

# Operating Leverage

## A Framework for Anticipating Changes in Earnings

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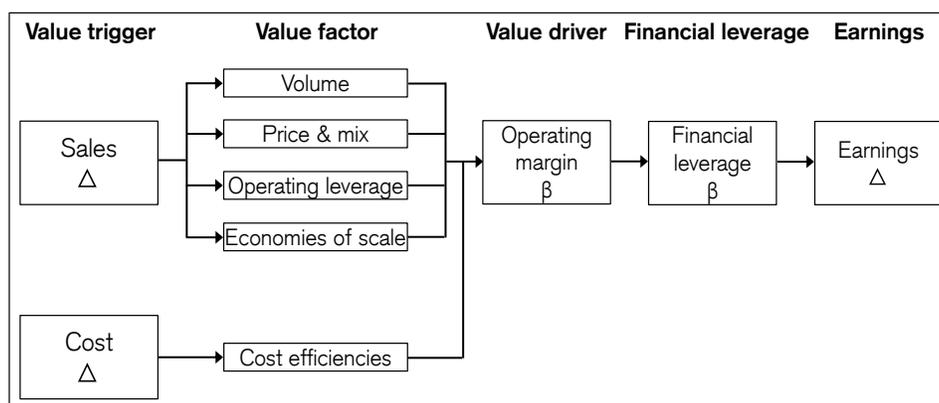
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Source: Alfred Rappaport and Michael J. Mauboussin, *Expectations Investing: Reading Stock Prices for Better Returns* (Boston, MA: Harvard Business School Press, 2001), 41.

“Analysts’ usual optimism, their tendency to forecast in a narrow and comfortable range, and the business cycle prove to be the bane of their forecasts. Acceleration or deceleration in economic growth tends to catch analysts off-guard.”

Vijay Kumar Chopra<sup>1</sup>

- Analysts are commonly too optimistic about earnings growth and often miss estimates by a wide margin.
- This report outlines a systematic way to assess earnings revisions with a specific emphasis on operating leverage.
- We cover the drivers of sales growth and then discuss the value factors, which determine the impact of sales changes on operating profit.
- To measure operating leverage, we examine the relationship between the change in sales and the change in operating profit for the top 1,000 companies from 1950 through 2014. We also examine eight sectors.
- Operating leverage and financial leverage together determine earnings volatility.
- Sales growth, profit growth, and value creation do not always go together.

## Introduction

For a fundamental investor, anticipating revisions in expectations is the key to generating attractive returns.<sup>2</sup> Sources of those revisions include fundamental outcomes (typically earnings revisions) and an assessment of how the market will value those fundamentals (multiple expansion or contraction). Investors who are able to forecast earnings in a year's time that are substantially different than today's expectations can earn meaningful excess returns.<sup>3</sup>

Analysts are commonly too optimistic about earnings growth and often miss estimates by a wide margin.<sup>4</sup> This is especially pronounced for companies that have high operating leverage and surprise the market with weak sales.<sup>5</sup> Buy-side analysts are generally more optimistic and less accurate than sell-side analysts.<sup>6</sup>

Operating leverage measures the change in operating profit as a function of the change in sales. Operating leverage is high when a company realizes a relatively large change in operating profit for every dollar of change in sales. Operating leverage is low when operating profit is mostly unchanged for every dollar of change in sales. Operating profit is earnings before interest and taxes (EBIT) and is the same as operating income.

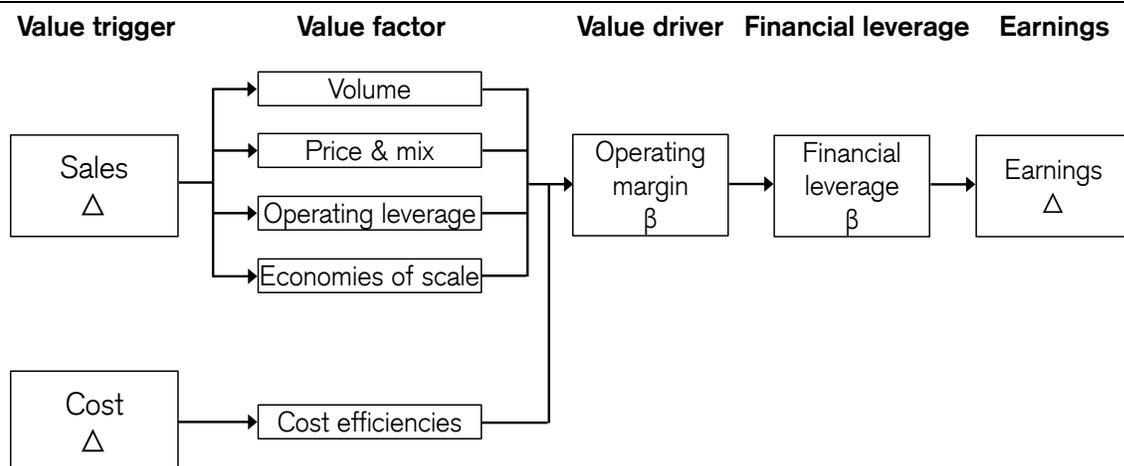
This report outlines a systematic way to assess earnings revisions with a specific emphasis on operating leverage. The goal is to be able to better anticipate revisions in expectations. The issue of operating leverage does not receive enough attention, in our view, and it can provide insight into excess returns. For instance, there is empirical evidence that operating leverage can help explain the value premium.<sup>7</sup>

Exhibit 1 is the roadmap for this analysis. The process starts on the left side with an analysis of the change in sales. Sales changes, in turn, can be refined using "value factors" to determine the impact on operating profit. The value factors are based on established microeconomic principles. Consideration of sales changes and the role of the value factors allows you to calculate operating leverage, or "operating margin beta ( $\beta$ )."

You can then incorporate the degree of financial leverage to determine the variability of earnings.

The main utility of exhibit 1 is to allow you to understand the cause and effect of changes in earnings. The interaction between sales and operating profit is crucial. Not all sales growth has the same effect on profitability. Note that you can use the roadmap to analyze the past as well as to anticipate the future.

### Exhibit 1: Framework for Assessing Operating Leverage



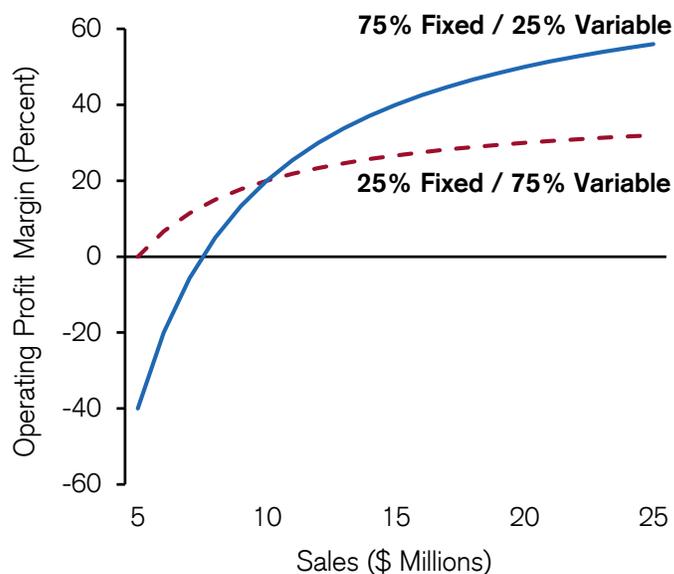
Source: Alfred Rappaport and Michael J. Mauboussin, *Expectations Investing: Reading Stock Prices for Better Returns* (Boston, MA: Harvard Business School Press, 2001), 41.

The easiest way to think about operating leverage is as the ratio of fixed to variable costs. Fixed costs are costs that a company must bear irrespective of its sales level. If sales shrink, fixed costs don't budge and profits fall sharply. Conversely, profits rise substantially if sales grow. Theme parks are an example of a business with high operating leverage. Roughly three-quarters of the costs for that business are fixed, with labor as the largest component.<sup>8</sup>

Variable costs are linked to output. These costs rise and fall in tandem with sales. The commissions a company pays to its sales force is an example of a variable cost. Commissions move together with sales, limiting the degree of operating leverage.

Exhibit 2 illustrates the impact that sales changes have on operating profit margins for businesses with high (75 percent) or low (25 percent) fixed costs. The operating profit margin is 20 percent for both businesses when sales are \$10 million. At \$25 million of sales, the high-fixed-cost business sees its operating profit margin soar to nearly 60 percent, while the low-fixed-cost business has an operating profit margin of only slightly above 30 percent. At \$5 million of sales, however, the business with high fixed costs loses money and records a margin of -40 percent, while the business with low variable costs breaks even.

### Exhibit 2: Cost Structure Composition and Operating Profit Scalability

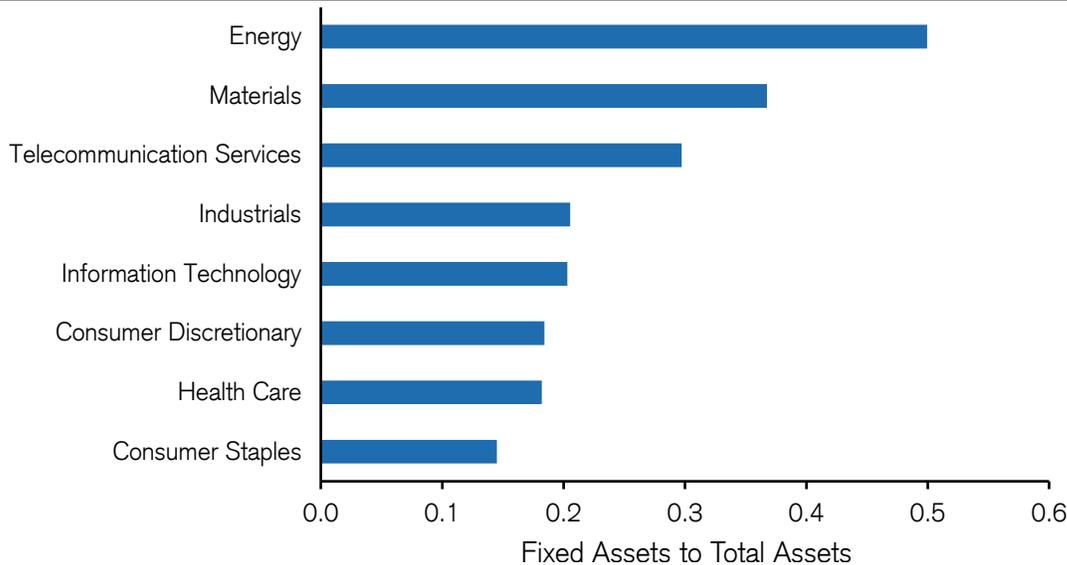


Source: Credit Suisse.

Note: Cost structure based on \$10 million in sales.

Exhibit 3 shows the ratio of fixed assets to total assets by sector. A fixed asset is not sold or consumed during the normal course of business. Examples include land, manufacturing plants, and acquired intangibles. The basic idea is that companies that rely on a high ratio of fixed to total assets have high fixed costs. There is a positive correlation between the ratio of fixed assets to total assets and operating leverage.

**Exhibit 3: Fixed Assets to Total Assets by Sector**



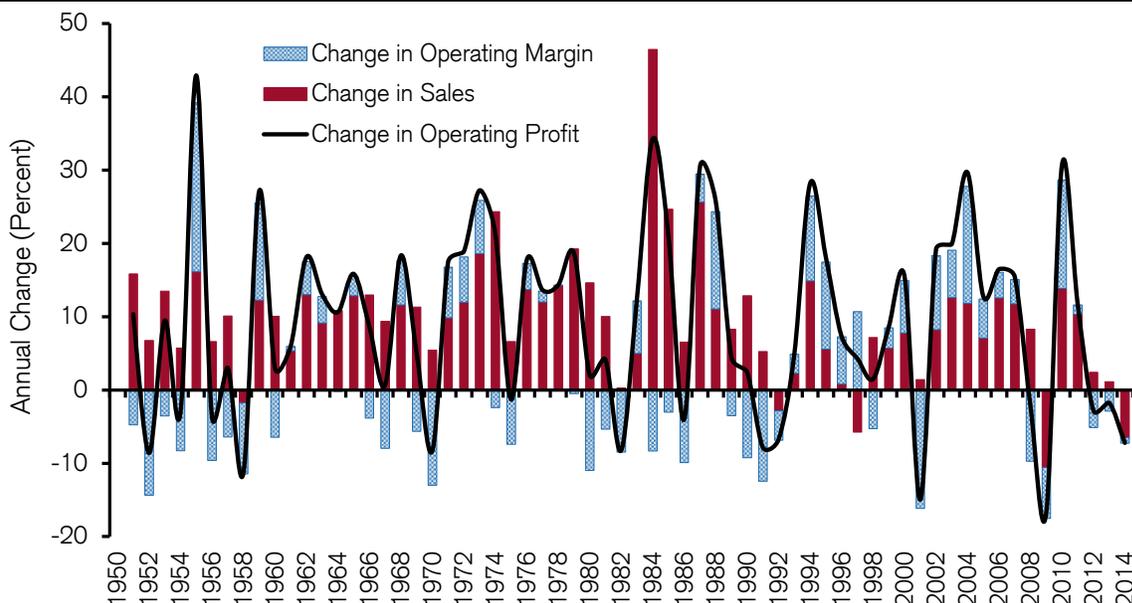
Source: Aswath Damodaran.

Note: Global companies as of January 2015; Fixed-to-total asset ratio for each sector is the average of the industries in that sector.

It is important to underscore that all costs are variable in the long run. While the distinction between fixed and variable costs is practical and useful for modeling purposes, companies can reduce fixed and variable costs if sales decline.<sup>9</sup> Further, growth eventually dilutes the advantage of an incumbent in a business with high fixed costs, because the ratio of fixed to variable costs declines as the industry grows.<sup>10</sup>

Exhibit 4 shows the drivers of operating profit changes for the largest 1,000 global companies, by market capitalization, for the last 65 years. The sample excludes companies in the financial services and utility industries. Operating leverage is particularly pronounced in periods of recession and subsequent recovery.

**Exhibit 4: Drivers of Operating Profit for Top 1,000 Companies (1950-2014)**



Source: Credit Suisse HOLT®.

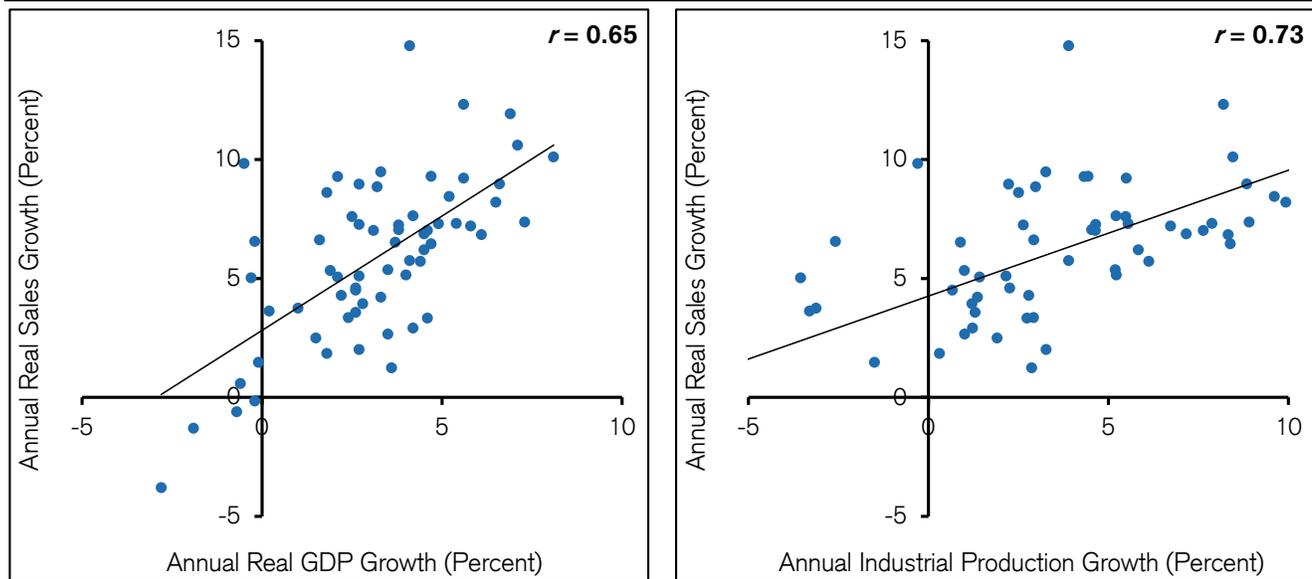
Note: Sample excludes financial services and utilities.

The rest of this report has four parts. We start with the drivers of sales growth. We then discuss the value factors, which determine the impact of sales changes on operating profit. Next we review the empirical results of our analysis of operating margin  $\beta$ , or how the change in operating profit relates to the change in sales. We conclude with data on financial leverage. Companies with debt incur interest expense, which serves to amplify the changes in operating earnings. Companies with high operating and financial leverage have greater swings in earnings, and hence risk, than those with low operating and financial leverage.<sup>11</sup>

## Sales Growth

We can forecast sales growth using a number of approaches. One logical starting point is overall economic growth. The left panel of exhibit 5 shows the correlation between annual growth in gross domestic product (GDP) in the United States and the median sales growth rate for the top 1,000 global companies by market capitalization from 1950-2014. The right panel is the relationship between growth in industrial production (IP) in the United States and sales growth, both adjusted for inflation. GDP and IP are highly correlated.

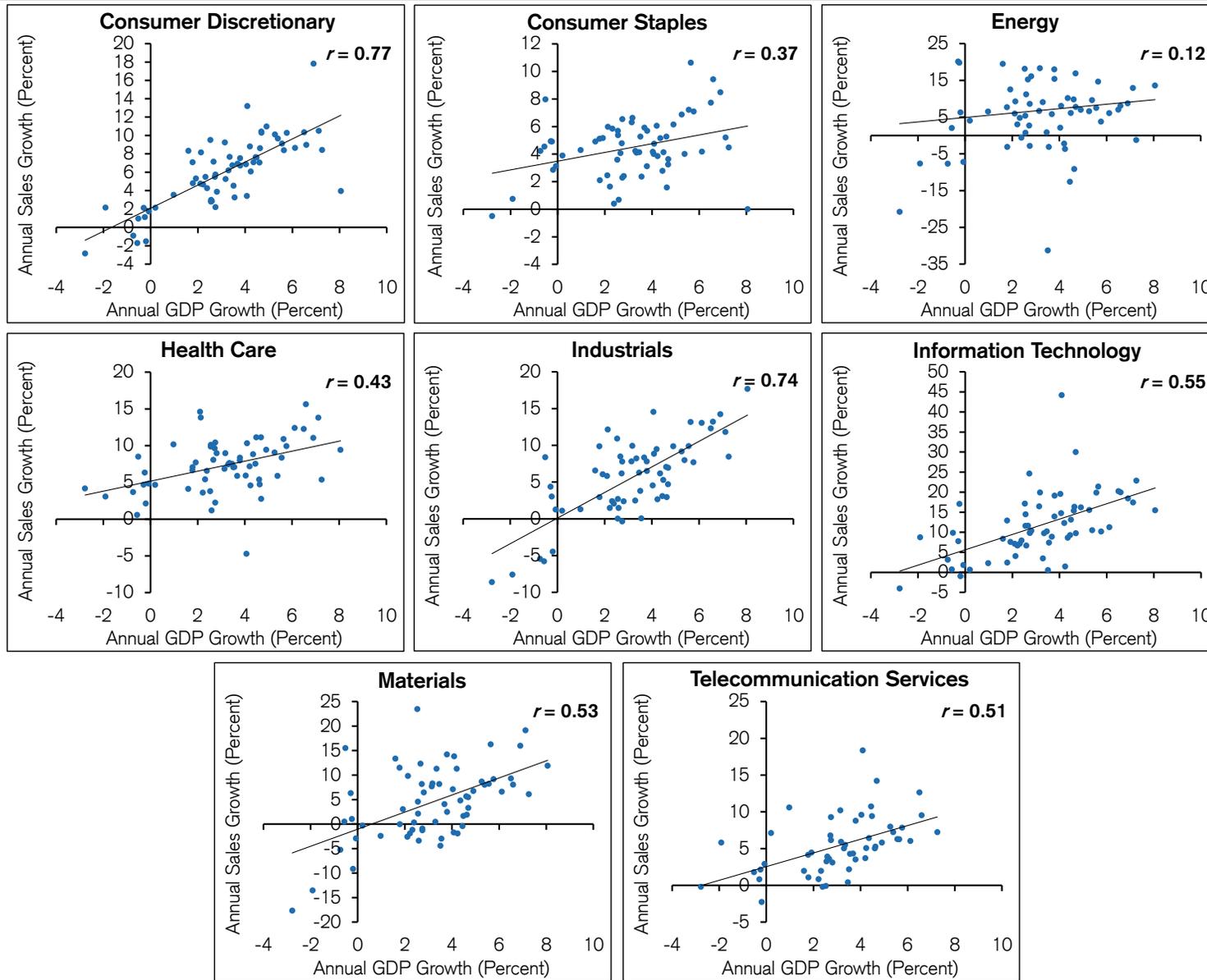
**Exhibit 5: Median Sales Growth Is Correlated with GDP and IP Growth (1950-2014)**



Source: Credit Suisse HOLT®; Bureau of Economic Analysis; Board of Governors of the Federal Reserve System.

Naturally, some sectors are more sensitive to overall economic growth than others. Exhibit 6 shows the correlation between annual U.S. GDP growth and median annual sales growth for eight sectors. The consumer discretionary and industrial sectors have relatively high correlations with GDP while consumer staples and health care have correlations that are relatively low.

**Exhibit 6: Sales Growth versus U.S. GDP Growth by Sector (1950-2014)**



Source: Credit Suisse HOLT®.

Note: Growth rates are adjusted for inflation. Sector growth rates are calculated using medians. Telecommunication Services includes 1960-2014.

Industry growth is the primary factor that analysts consider when they make sales forecasts.<sup>12</sup> There are a number of issues to consider when assessing industry growth.<sup>13</sup> The first is where the industry is in its life cycle.<sup>14</sup> Industry growth tends to follow an S-curve, where there is rapid sales growth for a time followed by flattened sales growth. Industries have different rates of growth as well as variations in growth rates.<sup>15</sup>

One common analytical mistake is to extrapolate high growth in the middle of an S-curve. One famous example is the production of color television sets, which were launched in the late 1950s and reached a sales peak in 1968. The industry grew rapidly in the 1960s, which encouraged manufacturers to add capacity. But they extrapolated the sharp growth and failed to recognize the top of the S-curve. The result was manufacturing capacity in the later 1960s of 14 million units and peak unit sales of 6 million units. A sensible judgment of the number of potential customers multiplied by the revenue per customer informs the assessment of industry size.

Mergers and acquisitions (M&A) are also important in determining sales growth. One study of the sales growth of large companies found that M&A accounted for about one-third of total top-line gain.<sup>16</sup> Large M&A deals merit careful analysis because they can change the nature of a company's operating leverage. However, the evidence shows it is challenging to create substantial value through M&A.<sup>17</sup>

Changes in a company's market share within an industry also influence sales growth rates. Market shares tend to be volatile in emerging industries, as technological change is rapid and entry and exit is rampant.<sup>18</sup> But market shares tend to settle down as an industry matures. There is a positive correlation between market share and profitability. But there is also evidence that corporate objectives focused on competitors, including market share targets, are mostly harmful to a firm's profitability.<sup>19</sup>

There are two basic ways to forecast. One is to gather information and create a bottom-up forecast. The other is to look at the outcomes of instances in a similar reference class.<sup>20</sup> For instance, you might forecast a beverage company's sales by estimating the price and volume of future servings. Alternatively, you might consider the distribution of the sales growth rates for companies of a similar size. In the latter case, you are considering the commonality with other businesses rather than focusing on the uniqueness of the situation.

Our report, "The Base Rate Book—Sales Growth," provides the base rates of sales growth for thousands of companies going back to 1950, offering a reality check for forecasts.<sup>21</sup> This research shows that analysts and companies are commonly too optimistic about sales growth rates, that sales declines occur much more frequently than forecasts suggest, and that mean and median sales growth rates decline as firm size increases.

Sales growth is the most important value driver for most companies because it is the largest source of cash and affects four of the value factors. But it is important to emphasize that sales growth, profit growth, and value creation are distinct. Sales growth only creates value when a company earns a rate of return on investment that is above the cost of capital. As a result, companies can grow profits without creating value. Indeed, sales growth destroys value for a company earning a return below the cost of capital.

The threshold margin is the level of operating profit margin at which a company earns its cost of capital.<sup>22</sup> To break even in terms of economic value, a company with higher capital intensity requires a higher operating profit margin than a company with lower capital intensity. So threshold margin is an analytically sound way to make the connection between sales growth, profits, and value creation. Appendix A defines threshold margin and incremental threshold margin. Appendix B shows that the overall rise in operating profit margin has been driven by companies in the highest margin quintile and documents the history of operating profit margin by sector.

## Value Factors

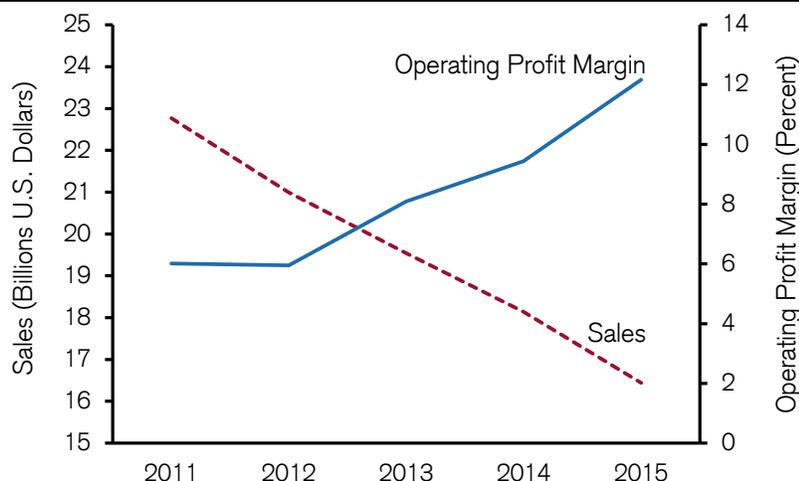
Sales changes can have varying effects on operating profit margins. Careful consideration of the value factors, including volume, price and mix, operating leverage, and economies of scale, will allow you to sort out cause and effect. Here’s a quick description of the value factors:<sup>23</sup>

- **Volume.** Volume captures the potential revision in expectations for the number of units a company sells. Volume changes lead to sales changes and can influence operating profit margins through operating leverage and economies of scale.
- **Price and Mix.** Change in selling price means that a company sells the same unit at a different price. If a company can raise its price in an amount greater than its incremental cost, margins will rise. Warren Buffett, chairman and chief executive officer of Berkshire Hathaway and one of the most successful investors in the past half century, argued that “the single most important decision in evaluating a business is pricing power.” This is not just relevant for established businesses. Marc Andreessen, co-founder and general partner of the venture capital firm Andreessen Horowitz, recently said “probably the single number one thing we try to get our companies to do is raise prices.”<sup>24</sup>

Price elasticity, a measure of the change in the demand for the quantity of a good or service relative to a change in price, is one way to assess pricing power. Goods or services that are inelastic (e.g., cigarettes and gasoline) have small changes in demand for a given price change, whereas price changes create large changes in demand for elastic goods (e.g., leisure airline travel and high-end spirits). One study of price elasticity for a sample of roughly 370 goods found that a 1 percent change in price would lead to an average of a 1.76 percent change in demand.<sup>25</sup>

Price mix captures the change in sales of high- and low-margin products. Goodyear Tire & Rubber is an example of a company that has had a positive sales mix in recent years. Goodyear’s sales in 2015 were 28 percent lower than those in 2011 and its total unit volume was 8 percent less. Both sales and volume declined in each year since 2011 with the exception of 2015 for volume. Yet the company’s operating income rose nearly 50 percent over that period, while its operating profit margin expanded 6 percentage points. A shift in mix from low-margin commodity tires to high-margin premium tires allowed the company to increase operating margins.<sup>26</sup> Exhibit 7 summarizes these figures.

**Exhibit 7: Goodyear Tire & Rubber Change in Sales Mix (2011-2015)**



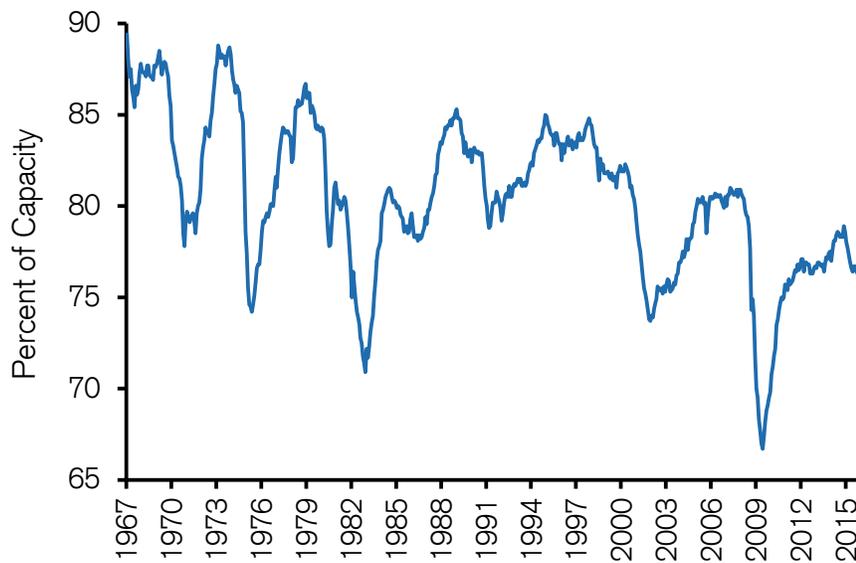
Source: Company reports.

- Operating Leverage.** Businesses almost always invest money before they can generate sales and profits. These outlays are called “preproduction costs.” For some companies, including those in the chemical, steel, and utility businesses, the costs relate to physical facilities. These investments are capitalized on the balance sheet and the accountants depreciate their value on the income statement over time. Other companies, such as those in the biotechnology or software industries, make huge investments in research and development or in writing code but expense most of those investments.

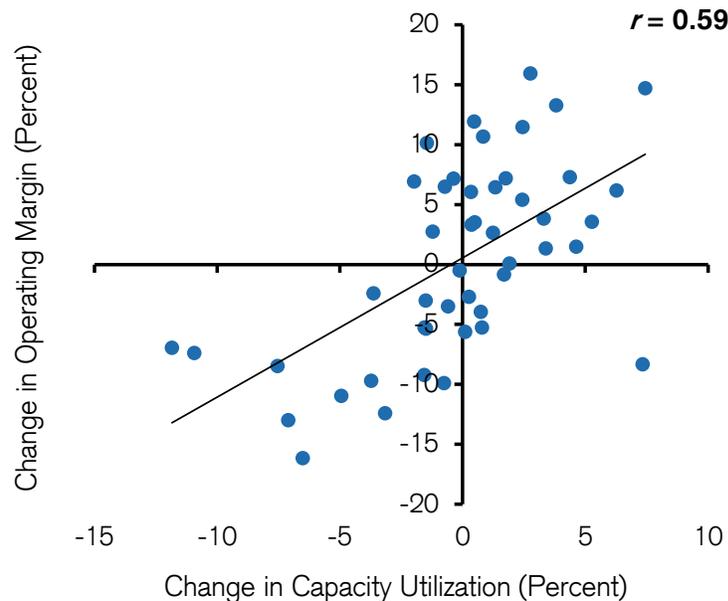
Preproduction costs lower operating profit margins in the short run. But as subsequent sales of the good or service occur, margins rise. Think of it this way: Say a manufacturing company incurs substantial preproduction costs to build a factory that can produce 100 widgets but only produces 50 today. As volume rises from 50 to 100 widgets, the incremental investment is small and operating margins rise. Operating leverage is relevant when you see a company in a position to reap the benefit of its spending on preproduction costs.

Capacity utilization is one way to assess operating leverage (see exhibit 8). Operating margins tend to shrink when capacity utilization falls and expand when utilization rises. Exhibit 9 shows this relationship.

**Exhibit 8: Capacity Utilization: Total Industry (1967-April 2016)**



Source: Board of Governors of the Federal Reserve System (U.S.).  
 Note: Monthly data.

**Exhibit 9: Changes in Capacity Utilization and Changes in Operating Margin (1967-2014)**

Source: Board of Governors of the Federal Reserve System (U.S.) and Credit Suisse HOLT®.  
Note: Annual data.

- **Economies of Scale.** A company enjoys economies of scale when it can perform key activities at a lower cost per unit as its volume increases. These tasks include purchasing, production, marketing, sales, and distribution. Economies of scale lead to greater efficiency as volume increases. This is distinct from operating leverage, where margin improvement is the result of spreading preproduction costs over larger volumes. Mistaking operating leverage for economies of scale may lead to the incorrect conclusion that unit costs will decline even as the company expands to meet new demand.

The financial results of Home Depot, the largest home improvement retailer in the United States, are an example of economies of scale. Home Depot's gross margins expanded from 27.7 percent in fiscal 1996 to 29.9 percent in fiscal 2001 as it added incremental sales in excess of \$30 billion. The company attributed the improvement in its profitability to the ability to use its size to get better prices from its suppliers.

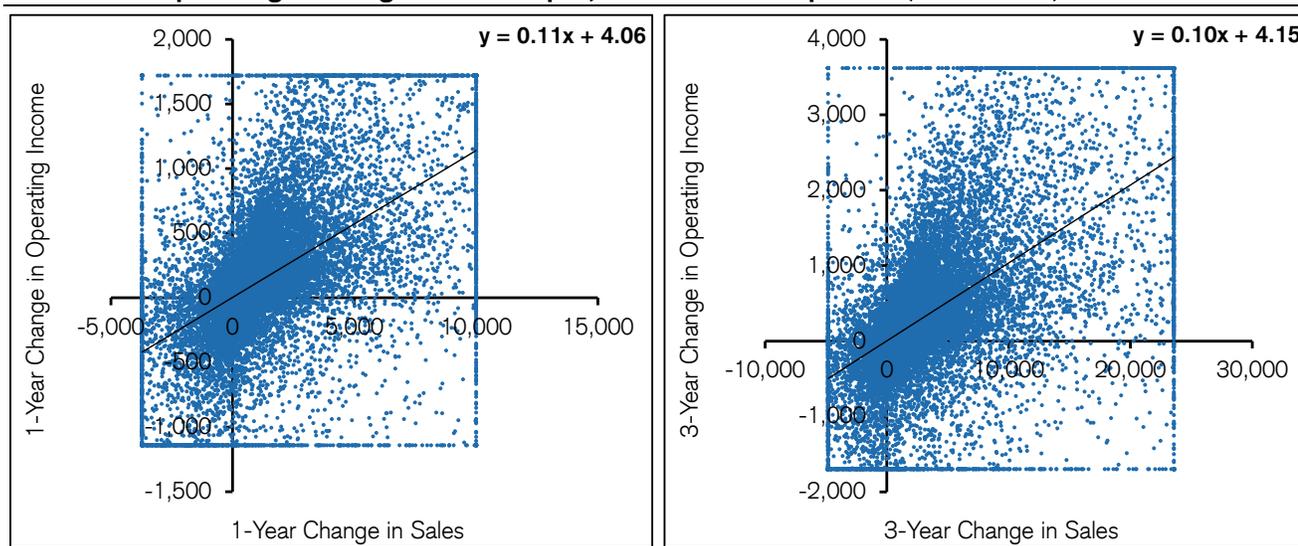
- **Cost Efficiencies.** Cost efficiencies can also affect operating profit margin but are unrelated to sales changes and hence not relevant to a discussion of operating leverage. Still, you must account for operating margin changes as the result of cost efficiencies. These efficiencies come about in two ways. A company can either reduce costs within an activity or it can reconfigure its activities.<sup>27</sup>

The discussion of sales changes and the value factors provides you with a framework to consider operating leverage, or how operating profit rises or falls as a function of a change in sales. We now turn to an empirical examination of operating leverage by sector to understand the past and to get a sense of where operating leverage is most pronounced.

## Empirical Results for Operating Leverage

We measure operating leverage by examining the relationship between the change in sales and the change in operating profit in a particular period. Exhibit 10 shows this calculation for the top 1,000 global companies by market capitalization, excluding financials and utilities, over 1- and 3-year periods from 1950 through 2014. We call the slope of the least-squares regression line the “operating margin beta ( $\beta$ ),” and it is a good proxy for the degree of operating leverage. The operating margin  $\beta$  for both periods is about 0.10, and is slightly higher for the one-year change. The way to interpret the  $\beta$  is that for every \$1.00 change in sales, operating profit changes by approximately \$0.10.

**Exhibit 10: Operating Leverage for the Top 1,000 Global Companies (1950-2014)**



Source: Credit Suisse HOLT®.

Note: All amounts in 2014 U.S. dollars; winsorized at 2<sup>nd</sup> and 98<sup>th</sup> percentiles.

Naturally, operating margin  $\beta$  varies by sector and industry given the different economic characteristics of each. Exhibit 11 shows the data and operating margin  $\beta$  for eight sectors, ranked from highest to lowest leverage. Exhibit 12 shows the results for each sector for the one- and three-year periods.

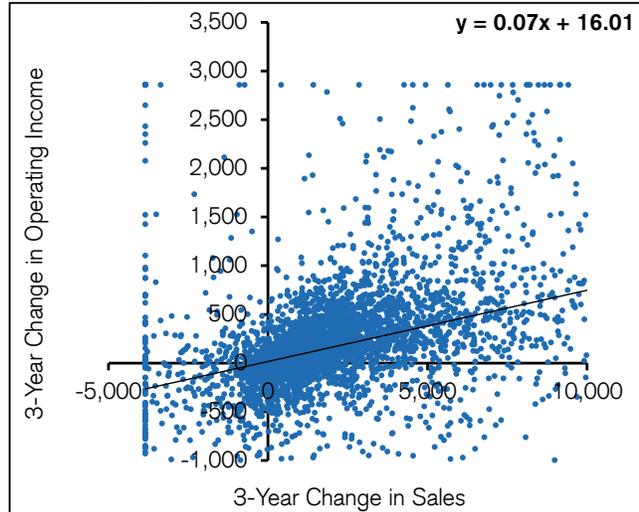
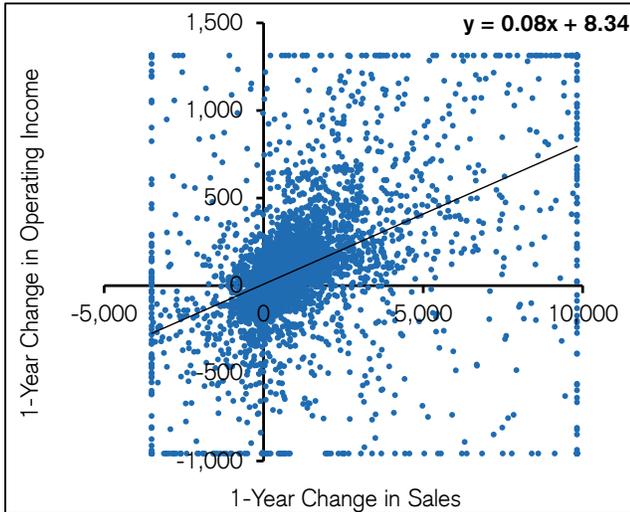
**Exhibit 11: Operating Margin Beta by Sector (1950-2014)**

Sector	One-Year Operating Margin Beta	Three-Year Operating Margin Beta
Materials	0.19	0.16
Information Technology	0.17	0.16
Telecommunication Services	0.17	0.19
Energy	0.13	0.10
Health Care	0.12	0.12
Industrials	0.08	0.08
Consumer Discretionary	0.08	0.07
Consumer Staples	0.07	0.07

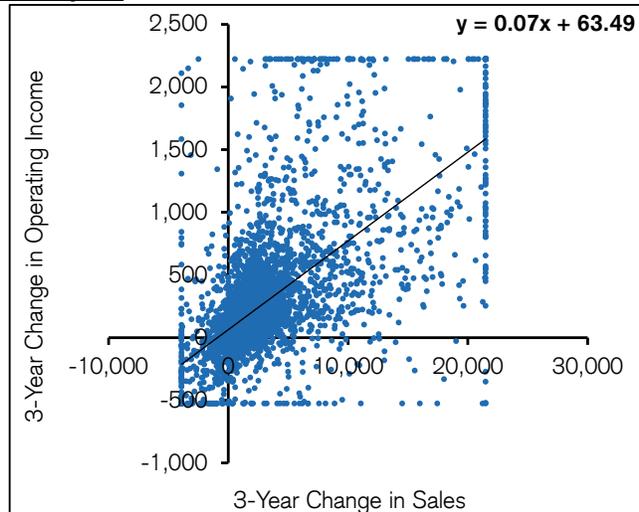
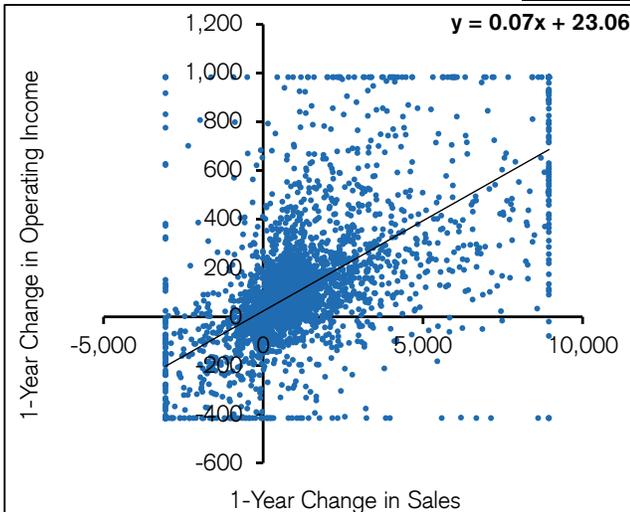
Source: Credit Suisse HOLT®.

**Exhibit 12: Operating Margin Beta by Sector (1950-2014)**

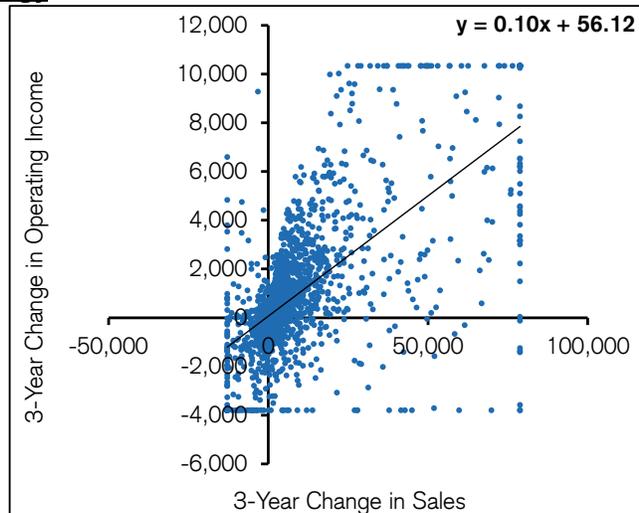
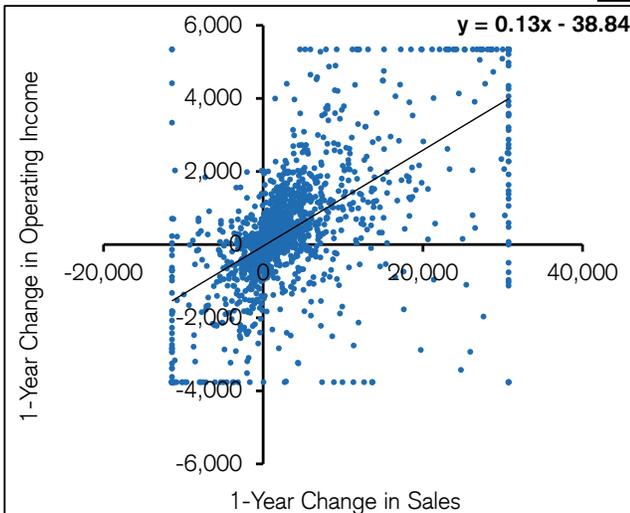
**Consumer Discretionary**



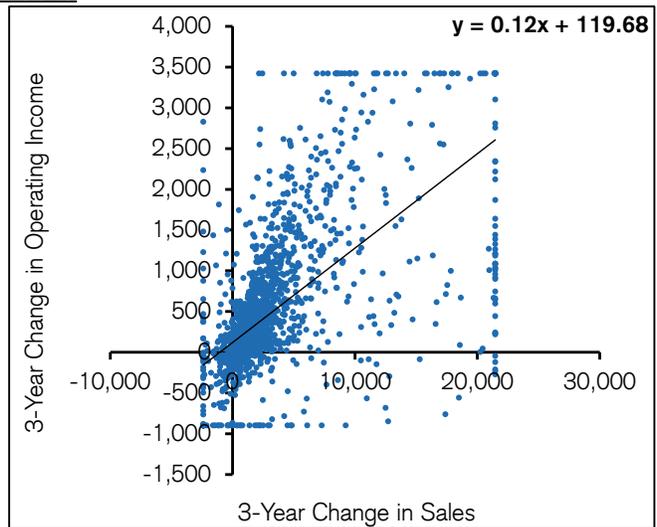
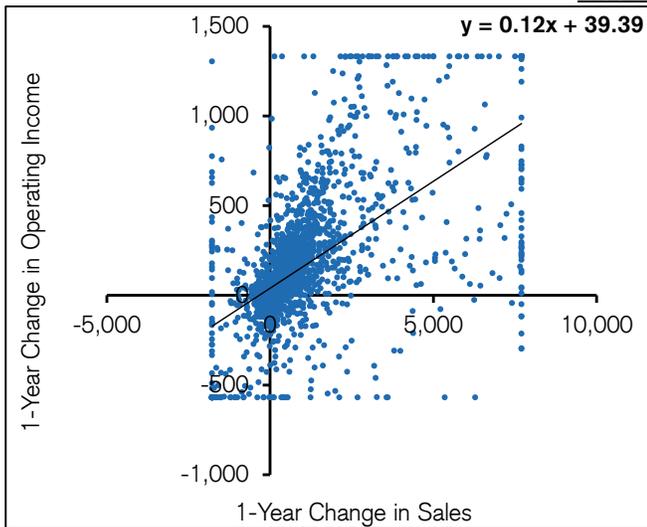
**Consumer Staples**



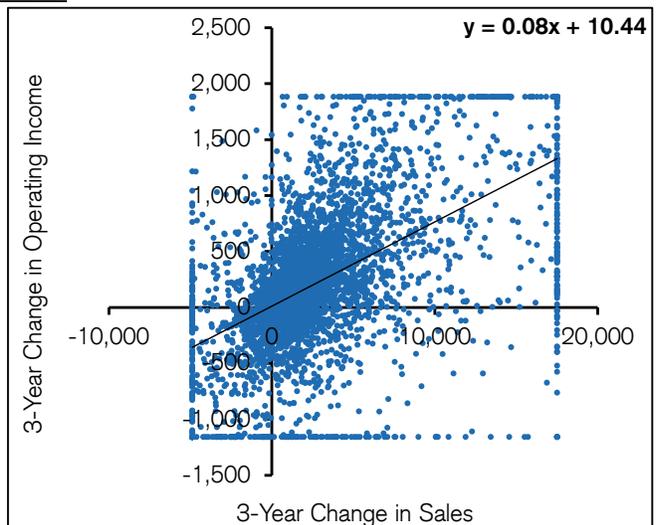
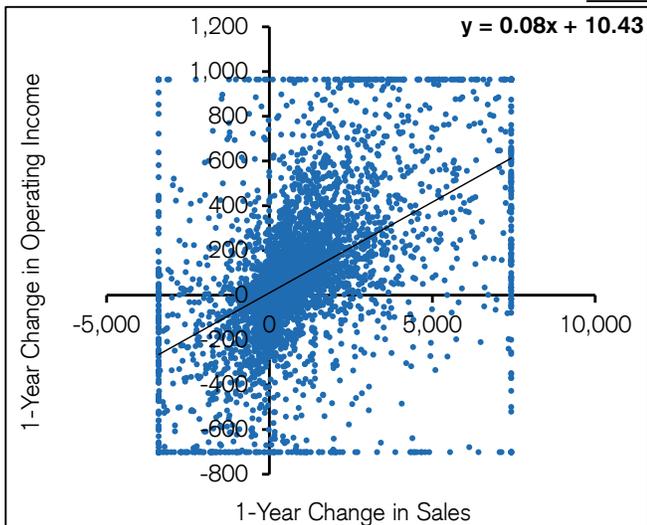
**Energy**



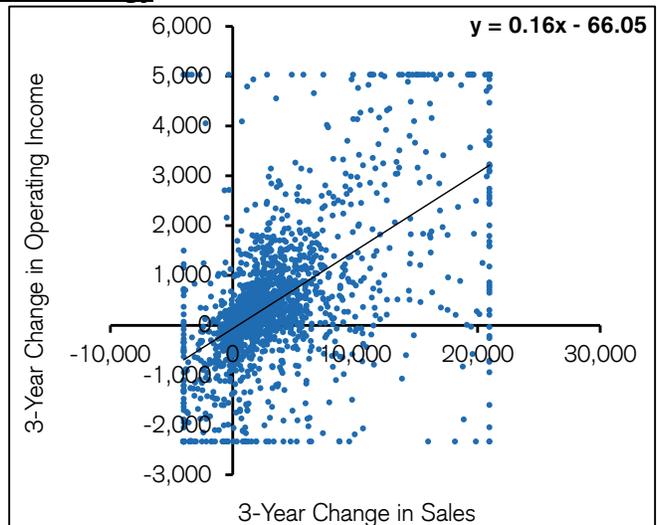
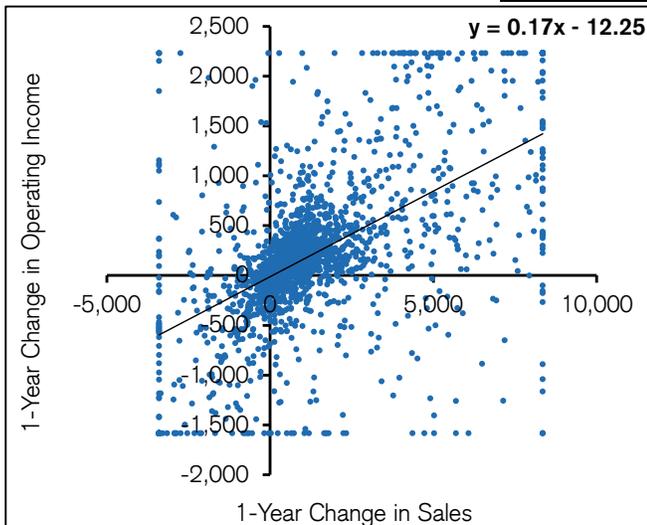
**Health Care**



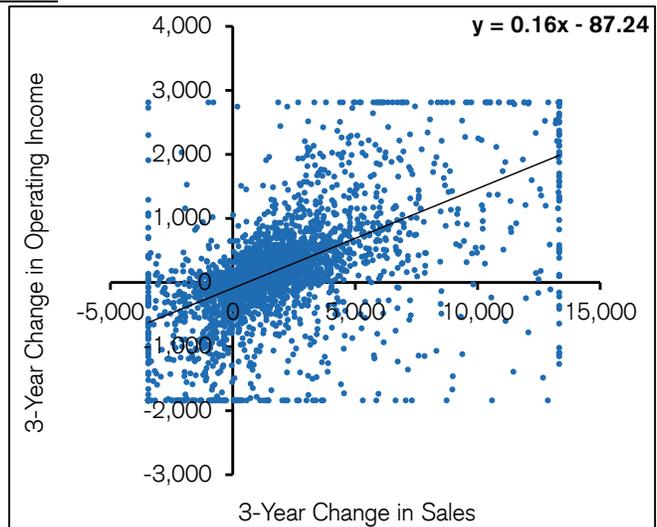
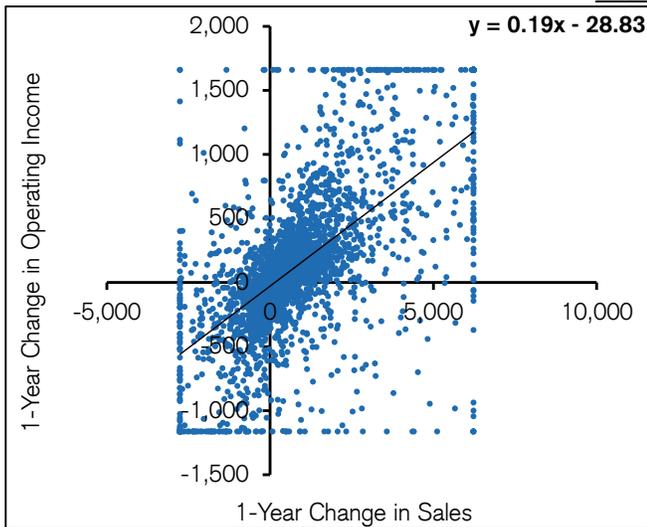
**Industrials**



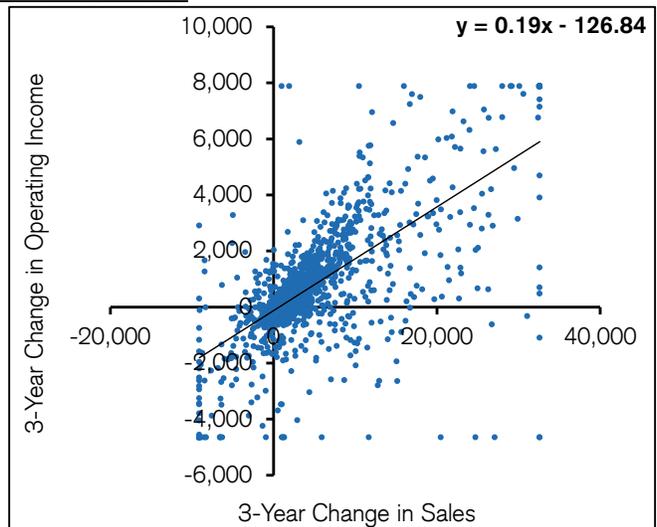
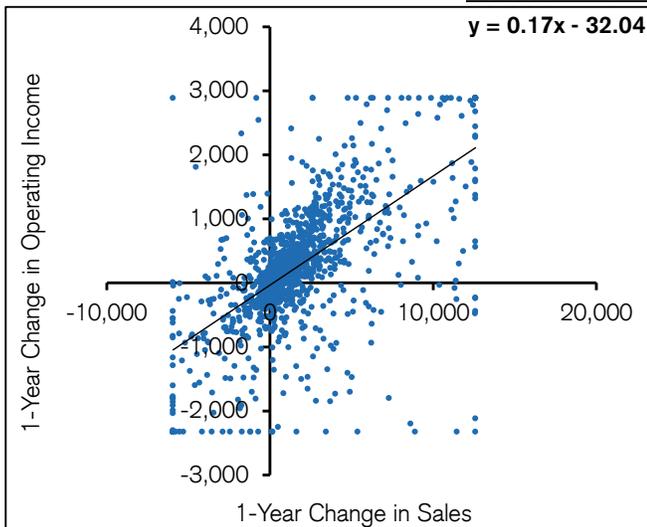
**Information Technology**



**Materials**



**Telecommunication Services**



Source: Credit Suisse HOLT®.

Note: All amounts in 2014 U.S. dollars; winsorized at 2<sup>nd</sup> and 98<sup>th</sup> percentiles.

Operating margin  $\beta$  has a few practical uses. The error in analyst forecasts tends to be larger in sectors and industries where the operating margin  $\beta$  is high. For example, earnings surprises are large in the metal industry but small in the food industry.<sup>28</sup> Understanding the full framework for assessing operating leverage is particularly important for sectors and industries with high operating margin  $\beta$ 's.

Analyst errors tend to be large at peaks and troughs in industrial production. When industrial production growth accelerates, the errors in analyst forecasts tend to fall. When industrial production decelerates, errors tend to rise. Analysts, who are normally optimistic, are rewarded when economic conditions are favorable and miss the mark substantially when conditions are poor.<sup>29</sup>

Notwithstanding the errors that analysts make when the economy is expanding or contracting, their earnings forecasts are more accurate than those of management for businesses with high operating margin  $\beta$ . Management forecasts are better than those of analysts when a firm is dealing with unusual issues such as losses, inventory increases, and excess capacity. Overall, forecasts by management are more accurate than analysts about half of the time, suggesting that the information advantage executives have may not be as significant as macroeconomic factors in determining the accuracy of their forecasts.<sup>30</sup>

At this point, we have developed a framework to anticipate changes in operating profit. The process involves consideration of macroeconomic outcomes and microeconomic factors, informed by empirical results. This analysis is the basis for "asset beta," the risk of a company based on the volatility of operating income and without regard for financial policy. We now introduce the role of financial leverage as a final step to understand volatility in earnings.

## Financial Leverage

Earnings volatility for a company is determined by the combination of volatility in operating profit and financial leverage. Financial leverage captures the amount of debt a company assumes, net of the cash that it holds. Lots of debt increases the volatility of earnings because a company has to pay interest expense, which you can think of as another fixed cost. As a result, financial leverage amplifies changes in operating income. In exhibit 1, we refer to this as "financial leverage beta ( $\beta$ )."

To illustrate the impact of financial leverage  $\beta$ , consider two companies, A and B, which have the same scenarios for operating profit next year:

### Company A

	<u>Operating profit</u>	<u>Interest expense</u>	<u>Pretax profit</u>
Bullish scenario	\$120	\$0	\$120
Base case scenario	100	0	100
Bearish scenario	80	0	80

Since A is free of debt, the variability of pretax profit mirrors that of operating profit. In this case, the highest profit scenario (\$120) is 50 percent greater than the lowest (\$80).

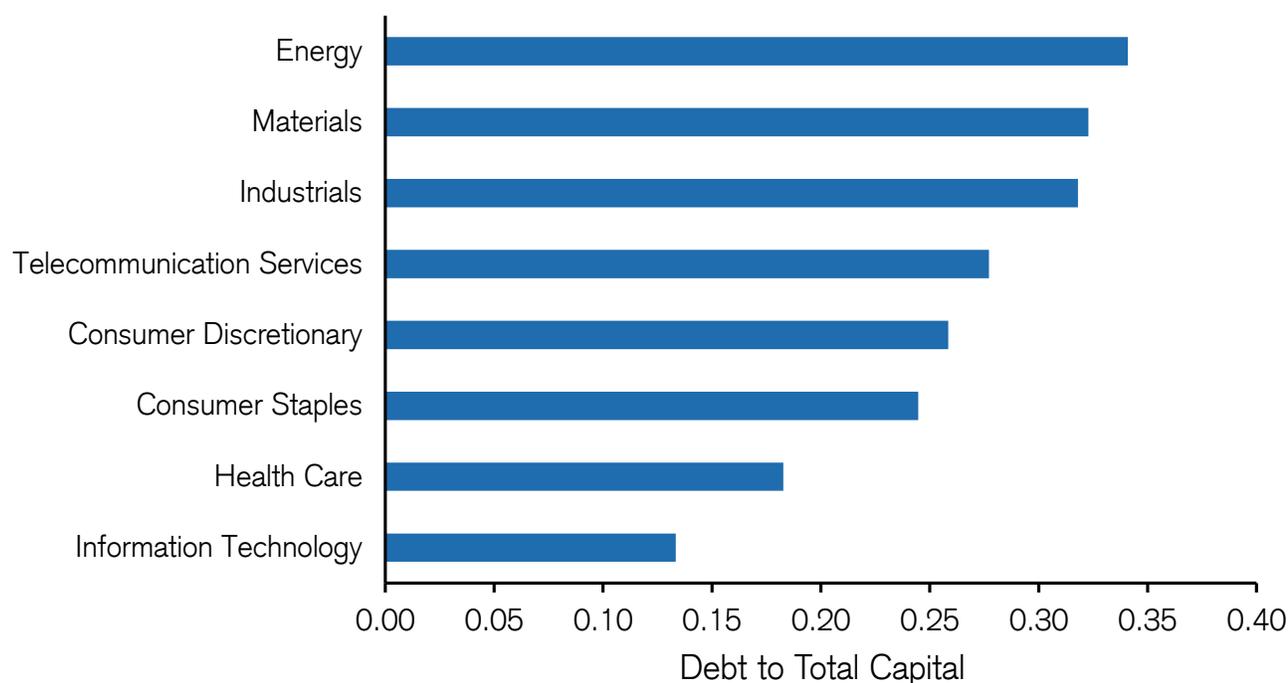
### Company B

	<u>Operating profit</u>	<u>Interest expense</u>	<u>Pretax profit</u>
Bullish scenario	\$120	\$30	\$90
Base case scenario	100	30	70
Bearish scenario	80	30	50

B has debt and hence interest expense. The variability of pretax profit for B is much higher than that for A. The highest profit (\$90) is 80 percent greater than the lowest profit (\$50). The addition of debt creates more volatility in earnings and may suggest different values for the businesses.

Exhibit 13 shows the debt-to-total capital ratios by sector. This ratio uses the book value of debt and the market value of equity. Higher ratios of debt to total capital are consistent with higher financial leverage. However, the substantial increase in cash holdings distorts this relationship. For example, Apple's debt-to-total-capital ratio was approximately 13 percent on March 31, 2016 (debt of \$78 billion and market value of equity of \$540 billion). But the company had a cash balance in excess of \$200 billion. This means that the company's net cash position was in excess of \$100 billion even after considering the taxes the company would pay if it repatriated the money.

### Exhibit 13: Debt-to-Total Capital Ratio by Sector



Source: Aswath Damodaran.

Note: Global companies as of January 2015; Debt-to-total capital ratio for each sector is the average of the industries in that sector.

Credit ratings are also a proxy for financial leverage. Exhibit 14 shows the statistics for companies of various investment ratings, including operating margins, the ratio of operating profit to interest expense, debt to total capital, and default rates. Companies with high ratings tend to have high margins, low amounts of debt, and strong interest expense coverage ratios.

**Exhibit 14: Statistics for Companies with Different Credit Ratings**

	AAA	AA	A	BBB	BB	B
Operating income/revenues (%)	28.0	26.9	22.7	21.3	17.9	19.2
EBIT interest coverage (x)	40.8	17.3	10.3	5.5	3.2	1.3
Debt/total capital (%)	2.8	17.2	30.7	41.1	50.4	72.7
Return on capital (%)	30.6	21.6	22.2	14.2	11.1	7.1
Median default rates, 1-Year (%)	0.00	0.00	0.00	0.12	0.71	3.46
Number of companies	4	15	94	233	253	266

Source: Standard & Poor's Ratings Services, Ratings Direct.

Note: Financial ratios are medians for 3-year averages (2011-2013) for U.S. companies; default rates are median 1-year global default rates (2014).

Academic research shows that companies with high operating leverage tend to have lower financial leverage.<sup>31</sup> Our findings are consistent with this when we measure financial leverage as debt-to-total capital based on book value. The idea is that companies with high operating margin  $\beta$  will seek low financial leverage so as to manage overall risk.

Over the past 30 years, the ratio of cash to assets has risen in the United States from 7 percent in 1980 to about 16 percent today.<sup>32</sup> This shift is consistent with the rise in companies that spend a lot of money on research and development (R&D). As R&D expense is a fixed or quasi-fixed cost, this trend reflects the efforts by executives to manage overall risk by using a cash buffer to dampen the impact of operating leverage.

Operating leverage and financial leverage together determine earnings volatility. Generally speaking, executives of companies with substantial operating leverage choose a conservative capital structure so as to reduce the volatility of the business results.

## Conclusion

Making money in markets requires having a point of view about financial results that is different than what the market reflects. This not only requires understanding the expectations that today's price embeds, it also means you must anticipate something that the market does not.

Many financial models that analysts build suffer from linear extrapolation. Quality modelling recognizes the interactions between sales growth, profitability, and financial leverage. This report offers a systematic approach to conducting this analysis, fortified with substantial empirical results. While much of our empirical work is based on analysis by sector, you can use the framework in exhibit 1 for individual companies.

## Operating Leverage Checklist

- Did you consider the relevant macroeconomic variables and their impact on sales growth rates?
- Do you understand the breakdown between the company's fixed and variable costs?
- Have you analyzed which value factors have been relevant in determining past results and which will come into play for future earnings?
- Did you determine the impact of cost efficiencies?
- Have you calculated the operating margin beta for past results and estimated it to make a thoughtful forecast?
- Did you analyze the balance sheet, including total debt and cash balances, to gauge the effect of financial leverage?

## Appendix A: Threshold and Incremental Threshold Operating Profit Margin

Considering the relationship between sales growth, profit growth, and value creation is vital throughout this analysis. One way to do this is to calculate the threshold margin, or the level of operating profit margin at which a company earns its cost of capital. To break even in terms of economic value, a company with higher capital intensity requires a higher margin than a company with lower capital intensity.<sup>33</sup>

Let's examine a simple example. Assume a company has the following financial characteristics:

Base sales	\$100
Sales growth	8.0%
Operating profit margin (base)	8.4%
Operating profit margin (incremental)	8.4%
Incremental fixed capital rate	35%
Incremental working capital rate	25%
Tax rate	35%
Cost of capital	10%

The definitions for sales growth, operating profit margin, tax rate, and the cost of capital are straightforward. The incremental fixed capital rate captures how much a company will spend on incremental investments in fixed capital (more formally, capital expenditures minus depreciation) and is measured as a percentage change in sales.

For example, if sales grow by \$10 and the incremental fixed capital rate is 35 percent, the company's capital expenditure, net of depreciation, is \$3.5. The same idea applies to working capital. For every incremental dollar in sales, the incremental working capital rate measures the percent a company needs to reinvest in working capital.

We get these figures if we apply the numbers to five years of free cash flow:

	<u>Year 0</u>	<u>Year 1</u>	<u>Year 2</u>	<u>Year 3</u>	<u>Year 4</u>	<u>Year 5</u>
Sales	\$100.0	108.0	116.6	126.0	136.0	146.9
Operating income	8.4	9.1	9.8	10.6	11.4	12.3
Taxes		3.2	3.4	3.7	4.0	4.3
Incremental fixed capital		2.8	3.0	3.3	3.5	3.8
Incremental fixed capital		2.0	2.2	2.3	2.5	2.7
Free cash flow		1.1	1.2	1.3	1.4	1.5

We can see that the company is growing modestly. But the question is whether it is creating shareholder value. We can only assess that by determining whether the company earns a return on its incremental investments that exceeds the cost of capital.

The answer is that this company is value neutral (see the column "shareholder value added" at the far right below). It earns its cost of capital on its investments. This demonstrates that growth does not equal value creation.

Year	<u>Free cash flow</u>	Present value of <u>free cash flow</u>	Cumulative present <u>value of free cash flow</u>	Present value of <u>residual value</u>	CUM PV of FCF + <u>PV of residual</u>	Shareholder <u>value added</u>
1	1.09	0.99	0.99	53.56	54.55	
2	1.18	0.97	1.97	52.58	54.55	0
3	1.27	0.96	2.92	51.63	54.55	0
4	1.37	0.94	3.86	50.69	54.55	0
5	1.48	0.92	4.78	49.77	54.55	0

With these parts in place, we can now calculate the incremental threshold margin. This is the margin the company must achieve on incremental investments in order to earn the cost of capital.

$$\text{Incremental threshold margin} = \frac{(\text{incremental fixed} + \text{working capital rate}) * (\text{cost of capital})}{(1 + \text{cost of capital}) * (1 - \text{tax rate})}$$

Substituting numbers from above, we can see that the threshold margin is 8.4 percent:

$$\text{Incremental threshold margin} = \frac{(0.35 + 0.25) * 0.10}{(1.10) * (0.65)} = \frac{0.06}{0.715} = 0.084$$

Given this company's sales growth, investment needs, tax rate, and cost of capital, it needs to achieve an incremental profit margin of 8.4 percent just to earn the cost of capital. What the equation also makes clear is that as a company's investment needs increase, the business must earn a higher operating profit margin to be value neutral.

While the incremental threshold margin captures the required margin on new sales, the threshold margin reflects the overall margin the company must earn to be value neutral.

Here's the equation:

$$\text{Threshold margin} = \frac{(\text{prior year operating income}) + (\text{incremental threshold margin} * \text{incremental sales})}{\text{prior sales} + \text{increase in sales}}$$

Running the numbers from year 1 to year 2, we see that the threshold margin is also 8.4 percent:

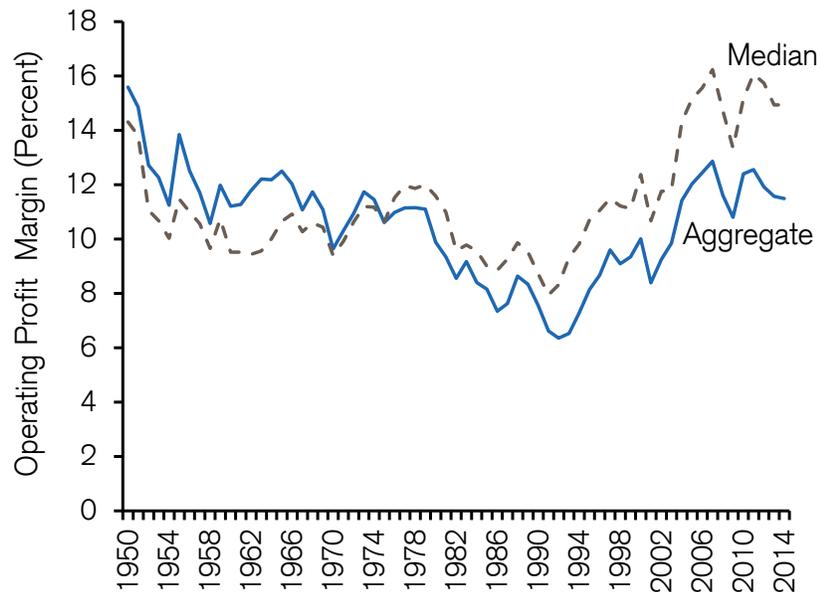
$$\text{Threshold margin} = \frac{9.1 + (0.084 * 8.6)}{108.0 + 8.6} = \frac{9.82}{116.6} = 0.084$$

Incorporating the concept of threshold margin helps clarify the essential link between growth, profitability, and value creation.

## Appendix B: Operating Margins—The Rich Get Richer

Exhibit 15 shows that the aggregate and median operating profit margin for the top 1,000 companies has been rising since the mid-1980s. The sample excludes companies in the financial services and utility industries. The aggregate margin is total operating profit divided by total sales for the companies in the sample. The decline in operating profit margin from 1950 through the early 1980s is the result of increased global competition in an economy dominated by manufacturing. Since the mid-1980s, the economy has shifted toward service and knowledge businesses, which tend to have higher operating profit margins.

**Exhibit 15: Aggregate and Median Operating Profit Margin (1950-2014)**

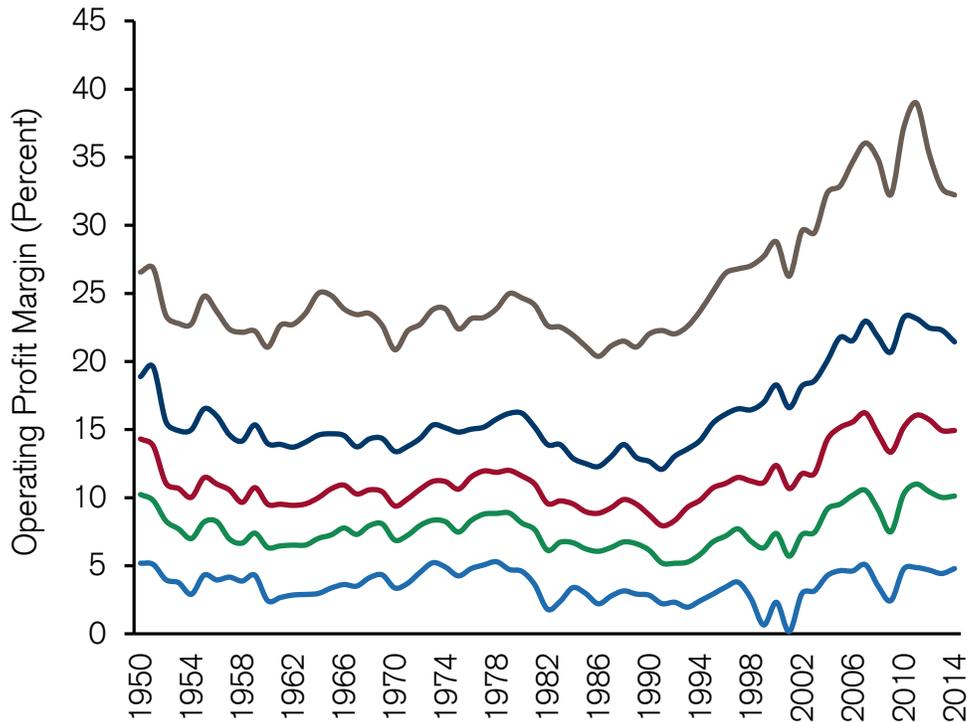


Source: Credit Suisse HOLT®.

Exhibit 16 shows that much of the expansion in aggregate operating profit margin is attributable to the top quintile.<sup>34</sup> Here, we use operating margin to sort the sample into quintiles in each year. We then see how the margins change for each of the quintiles over time. This method ensures that the composition of each quintile changes annually.

Over the full period, the operating margins of the bottom three quintiles remain roughly flat. But the top two quintiles, and especially the highest one, show substantial margin expansion. For example, the operating margin for the highest quintile went from 21 percent in 1985 to 33 percent in 2014.

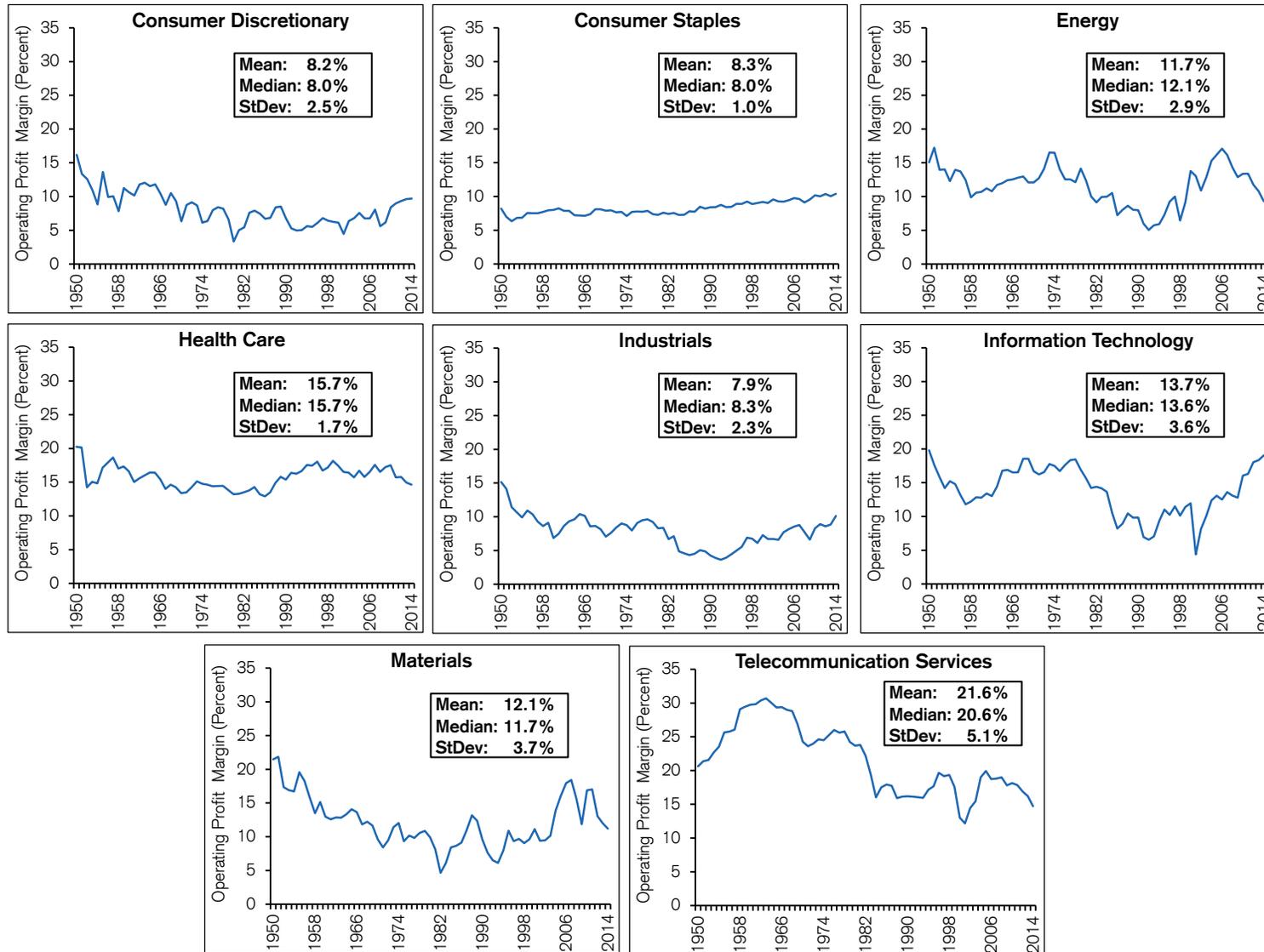
**Exhibit 16: Operating Profit Margins on the Rise for the Top 20 Percent**



Source: Credit Suisse HOLT®.

Exhibit 17 shows the trend in operating profit margin for all sectors. Note that the relative contribution of sectors changes over time. For example, the energy, materials, and industrial sectors represented 51 percent of the market capitalization of the top 1,500 companies in the U.S. market in 1980 but just 19 percent in 2015. During the same time, the healthcare and technology sectors went from 17 to 34 percent of the market capitalization.

**Exhibit 17: Operating Profit Margin by Sector (1950-2014)**



Source: Credit Suisse HOLT®.

## Endnotes

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