financial performance. Among the fraudulent practices identified by the SEC were the following: improper use of bill and hold accounting; recognition of revenue on a lease agreement subject to a side buy-back agreement; manipulating reserves and accruals; improperly delaying and capitalizing expenses; and writing up the value of used inventory.

Example 25 briefly summarizes another example of aggressive revenue recognition practices.

#### **EXAMPLE 25** Revenue Recognition Practices (3)

Groupon (NASDAQ GS: GRPN) is a deal-of-the-day website that features discounted gift certificates usable at local or national companies. Before going public in November 2011, GRPN amended its registration statement eight times. One SEC-mandated restatement forced it to change an auditor-sanctioned method of reporting revenue, reducing sales by more than 50 percent. Essentially, GRPN had initially counted the

gross amount its members paid for coupons or certificates as revenue, without deducting the share (typically half or more) that it sends on to local merchants. The SEC also demanded GRPN remove from its offering document a non-GAAP metric it had invented called “adjusted consolidated segment operating income.” This measure was considered misleading because it ignored marketing expenses, which are one of the major risks of GRPN’s business model.

Even when a company discloses its revenue-recognition practices, the analyst cannot always determine precisely by how much sales may be overstated. If a company is engaging in questionable revenue-recognition practices and the amount being manipulated is unknown, the analyst might do well to suggest avoiding investment in that company’s securities. At the very least, the analyst should be skeptical and assign the company a higher risk premium than otherwise, which would result in a lower justified P/S.

### 3.3.2. Valuation Based on Forecasted Fundamentals

Like other multiples, P/S can be linked to DCF models. In terms of the Gordon growth model, we can state P/S as<sup>43</sup>

$$\frac{P_0}{S_0} = \frac{(E_0/S_0)(1-b)(1+g)}{r-g} \quad (6)$$

where  $E_0/S_0$  is the business’s profit margin. Although the profit margin is stated in terms of trailing sales and earnings, the analyst may use a long-term forecasted profit margin in Equation 6. Equation 6 states that the justified P/S is an increasing function of the profit margin and earnings growth rate, and the intuition behind Equation 6 generalizes to more-complex DCF models.

Profit margin is a determinant of the justified P/S not only directly but also through its effect on  $g$ . We can illustrate this concept by restating the equation for the sustainable growth rate [ $g = (\text{Retention rate}, b) \times \text{ROE}$ ], as follows:

$$g = b \times \text{PM}_0 \times \frac{\text{Sales}}{\text{Total assets}} \times \frac{\text{Total assets}}{\text{Shareholders' equity}}$$

where  $\text{PM}_0$  is profit margin and the last three terms come from the DuPont analysis of ROE. An increase (decrease) in the profit margin produces a higher (lower) sustainable growth rate as long as sales do not decrease (increase) proportionately.<sup>44</sup> Example 26 illustrates the use of justified P/S and how to apply it in valuation.

<sup>43</sup>The Gordon growth model is  $P_0 = D_0(1+g)/(r-g)$ . Substituting  $D_0 = E_0(1-b)$  into the previous equation produces  $P_0 = E_0(1-b)(1+g)/(r-g)$ . Dividing both sides by  $S_0$  gives  $P_0/S_0 = (E_0/S_0)(1-b)(1+g)/(r-g)$ .

<sup>44</sup>That is, an increase (decrease) in the profit margin could be offset by a decrease (increase) in total asset turnover (sales/assets).

### EXAMPLE 26 Justified P/S Based on Forecasted Fundamentals

As a health care analyst, you are valuing the stocks of three medical equipment manufacturers, including the Swedish company Getinge AB (Stockholm: GETI) in March 2013. Based on an average of estimates obtained from capital asset pricing model (CAPM) and bond yield plus risk premium approaches, you estimate that GETI's required rate of return is 9 percent. You have gathered the following data from GETI's 2012 annual report (amounts in millions of Swedish krona, or SEK):

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Net sales	9,160	10,889	11,880	13,001	16,445	19,272	22,816	22,712	21,854	24,248
Growth rates (geometric)										
2003–2012	11.4%									
2008–2012	5.9%									
Year/Year		18.9%	9.1%	9.4%	26.5%	17.2%	18.4%	-0.5%	-3.8%	11.0%
Net profit	778	915	1,150	1,259	1,233	1,523	1,914	2,280	2,537	2,531
Growth rates										
2003–2012	14.0%									
2008–2012	13.5%									
Year/Year		17.6%	25.7%	9.5%	-2.1%	23.5%	25.7%	19.1%	11.3%	-0.2%
Net profit margin	8.5%	8.4%	9.7%	9.7%	7.5%	7.9%	8.4%	10.0%	11.6%	10.4%
Averages										
2003–2012	9.2%									
2008–2012	9.7%									
Dividend payout ratio	35.1%	36.4%	35.4%	35.4%	39.3%	33.2%	34.3%	34.0%	35.3%	39.2%
Averages										
2003–2012	35.8%									
2008–2012	35.2%									

Although sales growth picked up in 2012, it has slowed considerably in recent years and you are concerned that trend will ultimately be reflected in profit margins. Given this consideration, you make the following long-term forecasts:

Profit margin = 9.0 percent  
 Dividend payout ratio = 35.0 percent  
 Earnings growth rate = 7.0 percent

1. Based on these data, calculate GETI's justified P/S.
2. Given a forecast of GETI's sales per share (in Swedish krona) for 2013 of SEK108.9, estimate the intrinsic value of GETI stock.

3. Given a market price for GETI of SEK196.2 on 31 March 2013 and your answer to Part 2, determine whether GETI stock appears to be fairly valued, overvalued, or undervalued.

*Solution to 1:* From Equation 6, GETI's justified P/S is calculated as follows:

$$\frac{P_0}{S_0} = \frac{(E_0/S_0)(1-b)(1+g)}{r-g} = \frac{0.09 \times 0.35 \times (1+0.07)}{0.09-0.07} = 1.7$$

*Solution to 2:* An estimate of the intrinsic value of GETI stock is  $1.7 \times \text{SEK}108.9 = \text{SEK}185.13$ .

*Solution to 3:* GETI stock appears to be overvalued because its current market value of SEK196.20 is greater than its estimated intrinsic value of SEK185.13.

### 3.3.3. Valuation Based on Comparables

Using P/S in the method of comparables to value stocks follows the steps given in Section 3.1.5. As mentioned earlier, P/S ratios are usually reported on the basis of trailing sales. Analysts may also base relative valuations on P/S multiples calculated on forecasted sales. In doing so, analysts may make their own sales forecasts or may use forecasts supplied by data vendors.<sup>45</sup> In valuing stocks using the method of comparables, analysts should also gather information on profit margins, expected earnings growth, and risk. As always, the quality of accounting also merits investigation. Example 27 illustrates the use of P/S in the comparables approach.

#### EXAMPLE 27 P/S Comparables Approach

Continuing with the project to value Geringe AB, you have compiled the information on GETI and peer companies Smith & Nephew plc (London: SN) and CR Bard Inc. (NYSE: BCR) given in Exhibit 13.

EXHIBIT 13 P/S Comparables (as of 4 October 2013)

Measure	GETI	SN	BCR
Price/Sales (ttm)	2.14	2.66	3.07
Profit Margin (ttm)	8.82%	13.21%	6.25%
Quarterly Revenue Growth (yoy)	7.20%	4.40%	2.30%
Total Debt/Equity (mrq)	115.86	9.83	94.97
Enterprise Value/Revenue (ttm)	2.79	2.73	3.28

*Source:* Yahoo Finance.

<sup>45</sup> Although sales forecasts have historically been less readily available than earnings forecasts, several leading vendors of US market data currently provide forecasts of sales as well as such quantities as cash flow per share and dividends per share.



Use the data in Exhibit 13 to address the following:

1. Based on the P/S but referring to no other information, assess GETI's relative valuation.
2. State whether GETI is more closely comparable to SN or to BCR. Justify your answer.

*Solution to 1:* Because the P/S for GETI, 2.14, is the lowest of the three P/S multiples, if no other information is referenced, GETI appears to be relatively undervalued.

*Solution to 2:* On the basis of the information given, GETI appears to be more closely matched to SN than BCR. BCR's P/S is significantly higher than the P/S for GETI and SN. The profit margin and revenue growth are key fundamentals in the P/S approach, and despite BCR's higher P/S, its profit margin and revenue growth rate are both lower than those of GETI and SN. The big difference between GETI and SN is that GETI relies much more on debt as a funding source. Because of this, the enterprise value-to-revenue ratio arguably provides a more appropriate valuation measure than does P/S. We discuss enterprise value ratios later in this reading.

### 3.4. Price to Cash Flow

Price to cash flow is a widely reported valuation indicator. According to the *2012 BofA Merrill Lynch Institutional Factor Survey*, price to free cash flow trailed only P/E, beta, enterprise value/EBITDA, ROE, size, and P/B in popularity as a valuation factor and was used as a valuation metric by approximately half of the institutions surveyed.

In this section, we present price to cash flow based on alternative major cash flow concepts.<sup>46</sup> Because of the wide variety of cash flow concepts in use, the analyst should be especially careful to understand (and communicate) the exact definition of “cash flow” that is the basis for the analysis.

Analysts have offered the following rationales for the use of price to cash flow:

- Cash flow is less subject to manipulation by management than earnings.
- Because cash flow is generally more stable than earnings, price to cash flow is generally more stable than P/E.
- Using price to cash flow rather than P/E addresses the issue of differences in accounting conservatism between companies (differences in the quality of earnings).
- Differences in price to cash flow may be related to differences in long-run average returns, according to empirical research.<sup>47</sup>

<sup>46</sup>“Price to cash flow” is used to refer to the ratio of share price to any one of these definitions of cash flow. P/CF is reserved for the ratio of price to the earnings plus noncash charges definition of cash flow, explained subsequently.

<sup>47</sup>For example, see O'Shaughnessy (2005).

Possible drawbacks to the use of price to cash flow include the following:

- When cash flow from operations is defined as EPS plus noncash charges, items affecting actual cash flow from operations, such as noncash revenue and net changes in working capital, are ignored. So, for example, aggressive recognition of revenue (front-end loading) would not be accurately captured in the earnings-plus-noncash-charges definition because the measure would not reflect the divergence between revenues as reported and actual cash collections related to that revenue.
- Theory views free cash flow to equity (FCFE) rather than cash flow as the appropriate variable for price-based valuation multiples. We can use P/FCFE but FCFE does have the possible drawback of being more volatile than cash flow for many businesses. FCFE is also more frequently negative than cash flow.
- As analysts' use of cash flow has increased over time, some companies have increased their use of accounting methods that enhance cash flow measures. Operating cash flow, for example, can be enhanced by securitizing accounts receivable to speed up a company's operating cash inflow or by outsourcing the payment of accounts payable to slow down the company's operating cash outflow (while the outsource company continues to make timely payments and provides financing to cover any timing differences). Mulford and Comiskey (2005) describe a number of opportunistic accounting choices that companies can make to increase their reported operating cash flow.
- Operating cash flow from the Statement of Cash Flows under IFRS may not be comparable to operating cash flow under US GAAP because IFRS allow more flexibility in classification of interest paid, interest received, and dividends received. Under US GAAP, all three of these items are classified in operating cash flow; but under IFRS, companies have the option to classify them as operating or investing (for interest and dividends received) and as operating or financing (for interest paid).

One approximation of cash flow in practical use is EPS plus per-share depreciation, amortization, and depletion. This simple approximation is used in Example 28 to highlight issues of interest to the analyst in valuation.

#### EXAMPLE 28 Accounting Methods and Cash Flow

Consider two hypothetical companies, Company A and Company B, that have constant cash revenues and cash expenses (as well as a constant number of shares outstanding) in 2010, 2011, and 2012. In addition, both companies incur total depreciation of \$15.00 per share during the three-year period, and both use the same depreciation method for tax purposes. The two companies use different depreciation methods, however, for financial reporting. Company A spreads the depreciation expense evenly over the three years (straight-line depreciation, SLD). Because its revenues, expenses, and depreciation are constant over the period, Company A's EPS is also constant. In this example Company A's EPS is assumed to be \$10 each year, as shown in Column 1 in Exhibit 14.

Company B is identical to Company A except that it uses accelerated depreciation. Company B's depreciation is 150 percent of SLD in 2007 and declines to 50 percent of SLD in 2009, as shown in Column 5.

EXHIBIT 14 Earnings Growth Rates and Cash Flow (All Amounts per Share)

Year	Company A			Company B		
	Earnings (1)	Depreciation (2)	Cash Flow (3)	Earnings (4)	Depreciation (5)	Cash Flow (6)
2010	\$10.00	\$5.00	\$15.00	\$7.50	\$7.50	\$15.00
2011	10.00	5.00	15.00	10.00	5.00	15.00
2012	10.00	5.00	15.00	12.50	2.50	15.00
Total		\$15.00			\$15.00	

Because of the different depreciation methods used by Company A and Company B for financial reporting purposes, Company A's EPS is flat at \$10.00 (Column 1) whereas Company B's EPS (Column 4) shows 29 percent compound growth:  $(\$12.50/\$7.50)^{1/2} - 1.00 = 0.29$ . Thus, Company B appears to have positive earnings momentum. Analysts comparing Companies A and B might be misled by using the EPS numbers as reported instead of putting EPS on a comparable basis. For both companies, however, cash flow per share is level at \$15.

Depreciation may be the simplest noncash charge to understand; write-offs and other noncash charges may offer more latitude for the management of earnings.

### 3.4.1. Determining Cash Flow

In practice, analysts and data vendors often use simple *approximations* of cash flow from operations in calculating cash flow for price to cash flow analysis. For many companies, depreciation and amortization are the major noncash charges regularly added to net income in the process of calculating cash flow from operations by the add-back method, so the approximation focuses on them. A representative approximation specifies cash flow per share as EPS plus per-share depreciation, amortization, and depletion.<sup>48</sup> We call this estimation the “earnings-plus-noncash-charges” definition and in this section, use the acronym CF for it. Keep in mind, however, that this definition is only one commonly used in calculating price to cash flow, not a technically accurate definition from an accounting perspective. We will also describe more technically accurate cash flow concepts: cash flow from operations, free cash flow to equity, and EBITDA (an estimate of pre-interest, pretax operating cash flow).<sup>49</sup>

Most frequently, trailing price to cash flows are reported. A trailing price to cash flow is calculated as the current market price divided by the sum of the most recent four quarters' cash flow per share. A fiscal-year definition is also possible, as in the case of EPS.

<sup>48</sup>This representation is the definition of cash flow in Value Line, for example: “the total of net income plus non-cash charges (depreciation, amortization, and depletion) minus preferred dividends (if any).” (This definition appears in the Value Line online glossary—current as of July 2008.) To obtain cash flow per share, total cash flow is divided by the number of shares outstanding. Note that the term *depreciation* refers to fixed assets, *amortization* refers to intangible assets, and *depletion* refers to natural resources; all three accounting terms mean that an expenditure is systematically allocated over a period of time.

<sup>49</sup>Grant and Parker (2001) point out that EBITDA as a cash flow approximation assumes that changes in working capital accounts are immaterial. The EPS-plus-noncash-charges definition makes the same assumption (it is, essentially, earnings before depreciation and amortization).

Example 29 illustrates the calculation of P/CF with cash flow defined as earnings plus noncash charges.

#### EXAMPLE 29 Calculating Price to Cash Flow with Cash Flow Defined as Earnings plus Noncash Charges

In 2012, Koninklijke Philips Electronics N.V. (Euronext: PHIA and NYSE: PHG) reported net income from continuing operations of €262 million, equal to EPS of €0.28. The company's depreciation and amortization was €1,433 million, or €1.53 per share. An AEX price for PHIA as of 31 July 2013 was €24.06. Calculate the P/CF for PHIA.

*Solution:* CF (defined as EPS plus per-share depreciation, amortization, and depletion) is  $€0.28 + €1.53 = €1.81$  per share. Thus,  $P/CF = €24.06/€1.81 = 13.3$ .

Rather than use an approximate EPS-plus-noncash charges concept of cash flow, analysts can use cash flow from operations (CFO) in a price multiple. CFO is found in the statement of cash flows. Similar to the adjustments to normalize earnings, adjustments to CFO for components not expected to persist into future time periods may also be appropriate. In addition, adjustments to CFO may be required when comparing companies that use different accounting standards. For example, as noted above, under IFRS, companies have flexibility in classifying interest payments, interest receipts, and dividend receipts across operating, investing, and financing. US GAAP requires companies to classify interest payments, interest receipts, and dividend receipts as operating cash flows.

As an alternative to CF and CFO, the analyst can relate price to FCFE, the cash flow concept with the strongest link to valuation theory. Because the amounts of capital expenditures in proportion to CFO generally differ among companies being compared, the analyst may find that rankings by price to cash flow from operations (P/CFO) and by P/CF will differ from rankings by P/FCFE. Period-by-period FCFE may be more volatile than CFO (or CF), however, so a trailing P/FCFE is not necessarily more informative in a valuation. For example, consider two similar businesses with the same CFO and capital expenditures over a two-year period. If the first company times its capital expenditures to fall toward the beginning of the period and the second times its capital expenditures to fall toward the end of the period, the P/FCFEs for the two stocks may differ sharply without representing a meaningful economic difference.<sup>50</sup> This concern can be addressed, at least in part, by using price to average free cash flow, as in Hackel, Livnat, and Rai (1994).

Another cash flow concept used in multiples is EBITDA (earnings before interest, taxes, depreciation, and amortization).<sup>51</sup> To forecast EBITDA, analysts usually start with their projections of EBIT and simply add depreciation and amortization to arrive at an estimate for EBITDA. In calculating EBITDA from historical numbers, one can start with earnings from

<sup>50</sup>The analyst could, however, appropriately use the FCFE discounted cash flow model value, which incorporates all expected future free cash flows to equity.

<sup>51</sup>Another concept that has become popular is cash earnings, which has been defined in various ways, such as earnings plus amortization of intangibles or EBITDA minus net financial expenses.

continuing operations, excluding nonrecurring items. To that earnings number, interest, taxes, depreciation, and amortization are added.

In practice, both EV/EBITDA and P/EBITDA have been used by analysts as valuation metrics. EV/EBITDA has been the preferred metric, however, because its numerator includes the value of debt; therefore, it is the more appropriate method because EBITDA is pre-interest and is thus a flow to both debt and equity. EV/EBITDA is discussed in detail in a later section.

### 3.4.2. Valuation Based on Forecasted Fundamentals

The relationship between the justified price to cash flow and fundamentals follows from the familiar mathematics of the present value model. The justified price to cash flow, all else being equal, is inversely related to the stock's required rate of return and positively related to the growth rate(s) of expected future cash flows (however defined). We can find a justified price to cash flow based on fundamentals by finding the value of a stock using the most suitable DCF model and dividing that number by cash flow (based on our chosen definition of cash flow). Example 30 illustrates the process.

#### EXAMPLE 30 Justified Price to Cash Flow Based on Forecasted Fundamentals

As a technology analyst, you are working on the valuation of Western Digital (NYSE: WDC), a manufacturer of hard disk drives. As a first estimate of value, you are applying a FCFE model under the assumption of a stable long-term growth rate in FCFE:

$$V_0 = \frac{(1+g)\text{FCFE}_0}{r-g}$$

where  $g$  is the expected growth rate of FCFE. You estimate trailing FCFE at \$7.96 per share and trailing CF (based on the earnings plus noncash charges definition) at \$12.00. Your other estimates are a 12.0 percent required rate of return and a 3.0 percent expected growth rate of FCFE.

1. What is the intrinsic value of WDC according to a constant-growth FCFE model?
2. What is the justified P/CF based on forecasted fundamentals?
3. What is the justified P/FCFE based on forecasted fundamentals?

*Solution to 1:* Calculate intrinsic value as  $(1.03 \times \$7.96)/(0.12 - 0.03) = \$91.10$ .

*Solution to 2:* Calculate a justified P/CF based on forecasted fundamentals as  $\$91.10/\$12.00 = 7.6$ .

*Solution to 3:* The justified P/FCFE is  $\$91.10/\$7.96 = 11.4$ .

### 3.4.3. Valuation Based on Comparables

The method of comparables for valuing stocks based on price to cash flow follows the steps given previously and illustrated for P/E, P/B, and P/S. Example 31 is a simple exercise in the comparable method based on price to cash flow measures.

#### EXAMPLE 31 Price to Cash Flow and Comparables

Exhibit 15 provides information on P/CF, P/FCFE, and selected fundamentals as of 16 April 2012 for two hypothetical companies. Using the information in Exhibit 15, compare the valuations of the two companies.

EXHIBIT 15 Comparison of Two Companies (All Amounts per Share)

Company	Current Price (£)	Trailing CF per Share (£)	P/CF	Trailing FCFE per Share (£)	P/FCFE	Consensus Five-Year CF Growth Forecast (%)	Beta
Company A	17.98	1.84	9.8	0.29	62	13.4	1.50
Company B	15.65	1.37	11.4	-.99	NM	10.6	1.50

Company A is selling at a P/CF (9.8) approximately 14 percent smaller than the P/CF of Company B (11.4). Based on that comparison, we expect that, all else equal, investors would anticipate a higher growth rate for Company B. Contrary to that expectation, however, the consensus five-year earnings growth forecast for Company A is 280 basis points higher than it is for Company B. As of the date of the comparison, Company A appears to be relatively undervalued compared with Company B, as judged by P/CF and expected growth. The information in Exhibit 15 on FCFE supports the proposition that Company A may be relatively undervalued. The positive FCFE for Company A indicates that operating cash flows and new debt borrowing are more than sufficient to cover capital expenditures. Negative FCFE for Company B suggests the need for external funding of growth.

### 3.5. Price to Dividends and Dividend Yield

The total return on an equity investment has a capital appreciation component and a dividend yield component. Dividend yield data are frequently reported to provide investors with an estimate of the dividend yield component in total return. Dividend yield is also used as a valuation indicator. Although the 2012 *BofA Merrill Lynch Institutional Factor Survey* did not survey this metric, in its surveys from 1989 to 2006 slightly more than one-quarter of respondents on average reported using dividend yield as a factor in the investment process.

Analysts have offered the following rationales for using dividend yields in valuation:

- Dividend yield is a component of total return.
- Dividends are a less risky component of total return than capital appreciation.

Possible drawbacks of using dividend yields include the following:

- Dividend yield is only one component of total return; not using all information related to expected return is suboptimal.
- Investors may trade off future earnings growth to receive higher current dividends. That is, holding return on equity constant, dividends paid now displace earnings in all future periods (a concept known as the **dividend displacement of earnings**).<sup>52</sup>
- The argument about the relative safety of dividends presupposes that market prices reflect in a biased way differences in the relative risk of the components of return.

### 3.5.1. Calculation of Dividend Yield

This reading so far has presented multiples with market price (or market capitalization) in the numerator. P/Ds have sometimes appeared in valuation, particularly with respect to indices. Many stocks, however, do not pay dividends, and the P/D ratio is undefined with zero in the denominator. For such non-dividend-paying stocks, dividend yield (D/P) is defined: It is equal to zero. For practical purposes, then, dividend yield is the preferred way to present this multiple.

**Trailing dividend yield** is generally calculated by using the dividend rate divided by the current market price per share. The annualized amount of the most recent dividend is known as the **dividend rate**. For companies paying quarterly dividends, the dividend rate is calculated as four times the most recent quarterly per-share dividend. (Some data sources use the dividends in the last four quarters as the dividend rate for purposes of a trailing dividend yield.) For companies that pay semiannual dividends comprising an interim dividend that typically differs in magnitude from the final dividend, the dividend rate is usually calculated as the most recent annual per-share dividend.

The dividend rate indicates the annual amount of dividends per share under the assumption of no increase or decrease over the year. The analyst's forecast of leading dividends could be higher or lower and is the basis of the leading dividend yield. The **leading dividend yield** is calculated as forecasted dividends per share over the next year divided by the current market price per share. Example 32 illustrates the calculation of dividend yield.

#### EXAMPLE 32 Calculating Dividend Yield

Exhibit 16 gives quarterly dividend data for Canadian telecommunications company BCE Inc. (NYSE: BCE) and semiannual dividend data for the ADRs of BT Group (NYSE: BT), formerly British Telecom.

<sup>52</sup>Arnott and Asnes (2003) and Zhou and Ruland (2006), however, show that caution must be exercised in assuming that dividends displace future earnings in practice, because dividend payout may be correlated with future profitability.

EXHIBIT 16 Dividends Paid per Share for BCE Inc. and for BT Group ADRs

Period	BCE (\$)	BT ADR (\$)
4Q:2011	0.508	
1Q:2012	0.518	0.390
2Q:2012	0.543	
3Q:2012	0.543	0.884
Total	<u>2.112</u>	<u>1.274</u>
4Q:2012	0.568	
1Q:2013	0.568	0.451
2Q:2013	0.583	
3Q:2013	0.583	0.994
Total	<u>2.302</u>	<u>1.445</u>

Source: Value Line.

1. Given a price per share for BCE of \$42.70 during 4Q:2013, calculate this company's trailing dividend yield.
2. Given a price per ADR for BT of \$55.30 during 4Q:2013, calculate the trailing dividend yield for the ADRs.

*Solution to 1:* The dividend rate for BCE is  $\$0.583 \times 4 = \$2.332$ . The dividend yield is  $\$2.332/\$42.70 = 0.0546$  or 5.46 percent.

*Solution to 2:* Because BT pays semiannual dividends that differ in magnitude between the interim and final dividends, the dividend rate for BT's ADR is the total dividend in the most recent year, \$1.445. The dividend yield is  $\$1.445/\$55.30 = 0.0261$  or 2.61 percent.

### 3.5.2. Valuation Based on Forecasted Fundamentals

The relationship of dividend yield to fundamentals can be illustrated in the context of the Gordon growth model. From that model, we obtain the expression

$$\frac{D_0}{P_0} = \frac{r - g}{1 + g} \quad (7)$$

Equation 7 shows that dividend yield is negatively related to the expected rate of growth in dividends and positively related to the stock's required rate of return. The first point implies that the selection of stocks with relatively high dividend yields is consistent with an orientation to a value rather than growth investment style.

### 3.5.3. Valuation Based on Comparables

Using dividend yield with comparables is similar to the process that has been illustrated for other multiples. An analyst compares a company with its peers to determine whether it is



attractively priced, considering its dividend yield and risk. The analyst should examine whether differences in expected growth explain the differences in dividend yield. Another consideration used by some investors is the security of the dividend (the probability that it will be reduced or eliminated). A useful metric in assessing the safety of the dividend is the payout ratio: A high payout relative to other companies operating in the same industry may indicate a less secure dividend because the dividend is less well covered by earnings. Balance sheet metrics are equally important in assessing the safety of the dividend, and relevant ratios to consider include the interest coverage ratio and the ratio of net debt to EBITDA. Example 33 illustrates use of the dividend yield in the method of comparables.

### EXAMPLE 33 Dividend Yield Comparables

William Leiderman is a portfolio manager for a US pension fund's domestic equity portfolio. The portfolio is exempt from taxes, so any differences in the taxation of dividends and capital gains are not relevant. Leiderman's client requires high current income. Leiderman is considering the purchase of utility stocks for the fund in November 2013. In the course of his review he considers the four large-cap US electric utilities shown in Exhibit 17.

#### EXHIBIT 17 Using Dividend Yield to Compare Stocks

Company	Consensus Earnings Growth Forecast (%)	Beta	Dividend Yield (%)	Payout Ratio (%)
Duke Energy (NYSE:DUK)	3.66	0.34	4.4	110
Pepco Holdings (NYSE: POM)	3.82	0.37	5.6	NMF
Portland General Electric Co. (NYSE:POR)	6.45	0.55	3.7	88
PPL Corp. (NYSE:PPL)	-2.40	0.26	4.8	58

Sources: [www.finviz.com](http://www.finviz.com) and Yahoo! Finance.

All of the securities exhibit similar low market risk; they each have a beta less than 1.00. Although POM has the highest dividend yield, its dividend payout ratio is not meaningful due to a negative EPS. DUK's dividend payout ratio of 110 percent, the highest of the group, also suggests that its dividend may be subject to greater risk. Leiderman notes that PPL's relatively low payout ratio means that the dividend is well supported; however, the expected negative earnings growth rate is a negative factor. Summing POR's dividend yield and expected earnings growth rate, Leiderman estimates POR's expected total return as about 10.2 percent; because the total return estimate is relatively attractive and because POR does not appear to have any strong negatives, Leiderman decides to focus his further analysis on POR.

## 4. ENTERPRISE VALUE MULTIPLES

**Enterprise value multiples** are multiples that relate the enterprise value of a company to some measure of value (typically, a pre-interest income measure). Perhaps the most frequently advanced argument for using enterprise value multiples rather than price multiples in valuation is that enterprise value multiples are relatively less sensitive to the effects of financial leverage than price multiples when one is comparing companies that use differing amounts of leverage. Enterprise value multiples, in defining the numerator as they do, take a control perspective (discussed in more detail later). Thus, even where leverage differences are not an issue, enterprise value multiples may complement the perspective of price multiples. Indeed, although some analysts strictly favor one type of multiple, other analysts report both price and enterprise value multiples.

### 4.1. Enterprise Value to EBITDA

Enterprise value to EBITDA is by far the most widely used enterprise value multiple.

Earlier, EBITDA was introduced as an estimate of pre-interest, pretax operating cash flow. Because EBITDA is a flow to both debt and equity, as noted, defining an EBITDA multiple by using a measure of total company value in the numerator, such as EV, is appropriate. Recall that **enterprise value** is total company value (the market value of debt, common equity, and preferred equity) minus the value of cash and short-term investments. Thus, EV/EBITDA is a valuation indicator for the overall company rather than solely its common stock. If, however, the analyst can assume that the business's debt and preferred stock (if any) are efficiently priced, the analyst can use EV/EBITDA to draw an inference about the valuation of common equity. Such an inference is often reasonable.

Analysts have offered the following rationales for using EV/EBITDA:

- EV/EBITDA is usually more appropriate than P/E alone for comparing companies with different financial leverage (debt), because EBITDA is a pre-interest earnings figure, in contrast to EPS, which is postinterest.
- By adding back depreciation and amortization, EBITDA controls for differences in depreciation and amortization among businesses, in contrast to net income, which is postdepreciation and postamortization. For this reason, EV/EBITDA is frequently used in the valuation of capital-intensive businesses (for example, cable companies and steel companies). Such businesses typically have substantial depreciation and amortization expenses.
- EBITDA is frequently positive when EPS is negative.

Possible drawbacks to using EV/EBITDA include the following:<sup>53</sup>

- EBITDA will overestimate cash flow from operations if working capital is growing. EBITDA also ignores the effects of differences in revenue recognition policy on cash flow from operations.
- Free cash flow to the firm (FCFF), which directly reflects the amount of the company's required capital expenditures, has a stronger link to valuation theory than does EBITDA. Only if depreciation expenses match capital expenditures do we expect EBITDA to reflect differences in businesses' capital programs. This qualification to EBITDA comparisons may be particularly meaningful for the capital-intensive businesses to which EV/EBITDA is often applied.

<sup>53</sup>See Moody's (2000) and Grant and Parker (2001) for additional issues and concerns.

## 4.1.1. Determining Enterprise Value

We illustrated the calculation of EBITDA previously. As discussed, analysts commonly define enterprise value as follows:

Market value of common equity (Number of shares outstanding  $\times$  Price per share)

**Plus:** Market value of preferred stock (if any)<sup>54</sup>

**Plus:** Market value of debt

**Less:** Cash and investments (specifically: cash, cash equivalents, and short-term investments)<sup>55</sup>

**Equals:** Enterprise value

Cash and investments (sometimes termed **nonearning assets**) are subtracted because EV is designed to measure the net price an acquirer would pay for the company as a whole. The acquirer must buy out current equity and debt providers but then receives access to the cash and investments, which lower the net cost of the acquisition. (For example, cash and investments can be used to pay off debt or loans used to finance the purchase.) The same logic explains the use of market values: In repurchasing debt, an acquirer has to pay market prices. Some debt, however, may be private and it does not trade; some debt may be publicly traded but trade infrequently. When analysts do not have market values, they often use book values obtained from the balance sheet.<sup>56</sup> Example 34 illustrates the calculation of EV/EBITDA.

### EXAMPLE 34 Calculating EV/EBITDA

Western Digital Corporation (NYSE: WDC) manufactures hard disk drives. Exhibit 18 presents the company's consolidated balance sheet as of 29 March 2013.

EXHIBIT 18 Western Digital Corporation Condensed Consolidated Balance Sheet (in Millions except Par Values; Unaudited)

#### Assets

##### Current assets:

Cash and cash equivalents	\$4,060
Accounts receivable, net	1,700
Inventories	1,197

(continued)

<sup>54</sup>Minority interest, if any, usually should be added back unless it is already included elsewhere. **Minority interest** appears in the consolidated financial statements of a parent company that owns more than 50 percent but not 100 percent of a subsidiary; minority interest refers to that portion of equity in the subsidiary that is not owned by the parent.

<sup>55</sup>Some analysts attempt to distinguish between cash and investments that are or are not needed in the operations of the company, subtracting only the nonoperating part in this calculation. However, making such a distinction is not always practical.

<sup>56</sup>However, using so-called matrix price estimates of debt market values in such cases, where they are available, may be more accurate. Matrix price estimates are based on characteristics of the debt issue and information on how the marketplace prices those characteristics.

## EXHIBIT 18 (Continued)

Assets	
Other current assets	383
Total current assets	7,340
Property and equipment, net	3,803
Goodwill and other intangible assets, net	2,610
Other noncurrent assets	174
Total assets	<u>\$13,927</u>
Liabilities and Shareholders' Equity	
Current liabilities:	
Accounts payable	\$2,037
Accrued expenses	837
Accrued warranty	122
Current portion of long-term debt	230
Total current liabilities	3,226
Long-term debt	1,783
Other liabilities	495
Total liabilities	5,504
Commitments and contingencies (Notes 4 and 5)	
Shareholders' equity:	
Preferred stock, \$0.01 par value; authorized—5 shares; outstanding—none	—
Common stock, \$0.01 par value; authorized—450 shares; outstanding—238 shares	3
Additional paid-in capital	2,232
Accumulated comprehensive income (loss)	20
Retained earnings	7,073
Treasury stock—common shares at cost	(905)
Total shareholders' equity	8,423
Total liabilities and shareholders' equity	<u>\$13,927</u>

Source: Company 10-Q

The balance sheet is labeled as unaudited because it is a quarterly balance sheet and US companies are required to have audits only for their annual financial statements.

From WDC's financial statements, the income statement and statement of cash flows for the year ended 29 June 2012 and for the nine months ended 29 March 2013 and 30 March 2012 provided the following items (in millions):

Item	Source	Year Ended	Nine Months	Nine Months
		29 June 2012	Ended 29 March 2013	Ended 30 March 2012
Net income	Income statement	\$1,612	\$1,245	\$867
Interest expense (net of interest income)	Income statement	14	35	8
Income tax provision	Income statement	145	207	88
Depreciation and amortization	Statement of cash flows	825	931	486

The company's share price as of 1 July 2013 was \$63.06. Based on the above information, calculate EV/EBITDA.

*Solution:*

- For EV, we first calculate the total value of WDC's equity: 238 million shares outstanding times \$63.06 price per share equals \$15,008 million market capitalization.

WDC has only one class of common stock, no preferred shares, and no minority interest. For companies that have multiple classes of common stock, market capitalization includes the total value of all classes of common stock. Similarly, for companies that have preferred stock and/or minority interest, the market value of preferred stock and the amount of minority interest are added to market capitalization.

EV also includes the value of long-term debt. Per WDC's balance sheet, the amount of long-term debt is \$2,013 million (\$1,783 million plus the current portion of \$230 million). Typically, the book value of long-term debt is used in EV. If, however, the market value of the debt is readily available and materially different from the book value, the market value should be used.

EV excludes cash, cash equivalents, and short-term investments. Per WDC's balance sheet, the total of cash and cash equivalents is \$4,060 million.

So, WDC's EV is \$15,008 million + 2,013 million – \$4,060 million = \$12,961 million.

- For EBITDA, we first calculate the trailing 12 month (TTM) information using the first nine months of the current fiscal year plus the last three months of the prior fiscal year. For example, the TTM net income equals \$1,245 million from the first nine months ending 29 March 2013 plus \$745 million from the last three months of the previous fiscal year (\$1,612 million minus \$867 million.) EBITDA is calculated as net income plus interest plus taxes plus depreciation and amortization. The TTM EBITDA totals \$3,565 million. These calculations are summarized as follows:

EBITDA Component	Year Ended	9 Months	9 Months	Total (TTM)
	29 June 2012	Ended 29 March 2013	Ended 30 March 2012	
Net income	\$1,612	\$1,245	\$867	\$1,990
Interest	14	35	8	41
Taxes	145	207	88	264
Depreciation and amortization	825	931	486	1,270
EBITDA	<u>\$2,596</u>	<u>\$2,418</u>	<u>\$1,449</u>	<u>\$3,565</u>

WDC does not have preferred equity. Companies that do have preferred equity typically present in their financial statements net income available to common shareholders. In those cases, the EBITDA calculation uses net income available to *both* preferred and common equity holders.

We conclude that  $EV/EBITDA = (\$12,961 \text{ million})/(\$3,565 \text{ million}) = 3.6$ .

#### 4.1.2. Valuation Based on Forecasted Fundamentals

As with other multiples, intuition about the fundamental drivers of enterprise value to EBITDA can help when applying the method of comparables. All else being equal, the justified EV/EBITDA based on fundamentals should be positively related to the expected growth rate in free cash flow to the firm, positively related to expected profitability as measured by return on invested capital, and negatively related to the business's weighted average cost of capital. **Return on invested capital** (ROIC) is calculated as operating profit after tax divided by total invested capital. In analyzing ratios such as EV/EBITDA, ROIC is the relevant measure of profitability because EBITDA flows to all providers of capital.

#### 4.1.3. Valuation Based on Comparables

All else being equal, a lower EV/EBITDA value relative to peers indicates that a company is relatively undervalued. An analyst's recommendations, however, are usually not completely determined by relative EV/EBITDA; from an analyst's perspective, EV/EBITDA is simply one piece of information to consider.

Example 35 presents a comparison of enterprise value multiples for four peer companies. The example includes a measure of total firm value, **total invested capital** (TIC), sometimes also known as the **market value of invested capital**, that is an alternative to enterprise value. Similar to EV, TIC includes the market value of equity and debt, but does not deduct cash and investments.

### EXAMPLE 35 Comparable Enterprise Value Multiples

Exhibit 19 presents EV multiples for four companies in the data storage device industry: Western Digital Corporation (NYSE: WDC), Net App (NASDAQ GS: NTAP), EMC Corporation (NYSE: EMC), and Seagate Technology (NASDAQ GS: STX).

EXHIBIT 19 Enterprise Value Multiples for Industry Peers (amounts in \$ million, except where indicated otherwise)

Measure	WDC	NTAP	EMC	STX
Price	\$70.72	\$39.12	\$23.64	\$48.04
Times: shares outstanding (millions)	237	340	2,080	357
Equals: equity market cap	16,761	13,301	49,171	17,150
Plus: Debt (most recent quarter)	1,960	995	7,190	2,780

EXHIBIT 19 (Continued)

Measure	WDC	NTAP	EMC	STX
Plus: Preferred stock	—	—	—	—
Equals: Total Invested Capital (TIC)	18,721	14,296	56,361	19,930
Less: cash	4,310	5,080	11,150	2,190
Equals: Enterprise Value (EV)	\$14,411	\$9,216	\$45,211	\$17,740
EBITDA (TTM)	\$3,320	\$890	\$5,330	\$2,960
TIC/EBITDA	5.6	16.1	10.6	6.7
EV/EBITDA	4.3	10.4	8.5	6.0
Debt/Equity (book)	24.8%	24.8%	30.0%	79.2%
Profit margin (TTM)	6.38%	8.17%	12.45%	12.81%
Quarterly revenue growth (year over year)	−21.6%	27.9%	5.7%	−23.6%

Sources: Yahoo! Finance; calculations.

1. Exhibit 19 provides two alternative enterprise value multiples, TIC/EBITDA and EV/EBITDA. The ranking of the companies' multiples is identical by both multiples. In general, what could cause the rankings to vary?
2. Each EBITDA multiple incorporates a comparison with enterprise value. How do these multiples differ from price to cash flow multiples?
3. Based solely on the information in Exhibit 19, how does the valuation of WDC compare with that of the other three companies?

*Solution to 1:* The difference between TIC and EV is that EV excludes cash, cash equivalents, and marketable securities. So, a material variation among companies in cash, cash equivalents, or marketable securities relative to EBITDA could cause the rankings to vary.

*Solution to 2:* These multiples differ from price to cash flow multiples in that the numerator is a measure of firm value rather than share price, to match the denominator which is a pre-interest measure of earnings. These multiples thus provide a more appropriate comparison than price to cash flow when companies have significantly different capital structures.

*Solution to 3:* Based on its lower TIC/EBITDA and EV/EBITDA multiples of 5.6 and 4.3, respectively, WDC appears undervalued relative to the other three companies. However, these lower valuation ratios may be warranted given WDC's low profit margin and declining revenue growth. Compared with STX, the enterprise value multiples of WDC are slightly lower, which is consistent with its being less profitable than STX (profit margin of 6.38 percent versus 12.81 percent). The enterprise value multiples of NTAP are much higher than those of WDC, probably reflecting NTAP's recent relatively high revenue growth. Similarly, the enterprise value ratios for WDC are lower than those for EMC due also to differences in profitability and growth.

#### 4.2. Other Enterprise Value Multiples

Although EV/EBITDA is the most widely known and used enterprise value multiple, other enterprise value multiples are used together with or in place of EV/EBITDA—either in a broad range of applications or for valuations in a specific industry. EV/FCFF is an example of a broadly used multiple; an example of a special-purpose multiple is EV/EBITDAR (where R stands for rent expense), which is favored by airline industry analysts. This section reviews the most common such multiples (except EV/sales, which is covered in the next section). In each case, a valuation metric could be formulated in terms of TIC rather than EV.

Major alternatives to using EBITDA in the denominator of enterprise value multiples include FCFF (free cash flow to the firm), EBITA (earnings before interest, taxes, and amortization), and EBIT (earnings before interest and taxes). Exhibit 20 summarizes the components of each of these measurements and how they relate to net income. Note that, in practice, analysts typically forecast EBITDA by forecasting EBIT and adding depreciation and amortization.

EXHIBIT 20 Alternative Denominators in Enterprise Value Multiples

Free Cash Flow to the Firm =	Net Income	Plus Interest Expense	Minus Tax Savings on Interest	Plus Depreciation	Plus Amortization	Less Investment in Working Capital	Less Investment in Fixed Capital
EBITDA =	Net Income	plus Interest Expense	plus Taxes	plus Depreciation	plus Amortization		
EBITA =	Net Income	plus Interest Expense	plus Taxes		plus Amortization		
EBIT =	Net Income	plus Interest Expense	plus Taxes				

Note that the calculation of all the measures given in Exhibit 20 add interest back to net income, which reflects that these measures are flows relevant to all providers of both debt and equity capital. As one moves down the rows of Exhibit 20, the measures incorporate increasingly less precise information about a company's tax position and its capital investments, although each measure has a rationale. For example, EBITA may be chosen in cases in which amortization (associated with intangibles) but not depreciation (associated with tangibles) is a major expense for companies being compared. EBIT may be chosen where neither depreciation nor amortization is a major item.

In addition to enterprise value multiples based on financial measures, in some industries or sectors, the analyst may find it appropriate to examine enterprise value multiples based on a nonfinancial measurement that is specific to that industry or sector. For example, for satellite and cable TV broadcasters, an analyst might usefully examine EV to subscribers. For a resource-based company, a multiple based on reserves of the resource may be appropriate.

Regardless of the specific denominator used in an enterprise value multiple, the concept remains the same—namely, to relate the market value of the total company to some fundamental financial or nonfinancial measure of the company's value.



### 4.3. Enterprise Value to Sales

Enterprise value to sales is a major alternative to the price-to-sales ratio. The P/S multiple has the conceptual weakness that it fails to recognize that for a debt-financed company, not all sales belong to a company's equity investors. Some of the proceeds from the company's sales will be used to pay interest and principal to the providers of the company's debt capital. For example, a P/S for a company with little or no debt would not be comparable to a P/S for a company that is largely financed with debt. EV/S would be the basis for a valid comparison in such a case. In summary, EV/S is an alternative sales-based ratio that is particularly useful when comparing companies with diverse capital structures. Example 36 illustrates the calculation of EV/S multiples.

#### EXAMPLE 36 Calculating Enterprise Value to Sales

As described in Example 22, Stora Enso Oyj (Helsinki Stock Exchange: STERV) reported net sales of €10,814.8 million for 2012. Based on 788.6 million shares outstanding and a stock price of €6.72 on 16 September 2013, the total market value of the company's equity was €5,299.4 million. The company reported debt of €4,522.3 million, minority interest of €91.5 million, and cash of €1,849.9 million. Assume that the market value of the company's debt is equal to the amount reported. Calculate the company's EV/S.

*Solution:* Enterprise value = €5,299.4 million + €4,522.3 million + €91.5 million – €1,849.9 million = €8,063.3 million. So, EV/S = €8,063.3 million/€10,814.8 million = 0.75.

### 4.4. Price and Enterprise Value Multiples in a Comparable Analysis: Some Illustrative Data

In previous sections, we explained the major price and enterprise value multiples. Analysts using multiples and a benchmark based on closely similar companies should be aware of the range of values for multiples for peer companies and should track the fundamentals that may explain differences. For the sake of illustration Exhibit 21 shows, for fiscal year 2007, the median value of various multiples by GICS economic sector, the median dividend payout ratio, and median values of selected fundamentals:

- ROE and its determinants (net profit margin, asset turnover, and financial leverage).
- The compound average growth rate in operating margin for the three years ending with FY 2007 (shown in the last column under "3-Year CAGR Op Margin").

Exhibit 21 is based on the Standard & Poor's Super 1500 Composite Index for US equities consisting of the S&P 500, the S&P Midcap 400 Index, and the S&P SmallCap 600 Index. GICS was previously described in Section 3.1.5.

EXHIBIT 21 Fundamental and Valuation Statistics by GICS Economic Sector: Median Values from S&amp;P 1500, FY2007

GICS Sector (count)	Valuation Statistics										Fundamental Statistics					
	Trailing		P/CF		Dividend		EV/		Net Profit		Asset		Financial		Dividend	3-Year CAGR
	P/E	P/B	P/S	P/B	P/CF	Yield (%)	EBITDA	EV/S	Margin (%)	Turnover	Turnover	Leverage	ROE (%)	Payout Ratio (%)	Operating Margin (%)	
Energy (85)	14.406	2.531	2.186	8.622	0.4	7.733	2.64	13.942	0.573	2.103	19.688	4.024	12.035			
Materials (85)	15.343	2.254	0.888	9.588	1.4	7.686	1.095	5.568	0.995	2.465	15.728	17.874	4.157			
Industrials (207)	17.275	2.578	1.045	11.642	1.0	8.979	1.209	6.089	1.139	2.143	15.262	16.066	5.337			
Consumer																
Discretionary (279)	15.417	2.254	0.789	9.986	0.7	7.634	0.928	4.777	1.383	2.12	13.289	0	-2.682			
Consumer Staples (80)	19.522	3.048	1.122	13.379	1.4	10.66	1.237	5.306	1.351	2.208	17.264	23.133	-0.88			
Health Care (167)	23.027	3.088	2.061	15.762	0	11.623	2.274	6.637	0.83	1.854	12.399	0	-1.708			
Financials (257)	14.648	1.559	1.888	11.186	3.1	9.482	4.017	13.113	0.113	5.848	10.348	41.691	-4.124			
Information																
Technology (252)	20.205	2.444	2.162	45.073	0	11.594	1.811	7.929	0.743	1.587	10.444	0	1.524			
Telecommunication																
Services (13)	19.585	2.485	1.527	5.266	0.8	6.681	2.345	7.109	0.471	2.367	5.43	6.862	-2.421			
Utilities (75)	16.682	1.784	1.151	8.405	3.1	9.056	1.903	7.21	0.439	3.52	11.853	52.738	0.361			
Overall (1,500)	17.148	2.246	1.398	11.328	0.8	9.108	1.626	7.318	0.839	2.227	12.701	8.051	0.181			

Source: Standard &amp; Poor's Research Insight.

At the level of aggregation shown in Exhibit 21, the data are, arguably, most relevant to relative sector valuation. For the purposes of valuing individual companies, analysts would most likely use more narrowly defined industry or sector classification.

## 5. INTERNATIONAL CONSIDERATIONS WHEN USING MULTIPLES

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Clearly, to perform a relative-value analysis, an analyst must use comparable companies and underlying financial data prepared by applying comparable methods. Therefore, using relative-valuation methods in an international setting is difficult. Comparing companies across borders frequently involves differences in accounting methods, cultural differences, economic differences, and resulting differences in risk and growth opportunities. P/Es for individual companies in the same industry but in different countries have been found to vary widely.<sup>57</sup> Furthermore, P/Es of different national markets often vary substantially at any single point in time.

Although international accounting standards are converging, significant differences still exist across borders, sometimes making comparisons difficult. Even when harmonization of accounting principles is achieved, the need to adjust accounting data for comparability will remain. As we showed in earlier sections, even within a single country's accounting standards, differences between companies result from accounting choices (e.g., FIFO versus average cost for inventory valuation). Prior to 2008, the US SEC required non-US companies whose securities trade in US markets to provide a reconciliation between their earnings from home-country accounting principles to US GAAP. This requirement not only assisted the analyst in making necessary adjustments but also provided some insight into appropriate adjustments for other companies not required to provide this data. In December 2007, however, the SEC eliminated the reconciliation requirement for non-US companies that use IFRS. Research analyzing reconciliations by EU companies with US listings shows that most of those companies reported net income under IFRS that was higher than they would have reported under US GAAP and lower shareholders' equity than they would have under US GAAP, with a result that more of the sample companies reported higher ROE under IFRS than under US GAAP.<sup>58</sup>

Exhibit 22 presents a reconciliation of net earnings and shareholders' equity from IFRS to US GAAP for ASM International (Euronext: ASM; NASDAQ:ASMI). Headquartered in Almere, Netherlands, ASM is a leading supplier of semiconductor process equipment for wafer processing.

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<sup>57</sup>Copeland, Koller, and Murrin (1994, p. 375) provide an interesting example.

<sup>58</sup>In Henry, Lin, and Yang (2009), 28% of the sample firms' ROE under IFRS is more than 5 percentage points higher than under US GAAP, whereas fewer than 10% of the sample report ROE more than 5 percentage points lower.

EXHIBIT 22 Principal Differences between IFRS and US GAAP for ASM (Years Ended 31 December; Euros in Thousands)

Measure	2012	2011
Net earnings in accordance with IFRS	48,453	324,146
Allowance for inventory obsolescence	-335	1,639
Tax rate difference on eliminated intercompany profit	718	-768
Pensions	691	—
Debt issuance expenses credit facility	-446	55
Development expenses	-8,650	-8,908
Net earnings in accordance with US GAAP	40,431	316,164
Total equity in accordance with IFRS	1,095,366	991,841
Goodwill	10,481	10,647
Allowance for inventory obsolescence	-2,009	-1,626
Tax rate difference on eliminated intercompany profit	-49	-768
Debt issuance expenses credit facility	735	1,181
Development expenses	-51,386	-43,740
Pension plans	-3,329	179
Total equity in accordance with US GAAP	1,049,809	957,714

Source: ASM 2012 Annual Report.

In a study of companies filing such reconciliations to US GAAP, Harris and Muller (1999) classified common differences into seven categories, as shown in Exhibit 23.

EXHIBIT 23 Reconciliation of IFRS to US GAAP: Average Adjustment

Category	Earnings	Equity
Differences in the treatment of goodwill	Minus	Plus
Deferred income taxes	Plus	Plus
Foreign exchange adjustments	Plus	Minus
Research and development costs	Minus	Minus
Pension expense	Minus	Plus
Tangible asset revaluations	Plus	Minus
Other	Minus	Minus

In a more recent study of reconciliation data, Henry, Lin, and Yang (2009) find that among 20 categories of reconciliations, the most frequently occurring adjustments are in the pension category (including post-retirement benefits) and the largest value of adjustments are in the goodwill category.

Although the SEC's decision to eliminate the requirement for reconciliation has eliminated an important resource for analysts, accounting research can provide some insight into areas where differences between IFRS and US GAAP have commonly arisen. Going forward,

analysts must be aware of differences across standards and make adjustments when disclosures provide sufficient data to do so.

International accounting differences affect the comparability of all price multiples. Of the price multiples examined in this reading, P/CFO and P/FCFE will generally be least affected by accounting differences. P/B, P/E, and multiples based on such concepts as EBITDA, which start from accounting earnings, will generally be the most affected.

## 6. MOMENTUM VALUATION INDICATORS

The valuation indicators we call momentum indicators relate either price or a fundamental, such as earnings, to the time series of their own past values or, in some cases, to the fundamental's expected value. One style of growth investing uses positive momentum in various senses as a selection criterion, and practitioners sometimes refer to such strategies as "growth/momentum investment strategies." Momentum indicators based on price, such as the relative-strength indicator we will discuss here, have also been referred to as **technical indicators**. According to the *BofAMerrill Lynch Institutional Factor Survey*, various momentum indicators were used by many institutional investors. In this section, we review three representative momentum indicators: earnings surprise, standardized unexpected earnings, and relative strength.

To define standardized unexpected earnings, we define **unexpected earnings** (also called **earnings surprise**) as the difference between reported earnings and expected earnings:

$$UE_t = EPS_t - E(EPS_t)$$

where  $UE_t$  is the unexpected earnings for quarter  $t$ ,  $EPS_t$  is the reported EPS for quarter  $t$ , and  $E(EPS_t)$  is the expected EPS for the quarter.

For example, a stock with reported quarterly earnings of \$1.05 and expected earnings of \$1.00 would have a positive earnings surprise of \$0.05. Often, the percent earnings surprise (i.e., earnings surprise divided by expected EPS) is reported by data providers; in this example, the percent earnings surprise would be  $\$0.05/\$1.00 = 0.05$  or 5 percent. When used directly as a valuation indicator, earnings surprise is generally scaled by a measure reflecting the variability or range in analysts' EPS estimates. The principle is that the less disagreement among analysts' forecasts, the more meaningful the EPS forecast error of a given size in relation to the mean. A way to accomplish such scaling is to divide unexpected earnings by the standard deviation of analysts' earnings forecasts, which we refer to as the **scaled earnings surprise**. Example 37 illustrates the calculation of such a scaled earnings surprise.

### EXAMPLE 37 Calculating Scaled Earnings Surprise by Using Analysts' Forecasts

As of late 2012, the mean consensus earnings forecast for BP plc (LSE: BPL; NYSE: BP) for the fiscal year ending December 2012 was \$0.91. Of the 33 estimates, the low forecast was \$0.87, the high forecast was \$1.20, and the standard deviation was \$0.0952. If actual reported earnings for 2012 come in equal to the high forecast, what would be the measure of the earnings surprise for BP scaled to reflect the dispersion in analysts' forecasts?

*Solution:* In this case, scaled earnings surprise would be  $(\$1.20 - \$0.91)/\$0.0952 = 3.05$ .

The rationale behind using earnings surprise is the thesis that positive surprises may be associated with persistent positive abnormal returns, or alpha. The same rationale lies behind a momentum indicator that is closely related to earnings surprise but more highly researched, namely, **standardized unexpected earnings** (SUE). The SUE measure is defined as

$$\text{SUE}_t = \frac{\text{EPS}_t - E(\text{EPS}_t)}{\sigma[\text{EPS}_t - E(\text{EPS}_t)]}$$

where

$\text{EPS}_t$  = actual EPS for time  $t$   
 $E(\text{EPS}_t)$  = expected EPS for time  $t$   
 $\sigma[\text{EPS}_t - E(\text{EPS}_t)]$  = standard deviation of  $[\text{EPS}_t - E(\text{EPS}_t)]$  over some historical time period

In words, the numerator is the unexpected earnings at time  $t$  and the denominator is the standard deviation of past unexpected earnings over some period prior to time  $t$ —for example, the 20 quarters prior to  $t$  as in Latané and Jones (1979), the article that introduced the SUE concept.<sup>59</sup> In SUE, the magnitude of unexpected earnings is scaled by a measure of the size of historical forecast errors or surprises. The principle is that the smaller (larger) the historical size of forecast errors, the more (less) meaningful a given size of EPS forecast error.

Suppose that for a stock with a \$0.05 earnings surprise, the standard deviation of past surprises is \$0.20. The \$0.05 surprise is relatively small compared with past forecast errors, which would be reflected in a SUE score of  $\$0.05/\$0.20 = 0.25$ . If the standard error of past surprises were smaller—say, \$0.07—the SUE score would be  $\$0.05/\$0.07 = 0.71$ . Example 38 applies analysis of SUE to two electronics companies.

### EXAMPLE 38 Unexpected Earnings

Exhibits 24 and 25 provide information about the earnings surprise history for two companies: Exxon Mobil Corporation (NYSE: XOM) and Volkswagen AG (Xetra: VOW).

#### EXHIBIT 24 Earnings Surprise History for Exxon Mobil Corporation

Quarter Ending	EPS Release Date	Mean		% Surprise	Std. Dev.	SUE Score
		Consensus EPS Forecast	Actual EPS			
Sep 2013	31 Oct 2013	1.77	1.79	0.88	0.1250	0.16
Jun 2013	1 Aug 2013	1.90	1.55	-18.39	0.0997	-3.51
Mar 2013	25 Apr 2013	2.05	2.12	3.59	0.0745	0.94
Dec 2012	1 Feb 2013	2.00	2.20	10.20	0.0463	4.32

<sup>59</sup>For a summary of the research on SUE, see Reilly and Brown (2006) or Brown (1997).

EXHIBIT 25 Earnings Surprise History for Volkswagen AG (in Euros)

Quarter Ending	EPS Release Date	Mean		% Surprise	Std. Dev.	SUE Score
		Consensus EPS Forecast	Actual EPS			
Sep 2013	30 Oct 2013	4.53	3.79	-16.37	0.2846	-2.60
Jun 2013	30 Jul 2013	5.10	5.86	14.99	0.3858	1.97
Mar 2013	24 Apr 2013	4.15	4.24	2.17	1.1250	0.08
Dec 2012	22 Feb 2013	5.56	3.54	-36.33	0.5658	-3.57

Source: Thomson Surprise Report.

1. Explain how XOM's SUE score of 0.16 for the quarter ending September 2013 is calculated.
2. Based on these exhibits, for which company were the consensus forecasts less accurate over the past four quarters?
3. Was the consensus forecast more accurate for XOM or VOW for the quarter ending March 2013?

*Solution to 1:* The amount of XOM's unexpected earnings (i.e., its earnings surprise) for the quarter ending September 2013 was  $\$1.79 - \$1.77 = \$0.02$ . Dividing by the standard deviation of  $\$0.1250$  gives a SUE score of 0.16.

*Solution to 2:* The answer depends on whether accuracy is measured by the "% Surprise" or by the "SUE score." If accuracy is measured by the % Surprise, then VOW's consensus forecasts were less accurate: % Surprise varied from  $-36.33\%$  to  $+14.99\%$  for VOW versus  $-18.39\%$  to  $+10.20\%$  for XOM. Using SUE, XOM's consensus forecasts were less accurate: SUE varied from  $-3.51$  to  $+4.32$  for XOM versus  $-3.57$  to  $+1.13$  for VOW. The reason for these differing results is that the standard deviation of the earnings estimates is relatively smaller for XOM than it is for VOW.

*Solution to 3:* For the quarter ending March 2013, the consensus forecast was more accurate for VOW than XOM. Both the % Surprise and SUE were lower for VOW in this quarter.

Another set of indicators, **relative-strength indicators**, compares a stock's performance during a particular period either with its own past performance or with the performance of some group of stocks. The simplest relative-strength indicator that compares a stock's performance during a period with its past performance is the stock's compound rate of return over some specified time horizon, such as six months or one year. This indicator has also been referred to as **price momentum** in the academic literature. Despite its simplicity, this measure has been used in numerous studies.<sup>60</sup> The rationale behind its use is the thesis that patterns of persistence or reversal exist in stock returns that may be shown empirically to depend on the investor's time horizon (Lee and Swaminathan 2000).

<sup>60</sup>See Salsman (1997) for an example.

Other definitions of relative strength relate a stock's return over a recent period to its return over a longer period that includes the more recent period. For example, a classic study of technical momentum indicators (Brock, Lakonishok, and LeBaron 1992) examined trading strategies based on two technical rules—namely, a moving-average oscillator and a trading-range break (i.e., resistance and support levels)—in which buy and sell signals are determined by the relationship between a short period's moving average and a longer period's moving average (and bands around those averages). The reader should keep in mind that research on patterns of historical stock returns is notoriously vulnerable to data snooping and hindsight biases. Furthermore, investing strategies based purely on technical momentum indicators are viewed as inherently self-destructing, in that “once a useful technical rule (or price pattern) is discovered, it ought to be invalidated when the mass of traders attempts to exploit it” (Bodie, Kane, and Marcus 2008, p. 377). Yet, the possibility of discovering a profitable trading rule and exploiting it prior to mass use continues to motivate research.

A simple relative-strength indicator of the second type (i.e., the stock's performance relative to the performance of some group of stocks) is the stock's performance divided by the performance of an equity index. If the value of this ratio increases, the stock price increases relative to the index and displays positive relative strength. Often, the relative-strength indicator is scaled to 1.0 at the beginning of the study period. If the stock goes up at a higher (lower) rate than the index, then relative strength will be above (below) 1.0. Relative strength in this sense is often calculated for industries and individual stocks. Example 39 explores this indicator.

### EXAMPLE 39 Relative Strength in Relation to an Equity Index

Exhibit 26 shows the values of the S&P 500 and three exchange-traded funds (ETFs) for the end of each of 18 months from April 2012 through September 2013. The ETFs are for long-term US Treasury securities, the STOXX Europe 50 Index, an emerging Europe SPDR. SPDR stands for Standard & Poor's Depository Receipt.

EXHIBIT 26 A Relative Strength Comparison

Date	S&P 500 Index	SPDR Barclays Long-Term Treasury (TLO)	SPDR Stoxx Europe 50 Index (FEU)	SPDR S&P Emerging Europe ETF (GUR)
2-Apr-2012	1397.91	65.77	29.46	39.55
1-May-2012	1310.33	70.86	26.32	32.42
1-Jun-2012	1362.16	69.98	28.45	35.96
2-Jul-2012	1379.32	72.29	28.71	36.06
1-Aug-2012	1406.58	71.38	29.75	37.89
4-Sep-2012	1440.67	69.93	30.52	39.46
1-Oct-2012	1412.16	69.76	30.92	39.05
1-Nov-2012	1416.18	70.49	31.51	39.25
3-Dec-2012	1426.19	68.72	32.62	42.90
2-Jan-2013	1498.11	66.81	33.98	43.54
1-Feb-2013	1514.68	67.62	32.80	40.86
1-Mar-2013	1569.19	67.53	33.12	40.26



EXHIBIT 26 (Continued)

Date	S&P 500 Index	SPDR Barclays Long-Term Treasury (TLO)	SPDR Stoxx Europe 50 Index (FEU)	SPDR S&P Emerging Europe ETF (GUR)
1-Apr-2013	1597.57	70.35	34.49	39.93
1-May-2013	1630.74	65.86	34.26	38.78
3-Jun-2013	1606.28	63.56	32.87	36.89
1-Jul-2013	1685.73	62.60	34.85	37.81
1-Aug-2013	1632.97	61.82	34.31	36.81
3-Sep-2013	1639.77	61.02	34.67	36.67

To produce the information for Exhibit 27, we divided each ETF value by the S&P 500 value for the same month and then scaled those results so that the value of the relative-strength indicator (RSTR) for April 2012 would equal 1.0. To illustrate, on 2 April 2012, the value of TLO divided by the S&P 500 was  $65.77/1,397.91 = 0.0470$ . The RSTR for TLO on that date, by design, is then  $0.0470/0.0470 = 1.0$ . In May, the value of TLO divided by the S&P 500 was  $70.86/1,310.33 = 0.0541$ , which we scaled by the April number. The RSTR for 1 May 2012 for GLD is  $0.0541/0.0470 = 1.1494$ , shown in Exhibit 27 as 1.149.

EXHIBIT 27 Relative-Strength Indicators

Date	RSTR SPDR Barclays Long-Term Treasury (TLO)	RSTR SPDR STOXX Europe 50 Index (FEU)	RSTR SPDR Emerging Europe (GUR)
2-Apr-2012	1.000	1.00	1.00
1-May-2012	1.149	0.953	0.875
1-Jun-2012	1.092	0.991	0.933
2-Jul-2012	1.114	0.988	0.924
1-Aug-2012	1.079	1.004	0.952
4-Sep-2012	1.032	1.005	0.968
1-Oct-2012	1.050	1.039	0.977
1-Nov-2012	1.058	1.056	0.980
3-Dec-2012	1.024	1.085	1.063
2-Jan-2013	0.948	1.076	1.027
1-Feb-2013	0.949	1.028	0.953
1-Mar-2013	0.915	1.002	0.907
1-Apr-2013	0.936	1.024	0.883
1-May-2013	0.858	0.997	0.841
3-Jun-2013	0.841	0.971	0.812
1-Jul-2013	0.789	0.981	0.793
1-Aug-2013	0.805	0.997	0.797
3-Sep-2013	0.785	0.995	0.784

On the basis of Exhibits 26 and 27, address the following:

1. State the relative strength of long-term US Treasury securities, STOXX Europe 50 Index, and emerging Europe stocks over the entire time period April 2012 through September 2013. Interpret the relative strength for each sector over that period.
2. Discuss the relative performance of the STOXX Europe 50 Index ETF and the emerging Europe ETF in the period ending 3 December 2012.

*Solution to 1:* The relative-strength indicator for long-term US Treasuries is 0.785. This number represents  $0.785 - 1.000 = -0.215$ , or 21.5 percent under-performance relative to the S&P 500 over the time period. The relative-strength indicator for the STOXX Europe 50 Index is 0.995. This number represents  $1.000 - 0.995 = -0.005$ , or 0.5 percent underperformance relative to the S&P 500 over the time period. The relative-strength indicator for the emerging Europe ETF is 0.784, indicating that it underperformed the S&P 500 by 21.6 percent over the time frame.

*Solution to 2:* The December 2012 RSTR for the STOXX Europe 50 Index, at 1.085, is higher than in the prior month by 2.9 percent, whereas the emerging Europe RSTR, at 1.063, is higher than in the prior month by 8.3 percent. In December 2012, the emerging Europe ETF outperformed the STOXX Europe 50 Index ETF. The relative performance for that one month differs from the relative performance over the entire period, during which the STOXX Europe 50 Index significantly outperformed the emerging Europe ETF.

Overall, momentum indicators have a substantial following among professional investors. Some view momentum indicators as signals that should prompt an analyst to consider whether a stock price is moving successively *farther from* or successively *closer to* the fundamental valuations derived from models and multiples. In other words, an analyst might be correct about the intrinsic value of a firm and the momentum indicators might provide a clue about when the market price will converge with that intrinsic value. The use of such indicators continues to be a subject of active research in industry and in business schools.

## 7. VALUATION INDICATORS: ISSUES IN PRACTICE

All the valuation indicators discussed in this reading are quantitative aids but not necessarily solutions to the problem of security selection. In this section, we discuss some issues that arise in practice when averages are used to establish benchmark multiples and then illustrate the use of multiple valuation indicators.

### 7.1. Averaging Multiples: The Harmonic Mean

The harmonic mean and the weighted harmonic mean are often applied to average a group of price multiples.

Consider a hypothetical portfolio that contains two stocks. For simplicity, assume the portfolio owns 100 percent of the shares of each stock. One stock has a market capitalization of €715 million and earnings of €71.5 million, giving it a P/E of 10. The other stock has a market capitalization of €585 million and earnings of €29.25 million, for a P/E of 20. Note that the P/E for the portfolio is calculated directly by aggregating the companies' market capitalizations and earnings:  $(€715 + €585)/(€71.50 + €29.25) = €1,300/€100.75 = 12.90$ . The question that will be addressed is: What calculation of portfolio P/E, based on the individual stock P/Es, best reflects the value of 12.90?

If the ratio of an individual holding is represented by  $X_i$ , the expression for the simple **harmonic mean** of the ratio is

$$X_H = \frac{n}{\sum_{i=1}^n (1/X_i)} \quad (8)$$

which is the reciprocal of the arithmetic mean of the reciprocals.

The expression for the **weighted harmonic mean** is

$$X_{WH} = \frac{1}{\sum_{i=1}^n (w_i/X_i)} \quad (9)$$

where the  $w_i$  are portfolio value weights (summing to 1) and  $X_i > 0$  for  $i = 1, 2, \dots, n$ .

Exhibit 28 displays the calculation of the hypothetical portfolio's simple arithmetic mean P/E, weighted mean P/E, (simple) harmonic mean P/E, and weighted harmonic mean P/E.

EXHIBIT 28 Alternative Mean P/Es

Security	Market Cap		Earnings (€ Millions)	Stock P/E	(1)	(2)	(3)	(4)
	(€ Millions)	Percent						
Stock 1	715	55	71.50	10	$0.5 \times 10$	$0.55 \times 10$	$0.5 \times 0.1$	$0.55 \times 0.1$
Stock 2	585	45	29.25	20	$0.5 \times 20$	$0.45 \times 20$	$0.5 \times 0.05$	$0.45 \times 0.05$
					15	14.5	0.075	0.0775
Arithmetic mean P/E (1)					15			
Weighted mean P/E (2)						14.5		
Harmonic mean P/E (3)							$1/0.075 =$ 13.33	
Weighted harmonic mean P/E (4)								$1/0.0775 =$ 12.90

The weighted harmonic mean P/E precisely corresponds to the portfolio P/E value of 12.90. This example explains why index fund vendors frequently use the weighted harmonic mean to calculate the "average" P/E or average value of other price multiples for indices. In some applications, an analyst might not want or be able to incorporate the market value weight information needed to calculate the weighted harmonic mean. In such cases, the simple harmonic mean can still be calculated.

Note that the simple harmonic mean P/E is smaller than the arithmetic mean and closer to the directly calculated value of 12.90 in this example. The harmonic mean inherently gives less weight to higher P/Es and more weight to lower P/Es. In general, unless all the observations in a data set have the same value, the harmonic mean is less than the arithmetic mean.

As explained and illustrated earlier in this reading, using the median rather than the arithmetic mean to derive an average multiple mitigates the effect of outliers. The harmonic mean is sometimes also used to reduce the impact of large outliers—which are typically the major concern in using the arithmetic mean multiple—but not the impact of small outliers (i.e., those close to zero). The harmonic mean tends to mitigate the impact of large outliers. The harmonic mean may aggravate the impact of small outliers, but such outliers are bounded by zero on the downside.

We can use the group of telecommunications companies examined earlier in the reading (see Exhibit 5) to illustrate differences between the arithmetic mean and harmonic mean. This group includes two large outliers for P/E, Equinix at a P/E of 131.28 and Verizon at a P/E of 86.06. Exhibit 29 shows mean values including and excluding the outliers.

EXHIBIT 29 Arithmetic versus Harmonic Mean

Company	Trailing P/E (with Outliers)	Trailing P/E (No Outliers)
AT&T (NYSE: T)	25.73	25.73
BCE Inc. (NYSE: BCE; TSX: BCE)	14.49	14.49
Centurytel (NYSE: CTL)	18.86	18.86
Equinix (NASDAQ GS: EQIX)	131.28	
Frontier Communications Corp. (NASDAQ GS: FTR)	43.30	43.30
Verizon Communications (NYSE: VZ)	86.06	
Windstream Corp. (NYSE: WIN)	36.91	36.91
Arithmetic mean	50.95	27.86
Median	36.91	25.73
Harmonic mean	30.39	23.69

Note that for the entire group, the mean (50.95) is far higher than the median (36.91) because of Equinix and Verizon. The harmonic mean (30.39) is much closer to the median and more plausible as representing central tendency. Once the outliers are eliminated, the values for the arithmetic mean (27.86), median (25.73), and harmonic mean (23.69) are more tightly grouped. The lower value for the harmonic mean reflects the fact that this approach mitigates the effect of the relatively high P/E for Frontier (43.30) and Windstream (36.91).

This example illustrates the importance for the analyst of understanding how an average has been calculated, particularly when the analyst is reviewing information prepared by another analyst, and the usefulness of examining several summary statistics.

## 7.2. Using Multiple Valuation Indicators

Because each carefully selected and calculated price multiple, momentum indicator, or fundamental may supply some piece of the puzzle of stock valuation, many investors and analysts

use more than one valuation indicator (in addition to other criteria) in stock valuation and selection. Example 40 illustrates the use of multiple indicators.

#### EXAMPLE 40 Multiple Indicators in Stock Valuation

The following excerpts from past equity analyst reports illustrate the use of multiple ratios in communicating views about a stock's value. In the first excerpt, from a report on Colorpak Ltd. (Australian Stock Exchange: CKL), the analyst has used a discounted cash flow valuation as the preferred methodology but notes that the stock is also attractive when a price-to-earnings ratio (PER in the report) is used. In the second excerpt, from a report on AB InBev (Euronext Belgium: ABI), an analyst evaluates the stock price (then trading at 42.80) by using two multiples, price to earnings (P/E) and EV/EBITDA, in relation to revised forecasts.

##### **Colorpak Ltd. (Australian Stock Exchange: CKL)**

Our DCF for CKL is A\$0.82ps, which represents a 44% prem. to the current price. Whilst the DCF valuation is our preferred methodology, we recognise that CKL also looks attractive on different metrics.

Applying a mid-cycle PER multiple of 10.5× (30% disc to mkt) to FY08 EPS of 7.6cps, we derive a valuation of A\$0.80. Importantly, were the stock to reach our target of A\$0.75ps in 12mths, CKL would be trading on a fwd PER of 9.1×, which we do not view as demanding. At current levels, the stock is also offering an attractive dividend yield of 5.7% (fully franked). [*Note*: “fully franked” is a concept specific to the Australian market and refers to tax treatment of the dividend.]

Mario Maia, CFA  
Merrill Lynch (Australia)

##### **AB InBev (Euronext Belgium: ABI)**

Based on our slightly increased estimates, the shares are valued at a P/E and EV/EBITDA 2012 of 12.4x and 9x, slightly below the valuation of the large FMCG (fast-moving consumer goods) and spirits companies. Given its stronger profit growth, the brewer [ABI] could command a premium. We raise our target price from EUR52 to EUR53, implying a 24% upside. Buy.

Ton van Ooijen, CFA  
Kepler Research

In selecting stocks, institutional investors surveyed in the *BofA Merrill Lynch Institutional Factor Surveys* from 1989 to 2012 used an average of 9.3 factors in selecting stocks (does not include 2008–2010 due to a lack of sufficient responses). The survey factors included not only price multiples, momentum indicators, and the DDM but also the fundamentals ROE, debt to equity, projected five-year EPS growth, EPS variability, EPS estimate dispersion, size, beta, foreign exposure, low price, and neglect. Exhibit 30 lists the factors classified by percentage

of investors indicating that they use that factor in making investment decisions, out of 137 responders in 2012.

EXHIBIT 30 Frequency of Investor Usage of Factors in Making Investment Decisions

Factor	Frequency	
	High (●) >50%; Med (◆) >30%<50%; Low (○) <30%	
P/E	●	
Beta	●	
EV/EBITDA	●	
ROE	●	
Size	●	
P/B	●	
P/FCF	◆	
Share Repurchase	◆	
Earnings Estimate Revision	◆	
Margins	◆	
Relative Strength	◆	
EPS Momentum	◆	
D/E	◆	
EPS Variability	◆	
DDM/DCF	◆	
PEG	◆	
Long-Term Price Trend	◆	
P/CF	◆	
Analyst Neglect	◆	
Dividend Growth	◆	
Projected 5-Year EPS Growth	◆	
Mean Reversion	◆	
Normalized P/E	◆	
P/S	◆	
Net Debt/EBITDA	○	
EPS Surprise	○	
ROC	○	
ROA	○	
EPS Estimate Dispersion	○	
Analyst Rating Revisions	○	
Foreign Exposure	○	
Long-Term Price Trend w/ Short-Term Reversal	○	

EXHIBIT 30 (Continued)

High (●) >50%; Med (◆) >30%<50%; Low (○) <30%	
Factor	Frequency
Trading Volume	○
Price Target	○
Ownership	○
Short-Term Price Trend	○
EV/Sales	○
Low Price	○
Altman Z-Score	○
Equity Duration	○

Source: BofA Merrill Lynch 2012 Institutional Factor Survey.

An issue concerning the use of ratios in an investing strategy is look-ahead bias. **Look-ahead bias** is the use of information that was not contemporaneously available in computing a quantity. Investment analysts often use historical data to back test an investment strategy that involves stock selection based on price multiples or other factors. When back testing, an analyst should be aware that time lags in the reporting of financial results create the potential for look-ahead bias in such research. For example, as of early January 2014, most companies had not reported EPS for the last quarter of 2013, so at that time, a company's trailing P/E would be based on EPS for the first, second, and third quarters of 2013 and the last quarter of 2012. Any investment strategy based on a trailing P/E that used actual EPS for the last quarter of 2013 could be implemented only after the data became available. Thus, if an analysis assumed that an investment was made in early January 2014 based on full-year 2013 data, the analysis would involve look-ahead bias. To avoid this bias, an analyst would calculate the trailing P/E based on the most recent four quarters of EPS then being reported. The same principle applies to other multiples calculated on a trailing basis.

The application of a set of criteria to reduce an investment universe to a smaller set of investments is called **screening**. Stock screens often include not only criteria based on the valuation measures discussed in this reading but also on fundamental criteria that may explain differences in such measures. Computerized stock screening is an efficient way to narrow a search for investments and is a part of many stock selection disciplines. The limitations to many commercial databases and screening tools usually include lack of control by the user of the calculation of important inputs (such as EPS); the absence of qualitative factors in most databases is another important limitation. Example 41 illustrates the use of a screen in stock selection.

#### EXAMPLE 41 Using Screens to Find Stocks for a Portfolio

Janet Larsen manages an institutional portfolio and is currently looking for new stocks to add to the portfolio. Larsen has a commercial database with information on US stocks. She has designed several screens to select stocks with low P/Es and low P/B multiples. Because Larsen is aware that screening for low P/E and low P/B multiples

may identify stocks with low expected growth, she also wants stocks that have a PEG less than 1.0. She decides to screen for stocks with a dividend yield of at least 3.0 percent and a total market capitalization over \$10 billion. Exhibit 31 shows the number of stocks that successively met each of the five criteria as of January 2014 (so, the number of stocks that met all five criteria is 6).

EXHIBIT 31 Stock Screen

Criterion	Stocks Meeting Each Criterion Successively
P/E < 20.0	1,674
P/B < 2.0	1,135
PEG < 1.0	156
Dividend yield $\geq$ 3.0%	113
Market capitalization over \$10 billion	6

Other information:

- The screening database indicates that the P/E was 19.4, P/B was 2.6, and the dividend yield was 2.1 percent for the S&P 500 as of the date of the screen.
- S&P's *US Style Indices Methodology* indicates that the style indices measure growth and value by the following six factors, which S&P standardizes and uses to compute growth and value scores for each company:

**Three Growth Factors**

- Three-year change in EPS over price per share
- Three-year sales per share growth rate
- Momentum (12-month percentage price change)

**Three Value Factors**

- Book value to price ratio
- Earnings to price ratio
- Sales to price ratio

- In July of 2013, the S&P Dow Jones US Index Committee raised the market cap guidelines used when selecting companies for the S&P 500, S&P Mid-Cap 400, and S&P Small-Cap 600. The new guidelines are:
  - S&P 500: Over \$4.6 billion
  - S&P Mid-Cap 400: \$1.2 to \$5.1 billion
  - S&P Small-Cap 600: \$350 million to \$1.6 billion

Using the information supplied, answer the following questions:

1. What type of valuation indicators does Larsen *not* include in her stock screen?
2. Characterize the overall orientation of Larsen as to investment style.
3. State two limitations of Larsen's stock screen.

*Solution to 1:* Larsen has not included momentum indicators in the screen.

*Solution to 2:* Larsen can be characterized as a large-cap value investor, based on the specified market capitalization. Although her screen does include a PEG, it excludes



explicit growth rate criteria, such as those used by S&P, and it excludes momentum indicators usually associated with a growth orientation, such as positive earnings surprise. Larsen also uses a cutoff for P/B that is less than the average P/B for the S&P 500. Note that her criteria for multiples are all “less than” criteria.

*Solution to 3:* Larsen does not include any profitability criteria or risk measurements. These omissions are a limitation because a stock’s expected low profitability or high risk may explain its low P/E. Another limitation of her screen is that the computations of the value indicators in a commercial database may not reflect the appropriate adjustments to inputs. The absence of qualitative criteria is also a possible limitation.

Investors also apply all the metrics that we have illustrated in terms of individual stocks to industries and economic sectors. For example, average price multiples and momentum indicators can be used in sector rotation strategies to determine relatively under- or overvalued sectors.<sup>61</sup> (A sector rotation strategy is an investment strategy that overweights economic sectors that are anticipated to outperform or lead the overall market.)

## 8. SUMMARY

In this reading, we have defined and explained the most important valuation indicators in professional use and illustrated their application to a variety of valuation problems.

- Price multiples are ratios of a stock’s price to some measure of value per share.
- Price multiples are most frequently applied to valuation in the method of comparables. This method involves using a price multiple to evaluate whether an asset is relatively undervalued, fairly valued, or overvalued in relation to a benchmark value of the multiple.
- The benchmark value of the multiple may be the multiple of a similar company or the median or average value of the multiple for a peer group of companies, an industry, an economic sector, an equity index, or the company’s own median or average past values of the multiple.
- The economic rationale for the method of comparables is the law of one price.
- Price multiples may also be applied to valuation in the method based on forecasted fundamentals. Discounted cash flow (DCF) models provide the basis and rationale for this method. Fundamentals also interest analysts who use the method of comparables because differences between a price multiple and its benchmark value may be explained by differences in fundamentals.
- The key idea behind the use of price-to-earnings ratios (P/Es) is that earning power is a chief driver of investment value, and earnings per share (EPS) is probably the primary focus of security analysts’ attention. The EPS figure, however, is frequently subject to distortion, often volatile, and sometimes negative.

<sup>61</sup>Chan, Jegadeesh, and Lakonishok (1999) and Lee and Swaminathan (2000).

- The two alternative definitions of P/E are trailing P/E, based on the most recent four quarters of EPS, and forward P/E, based on next year's expected earnings.
- Analysts address the problem of cyclicity by normalizing EPS—that is, calculating the level of EPS that the business could achieve currently under midcyclical conditions (normalized EPS).
- Two methods to normalize EPS are the method of historical average EPS (calculated over the most recent full cycle) and the method of average return on equity (EPS = average ROE multiplied by current book value per share).
- Earnings yield (E/P) is the reciprocal of the P/E. When stocks have zero or negative EPS, a ranking by earnings yield is meaningful whereas a ranking by P/E is not.
- Historical trailing P/Es should be calculated with EPS lagged a sufficient amount of time to avoid look-ahead bias. The same principle applies to other multiples calculated on a trailing basis.
- The fundamental drivers of P/E are the expected earnings growth rate and the required rate of return. The justified P/E based on fundamentals bears a positive relationship to the first factor and an inverse relationship to the second factor.
- PEG (P/E to growth) is a tool to incorporate the impact of earnings growth on P/E. PEG is calculated as the ratio of the P/E to the consensus growth forecast. Stocks with low PEGs are, all else being equal, more attractive than stocks with high PEGs.
- We can estimate terminal value in multistage DCF models by using price multiples based on comparables. The expression for terminal value,  $V_n$ , is (using P/E as the example)

$$V_n = \text{Benchmark value of trailing P/E} \times E_n$$

or

$$V_n = \text{Benchmark value of forward P/E} \times E_{n+1}$$

- Book value per share is intended to represent, on a per-share basis, the investment that common shareholders have in the company. Inflation, technological change, and accounting distortions, however, may impair the use of book value for this purpose.
- Book value is calculated as common shareholders' equity divided by the number of shares outstanding. Analysts adjust book value to accurately reflect the value of the shareholders' investment and to make P/B (the price-to-book ratio) more useful for comparing different stocks.
- The fundamental drivers of P/B are ROE and the required rate of return. The justified P/B based on fundamentals bears a positive relationship to the first factor and an inverse relationship to the second factor.
- An important rationale for using the price-to-sales ratio (P/S) is that sales, as the top line in an income statement, are generally less subject to distortion or manipulation than other fundamentals, such as EPS or book value. Sales are also more stable than earnings and are never negative.
- P/S fails to take into account differences in cost structure between businesses, may not properly reflect the situation of companies losing money, and may be subject to manipulation through revenue recognition practices.
- The fundamental drivers of P/S are profit margin, growth rate, and the required rate of return. The justified P/S based on fundamentals bears a positive relationship to the first two factors and an inverse relationship to the third factor.

- Enterprise value (EV) is total company value (the market value of debt, common equity, and preferred equity) minus the value of cash and investments.
- The ratio of EV to total sales is conceptually preferable to P/S because EV/S facilitates comparisons among companies with varying capital structures.
- A key idea behind the use of price to cash flow is that cash flow is less subject to manipulation than are earnings. Price to cash flow multiples are often more stable than P/E. Some common approximations to cash flow from operations have limitations, however, because they ignore items that may be subject to manipulation.
- The major cash flow (and related) concepts used in multiples are earnings plus noncash charges (CF), cash flow from operations (CFO), free cash flow to equity (FCFE), and earnings before interest, taxes, depreciation, and amortization (EBITDA).
- In calculating price to cash flow, the earnings-plus-noncash-charges concept is traditionally used, although FCFE has the strongest link to financial theory.
- CF and EBITDA are not strictly cash flow numbers because they do not account for non-cash revenue and net changes in working capital.
- The fundamental drivers of price to cash flow, however defined, are the expected growth rate of future cash flow and the required rate of return. The justified price to cash flow based on fundamentals bears a positive relationship to the first factor and an inverse relationship to the second.
- EV/EBITDA is preferred to P/EBITDA because EBITDA, as a preinterest number, is a flow to all providers of capital.
- EV/EBITDA may be more appropriate than P/E for comparing companies with different amounts of financial leverage (debt).
- EV/EBITDA is frequently used in the valuation of capital-intensive businesses.
- The fundamental drivers of EV/EBITDA are the expected growth rate in free cash flow to the firm, profitability, and the weighted average cost of capital. The justified EV/EBITDA based on fundamentals bears a positive relationship to the first two factors and an inverse relationship to the third.
- Dividend yield has been used as a valuation indicator because it is a component of total return and is less risky than capital appreciation.
- Trailing dividend yield is calculated as four times the most recent quarterly per-share dividend divided by the current market price.
- The fundamental drivers of dividend yield are the expected growth rate in dividends and the required rate of return.
- Comparing companies across borders frequently involves dealing with differences in accounting standards, cultural differences, economic differences, and resulting differences in risk and growth opportunities.
- Momentum indicators relate either price or a fundamental to the time series of the price or fundamental's own past values (in some cases, to their expected values).
- Momentum valuation indicators include earnings surprise, standardized unexpected earnings (SUE), and relative strength.
- Unexpected earnings (or earnings surprise) equals the difference between reported earnings and expected earnings.
- SUE is unexpected earnings divided by the standard deviation in past unexpected earnings.
- Relative-strength indicators allow comparison of a stock's performance during a period either with its own past performance (first type) or with the performance of some group of stocks (second type). The rationale for using relative strength is the thesis that patterns of persistence or reversal in returns exist.

- Screening is the application of a set of criteria to reduce an investment universe to a smaller set of investments and is a part of many stock selection disciplines. In general, limitations of such screens include the lack of control in vendor-provided data of the calculation of important inputs and the absence of qualitative factors.

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## PROBLEMS

1. As of February 2008, you are researching Jonash International, a hypothetical company subject to cyclical demand for its services. Jonash shares closed at \$57.98 on 2 February 2007. You believe the 2003–2006 period reasonably captures average profitability:

Measure	2007	2006	2005	2004	2003
EPS	E\$3.03	\$1.45	\$0.23	\$2.13	\$2.55
BV per share	E\$19.20	\$16.21	\$14.52	\$13.17	\$11.84
ROE	E16.0%	8.9%	1.6%	16.3%	21.8%

- A. Define normalized EPS.  
 B. Calculate a normalized EPS for Jonash based on the method of historical average EPS and then calculate the P/E based on normalized EPS.  
 C. Calculate a normalized EPS for Jonash based on the method of average ROE and the P/E based on normalized EPS.
2. An analyst plans to use P/E and the method of comparables as a basis for recommending purchasing shares of one of two peer-group companies in the business of manufacturing personal digital assistants. Neither company has been profitable to date, and neither is expected to have positive EPS over the next year. Data on the companies' prices, trailing EPS, and expected growth rates in sales (five-year compounded rates) are given in the following table:

Company	Price	Trailing EPS	P/E	Expected Growth (Sales)
Hand	\$22	−\$2.20	NM	45%
Somersault	\$10	−\$1.25	NM	40%

Unfortunately, because the earnings for both companies have been negative, their P/Es are not meaningful. On the basis of this information, address the following:

- A. Discuss how the analyst might make a relative valuation in this case.  
 B. State which stock the analyst should recommend.
3. May Stewart, CFA, a retail analyst, is performing a P/E-based comparison of two hypothetical jewelry stores as of early 2009. She has the following data for Hallwhite Stores (HS) and Ruffany (RUF).
- HS is priced at \$44. RUF is priced at \$22.50.
  - HS has a simple capital structure, earned \$2.00 per share (basic and diluted) in 2008, and is expected to earn \$2.20 (basic and diluted) in 2009.
  - RUF has a complex capital structure as a result of its outstanding stock options. Moreover, it had several unusual items that reduced its basic EPS in 2008 to \$0.50 (versus the \$0.75 that it earned in 2007).