CHAPTER 20

Revenue Multiples and Sector-Specific Multiples

While earnings and book value multiples are intuitively appealing and widely used, analysts in recent years have increasingly turned to alternative multiples to value companies. For young firms that have negative earnings, multiples of revenues have replaced multiples of earnings in many valuations. In addition, these firms are being valued on multiples of sector-specific measures such as the number of customers, subscribers, or even web site visitors (for new economy firms). In this chapter, the reasons for the increased use of revenue multiples are examined first, followed by an analysis of the determinants of these multiples and how best to use them in valuation. This is followed by a short discussion of the sector-specific multiples, the dangers associated with their use and the adjustments that might be needed to make them work.

REVENUE MULTIPLES

A revenue multiple measures the value of the equity or a business relative to the revenues that it generates. As with other multiples, other things remaining equal, firms that trade at low multiples of revenues are viewed as cheap relative to firms that trade at high multiples of revenues.

Revenue multiples have proved attractive to analysts for a number of reasons. First, unlike earnings and book value ratios, which can become negative for many firms and thus not meaningful, revenue multiples are available even for the most troubled firms and for very young firms. Thus, the potential for bias created by eliminating firms in the sample is far lower. Second, unlike earnings and book value, which are heavily influenced by accounting decisions on depreciation, inventory, research and development (R&D), acquisition accounting, and extraordinary charges, revenue is relatively difficult to manipulate. Third, revenue multiples are not as volatile as earnings multiples, and hence are less likely to be affected by year-to-year swings in a firm's fortune. For instance, the price-earnings ratio of a cyclical firm changes much more than its price-sales ratios, because earnings are much more sensitive to economic changes than revenues are.

The biggest disadvantage of focusing on revenues is that it can lull you into assigning high values to firms that are generating high revenue growth while losing significant amounts of money. Ultimately, a firm has to generate earnings and cash flows for it to have value. While it is tempting to use price-sales multiples to value

firms with negative earnings and book value, the failure to control for differences across firms in costs and profit margins can lead to misleading valuations.

Definition of Revenue Multiple

There are two basic revenue multiples in use. The first, and more popular one, is the multiple of the market value of equity to the revenues of a firm; this is termed the price-to-sales ratio. The second, and more robust, ratio is the multiple of the value of the firm (including both debt and equity) to revenues; this is the value to-sales ratio.

 $Price-to-sales ratio = \frac{Market value of equity}{Revenues}$ $\frac{Enterprise value}{to sales ratio} = \frac{Market value of equity + Market value of debt - Cash}{Revenues}$

As with the EBITDA multiple, we net cash out of firm value, because the income from cash is not part of revenue. The enterprise value-to-sales ratio is a more robust multiple than the price-to-sales ratio because it is internally consistent. It divides the total value of the firm by the revenues generated by that firm. The priceto-sales ratio divides an equity value by revenues that are generated for the firm. Consequently, it will yield lower values for more highly levered firms, and may lead to misleading conclusions when price-to-sales ratios are compared across firms in a sector with different degrees of leverage.

Accounting standards across different sectors and markets are fairly similar when it comes to how revenues are recorded. There have been firms, in recent years though, that have used questionable accounting practices in recording installment sales and intracompany transactions to make their revenues higher. Notwithstanding these problems, revenue multiples suffer far less than other multiples from differences across firms.

Cross-Sectional Distribution

As with the price-earnings ratio, the place to begin the examination of revenue multiples is with the cross sectional distribution of price to sales and enterprise value to sales ratios across firms in the United States. Figure 20.1 summarizes this distribution in January 2011.

There are two things worth noting in this distribution. The first is that revenue multiples are even more skewed toward positive values than earnings multiples. The second is that the price-to-sales ratio is generally lower than the value to sales ratio, which should not be surprising since the former includes only equity while the latter considers firm value.

Table 20.1 provides summary statistics on both the price to sales and the value to sales ratios. The average values for both multiples are much higher than the median values, largely as the result of outliers—there are firms that trade at multiples that exceed 100 or more.

Analysis of Revenue Multiples

The variables that determine the revenue multiples can be extracted by going back to the appropriate discounted cash flow models—dividend discount model (or an FCFE valuation model) for price-to-sales ratios and a firm valuation model for value-to-sales ratios.



TABLE 20.1PS and EV/Sales Multiples: Distributional Statisticsfor U.S. firms in January 2011

	PS Ratio	EV/Sales Ratio
Number of firms	4766	4766
Average	36.36	34.45
Median	1.3	1.48
25th percentile	0.55	0.32
25th percentile	3.1	3.29

psdata.xls: This dataset on the Web summarizes price-to-sales and value-to-sales ratios and fundamentals by industry group in the United States for the most recent year.

Price-to-Sales Ratios The price-to-sales ratio for a stable firm can be extracted from a stable growth dividend discount model:

$$P_0 = \frac{DPS_1}{k_e - g_n}$$

where $P_0 =$ Value of equity

 DPS_1^0 = Expected dividends per share next year

k = Cost of equity

 $g_n =$ Growth rate in dividends (forever)

Substituting in for $DPS_1 = EPS_0(1 + g_n)$ (Payout ratio), the value of the equity can be written as:

$$P_0 = \frac{EPS_0 \times Payout \ ratio \times (1+g_n)}{k_e - g_n}$$

Defining the net profit margin = $EPS_0/Sales$ per share, the value of equity can be written as:

$$P_0 = \frac{\text{Sales}_0 \times \text{Net margin} \times \text{Payout ratio} \times (1 + g_n)}{k_e - g_n}$$

Rewriting in terms of the price-sales ratio,

$$\frac{P_0}{\text{Sales}_0} = PS = \frac{\text{Net margin} \times \text{Payout ratio} \times (1 + g_n)}{k_e - g_n}$$

The PS ratio is an increasing function of the profit margin, the payout ratio, and the growth rate, and a decreasing function of the riskiness of the firm.

The price-sales ratio for a high-growth firm can also be related to fundamentals. In the special case of the two-stage dividend discount model, this relationship can be made explicit fairly simply. With two stages of growth, a high-growth stage and a stable-growth phase, the dividend discount model can be written as follows:

$$P_{0} = \frac{EPS_{0} \times Payout ratio \times (1+g) \times \left[1 - \frac{(1+g)^{n}}{(1+k_{e,hg})^{n}}\right]}{k_{e,hg} - g} + \frac{EPS_{0} \times Payout ratio_{n} \times (1+g)^{n} \times (1+g_{n})}{(k_{e,st} - g_{n})(1+k_{e,hg})^{n}}$$

where

g = Growth rate in the first n years

 $k_{e,hg} = Cost of equity in high growth$

Payout = Payout ratio in the first n years

 $g_n =$ Growth rate after n years forever (stable growth rate)

 $k_{e,st}$ = Cost of equity in stable growth

 $Payout_n = Payout ratio after n years for the stable firm$

Rewriting EPS_0 in terms of the profit margin, $EPS_0 = Sales_0 \times Profit$ margin, and bringing $Sales_0$ to the left-hand side of the equation, you get:

$$\frac{\text{Price}}{\text{Sales}} = \text{Net margin} \times \begin{cases} \frac{\text{Payout ratio} \times (1+g) \times \left[1 - \frac{(1+g)^n}{(1+k_{e,hg})^n}\right]}{k_{e,hg} - g} \\ + \frac{\text{Payout ratio}_n \times (1+g)^n \times (1+g_n)}{(k_{e,st} - g_n)(1+k_{e,hg})^n} \end{cases}$$

The left-hand side of the equation is the price-sales ratio. It is determined by:

- Net profit margin: net income/revenues. The price-sales ratio is an increasing function of the net profit margin. Firms with higher net margins, other things remaining equal, should trade at higher price-to-sales ratios.
- Payout ratio during the high-growth period and in the stable period. The PS ratio increases as the payout ratio increases, for any given growth rate.
- Riskiness (through the discount rate k_{e,hg} in the high-growth period and k_{e,st} in the stable period). The PS ratio becomes lower as riskiness increases, since higher risk translates into a higher cost of equity.
- Expected growth rate in earnings, in both the high-growth and stable phases. The PS increases as the growth rate increases, in both the high-growth and stable-growth periods.

You can apply this equation to estimate the price-to-sales ratio, even for a firm that is not paying dividends currently. As with the price to book ratio, you can substitute in the free cash flows to equity for the dividends in making this estimate. Doing so will yield a more reasonable estimate of the price-to-sales ratio for firms that pay out dividends that are far lower than they what can afford to pay out.

$$\frac{\text{Price}}{\text{Sales}} = \text{Net margin} \times \begin{cases} \frac{\left(\frac{\text{FCFE}}{\text{Earnings}}\right) \times (1+g) \times \left[1 - \frac{(1+g)^n}{(1+k_{e,hg})^n}\right]}{k_{e,hg} - g} \\ + \frac{\left(\frac{\text{FCFE}}{\text{Earnings}}\right)_n \times (1+g)^n \times (1+g_n)}{(k_{e,st} - g_n)(1+k_{e,hg})^n} \end{cases} \end{cases}$$

As with the price-to-book ratio, this equation can be modified to allow for different net margins in high-growth and stable-growth periods.

ILLUSTRATION 20.1: Estimating the Price-to-Sales Ratio for a High-Growth Firm in the Two-Stage Model

Assume that you have been asked to estimate the PS ratio for a firm that is expected to be in high growth for the next five years. The following is a summary of the inputs for the valuation:

Growth rate in first five years = 20%Growth rate after five years = 8%Beta = 1.0Net profit margin = 10% Cost of equity = 6% + 1(5.5%) = 11.5%Payout ratio in first five years = 20%Payout ratio after five years = 50%Risk-free rate = T-bond rate = 6%

This firm's price-to-sales ratio can be estimated as follows:

$$PS = 0.10 \times \left\{ \frac{0.2 \times (1.20) \times \left[1 - \frac{(1.20)^5}{(1.115)^5} \right]}{(.115 - .20)} + \frac{0.50 \times (1.20)^5 \times (1.08)}{(.115 - .08)(1.115)^5} \right\} = 2.35$$

Based on this firm's fundamentals, you would expect its equity to trade at 2.35 times revenues.

ILLUSTRATION 20.2: Estimating the Intrinsic Price-to-Sales Ratio for a High Growth Firm: Whole Foods Markets in May 2011

Whole Foods Markets was founded as a grocery chain designed to provide alternatives for healthconscious shoppers, willing to pay a premium for organic food. The retailer grew significantly between 2005 and 2010 and had more than 300 stores open at by May 2011. The firm reported net income of \$246 million in 2010 on revenues of \$9,006 million, giving it a net profit margin of 2.73%:

Net profit margin = Net income/Sales = \$246/ \$9,006 million = 2.73%

Based on its book value of equity of \$1,628 million at the end of 2009, the firm generated a return on equity of 15.11%:

Return on equity = $\frac{\text{Net income}_{2010}}{\text{Book value}_{2009}} = \frac{\$246}{\$1,628} = 15.11\%$

We will assume that the firm will be able to maintain a growth rate in net income of 10% a year for the next 10 years, while preserving its current net margin and return on equity. After the tenth year, we will assume that the firm will be in stable growth, growing 3% a year in perpetuity, with a net margin of 2.5% and a return on equity of 10%. To estimate the cost of equity, we will assume that the firm has a beta of 1.00 for the high growth period and 0.90 in stable growth; the risk-free rate was 3.5% and the equity risk premium was 5%. The inputs used in the estimation are summarized below:

High Growth	Stable-Growth
5	Forever
2.73%	2.50%
5.53	4.00
15.11%	10.00%
1 - 10%/15.11% = 33.82%	1 - 3%/10% = 70%
10.00%	3.00%
3.5% + 1 (5.5 %) = 8.50%	3.5% + .9(5%) = 8.00%
	High Growth 5 2.73% 5.53 15.11% 1 - 10%/15.11% = 33.82% 10.00% 3.5% + 1 (5.5%) = 8.50%

The price-to-sales ratio, based on these inputs, is estimated here.

$$PS = (0.0273) \left[\frac{(0.3382)(1.10) \left(1 - \frac{(1.10)^{10}}{(1.09)^{10}} \right)}{0.09 - 0.10} + \frac{(0.75)(1.10)^{10}(1.03)}{(0.085 - 0.03)(1.10)^{10}} \right] = 0.55$$

Whole Foods was trading at a price to sales ratio of 1.11 in May 2011, making it significantly over valued.

Value to Sales Ratios To analyze the relationship between value and sales, consider the value of a stable-growth firm:

$$\frac{\text{Firm}}{\text{value}} = \frac{\text{EBIT}(1-t)(1-\text{Reinvestment rate})}{\text{Cost of capital} - g_n}$$

Dividing both sides by the revenue, you get:

Firm value	[EBIT(1-t)/Sales](1 – Reinvestment rate)
Sales	Cost of capital – g _n
Firm value ₀ _	After-tax operating margin(1–Reinvestment rate)
Sales	Cost of capital – g _n

Just as the price-to-sales ratio is determined by net profit margins, payout ratios, and costs of equity, the value-to-sales ratio is determined by after-tax operating margins, reinvestment rates, and the cost of capital. Firms with higher operating margins, lower reinvestment rates (for any given growth rate), and lower costs of capital will trade at higher value-to-sales multiples.

This equation can be expanded to cover a firm in high growth by using a twostage firm valuation model:

$$\begin{split} \textbf{EV} = \textbf{AT oper margin} \begin{cases} \frac{(1 - \textbf{RIR}) \times (1 + \textbf{g}) \times \left[1 - \frac{(1 + \textbf{g})^n}{(1 + \textbf{k}_{c,hg})^n}\right]}{\textbf{k}_{c,hg} - \textbf{g}} \\ + \frac{(1 - \textbf{RIR}_n) \times (1 + \textbf{g})^n \times (1 + \textbf{g}_n)}{(\textbf{k}_{c,st} - \textbf{g}_n)(1 + \textbf{k}_{c,hg})^n} \end{cases} \end{split}$$

where $\frac{\text{AT oper margin}}{\text{AT oper margin}} = \text{After-tax operating margin} = \text{EBIT}(1 - t)/\text{Sales}$

- RIR = Reinvestment rate (RIR_n is for stable growth period)
 - k_c = Cost of capital (hg: high growth and st: stable growth periods)
 - g = Growth rate in operating income in high-growth and stable-growth periods

Note that the determinants of the value to-sales ratio remain the same as they were in the stable growth model—the growth rate, the reinvestment rate, the operating margin, and the cost of capital—but the number of estimates increases to reflect the existence of a high-growth period.

ILLUSTRATION 20.3: Estimating the Intrinsic EV-to-Sales Ratio for a High Growth Firm: Coca-Cola in May 2011

Coca-Cola has been successful in delivering high growth with impressive margins for decades. In 2010, Coca Cola reported pretax operating income of \$8,449 million on revenues of \$35,119 million; the tax rate for the company was approximately 40%. At the end of 2009, the firm had total capital invested of \$31,679 million leading to the following inputs:

Invested Capital = BV of equity + BV of debt - Cash = 24799 + 11,859 - 4979 = \$31,679 million After-tax operating margin = Operating income (1 - t)/ Revenues = 8,449/35,119 = 14.43%Sales/ Capital = \$35,119/\$31,169 = 1.11

Return on invested capital = After-tax operating margin \times Sales/Capital = 14.43% \times 1.11 = 16%

We will assume that the firm will be able to maintain its current margin and return on capital for the next 10 years, while reinvesting 60 percent of its after-tax operating income back into the business (the average over the last five years). During this period, we will also assume that Coca-Cola will have a beta of 0.90, a pretax cost of debt of 4.50% and that it will remain at its existing debt to capital ratio of 7.23%, resulting in a cost of capital of 8.03%:

Cost of equity = Riskfree rate + Beta (Equity risk premium) = 3.5% + .9(5.5%) = 8.45%Cost of capital = 8.45% (1 - .0723) + 4.5% (1 - .40) (.0723) = 8.03%

After year 10, we will assume that Coca-Cola will be in stable growth, growing 3.5% a year and that its operating margin and sales-to-capital ratio will drop back towards (but not all the way to) industry averages (After-tax operating margin will be 12% and sales to capital ratio will converge on one). In stable growth, we also assume that the beta for the company will be one and that the debt ratio will rise to 20%.

Cost of equity = 3.5% + 1 (5.5%) = 9%Cost of capital = 9% (.80) + 4.5% (1 - .4) (.20) = 7.74%

The inputs that we will use to estimate the EV/Sales ratio for Coca Cola are listed here:

	High Growth	Stable Growth
Length of period	10	After year 5
After-tax operating margin	14.43%	12.00%
Sales/Capital	1.11	1.00
Return on capital	16.00%	12%
Reinvestment rate	60%	29.17%
Expected growth rate	9.60%	3.50%
Cost of capital	8.03%	7.74%

Plugging these numbers into the two-stage EV/Sales equation, we get:

$$EV/S = (0.1443) \left(\frac{(1 - 0.60)(1.096) \left[1 - \frac{(1.096)^{10}}{(1.0803)^{10}} \right]}{0.0803 - 0.096} \right) + (0.1443) \left(\frac{[1 - 0.2917](1.096)^{10}(1.035)}{(0.0774 - 0.035)(1.0803)^{10}} \right) = 3.51$$

Based on our inputs, the enterprise value for Coca-Cola should be 2.83 times revenues:

Expected enterprise value = $35,119 \times 3.51 = 123,197$ million

In May 2011, Coca-Cola's market capitalization was \$152,200 million. Incorporating the debt outstanding (\$11,859 million) and the cash balance (4,979 million) yields an actual enterprise value of

Actual enterprise value = \$152,200 + \$11,859 - \$4,979 = \$159,080 million

The company looks overvalued, based on our assumptions, by about 23%.

firmmult.xls: This spreadsheet allows you to estimate the value-to-sales ratio for a stable-growth or high-growth firm, given its fundamentals.

Revenue Multiples and Profit Margins The key determinant of revenue multiples is the profit margin—the net margin for price-to-sales ratios and operating margin for value-to-sales ratios. Firms involved in businesses that have high margins can expect to sell for high multiples of sales. However, a decline in profit margins has a twofold effect. First, the reduction in profit margins reduces the revenue multiple directly. Second, the lower profit margin can lead to lower growth and hence lower revenue multiples.

The profit margin can be linked to expected growth fairly easily if an additional term is defined—the ratio of sales to book value (BV), which is also called a turnover ratio. This turnover ratio can be defined in terms of book equity (Equity turnover = Sales/Book value of equity) or book capital (Capital turnover = Sales/Book value of capital). Using a relationship developed between growth rates and fundamentals, the expected growth rates in equity earnings and operating can be written as a function of profit margins and turnover ratios:

Expected growth_{equity} = Retention ratio × Return on equity = Retention ratio × (Net profit/Sales) × (Sales/BV of equity) = Retention ratio × Net margin × Sales/BV of equity

For example, in the valuation of Whole Foods in Illustration 20.2, the expected return on equity is 15.11%. This growth rate can be derived from Whole Food's net margin (2.73%) and sales-to-book value of equity ratio (5.53):

Net margin = 2.73% Sales/BV of equity = \$9,006/\$1,628 = 5.53 Return on equity = 2.73% × 5.53 = 15.11%

For growth in operating income,

Expected growth_{firm} = Reinvestment rate × Return on capital = Reinvestment rate × [EBIT(1 - t)/Sales] × (Sales/BV of capital) = Reinvestment rate × After-tax operating margin × Sales/BV of capital

In the valuation of Coca-Cola in Illustration 20.3, the return on capital is 16%. This growth rate can be derived from Coca-Cola's after-tax operating margin (14.43%) and sales/capital ratio (1.11):

After-tax operating margin = 14.43%Sales/ Invested capital = 35,119/31,679 = 1.11Return on capital = $14.43\% \times 1.11 = 16\%$

As the profit margin is reduced, the expected returns on equity and capital will decrease, if the sales do not increase proportionately.

ILLUSTRATION 20.4: Estimating the Effect of Lower Margins on Price-Sales Ratios

Consider again the firm analyzed in Illustration 20.1. If the firm's profit margin declines and total revenue remains unchanged, the price-sales ratio for the firm will decline with it. For instance, if the firm's profit margin declines from 10% to 5% and the sales/BV remains unchanged:

New growth rate in first five years = Retention ratio \times Profit margin \times Sales/BV = $.8 \times .05 \times 2.50 = 10\%$

The new price-sales ratio can then be calculated as follows:

$$PS = 0.05 \times \left\{ \frac{0.2 \times 1.10 \times \left[1 - \frac{1.10^5}{1.115^5} \right]}{(.115 - .10)} + \frac{0.50 \times 1.10^5 \times 1.08}{(.115 - .08)(1.115)^5} \right\} = 0.77$$

The relationship between profit margins and the price-sales ratio is illustrated more comprehensively in the Figure 20.2. The price-sales ratio is estimated as a function of the profit margin, keeping the sales/book value of equity ratio fixed. This linkage of price-sales ratios and profit margins can be utilized to analyze the value effects of changes in corporate strategy as well as the value of a brand name.



FIGURE 20.2 Price-to-Sales Ratios and Profit Margins

MULTIPLES AND COMPANION VARIABLES

By this point in the relative valuation discussion, the process of deconstructing multiples should no longer be a mystery. In fact, with each multiple, while we have highlighted multiple variables that affect its value, there is one variable that operates as a key driver. We call this variable the companion variable and the table below lists it out for each multiple:

Multiple	Companion variable
PE ratio	Expected growth rate in EPS
PBV	Return on equity
PS	Net margin
EV/EBITDA	Reinvestment rate
EV/Invested Capital	Return on invested capital
EV/Sales	After-tax operating margin

These variables matter for two reasons. The first is that changes in the variables have big effects on the multiples that they relate to. The second is that when a stock looks cheap, because it has a low value on a multiple, the first item to check is the companion variable. Thus, if a stock trades at a low price-to-book ratio, you should check its return on equity; most low price-to-book stocks have low or negative returns on equity.

How do you find the companion variable for a multiple? One way is to run the market regression for the multiple against all of the independent variables that should determine it. The variable that has the most statistical significance (highest t statistic) is invariably the companion variable. The other, more intuitive, approach is to do the following. If working with an equity multiple, divide net income by the denominator of the multiple to get the companion variable. With price-to-book value of equity, for instance, using this approach would require dividing net income by the book value of equity, which would yield the return on equity. With enterprise value multiples, dividing the after-tax operating income by the denominator should yield the companion variable. With EV to Sales, for instance, dividing the after-tax operating income by sales results in the after-tax operating margin.

Marketing Strategy and Value Every firm has a pricing strategy. At the risk of oversimplifying the choice, you can argue that firms have to decide whether they want to go with a low-price, high-volume strategy (volume leader) or with a high-price, lowervolume strategy (price leader). In terms of the variables that link growth to value, this choice will determine the profit margin and turnover ratio to use in valuation.

You could analyze the alternative pricing strategies that are available to a firm by examining the impact that each strategy will have on margins and turnover, and valuing the firm under each strategy. The strategy that yields the highest value for the firm is, in a sense, the optimal strategy.

Note that the effect of price changes on turnover ratios will depend in large part on how elastic or inelastic the demand for the firm's products are. Increases in the price of a product will have a minimal effect on turnover ratios if demand is

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inelastic. In this case, the value of the firm will generally be higher with a price leader strategy. On the other hand, the turnover ratio could drop more than proportionately if the product price is increased and demand is elastic. In this case, firm value will increase with a volume leader strategy.

ILLUSTRATION 20.5: Choosing between a High-Margin and a Low-Margin Strategy

Assume that a firm has to choose between the two pricing strategies. In the first strategy, the firm will charge higher prices (resulting in higher net margins) and sell less (resulting in lower turnover ratios). In the second strategy, the firm will charge lower prices and sell more. Assume that the firm has done market testing and arrived at the following inputs:

	High Margin,	Low Margin,
	Low Volume	High Volume
Net profit margin	10%	5%
Sales/Book value of equity	2.5	4.0

Assume, in addition, that the firm is expected to pay out 20% of its earnings as dividends over the next five years, and 50% of earnings as dividends after that. The growth rate after year 5 is expected to be 8%. The book value of equity per share is \$10. The cost of equity for the firm is 11.5%.

HIGH MARGIN STRATEGY

Expected growth rate in first five years_{high margin} = Profit margin × Sales/BV × Retention ratio = $0.10 \times 2.5 \times 0.8 = 20\%$

Price-sales ratio_{high margin} = 0.10 ×
$$\left\{ \frac{0.2 \times (1.20) \times \left[1 - \frac{(1.20)^5}{(1.115)^5} \right]}{(.115 - .20)} + \frac{0.50 \times (1.20)^5 \times (1.08)}{(.115 - .08)(1.115)^5} \right\} = 2.35$$

Sales/book value_{high margin} = 2.50

$$Price_{high margin} = Price/Sales \times Sales/BV \times BV = 2.35 \times 2.5 \times 10 = $58.83$$

LOW MARGIN STRATEGY

Expected growth rate in first five years_{low margin} = Profit margin \times Sales/BV \times Retention ratio = $0.05 \times 4 \times 0.8 = 16\%$

Price-sales ratio_{low margin} =
$$0.05 \times \left\{ \frac{0.2 \times (1.16) \times \left[1 - \frac{(1.16)^5}{(1.115)^5}\right]}{(.115 - .16)} + \frac{0.05 \times (1.16)^5 \times (1.08)}{(.115 - .08)(1.115)^5} \right\} = 0.9966$$

Sales/book value $_{low margin} = 4.00$

$$Price_{low margin} = V/S \times S/BV \times BV = 0.9966 \times 4 \times \$10 = \$39.86$$

The high margin strategy is clearly the better one to follow here, if the objective is value maximization.

ILLUSTRATION 20.6: Effects of Changing Pricing Strategy: Whole Foods in May 2011

In Illustration 20.2, we estimated an intrinsic price-to-sales ratio of 0.55 for Whole Foods. While this is higher than the median for other grocery stores, it is still lower than the current price to sales ratio of 1.11 that the firm trades at. In making the estimate of 0.55, we assumed that Whole Foods would be able to sustain a net profit margin of 2.73% and a sales-to-book equity of 5.53.

Assume now that concerned about sales erosion, if they continue with their premium pricing strategy, Whole Foods is considering reducing prices to get back market share. If they do cut prices by 10%, their net profit margin will drop to 2.5% but same store sales will surge by about 15%, increasing the sales-to-book ratio to 6.36 (5.53×1.15). Assuming that the stable growth inputs remain unchanged (growth rate = 3%; ROE = 10%), the effect of the strategy change on price to sales ratio and more importantly on equity value can be summarized here:

	Premium price strategy (current)	Lower price strategy
Base revenues	\$9,006.00	\$10,356.90
Expected net margin	2.73%	2.50%
Expected Sales/Capital	5.53	6.36
Expected ROE	15.11%	15.90%
Expected growth rate	10.00%	10.00%
Payout ratio	33.82%	37.10%
PS	0.55	0.56
Value of equity	\$4,967.36	\$5,812.63

The new price-to-sales ratio is computed using the same two-stage model we used in Illustration 20.2:

$$PS = 0.025 \left(\frac{(0.371)(1.10) \left[1 - \frac{(1.10)^{10}}{(1.09)^{10}} \right]}{0.09 - 0.10} + \frac{(0.75)(1.10)^{10}(1.03)}{(0.085 - 0.03)(1.10)^{10}} \right) = 0.56$$

Note that the base revenues increase by 15% from the current level of \$9,006 million to \$10,357 million. While the net effect on the price-to-sales ratio is very small (increase from 0.55 to 0.56), the value of equity increases almost 20% from \$4,967 million to \$5,812 million.

Value of a Brand Name One of the critiques of traditional valuation is that it fails to consider the value of brand names and other intangibles. Hiroyumi Itami, in his book *Mobilizing Invisible Assets*, provides a summary of this criticism. He says:

Analysts have tended to define assets too narrowly, identifying only those that can be measured, such as plant and equipment. Yet the intangible assets, such as a particular technology, accumulated consumer information, brand name, reputation, and corporate culture, are invaluable to the firm's competitive power. In fact, these invisible assets are the only real source of competitive edge that can be sustained over time.

While this criticism is clearly overstated, the approaches used by analysts to value brand names are often ad hoc and may significantly overstate or understate their value. Firms with well known brand names often sell for higher multiples than

PRICING STRATEGY, MARKET SHARE, AND COMPETITIVE DYNAMICS

All too often firms analyze the effects of changing prices in a static setting, where only the firm is acting and the competition stays still. The problem, though, is that every action (especially when it comes to pricing) generates reactions from competition, and the net effects can be unpredictable.

Consider, for instance, a firm that cuts prices, hoping to increase market share and sales. If the competition does nothing, the firm may be able to accomplish its objectives. If, on the other hand, the competition reacts by also cutting prices, the firm may find itself with lower margins and the same turnover ratios that it had before the price cut—a recipe for lower firm value. In competitive industries, you have to assume that the latter will happen and plan accordingly.

There are some firms that have focused on maximizing market share as their primary objective function. The linkage between increased market share and market value is a tenuous one, and can be examined using the profit-margin/revenue multiple framework developed in the preceding section. If increasing market share leads to higher margins, either because of economies of scale driving down costs or because of increased market power driving out competitors, it will lead to higher value. If the increase in the market share is accompanied by lower prices and profit margins, the net effect on value can be negative.

lesser-known firms. The standard practice of adding on a "brand name premium," often set arbitrarily, to discounted cash flow value, can lead to erroneous estimates. Instead, the value of a brand name can be estimated using the approach that relates profit margins to price-sales ratios.

One of the benefits of having a well-known and respected brand name is that firms can charge higher prices for the same products, leading to higher profit margins and hence to higher price-sales ratios and firm value. The larger the price premium that a firm can charge, the greater is the value of the brand name. In general, the value of a brand name can be written as:

Value of brand name = $(V/S_{b} - V/S_{g}) \times Sales$

where $V/S_b = EV$ -sales ratio of the firm with the benefit of the brand name $V/S_g = EV$ -sales ratio of the same firm with the generic product

ILLUSTRATION 20.7: Valuing a Brand Name Using Price-Sales Ratio

Consider two firms that produce similar products that compete in the same marketplace: Famous Inc. has a well-known brand name and has an after-tax operating profit margin of 10%, while NoFrills Inc. makes a generic version and has an after-tax operating margin of 5%. Both firms have the same sales-book capital ratio (2.50) and the cost of capital of 11.5%. In addition, both

firms are expected to reinvest 80% of their operating income in the next five years and 50% of earnings after that. The growth rate after year 5, for both firms, is 6%. Both firms have total sales of \$2.5 billion.

VALUING FAMOUS

 $\begin{array}{l} \mbox{Expected growth rate}_{\mbox{Famous}} = \mbox{Reinvestment rate} \times \mbox{Operating margin} \times \mbox{Sales/BV of capital} \\ = 0.8 \times 0.10 \times 2.50 = 20\% \end{array}$

Value/Sales ratio_{Famous} = 0.10×
$$\left\{ \frac{0.2 \times (1.20) \times \left[1 - \frac{(1.20)^5}{(1.115)^5} \right]}{(.115 - .20)} + \frac{0.50 \times (1.20)^5 \times (1.08)}{(.115 - .08)(1.115)^5} \right\} = 2.35$$

VALUING NOFRILLS

Expected growth rate_{NoFrills} = Reinvestment rate × Operating margin × Sales/BV of capital = $0.8 \times 0.05 \times 2.50 = 10\%$

$$\text{Value/Sales ratio}_{\text{NoFrills}} = 0.05 \times \left\{ \frac{0.2 \times (1.10) \times \left[1 - \frac{(1.10)^5}{(1.115)^5} \right]}{(.115 - .10)} + \frac{0.50 \times (1.10)^5 \times (1.08)}{(.115 - .08)(1.115)^5} \right\} = 0.77$$

Total sales = \$2.5 billion

 $Value of brand name = [Value/Sales_{Famous} - Value/Sales_{NoFrills}] \times Sales \\ = [2.35 - 0.77] \times \$2.5 \ billion = \$3.95 \ billion$

ILLUSTRATION 20.8: Valuing a Brand Name: Coca-Cola in May 2011

We estimated an enterprise value to sales ratio of 3.51 for Coca-Cola in May 2011 in Illustration 20.3, based on its strong operating margin and return on capital. It is undeniable that Coca-Cola has one of the most recognizable and valuable brand names in the world, but there are two key questions that need to be answered:

- 1. Should we be adding a premium to the estimated EV/Sales ratio for the strength of the brand name?
- 2. How much is the brand name adding to Coca-Cola's overall value? The answer to the first question is no. After all, it is the strength of the brand name that has allowed Coca-Cola to generate an after-tax operating margin of 14.43% and a return on capital of 16%. Adding a premium to estimated value would amount to double counting. The answer to the second question is nuanced. A segment of the estimated enterprise value can be attributed to the strong brand name, and it becomes a matter of isolating its impact.

The first step in estimating the value added by brand name, is finding out how much differential advantage Coca-Cola generates as a result of its brand name. In this pursuit, we were lucky to find a

generic soda company, Cott Corporation, that is publicly traded. In the table following, we summarize the values for Coca-Cola and Cott in 2010 (in millions for dollar values):

	Coca-Cola	Cott
Market value of equity	\$152,200	\$ 809
Debt	\$ 11,859	\$ 345
Cash	\$ 4,979	\$ 27
Enterprise value	\$159,080	\$1,127
Sales	\$ 35,119	\$1,803
Pretax operating income	\$ 8,449	\$99
EBITDA	\$ 9,892	\$ 173
Capital Invested	\$ 31,679	\$ 626
Tax rate	40%	40%
Beta–High growth	0.9	1.25
Pretax cost of debt =	4.50%	6%
Computed Values		
After-tax operating margin	14.43%	3.29%
Sales to invested capital	1.11	2.88
Return on capital	16.00%	9.49%
Cost of capital	8.03%	8.35%
Excess return	7.97%	1.14%

Note that Cott is much smaller than Coca-Cola and has weaker margins, a lower return on capital, and a higher cost of capital. While the scale differences make the companies difficult to compare directly, we will use the information gleaned from Cott in valuing Coca-Cola's brand name.

OPTION 1: BRAND NAME AFFECTS ONLY PRICING POWER

In the first and simplest version of valuing brand name, we assume that brand name affects only pricing power and through it, the operating margin. In effect, we value Coca-Cola with all of its other characteristics intact but giving it Cott's after-tax operating margin. During stable growth, we assume that Coca-Cola will earn its cost of capital, if it loses its brand name advantage:

	Coca-Cola	Coca-Cola with Cott's Margin
Current tax rate =	40.00%	40.00%
Current revenues =	\$ 35,119	\$35,119
High Growth Period		
Length of high-growth period $(n) =$	10	10
Reinvestment rate	60%	60%
After-tax operating margin	14.43%	3.29%
Sales/Invested capital	1.11	1.11
Return on capital	16.00%	3.65%
Growth rate during period $(g) =$	9.60%	2.19%
Cost of capital during period =	8.03%	8.03%
Stable Growth Period		
Growth rate in steady state =	3.50%	3.50%
Return on capital in steady state =	12.00%	7.74%
Reinvestment rate in stable growth	29.17%	45.22%
Cost of capital in steady state =	7.74%	7.74%
EV/Sales =	3.51	0.35
Enterprise value =	\$123.199	\$12.325

Note that lowering the margin, while keeping the sales to capital ratio reduces the return on capital to 3.65%. The EV/Sales ratio for Coca-Cola drops to 0.35, if it earns Cott's margins, while preserving all its own characteristics for the other variables. The estimated enterprise value drops to \$12.3 billion, and the brand name value accounts for almost 90% of Coca-Cola's estimated value:

Value of brand name = 123,199 - 12,325 = 110,874 million

OPTION 2: BRAND NAME AFFECTS PRICING POWER AND SALES TURNOVER

Generic companies that purse high volume strategies may be able to generate more revenue per dollar of capital invested. To capture this effect, we assume that Coca-Cola, if it loses it's brand name, will have Cott's margin and sales to capital ratio. In effect, this will give Coca-Cola the return on capital generated by Cott:

	Coca-Cola	Coca Cola with Cott' s ROIC
Current tax rate =	40.00%	40.00%
Current revenues =	\$ 35,119	\$35,119
Capital invested (Book values	\$ 31,679	\$31,679
of debt and equity)		
High Growth Period		
Length of high-growth period $(n) =$	10	10
Reinvestment rate	60.00%	60%
After-tax operating margin	14.43%	3.29%
Sales/Invested capital =	1.11	2.88
Return on capital =	16.00%	9.49%
Growth rate during period (g) =	9.60%	5.69%
Cost of capital during period	8.03%	8.03%
Stable Growth Period		
Growth rate in steady state =	3.50%	3.50%
Return on capital in steady state =	12.00%	7.74%
Reinvestment rate in stable growth =	29.17%	45.22%
Cost of capital in steady state =	7.74%	7.74%
After-tax cost of debt =	2.70%	2.70%
Debt ratio D / $(D + E) =$	20.00%	20.00%
EV/Sales =	3.51	1.22
Enterprise value =	\$123,199	\$42,968

There is a drop in value but it is less precipitous than under option 1, since the return on capital, even under the no-brand name scenario, is 9.49%, higher than the cost of capital during high growth. With the enterprise value to sales ratio of 1.22, the value of the brand name is still a substantial \$ 80.231 billion:

Value of brand name = \$123,199 - \$42,968 = \$80,231 million

OPTION 3: ASSUME THAT ALL EXCESS RETURNS EARNED ARE DUE TO BRAND NAME

The first two options presuppose the existence of a generic competitor, with accessible financial statements. In many cases, there is no truly generic alternative, or even if one exists, it is not public. If that is the case, valuing a brand name becomes more difficult. One alternative is to assume that the brand name is the only competitive advantage and that all excess returns (returns over

and above the cost of capital) can be attributed to brand name. Using that approach for Coca-Cola, we get:

	Coca-Cola	Coca-Cola No Excess Returns
Current tax rate =	40.00%	40.00%
Current revenues =	\$35,119.00	\$35,119.00
Capital invested	\$31,679.00	\$31,679.00
High Growth Period		
Length of high-growth period $(n) =$	10	10
Reinvestment rate	60%	60%
Return on capital =	16.00%	8.03%
Growth rate during period $(g) =$	9.60%	4.82%
Cost of capital during period =	8.03%	8.03%
Stable Growth Period		
Growth rate in steady state =	3.50%	3.50%
Return on capital in steady state =	12.00%	7.74%
Reinvestment Rate	29.17%	45.22%
Cost of capital in steady state =	7.74%	7.74%
EV/Sales =	3.51	0.96
Value of firm =	\$123,199	\$33,819

If we remove the excess returns generated by Coca-Cola, leaving all else unchanged, the enterprise value to sales ratio drops to 0.96, and the value of the brand name becomes \$89,380 million.

Value of brand name = \$123,199 - \$33,819 = \$89,380 million

The three approaches yield a range for brand name value from \$80.2 billion to \$110.9 billion. We believe that option 2 yields the most realistic estimate of brand name value, at least for Coca-Cola.

Using Revenue Multiples in Investment Analysis

The key determinants of the revenue multiples of a firm are its expected margins (net and operating), risk, cash flow, and growth characteristics. To use revenue multiples in analysis and to make comparisons across firms, you would need to control for differences on these characteristics. This section examines different ways of comparing revenue multiples across firms.

AN ASIDE ON BRAND NAME VALUE

It is common to see brand name premiums attached to discounted cash flow valuations. As you can see from the preceding example, this is a mistake. Done right, the value of a brand name is already built into the valuation in a number of places—higher operating margins, higher turnover ratios, and consequently higher returns on capital. These, in turn, have ripple effects, increasing expected growth rates and value. Adding a brand name premium to this value would be double counting.

What about firms that do not exploit a valuable brand name? You might add a premium to the values of these firms, but the premium is not for the brand name but rather for control. In fact, you could estimate similar premiums for any underutilized or mismanaged assets, but you would pay the premiums only if you could acquire control of the firm.

Looking for Mismatches While growth, risk, and cash flow characteristics affect revenue multiples, the key determinants of revenue multiples are profit margins net profit margin for equity multiples and operating margins for firm value multiples. Thus it is not surprising to find firms with low profit margins and low revenue multiples, and firms with high profit margins and high revenue multiples. However, firms with high profit margins should attract investors' attention as potentially overvalued and undervalued securities respectively. In Figure 20.3, this is presented in a matrix. You can identify under- or overvalued firms in a sector or industry by plotting them on this matrix, and looking for potential mismatches between margins and revenue multiples.

While intuitively appealing, there are at least three practical problems associated with this approach. The first is that data is more easily available on historical (current) profit margins than on expected profit margins. If a firm's current margins are highly correlated with future margins (a firm that has earned high margins historically will continue to do so, and one that have earned low margins historically will also continue to do so), using current margins and current revenue multiples to identify under- or overvalued securities is reasonable. If the current margins of firms are not highly correlated with expected future margins, it is no longer



Margin



appropriate to argue that firms are overvalued just because they have low current margins and trade at high price-to-sales ratios. The second problem with this approach is that it assumes that revenue multiples are linearly related to margins. In other words, as margins double, you would expect revenue multiples to double as well. The third problem is that it ignores differences on other fundamentals, especially risk. Thus a firm that looks undervalued because it has a high current margin and is trading at a low multiple of revenues may in fact be a fairly valued firm with very high risk.

ILLUSTRATION 20.9: Revenue Multiples and Margins: Specialty Retailers in July 2000

In the first comparison, we look at specialty retailers in the United States. In Figure 20.4 the EV-to-sales ratios of these firms are plotted against the operating margins of these firms in July 2000 (with the stock symbols for each firm next to each observation).

Firms with higher operating margins tend to have higher value-to-sales ratios, while firms with lower margin have lower value-to-sales ratios. Note, though, that there is a considerable amount of noise even in this subset of firms in the relationship between value-to-sales ratios and operating margins.



FIGURE 20.4 Value-to-Sales Ratios and Operating Margins

ILLUSTRATION 20.10: Revenue Multiples and Margins: Internet Retailers in July 2000

In the second comparison, the price-to-sales ratios in July 2000 of Internet retailers are plotted against the net margins earned by these firms in the most recent year in Figure 20.5.

Here there seems to be almost no relationship between price-to-sales ratios and net margins. This should not be surprising. Most Internet firms have negative net income and net margins. The market values of these firms are based not on what they earn now but what they are expected to earn in the future, and there is little correlation between current and expected future margins.

Statistical Approaches When analyzing price-earnings and price-to-book value ratios, we used regressions to control for differences in risk, growth, and payout ratios across firms. We could also use regressions to control for differences across firms to analyze revenue multiples. In this section, we begin by applying this approach to comparables defined narrowly as firms in the same business, and then expanded to cover the entire sector and the market.

Comparable Firms in the Same Business In the last section, we examined firms in the same business looking for mismatches—firms with high margins and low revenue multiples were viewed as undervalued. In a simple extension of this approach, we could regress revenue multiples against profit margins across firms in a sector:

Price-to-sales ratio = a + b(Net profit margin) Value-to-sales ratio = a + b(After-tax operating margin)



FIGURE 20.5 Price-to-Sales Ratios versus Net Margins: Internet Stocks

These regressions can be used to estimate predicted values for firms in the sample, helping to identify undervalued and overvalued firms.

If the number of firms in the sample is large enough to allow for it, this regression can be extended to add other independent variables. For instance, the standard deviation in stock prices or the beta can be used as an independent variable to capture differences in risk, and analyst estimates of expected growth can control for differences in growth. The regression can also be modified to account for nonlinear relationships between revenue multiples and any or all of these variables.

Can this approach be used for sectors such as the Internet where there seems to be little or no relationship between revenue multiples and fundamentals? It can, but only if you adapt it to consider the determinants of value in these sectors.

ILLUSTRATION 20.11: Regression Approach—Specialty Retailers in July 2000

Consider again the scatter plot of value to sales ratios and operating margins for retailers in Illustration 20.9. There is clearly a positive relationship and a regression of value to sales ratios against operating margins for specialty retailers yields the following:

 $\label{eq:Value-to-sales ratio} \begin{array}{ll} \mbox{Value-to-sales ratio} = 0.0563 + 6.6287 \mbox{ After-tax operating margin} & R^2 = 39.9\% \\ [0.72] & [10.39] \end{array}$

This regression has 162 observations and the t statistics are reported in brackets. To estimate the predicted value to sales ratio for Talbots, one of the specialty retailers in the group, which has an 11.22% after-tax operating margin:

Predicted value-to-sales ratio = 0.0563 + 6.6287(.1122) = 0.80

With an actual value to sales ratio of 1.27, Talbots can be consider overvalued. This regression can be modified in two ways. One is to regress the value-to-sales ratio against the In(operating margins) to allow for the nonlinear relationship between the two variables:

Value-to-sales ratio = 1.8313 + 0.4339 ln(After-tax operating margin) $R^2 = 22.40\%$ [10.76] [6.89]

The other is to expand the regression to include proxies for risk and growth:

Value to sales = -0.6209 + 7.21(Operating Mgn) $- 0.0209 \sigma_{\text{Opline}} + 3.1460$ Growth [3.47] [10.34] [0.22] [4.91]

where Operating Mgn = After-tax operating margin

 $\sigma_{_{\text{OpInc}}} =$ Standard deviation in operating income over previous five years Growth = Expected growth rate in earnings over next five years

This regression has fewer observations (124) than the previous two but a higher R-squared of 50.09%. The predicted value-to-sales ratio for Talbots using this regression is:

Predicted value to sales = -0.6209 + 7.21(.1122) - 0.0209(.7391) + 3.1460(.225) = 0.88

Talbots remains overvalued even after adjusting for differences in growth and risk.

ILLUSTRATION 20.12: Regression Approach—Internet Retailers in July 2000

In the case of the Internet stocks graphed in Illustration 20.10, the regression of price-to-sales ratios against net margins yields the following:

Price-to-sales ratio = 44.4495 - 0.7331 (Net margin) $R^2 = 0.22\%$ [4.39] [1.20]

Not only is the R-squared close to zero, but the relationship between current net margins and priceto-sales ratios is negative. Thus there is little relationship between the pricing of these stocks and their current profitability.

What variables might do a better job of explaining the differences in price-to-sales ratios across Internet stocks? Consider the following propositions.

- Since this sample contains some firms with very little in revenues and other firms with much higher revenues, you would expect the firms with less in revenues to trade at a much higher multiple of revenues than firms with higher revenues. Thus, Amazon with revenues of almost \$2 billion can be expected to trade at a lower multiple of this value than iVillage with revenues of less than \$60 million.
- There is a high probability that some or many of these Internet firms will not survive because they will run out of cash. A widely used measure of this potential for cash problems is the cash burn ratio, which is the ratio of the cash balance to the absolute value of EBITDA (which is usually a negative number). Firms with a low cash burn ratio are at higher risk of running into a cash crunch and should trade at lower multiples of revenues.
- Revenue growth is a key determinant of value at these firms. Firms that are growing revenues more quickly are likely to reach profitability sooner, other things remaining equal.

The following regression relates price-to-sales ratios to the level of revenues [In(Revenues)], the cash burn ratio (absolute value of Cash/EBITDA) and revenue growth over the past year for Internet firms:

The regression has 117 observations and an R-squared of 13.83%. The coefficients all have the right signs, but are of marginal statistical significance. You could obtain a predicted price-to-sales ratio for Amazon.com in July 2000 in this regression of:

 $PS_{Amazon com} = 37.18 - 4.34 \ln(1,920) + 0.75(2.12) + 8.37(1.4810) = 18.364$

At its actual price-to-sales ratio of 6.69, Amazon looks significantly undervalued relative to other Internet firms.

In any case, the regressions are much too noisy to attach much weight to the predictions. In fact, the low explanatory power with fundamentals and the huge differences in measures of relative value should sound a note of caution on the use of multiples in sectors such as this one, where firms are in transition and changing dramatically from period to period.

ILLUSTRATION 20.13: Price to Sales and Net Margins: Whole Foods and the Grocery Sector Over Time

If the essence of finding cheap stocks in relative valuation is spotting mismatches, making money from these stocks is possible only if the mismatches get corrected over time. Put differently, you can buy a stock with high margins that trades at a low multiple of revenues, but you need the revenue multiple to increase to match the high margins to make money on the stock.

To provide an illustration of the process, we will track Whole Foods from January 2007 through May 2011, in Figure 20.6, relative to the rest of the companies in the grocery sector; the regression line for price to sales ratio is also shown on the graph, with 90% confidence intervals. As the scatter plot of price to sales against net margins for the sector reveals, Whole Foods stood out with the highest price-to-sales ratio (1.40) and the second highest net margin (3.41%) in the sector



FIGURE 20.6 Price to Sales Ratios and Net Margins: Grocery Sector in January 2007

To see if the higher margin earned by Whole Foods should justify a price to sales ratio of 1.41, we regressed the price-to-sales ratio against net margins for the sector:

PS = -0.16 + 33.26 (Net Profit Margin)

Plugging in Whole Food's net margin into the regression, we get:

$$PS_{WEM} = -0.16 + 33.26 (.0341) = .97$$

Even after controlling for the higher margin, Whole Foods looks significantly overvalued at 1.41 time sales.

In January 2009, we revisited the grocery sector and plotted price-to-sales ratios against net margins (see Figure 20.7). In the intervening two years, Whole Foods seems to have fallen out of favor with investors. As its net profit margin dropped to 2.77% its price-to-sales ratio took a more significant drop to 0.31.



FIGURE 20.7 Price to Sales Ratios and Net Margins: Grocery Sector in January 2009

To assess whether the market over-reacted to the decline in margin, we regressed the price-to salesratio against the net margin and arrived at the following:

PS = 0.07 + 10.49 (Net profit margin PS ging in Whole Food's net margin into the regression, we get:

$$PS_{WFM} = 0.07 + 10.49 (.0277) = 0.36$$

Whole Foods now looks undervalued at 0.31 times revenues, though it falls just above the lower bound for statistical significance.

Moving forward a year to January 2010, we plotted price-to-sales ratio against the net margins for grocery stores. While the net margin for Whole Foods dropped to 1.44% over the year, its price to sales ratio increased to 0.50, putting it right in the middle of the pack (see Figure 20.8).

Again, we regressed price to sales ratios against net margins for the sector:

$$PS = 0.06 + 11.43$$
 Net margin

Plugging in Whole Food's net margin into the regression, we get:

Predicted price-to-sales = 0.06 + 11.43 (.0144) = 0.22

Whole Foods reverted back to being over valued in 2011_{L} and it falls just above the upper bound for statistical significance.

Finally, we revisited the sector in May 2011 and plotted price-to-sales ratios against net margins for firms in the sector. As noted in the earlier illustrations, Whole Foods has reclaimed its premium status in terms of pricing, trading at 1.11 times revenues, and its net profit margin has increased to 2.73% (See Figure 20.9.)







FIGURE 20.8 Price to Sales Ratios and Net Margins: Grocery Sector in January 2010



FIGURE 20.9 Price-to-Sales Ratios and Net Margins: Grocery Sector in May 2011

Regressing price to sales ratio against net margins, we get:

$$PS = 0.304 + 0.126$$
(Net margin)

Plugging in Whole Food's net margin into the regression, we get:

$$PS = 0.304 + 0.126(.273) = 0.34$$

Whole Food looks significantly over valued in May 2011.

In hindsight, these regressions would have suggesting selling short on Whole Foods in January 2007, buying the stock again in January 2009 and reverting back to selling short in January 2010. The first two actions would have generated significant profits, but the last one would have been a money loser since the stock became even more overvalued between 2010 and 2011.

Market Regressions If you can control for differences across firms using a regression, you can extend this approach to look at much broader cross sections of firms. Here, the cross-sectional data is used to estimate the price-to-sales ratio as a function of fundamental variables—profit margin, dividend payout, beta, and growth rate in earnings.

This approach can be extended to cover the entire market. In the first edition of this book, regressions of price-sales ratios on fundamentals—dividend payout ratio, growth rate in earnings, profit margin, and beta—were run for each year from 1987 to 1991.

Year	Regression	R-Squared
1987	PS = 0.7894 + .0008 Payout – 0.2734 Beta	
	+ 0.5022 EGR + 6.46 Margin	0.4434
1988	PS = 0.1660 + .0006 Payout – 0.0692 Beta	
	+ 0.5504 EGR + 10.31 Margin	0.7856
1989	PS = 0.4911 + .0393 Payout – 0.0282 Beta	
	+ 0.2836 EGR + 10.25 Margin	0.4601
1990	PS = 0.0826 + .0105 Payout – 0.1073 Beta	
	+ 0.5449 EGR + 10.36 Margin	0.8885
1991	PS = 0.5189 + 0.2749 Payout – 0.2485 Beta	
	+ 0.4948 EGR + 8.17 Margin	0.4853

where PS = Price-sales ratio at the end of the year

- Payout = Payout ratio = Dividends/Earnings at the end of the year Beta = Beta of the stock
- Margin = Profit margin for the year = Net income/Sales for the year (in %) EGR = Earnings growth rate over the previous five years

These regressions were updated in May 2011 for both price-to-sales and EV/Sales ratios for companies listed and traded in the United States:

$$PS = -0.413 + 7.27 \text{ Expected growth}_{EPS} + 0.16 \text{ Payout} + 0.42 \text{ Beta} + 14.44 \text{ Net margin} (2.99) (14.10) (1.02) (5.86) (35.90) \\ \text{R-squared} = 49\%$$

EV/S = 0.74 + 10.19 Expected growth_{Sales}-1.03 DC -2.25 Tax rate + 8.06 Operating Margin (4.91) (10.07) (4.38) (6.59) (32.73) R-squared = 59%

DC = Market debt to capital ratio

Operating Margin = Pretax operating margin

We switched from growth in equity earnings (EPS) for the equity multiple to growth in revenues for the enterprise value multiple to maintain consistency.

Extending the analysis to global markets, we ran regressions for the EV/Sales ratio for companies in European, Emerging and the Japanese markets. The results are summarized below:

Regression — January 2010	R-Squared
EV/Sales = 0.38 + 3.20 Expected	73.4%
growth + 12.74 Operating margin	
-2.50 Tax rate + 0.13 Reinvestment rate	
EV/Sales = 0.01 + 6.72 Operating	26.4%
margin – 1.99 Tax rate + 5.58	
Debt/Capital	
EV/Sales = 2.15 – 3.50 Tax rate + 10.09	40.7%
Operating margin –2.01 Debt/Capital	
+ 0.16 Reinvestment rate	
	Regression — January 2010 EV/Sales = 0.38 + 3.20 Expected growth + 12.74 Operating margin -2.50 Tax rate + 0.13 Reinvestment rate EV/Sales = 0.01 + 6.72 Operating margin - 1.99 Tax rate + 5.58 Debt/Capital EV/Sales = 2.15 -3.50 Tax rate + 10.09 Operating margin - 2.01 Debt/Capital + 0.16 Reinvestment rate

The revenue multiples perform well across the globe.

ILLUSTRATION 20.14: Valuing Whole Foods and Coca-Cola Using Market Regression in May 2011

Earlier in this chapter, we estimated intrinsic price-to-sales and EV-to-sales multiples for Whole Foods and Coca-Cola in May 2011. We will now try to re-estimate the multiples, using the market regression from the last section.

First, we plug in the numbers for Whole Foods into the price-to-sales regression (Whole Food's net margin = 2.73%; Payout ratio = 23.12%; Beta = 1.00; and Expected growth rate = 10%):

 $\label{eq:PS} \begin{array}{l} PS = -0.413 + 7.27 \mbox{ Expected growth}_{\mbox{\tiny EPS}} + 0.16 \mbox{ Payout} + 0.42 \mbox{ Beta} + 14.44 \mbox{ Net margin} \\ PS_{\mbox{\tiny WFM}} = -0.413 + 7.27 \mbox{ } (.10) + 0.16 \mbox{ } (.2312) + 0.42 \times (1.00) + 14.44 \mbox{ } (.0273) = 1.17 \end{array}$

This is slightly higher than the actual price-to-sales ratio for Whole Foods in May 2011 of 1.11; the stock looks undervalued, given how the rest of the market is being priced.

Next, we estimate the EV-to-sales ratio for Coca-Cola, again drawing on the inputs that we used for the intrinsic valuation earlier (Coca-Cola's expected growth rate = 9.60%; Debt-to-capital ratio = 7.23%; Tax rate = 40%; and Pretax operating margin = 24.06%):

$$\label{eq:EV/S} \begin{split} & \text{EV/S} = 0.74 + 10.19 \text{ Expected growth}_{\text{Sales}} - 1.03 \text{ DC} - 2.25 \text{ Tax rate} + 8.06 \text{ Operating Margin} \\ & \text{EV/S}_{\text{KO}} = 0.74 + 10.19 \ (.096) - 1.03 \ (.0723) - 2.25 \ (.40) + 8.06 \ (.2406) = 2.68 \end{split}$$

Coca-Cola looks over valued at its current EV/Sales ratio of 4.53, relative to the rest of the market.

Multiples of Future Revenues

Chapter 18 examined the use of market value of equity as a multiple of earnings in a future year. Revenue multiples can also be measured in terms of future revenues. Thus, you could estimate the value as a multiple of revenues five years from now. There are some advantages to doing this:

- For firms that have little in revenues currently but are expected to grow rapidly over time, the revenues in the future—say five years from now—are likely to better reflect the firm's true potential than revenues today.
- It is easier to estimate multiples of revenues when growth rates have leveled off and the firm's risk profile is stable. This is more likely to be the case five years from now than it is today.

Assuming that revenues five years from now are to be used to estimate value, what multiple should be used on these revenues? You have three choices. One is to use the average multiples of value (today) to revenues today of comparable firms to estimate a value five years from now, and then discount that value back to the present. Consider, for example, a company like Tesla whose current revenues are only \$117 million but which we expect to grow to \$4,877 billion in 10 years. If the average EV-to-sales ratio of more mature automobile firms is 0.82, the estimated value of Tesla can be estimated as follows:

Revenues at Tesla Motors in 10 years = \$4,877 million

Value of Tesla Motors in 10 years = $4,877 \times 0.82 = 3,999$ million

This could be discounted back at Tesla's cost of capital to the present to yield a value for the firm today.

Value of firm today = \$3,999/2.5945 = \$1,541 million

Adding the current cash balance (\$196 million), subtracting out debt outstanding (\$106 million), netting out the value of management options (\$152 million), and dividing by the number of shares (94.908 million) yields a value per share of \$15.59:

Value per share = (1541 + 196 - 106 - 152)/94.908 = \$15.59

The second approach is to forecast the expected revenue in five years for each of the comparable firms, and to divide each firm's current value by these revenues. This multiple of current value to future revenues can be used to estimate the value today. To illustrate, if current value is 0.4 times revenues in 10 years for comparable firms, the value of Tesla Motors can be estimated as follows:

Revenues at Tesla in 10 years = 4,877 million Value today = Revenues in 10 years × (Value today/Revenues_{in year 10})_{comparable firms} = 4,877(0.4) = 19551 million

In the third approach, you can adjust the multiple of future revenues for differences in operating margin, growth and risk for differences between the firm and comparable firms. For instance, Tesla Motors, 10 years from now will have an

Sector-Specific Multiples

expected operating margin of 10% and an expected growth rate of 3.5% over the following years,

You could run a regression of EV/Sales ratios against expected growth rates and operating margins at automobile companies today and then plug in the values for Tesla Motors into the regression to get the predicted EV to sales ratio for the firm in 10 years. That predicted EV would be used instead of the industry average to estimate the future value.

SECTOR-SPECIFIC MULTIPLES

The value of a firm can be standardized using a number of sector-specific multiples. The value of steel companies can be compared based on market value per ton of steel produced, and the value of electricity generators can be computed on the basis of kilowatt hour (kwh) of power produced. In the past few years, analysts following new technology firms have become particularly inventive with multiples that range from value per subscriber for Internet service providers to value per web site visitor for Internet portals to value per customer for Internet retailers.

Why Analysts Use Sector-Specific Multiples

The increase in the use of sector-specific multiples in the last few years has opened up a debate about whether they are a good way to compare relative value. There are several reasons why analysts use sector-specific multiples:

- They link firm value to operating details and output. For analysts who begin with these forecasts—predicted number of subscribers for an Internet service provider, for instance—they provide a much more intuitive way of estimating value.
- Sector-specific multiples can often be computed with no reference to accounting statements or measures. Consequently, they can be estimated for firms where accounting statements are nonexistent, unreliable, or just not comparable. Thus, you could compute the value per kwh sold for Latin American power companies and not have to worry about accounting differences across these countries.
- Though this is usually not admitted to, sector-specific multiples are sometimes employed in desperation because none of the other multiples can be estimated or used. For instance, an impetus for the use of sector-specific multiples for new economy firms was that they often had negative earnings and little in terms of book value or revenues.

Limitations

Though it is understandable that analysts sometimes turn to sector-specific multiples, there are two significant problems associated with their use:

1. They feed into the tunnel vision that plagues analysts who are sector focused, and thus they allow entire sectors to become overpriced. A cable company

trading at \$50 a subscriber might look cheap next to another one trading at \$125 a subscriber, but it is entirely possible that they are both overpriced or underpriced.

2. As will be shown later in this section, the relationship of sector-specific multiples to fundamentals is complicated, and consequently it is very difficult to control for differences across firms when comparing them on these multiples.

Definitions of Sector-Specific Multiples

The essence of sector-specific multiples is that the way they are measured vary from sector to sector. In general, though, they share some general characteristics:

- The numerator is usually enterprise value—the market values of both debt and equity netted out against cash and marketable securities.
- The denominator is defined in terms of the operating units that generate revenues and profits for the firm.

For commodity companies such as oil refineries and gold-mining companies, where revenue is generated by selling units of the commodity, the market value can be standardized by dividing by the value of the reserves that these companies have of the commodity:

Value per commodity unit =
$$\frac{(Market value of equity + Market value of debt - Cash)}{Number of units of the commodity in reserves}$$

Oil companies can be compared on enterprise value per barrel of oil in reserves and gold-mining companies on the basis of enterprise value per ounce of gold in reserves.

For manufacturing firms that produce a homogeneous product (in terms of quality and units), the market value can be standardized by dividing by the number of units of the product that the firm produces or has the capacity to produce:

Value per unit product =
$$\frac{(Market value of equity + Market value of debt - Cash)}{Number of units produced (or capacity)}$$

For instance, steel companies can be compared based on their enterprise value per ton of steel produced or in capacity.

For subscription-based firms such as cable companies, Internet service providers, and information providers (such as TheStreet.com), revenues come from the number of subscribers to the base service provided. Here, the value of a firm can be stated in terms of the number of subscribers:

Value per subscriber = $\frac{(Market value of equity + Market value of debt - Cash)}{Number of subscribers}$

In each of the cases we have discussed, you could make an argument for the use of a sector-specific multiple because the units (whether they be barrels of oil, kwh

Sector-Specific Multiples

of electricity, or subscribers) generate similar revenues. Sector multiples become much more problematic when the units used to scale value are not homogeneous. Let us consider two examples.

For retailers such as Amazon that generate revenue from customers who shop at their websites, the value of the firm can be stated in terms of the number of regular customers:

Value per customer =
$$\frac{(Market value of equity + Market value of debt - Cash)}{Number of customers}$$

The problem, here, is that amount spent can vary widely across customers, so it is not clear that a firm that looks cheap on this basis is undervalued.

For Internet portals that generate revenue from advertising revenues that are based on traffic to the sites, the revenues can be stated in terms of the number of visitors to the sites:

Value per subscriber =
$$\frac{(Market value of equity + Market value of debt - Cash)}{Number of subscribers}$$

Here, again, the link between visitors and advertising revenues is neither clearly established nor obvious. In 2010, it was the social media companies such as Facebook and Twitter that were attracting market attention, partly because of their huge membership rolls. For these companies, the enterprise value can be scaled to the number of members.

Determinants of Value

What are the determinants of value for these sector-specific multiples? Not surprisingly, they are the same as the determinants of value for other multiples—cash flows, growth, and risk—though the relationship can be complex. The fundamentals that drive these multiples can be derived by going back to a discounted cash flow model stated in terms of these sector-specific variables.

Consider an Internet service provider that has NX existing subscribers, and assume that each subscriber is expected to remain with the provider for the next n years. In addition, assume that the firm will generate net cash flows per customer (revenues from each customer minus cost of serving the customer) of CFX per year for these n years.¹ The value of each existing customer to the firm can then be written as:

Value per customer = VX =
$$\sum_{t=1}^{t=n} \frac{CFX}{(1+r)^t}$$

¹For purposes of simplicity, it has been assumed that the cash flow is the same in each year. This can be generalized to allow cash flows to grow over time.

The discount rate used to compute the value per customer can range from close to the riskless rate, if the customer has signed a contract to remain a subscriber for the next n years, to the cost of capital, if the estimate is just an expectation based on past experience.

Assume that the firm expects to continue to add new subscribers in future years and that the firm will face a cost (advertising and promotion) of C_t for each new subscriber added in period t. If the new subscribers (ΔNX_t) added in period t will generate the a value VX_t per subscriber, the value of this firm can be written as:

Value of firm = NX × VX +
$$\sum_{t=1}^{t=\infty} \frac{\Delta NX_t (VX_t - C_t)}{(1 + k_c)^t}$$

Note that the first term in this valuation equation represents the value generated by existing subscribers, and that the second is the value of expected growth. The subscribers added generate value only if the cost of adding a new subscriber (C_t) is less than the present value of the net cash flows generated by that subscriber for the firm.

Dividing both sides of this equation by the number of existing subscribers (NX) yields the following:

Value per existing subscriber =
$$\frac{\text{Value of firm}}{\text{NX}} = \text{VX} + \frac{\sum_{t=1}^{t=\infty} \frac{\Delta \text{NX}_t(\text{VX}_t - \text{C}_t)}{(1 + k_c)^t}}{\text{NX}}$$

In the most general case, then, the value of a firm per subscriber will be a function not only of the expected value that will be generated by existing subscribers, but of the potential for value creation from future growth in the subscriber base. If you assume a competitive market, where the cost of adding new subscribers (C_t) converges on the value that is generated by that customer, the second term in the equation drops out and the value per subscriber becomes just the present value of cash flows that will be generated by each existing subscriber.

Value per existing subscriber_{C=VX} = VX

A similar analysis can be done to relate the value of an Internet retailer to the number of customers it has, though it is generally much more difficult to estimate the value that will be created by a customer. Unlike subscribers who pay a fixed fee, retail customers' buying habits are more difficult to predict.

In either case, you can see the problems associated with comparing these multiples across firms. Implicitly, either you have to assume competitive markets and conclude that the firms with the lowest market value per subscriber are the most undervalued, or, alternatively, you have to assume that the value of growth is the same proportion of the value generated by existing customers for all of the firms in your analysis, leading to the same conclusion.

Sector-Specific Multiples

For social media companies, value can be related to the number of members but only if the link between revenue and the number of members is made explicit. For instance, Facebook's advertising revenues can be directly tied to the number of members, and the value of the company can be stated on a per-member basis. Since social media companies may have to invest resources to add to their membership, it is the net value generated for each member that ultimately determines value.

ILLUSTRATION 20.15: Estimating the Value per Subscriber: Internet Portal

Assume that you are valuing Golive Online (GOL), an Internet service provider with 1 million existing subscribers. Each subscriber is expected to remain for three years, and GOL is expected to generate \$100 in net after-tax cash flow (subscription revenues minus costs of providing subscription service) per subscriber each year. GOL has a cost of capital of 15%. The value added to the firm by each existing subscriber can be estimated as follows:

Value per subscriber =
$$\sum_{t=1}^{t=3} \frac{100}{(1.15)^t} = $228.32$$

Value of existing subscriber base = \$228.32 million

Furthermore, assume that GOL expects to add 100,000 subscribers each year for the next 10 years, and that the value added by each subscriber will grow from the current level (\$228.32) at the inflation rate of 3% every year. The cost of adding a new subscriber is \$100 currently, assumed to be growing at the inflation rate.

		Cost of	Number of	
	Value Added	Acquiring	Subscribers	Present Value
Year	per Subscriber	Subscriber	Added	at 15%
1	\$235.17	\$103.00	100,000	\$11,493,234
2	\$242.23	\$106.09	100,000	\$10,293,940
3	\$249.49	\$109.27	100,000	\$ 9,219,789
4	\$256.98	\$112.55	100,000	\$ 8,257,724
5	\$264.69	\$115.93	100,000	\$ 7,396,049
6	\$272.63	\$119.41	100,000	\$ 6,624,287
7	\$280.81	\$122.99	100,000	\$ 5,933,057
8	\$289.23	\$126.68	100,000	\$ 5,313,956
9	\$297.91	\$130.48	100,000	\$ 4,759,456
10	\$306.85	\$134.39	100,000	\$ 4,262,817
				\$73,554,309

The cumulative value added by new subscribers is \$73.55 million. The total value of the firm is the sum of the value generated by existing customers and the value added by new customers:

Value of firm = Value of existing subscriber base + Value added by new customers = \$228.32 million + \$73.55 million = \$301.87 million

Value per existing subscriber = Value of firm/Number of subscribers = \$301.87 million/1 million = \$301.87 per subscriber

Note, though, that a portion of this value per subscriber is attributable to future growth. As the cost of acquiring a subscriber converges on the value added by each subscriber, the value per subscriber will converge on \$228.32.

Analysis Using Sector-Specific Multiples

To analyze firms using sector-specific multiples, you have to control for the differences across firms on any or all of the fundamentals that you identified as affecting these multiples in the last part.

With value per subscriber, for instance, you have to control for differences in the value generated by each subscriber. In particular:

- Firms that are more efficient in delivering a service for a given subscription price (resulting in lower costs) should trade at a higher value per subscriber than comparable firms. This would also apply if a firm has significant economies of scale. In Illustration 20.13, the value per subscriber would be higher if each existing subscriber generated \$120 in net cash flows for the firm each year instead of \$100.
- Firms that can add new subscribers at a lower cost (through advertising and promotion) should trade at a higher value per subscriber than comparable firms.
- Firms with higher expected growth in the subscriber base (in percentage terms) should trade at a higher value per subscriber than comparable firms.

You could make similar statements about value per customer.

With value per site visitor, you have to control for the additional advertising revenue that is generated by each visitor (the greater the advertising revenue, the higher the value per site visitor) and the cost of attracting each visitor (the higher the costs, the lower the value per site visitor).

ILLUSTRATION 20.16: Cascading Values: Value per Member and Social Media Companies

In May 2011, Linkedin became the first of the major social media companies to go public to a rapturous response: The stock price doubled on the offering day and the company was valued at about \$10 billion, even though it had revenues of only \$243 million. At about the same time, Microsoft acquired Skype for \$8.5 billion, though Skype reported an operating loss of \$7 million in the prior year. Facebook and Twitter, while not public, also commanded lofty valuations in private markets for shares in the companies.

One justification for the high valuations was the number of members/users of the resources offered by these companies. The table below lists the four social media companies, the market (or estimated) values of these companies, the value per user/member and a more conventional EV/Sales multiple:

	Members/Users	Enterprise Value	EV/Member	Revenues in 2010	
Company	(millions)	(millions)	(user)	(millions)	EV/Sales
Facebook	500	\$50,000*	\$100.00	\$710.00	70.42
Twitter	175	\$ 6,000*	\$ 34.29	\$ 1.30	4615.38
Skype	170	\$ 8,500	\$ 50.00	\$860.00	9.88
Linkedin	75	\$10,000	\$133.33	\$243.00	41.15
*Ectimated b	acad on reported trans	pactions			

*Estimated based on reported transactions.

Note that the values for Skype and Linkedin represented public transactions, whereas the estimated values for Facebook and Twitter are based on private transactions. All four of the companies look

Questions and Short Problems

hopelessly overvalued on the EV/Sales multiple, with Twitter trading at 4615 times revenues in 2010. On the value/member dimension, though, Twitter looks cheap, and Microsoft seems to have bought Skype at a bargain.

In making these comparisons, though, note that we are assuming that the revenue models for all four firms are similar and will generate roughly the same value per member (user). It is possible that Linkedin, as a professional, business-oriented site can generate higher value per member and that it will be tougher for Twitter to commercialize its site, but at this stage in the process, it is entirely speculative.

CONCLUSION

The price-to-sales multiple and value-to-sales ratio are widely used to value technology firms and to compare value across these firms. An analysis of the fundamentals highlights the importance of profit margins in determining these multiples, in addition to the standard variables—the dividend payout ratio, the cost of equity, and the expected growth rates in net income for price to sales, and the reinvestment rate, cost of capital, and growth in property income for value to sales. Comparisons of revenue multiples across firms have to take into account differences in profit margins. One approach is to look for mismatches—low margins and high revenue multiples suggesting overvalued firms and high margins and low revenue multiples suggesting undervalued firms. Another approach that controls for differences in fundamentals is the cross-sectional regression approach, where revenue multiples are regressed against fundamentals across firms in a business, an entire sector, or the market.

Sector-specific multiples relate value to sector-specific variables, but they have to be used with caution. It is often difficult to compare these multiples across firms without making stringent assumptions about their operations and growth potential.

QUESTIONS AND SHORT PROBLEMS

- In the problems following, use an equity risk premium of 5.5 percent if none is specified.
- 1. Longs Drug Stores, a large U.S. drugstore chain operating primarily in Northern California, had sales per share of \$122 in 1993, on which it reported earnings per share of \$2.45 and paid a dividend per share of \$1.12. The company is expected to grow 6% in the long term, and has a beta of 0.90. The current T-bond rate is 7%, and the market risk premium is 5.5%.
 - a. Estimate the appropriate price-sales multiple for Longs Drug.
 - b. The stock is currently trading for \$34 per share. Assuming the growth rate is estimated correctly, what would the profit margin need to be to justify this price per share?

2. You are examining the wide differences in price-sales ratios that you can observe among firms in the retail store industry, and trying to come up with a rationale to explain these differences:

		Per-Share		Expected		
Company	Price	Sales	Earnings	Growth	Beta	Payout
Bombay Co.	\$38	\$ 9.70	\$0.68	29.00%	1.45	0%
Bradlees	\$15	\$168.60	\$1.75	12.00%	1.15	34%
Caldor	\$32	\$147.45	\$2.70	12.50%	1.55	0%
Consolidated	\$21	\$ 23.00	\$0.95	26.50%	1.35	0%
Dayton Hudson	\$73	\$272.90	\$4.65	12.50%	1.30	38%
Federated	\$22	\$ 58.90	\$1.40	10.00%	1.45	0%
Kmart	\$23	\$101.45	\$1.75	11.50%	1.30	59%
Nordstrom	\$36	\$ 43.85	\$1.60	11.50%	1.45	20%
Penney	\$54	\$ 81.05	\$3.50	10.50%	1.10	41%
Sears	\$57	\$150.00	\$4.55	11.00%	1.35	36%
Tiffany	\$32	\$ 35.65	\$1.50	10.50%	1.50	19%
Wal-Mart	\$30	\$ 29.35	\$1.05	18.50%	1.30	11%
Woolworth	\$23	\$ 74.15	\$1.35	13.00%	1.25	65%

- a. There are two companies that sell for more than revenues, the Bombay Company and Wal-Mart. Why?
- b. What is the variable that is most highly correlated with price-sales ratios?
- c. Which of these companies is most likely to be over/undervalued? How did you arrive at this judgment?
- 3. Walgreen, a large retail drugstore chain in the United States, reported net income of \$221 million in 1993 on revenues of \$8,298 million. It paid out 31% of its earnings as dividends, a payout ratio it was expected to maintain between 1994 and 1998, during which period earnings growth was expected to be 13.5%. After 1998, earnings growth was expected to decline to 6%, and the dividend payout ratio was expected to increase to 60%. The beta was 1.15 and was expected to remain unchanged. The Treasury bond rate was 7%, and the risk premium is 5.5%.
 - a. Estimate the price/sales ratio for Walgreens, assuming its profit margin remains unchanged at 1993 levels.

b. How much of this price/sales ratio can be attributed to extraordinary growth?

4. Tambrands, a leading producer of tampons, reported net income of \$122 million on revenues of \$684 million in 1992. Earnings growth was anticipated to be 11% over the next five years, after which it was expected to be 6%. The firm paid out 45% of its earnings as dividends in 1992, and this payout ratio was expected to increase to 60% during the stable period. The beta of the stock was 1.00.

During the course of 1993, erosion of brand loyalty and increasing competition for generic brands lead to a drop in net income to \$100 million on revenues of \$700 million. The sales/book value ratio was comparable to 1992 levels. (The Treasury bond rate in 1992 and 1993 was 7%, and the risk premium is 5.5%.)

- a. Estimate the price-sales ratio, based on 1992 profit margins and expected growth.
- b. Estimate the price-sales ratio, based on 1993 profit margins and expected growth. (Assume that the extraordinary growth period remains five years, but that the growth rate will be impacted by the lower margins.)

Questions and Short Problems

5. Gillette Inc. was faced with a significant corporate strategy decision early in 1994 on whether it would continue its high-margin strategy or shift to a lower margin to increase sales revenues in the face of intense generic competition. The two strategies being considered are as follows:

Status Quo High-Margin Strategy

- Maintain profit margins at 1993 levels from 1994 to 2003. (In 1993, net income was \$575 million on revenues of \$5,750 million.)
- The sales/book value ratio, which was 3 in 1993, can then be expected to decline to 2.5 between 1994 and 2003.

Low-Margin Higher-Sales Strategy

- Reduce net profit margin to 8% from 1994 to 2003.
- The sales/book value ratio will then stay at 1993 levels from 1994 to 2003.

The book value per share at the end of 1993 is \$9.75. The dividend payout ratio, which was 33% in 1993, is expected to remain unchanged from 1994 to 2003 under either strategy, as is the beta, which was 1.30 in 1993. (The T-bond rate is 7%, and the risk premium is 5.5%.)

After 2003, the earnings growth rate is expected to drop to 6%, and the dividend payout ratio is expected to be 60% under either strategy. The beta will decline to 1.0.

- a. Estimate the price-sales ratio under the status quo strategy.
- b. Estimate the price-sales ratio under the low-margin strategy.
- c. Which strategy would you recommend and why?
- d. How much would sales have to drop under the status quo strategy for the two strategies to be equivalent?
- 6. You have regressed price-sales ratios against fundamentals for NYSE stocks in 1994 and come up with the following regression:

PS = 0.42 + 0.33 Payout + 0.73 Growth - 0.43 Beta + 7.91 Margin

For instance, a firm with a 35% payout, a 15% growth rate, a beta of 1.25, and a profit margin of 10% would have had a price-sales ratio of:

 $PS = 0.42 + 0.33 \times 0.35 + 0.73 \times 0.15 - 0.43 \times 1.25 + 7.91 \times 0.10$ = 0.8985

- a. What do the coefficients on this regression tell you about the independent variable's relationship with the dependent variable? What statistical concerns might you have with this regression?
- b. Estimate the price-sales ratios for all the drugstore chains described in question 2. Why might this answer be different from the one obtained from the regression of only the drugstore firms? Which one would you consider more reliable and why?
- 7. Ulysses Inc. is a retail firm that reported \$1.5 billion in after-tax operating income on \$15 billion in revenues in the just-ended financial year; the firm also had a capital turnover ratio of 1.5. The firm's cost of capital is 10%.
 - a. If you expect operating income to grow 5% a year in perpetuity, estimate the value-to-sales ratio for the firm.
 - b. How would your answer change if you were told that the operating income will grow 10% a year for the next five years and then grow 5% in perpetuity?

8. You have run a regression of value/sales ratios against operating margins for cosmetics firms:

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Value/Sales = 0.45 + 8.5(After-tax operating margin)

You are trying to estimate the brand name value of Estée Lauder. The firm earned \$80 million after interest and after taxes on revenues of \$500 million. In contrast, GenCosmetics, a manufacturer of generic cosmetics, had an after-tax operating margin of 5%. Estimate the brand name value for Estée Lauder.

- 9. You are trying to estimate the brand name value for Steinway, one of the world's best-known piano manufacturers. The firm reported operating income of \$30 million on revenues of \$100 million in the most recent year; the tax rate is 40%. The book value of capital at the firm is \$90 million, and the cost of capital is 10%. The firm is in stable growth and expects to grow 5% a year in perpetuity. a. Estimate the value/sales ratio for this firm.
 - b. Assume now that the operating profit margin (EBIT/Sales) for generic piano manufacturers is half of the operating profit margin for Steinway. Assuming generic piano manufacturers have the same stable growth rate, capital turnover ratio, and cost of capital as Steinway, what is the value of the Steinway brand name?

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