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The Base Rate Book

Integrating the Past to Better Anticipate the Future

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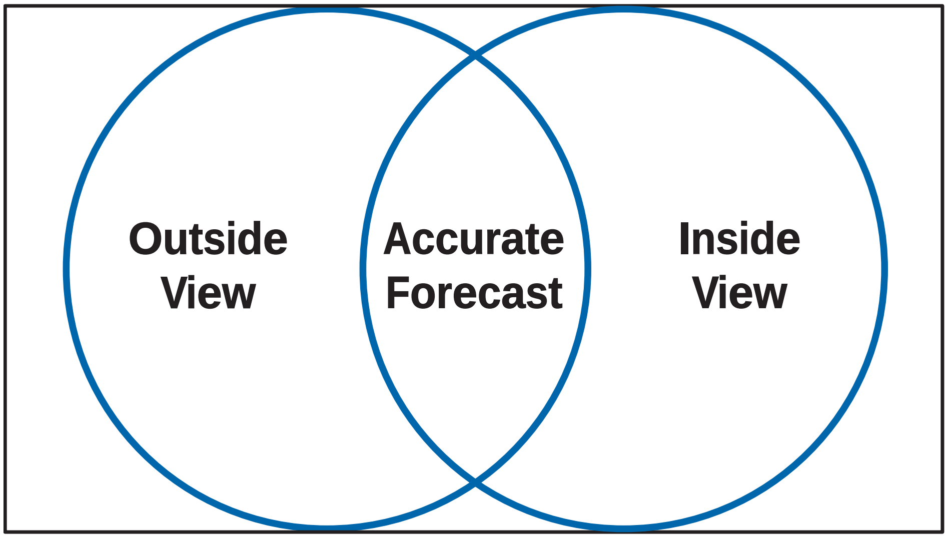

Source: Credit Suisse.

"People who have information about an individual case rarely feel the need to know the statistics of the class to which the case belongs."

Daniel Kahneman[1]

- Successful active investing requires a forecast that is different than what the market is discounting.
- Executives and investors commonly rely on their own experience and information in making forecasts (the "inside view") and don't place sufficient weight on the rates of past occurrences (the "outside view").
- This book is the first comprehensive repository for base rates of corporate results. It examines sales growth, gross profitability, operating leverage, operating profit margin, earnings growth, and cash flow return on investment. It also examines stocks that have declined or risen sharply and their subsequent price performance.
- We show how to thoughtfully combine the inside and outside views.
- The analysis provides insight into the rate of regression toward the mean and the mean to which results regress.

Table of Contents

We offer special thanks to members of the HOLT team, who facilitated our access to data and contributed a number of useful concepts. Specifically, we thank Bryant Matthews, David Holland, David Rones, Greg Williamson, Chris Morck, and Sean Burns.

Executive Summary

- The objective of a fundamental investor is to find a gap between the financial performance implied by an asset price and the results that will ultimately be revealed. As a result, investing requires a clear sense of what's priced in today and possible future results.

- The natural and intuitive way to create forecasts is to focus on an issue, gather information, search for evidence based on our experience, and extrapolate with some adjustment. This is what psychologists call the "inside view." It is common for the inside view to lead to a forecast that is too optimistic.

- Another way to make a forecast is to consider the outcomes of a relevant reference class. This is called the "outside view." Rather than emphasizing differences, as the inside view does, the outside view relies on similarity. Using the outside view can be unnatural because you have to set aside your own information and experience as well as find and appeal to an appropriate reference class, or base rate.

- Most executives and investors rely on their memory of prior instances as a basis for comparison. For example, they may deem this private equity deal similar to that prior deal, and hence assume the return on investment will be similar. An appropriate reference class is one that has a sample size that is sufficient to be robust but is similar enough to the class you are examining to be relevant.

- Research in psychology shows that the most accurate forecasts are a thoughtful blend of the inside and the outside views. Here's a helpful guide: If skill determines the outcome, you can rely more on the inside view. If luck plays a large role, you should place more weight on the outside view.

- Regression toward the mean is a tricky concept that most investors believe in but few fully understand. The concept says that outcomes that are far from average will be followed by outcomes with an expected value closer to the average. Examining correlations allows us to not only acknowledge the role of regression toward the mean, but also to understand its pace. The data in this book not only offer a basis for an assessment of the rate of regression toward the mean, but also document the mean, or average, to which results regress.

- This book provides the base rates of corporate performance for sales growth, gross profitability (gross profits/assets), operating leverage, operating profit margin, earnings growth, and cash flow return on investment (CFROI®*). In most cases, the data go back to 1950 and include dead companies. It also examines stocks that have declined or risen sharply, and shows the subsequent price performance based on how the stocks screen on momentum, valuation, and quality.

- Integrating the outside view allows an executive or investor to improve the quality of his or her forecast. It also serves as a valuable reality check on the claims of others.

- This report is the result of a deep collaboration with our HOLT team. HOLT® aims to remove the vagaries of accounting in order to allow comparison of corporate performance across a portfolio, a market, or a universe (cross sectional) as well as over time (longitudinal).

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* CFROI® is a registered trademark in the United States and other countries (excluding the United Kingdom) of Credit Suisse Group AG or its affiliates.

Introduction

The objective of a fundamental investor is to find a gap between the financial performance implied by an asset price and the results that will ultimately be revealed. A useful analogy is pari-mutuel betting in horse racing. The odds provide the probability that a horse will win (implied performance) and the running of the race determines the outcome (actual performance). The goal is not to pick the winner of the race but rather the horse that has odds that are mispriced relative to its likelihood of winning.

As a result, investing requires a clear sense of what's priced in today and possible future results. Today's stock price, for example, combines a company's past financial performance with expectations of how the company will perform in the future. Market psychology also comes into play. The fundamental analyst has to have a sense of a company's future performance to invest intelligently.

There is a natural and intuitive approach to creating a forecast of any kind. We focus on an issue, gather information, search for evidence based on our experience, and extrapolate with some adjustment. Psychologists call this approach the "inside view."

An important feature of the inside view is that we dwell on what is unique about the situation.[2] Indeed, Daniel Gilbert, a psychologist at Harvard University, suggests that "we tend to think of people as more different from one another than they actually are."[3] Likewise, we think of the things we are trying to forecast as being more unique than they are. The inside view commonly leads to a forecast that is too optimistic, whether it's the likely success of a new business venture, the cost and time it will take to build a bridge, or when a term paper will be ready to be submitted.

The "outside view" considers a specific forecast in the context of a larger reference class. Rather than emphasizing differences, as the inside view does, the outside view relies on similarity. The outside view asks, "What happened when others were in this situation?" This approach is also called "reference class forecasting." Psychologists have shown that our forecasts improve when we thoughtfully incorporate the outside view.[4]

Analysis of mergers and acquisitions (M&A) provides a good example of these contrasting approaches. The executives at the companies that are merging will dwell on the strategic strength of the combined entities and the synergies they expect. The uniqueness of the combined businesses is front and center in the minds of the dealmakers, who almost always feel genuinely good about the deal. That's the inside view.

The outside view asks not about the details of a specific deal but rather how all deals tend to do. Historically, about 60 percent of deals have failed to create value for the acquiring company.[5] If you know nothing about a specific M&A deal, the outside view would have you assume a success rate similar to all deals.

Considering the outside view is useful but most executives and investors fail to do so. Dan Lovallo, Carmina Clarke, and Colin Camerer, academics who study decision making, examined how executives make strategic choices and found that they frequently rely either on a single analogy or a handful of cases that come to mind.[6] Investors likely do the same.

Using an analogy or a small sample of cases from memory has the benefit of being easy. But the cost is that it prevents a decision maker from properly incorporating the outside view.

Yet not all instances in a reference class are equally informative. For instance, M&A deals financed with cash tend to do better than those funded with equity. Therefore, a proper analogy, or set of cases, may be a better match with the current decision than a broad base rate. You trade sample size for specificity.

Lovallo, Clarke, and Camerer created a matrix with the columns representing the reference class and the rows reflecting the weighting (see Exhibit 1). The ideal is a large sample of cases similar to the problem at hand.

Exhibit 1: Reference Class versus Weighting Matrix

		Reference Class	
		Recall	**Distribution**
Weighting	**Event-based**	Single analogy	Reference class forecasting (RCF)
	Similarity-based	Case-based decision theory (CBDT)	Similarity-based forecasting (SBF)

Source: Dan Lovallo, Carmina Clarke, and Colin Camerer, "Robust Analogizing and the Outside View: Two Empirical Tests of Case-Based Decision Making," Strategic Management Journal, *Vol. 33, No. 5, May 2012, 498.*

"Single analogy," found in the top left corner, refers to cases where an executive recalls a sole analogy and places all of his or her decision weight on it. This is a common approach that substantially over-represents the inside view. As a result, it frequently yields assessments that are too optimistic.

"Case-based decision theory," the bottom left corner, reflects instances when an executive recalls a handful of case studies that seem similar to the relevant decision. The executive assesses how comparable the cases are to the focal decision and weights the cases appropriately.

The top right corner is reference class forecasting.[14] Here, a decision maker considers an unbiased reference class, determines the distribution of that reference class, makes an estimate of the outcome for the focal decision, and then corrects the intuitive forecast based on the reference class. The decision maker weights equally all of the events in the reference class.

Lovallo, Clarke, and Camerer advocate "similarity-based forecasting," the bottom right corner, which starts with an unbiased reference class but assigns more weight to the cases that are similar to the focal problem without discarding the cases that are less relevant. Done correctly, this approach is the best of both worlds as it considers a large reference class as well as a means to weight relevance.

The scientists ran a pair of experiments to test the empirical validity of their approach. In one, they asked private equity investors to consider a current deal, including key steps to success, performance milestones, and the expected rate of return. This revealed the inside view.

They then asked the professionals to recall two past deals that were similar, to compare the quality of those deals to the project under consideration, and to write down the rate of return for those projects. This was a prompt to consider the outside view.

The average estimated return for the focal project was almost 30 percent, while the average for the comparable projects was close to 20 percent. Every subject wrote a rate of return for the focal project that was equal to or higher than the comparable projects.

Over 80 percent of subjects who had higher forecasts for the focal project revised down their forecasts when given the opportunity. The prompt to consider the outside view tempered their estimates of the rate of return for the deal under consideration. It is not hard to imagine similar results for corporate executives or investors in public markets.

If the outside view is so useful, why do so few forecasters use it? There are a couple of reasons. Integrating the outside view means less reliance on the inside view. We are reluctant to place less weight on the inside view because it reflects the information we have gathered as well as our experience. Further, we don't always have access to the statistics of the appropriate reference class. As a result, even if we want to incorporate the outside view we do not have the data to do so.

This book provides a deep, empirical repository for the outside view, or base rates, for a number of the key drivers of corporate performance. These include sales growth, gross profitability, operating profit margins, net income growth, and rates of fade for cash flow return on investment (CFROI®). It also offers data for how stocks perform following big moves down or up versus the stock market.

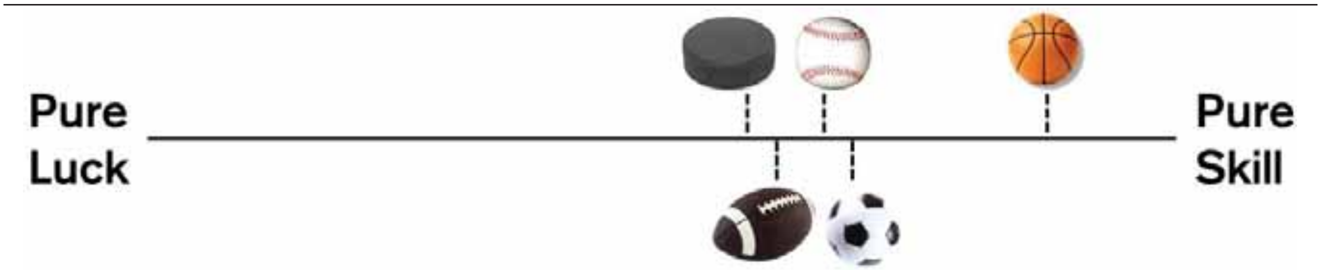
How to Combine the Inside and Outside Views

Daniel Kahneman, a psychologist who won the Nobel Prize in Economics in 2002, wrote a paper with his colleague Amos Tversky called "On the Psychology of Prediction." The paper, published in *Psychological Review* in 1973, argues that there are three types of information relevant to a statistical prediction: the base rate (outside view), the specifics about the case (inside view), and the relative weights you should assign to each.[7]

One way to determine the relative weighting of the outside and inside views is based on where the activity lies on the luck-skill continuum.[8] Imagine a continuum where luck alone determines results on one end and where skill solely defines outcomes on the other end (see Exhibit 2). A blend of luck and skill reflects the results of most activities, and the relative contributions of luck and skill provide insight into the weighting of the outside versus the inside view.

For reference, the exhibit shows where professional sports leagues fall on the continuum based on one season. The National Basketball Association is the furthest from luck and the National Hockey League is the closest to it.

Exhibit 2: The Luck-Skill Continuum



Source: Michael J. Mauboussin, The Success Equation: Untangling Skill and Luck in Business, Sports, and Investing *(Boston, MA: Harvard Business Review Press, 2012), 23.*
Note: Average of last five completed seasons.

For activities where skill dominates, the inside view should receive the greatest weight. Suppose you first listen to a song played by a concert pianist followed by a tune played by a novice. Playing music is predominantly a matter of skill, so you can base the prediction of the quality of the next piece played by each musician on the inside view. The outside view has little or no bearing.

By contrast, when luck dominates the best prediction of the next outcome should stick closely to the base rate. For example, money management has a lot of luck, especially in the short run. So if a fund has a particularly good year, a reasonable forecast for the subsequent year would be a result closer to the average of all funds.

There are two analytical concepts that can help you improve your judgment. The first is an equation that allows you to estimate true skill:[9]

Estimated true skill = grand average + *shrinkage factor* (observed average – grand average)

The shrinkage factor has a range of zero to 1.0. Zero indicates complete regression toward the mean and 1.0 implies no regression toward the mean at all.[10] In this equation, the shrinkage factor tells us how much we should regress the results toward the mean, and the grand average tells us the mean to which we should regress.

Here is an example to make this concrete. Assume that you want to estimate the true skill of a mutual fund manager based on an annual result. The grand average would be the average return for all mutual funds in a similar category, adjusted for risk. Let's say that's eight percent. The observed average would be the fund's result. We'll assume 12 percent. In this case, the shrinkage factor is close to zero, reflecting the high dose of luck in short-term results for mutual fund managers. You will use a shrinkage factor for one-year risk-adjusted excess return of .10. The estimate of the manager's true skill based on these inputs is 8.4 percent, calculated as follows:

8.4% = 8% + *.10*(12% - 8%)

The second concept, intimately related to the first, is how to come up with an estimate for the shrinkage factor. It turns out that the correlation coefficient, *r*, a measure of the degree of linear relationship between two variables in a pair of distributions, is a good proxy for the shrinkage factor.[11] Positive correlations take a value of zero to 1.0.

Say you had a population of violinists, from beginners to concert-hall performers, and on a Monday rated the quality of their playing numerically from 1 (the worst) to 10 (the best). You then have them come back on Tuesday and rate them again. The correlation coefficient would be very close to 1.0—the best violinists would play well both days, and the worst would be consistently bad. There is very little need to appeal to the outside view. The inside view correctly receives the preponderance of the weight in forecasting results.

Unlike the violinists, the correlation of excess returns of mutual funds is low.[12] That means that in the short run, returns that are well above or below average may not be a reliable indicator of skill. So it makes sense to use a shrinkage factor that is much closer to zero than to 1.0. You accord the outside view most of the weight in your forecast.

To summarize, here are the steps to integrate the outside view:[13]

- **Choose an appropriate reference class.** The goal is to find a reference class that is large enough to be statistically useful but sufficiently narrow to be applicable to the decision you face. In the world of investing and corporate performance, there is a rich amount of reference class data.

- **Assess the distribution of outcomes.** These distributions are the heart of this book. Not all outcomes follow a normal, bell-shaped distribution. For example, of the roughly 2,900 initial public offerings (IPOs) in technology since 1980, a small fraction of the companies have created the vast preponderance of the value. So while this is a relevant reference class, the outcomes are heavily skewed.

- **Make a prediction.** With data from the reference class and knowledge of the distribution, make an estimate using the inside view. At this juncture you should be ready to consider a range of probabilities and outcomes.

- **Assess the reliability of your prediction and adjust as appropriate.** This last step is a crucial one, as it takes into account how much you should regress your estimate toward the average. In cases where correlation is low, indicating low reliability, it is appropriate to regress your estimate substantially toward the mean.

Regression toward the Mean

Regression toward the mean is a tricky concept that most investors believe in but few fully understand.[14] The concept says that an outcome that is far from average will be followed by an outcome with an expected value closer to the average. Here's an example to make the idea clearer. Say a teacher assigns her students 100 pieces of information to study, and one particular student learns 80 of them. The teacher then creates a test by selecting 20 pieces of information at random. The student will score an 80 on average, but it is possible, albeit extremely unlikely, that he will score 100 or 0.

Assume he scores 90. You could say that his skill contributed 80 and that good luck added 10. If the following test has the same setup, what score would you expect? The answer, of course, is 80. You could assume that his skill of 80 would persist and that his luck, which is transitory, would be zero. Naturally, there's no way to know if luck will be zero. In fact, the student may get luckier on the second test. On average, however, the student's score will be closer to his skill.

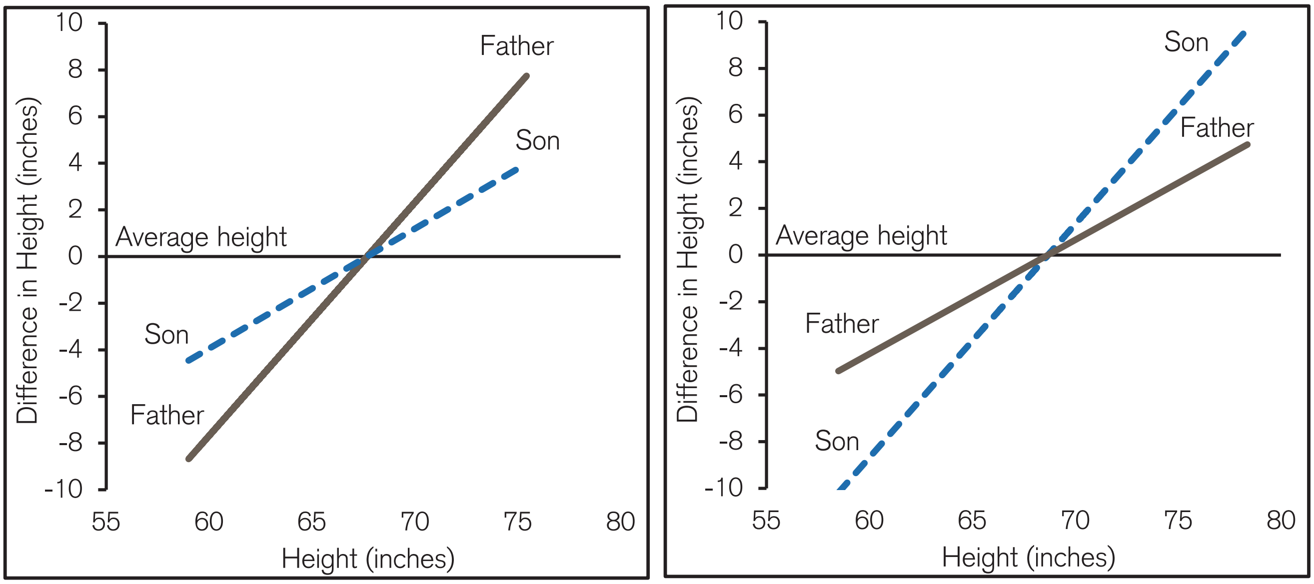
Any time the correlation coefficient between two measures of the same quantity over time is less than one, you will see regression toward the mean. The additional insight is that the correlation coefficient indicates the rate of regression toward the mean. High correlations mean that you should expect modest regression while low correlations suggest rapid regression.

The illusion of causality and the illusion of declining variance are two major errors in thinking commonly associated with regression toward the mean. These illusions cause a lot of confusion for investors and even trained economists. We will show how these apply to business in a moment, but we will start with a classic example of human height.

Exhibit 3 shows the heights of more than 1,000 fathers and sons relative to the average of each population. The left side of the exhibit shows regression toward the mean. Tall fathers have tall sons, but the tallest fathers are about eight inches taller than the average of all fathers while the tallest sons are only about four inches taller than the average of all sons.

More formally, the correlation coefficient is 0.50. Using the equation above, a son's height is expected to be halfway between his father's height and the average. A son has an expected height of 73 inches if his father is 76 inches tall and the average for the male population is 70 inches (73 = 70 + *0.50*(76-70)).

Exhibit 3: Heights of Fathers and Sons, and Sons and Fathers



Source: Karl Pearson and Alice Lee, "On the Laws of Inheritance in Man: I. Inheritance of Physical Characteristics," Biometrika, *Vol. 2, No. 4, November 1903, 357-462.*

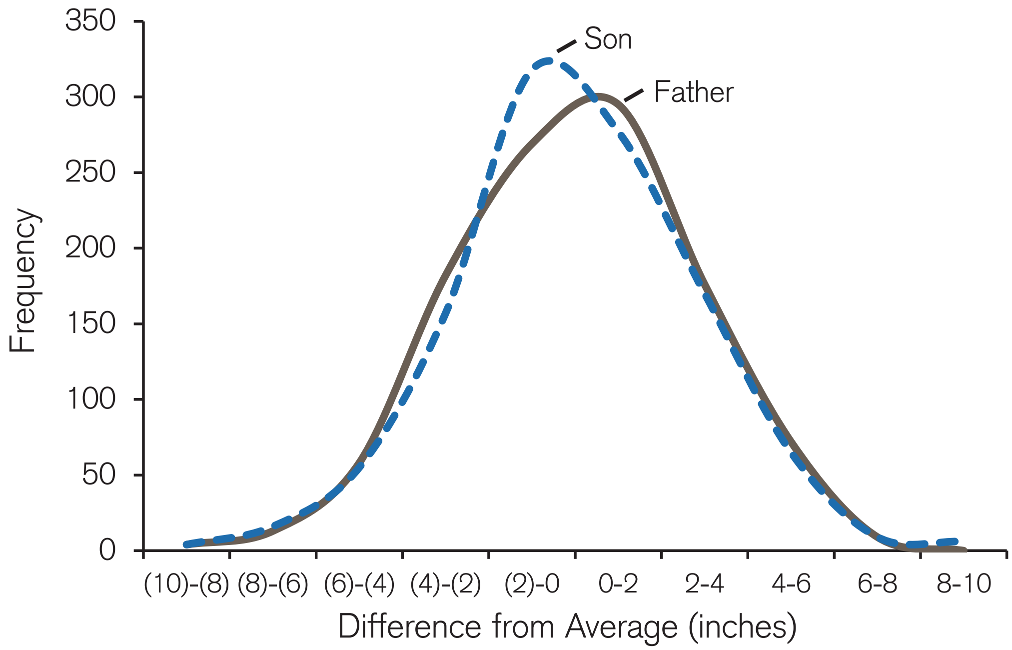
But regression toward the mean implies something that doesn't make as much sense: because the phenomenon is the result of imperfect correlation, the arrow of time doesn't matter. So tall sons have tall fathers, but the sons have a greater difference between their heights and the average than their fathers do. The same relationship is true for short sons and fathers. The right side of exhibit 3 shows this.

That the arrow of time can point in either direction reveals the risk of falsely attributing causality. While it is true that tall fathers cause tall sons, it makes no sense to say that tall sons cause tall fathers. We find it difficult to refrain from assigning causality, even though regression toward the mean doesn't require it.

Regression toward the mean also seems to convey the sense that the difference between the extremes shrinks over time. But that sense is deceptive. The way to think about it is that the values that are far from average basically have nowhere to go but toward the average, and the values that are close to average don't show much change in the aggregate as large moves up and down cancel out one another.

An examination of the dispersion of values is the best way to evaluate whether the distribution has changed. You can do that by measuring the standard deviation of the distribution or, even better, the coefficient of variation. A normalized measure of dispersion, the coefficient of variation equals the standard deviation divided by the mean. Exhibit 4 shows the distribution of the heights of fathers and sons. While the distributions are different at the top, the tails are remarkably similar. The coefficient of variation is nearly identical. The heights of the sons are no more clustered toward the average than those of the fathers.

Exhibit 4: The Distributions of Heights for Fathers and Sons Are Nearly Identical



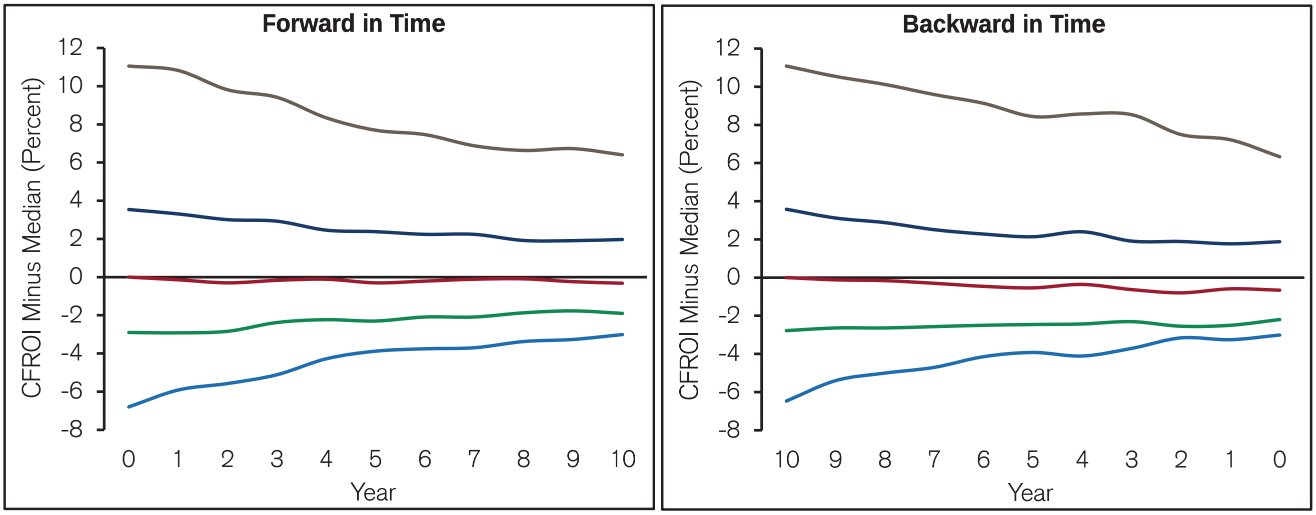
Source: Karl Pearson and Alice Lee, "On the Laws of Inheritance in Man: I. Inheritance of Physical Characteristics," Biometrika, *Vol. 2, No. 4, November 1903, 357-462.*

If you ask a group of executives or investors to explain why companies with high CFROIs have lower CFROIs in the future, and companies with low CFROIs have higher prospective CFROIs, you will likely hear them chant the word "competition" in unison. The thinking is straightforward. Companies with high CFROIs attract competition, driving down returns. Companies with low CFROIs disinvest and commonly consolidate, lifting returns. This is basic microeconomics.

The left side of exhibit 5 shows this for roughly 6,600 global companies excluding the financial services and utilities sectors. We start by ranking companies by quintile based on CFROI less the median return for the universe. We then follow the companies over a decade. The cohort of companies with the highest returns realizes an overall decline, while the cohort with the lowest returns sees its returns rise over the period. Just as with the height data, this comes as no surprise. This is especially the case given the perceived role of competition.

The right side of exhibit 5 is less intuitive. It starts by ranking companies based on the CFROI for the most recent year. It then tracks CFROI from 2015 to 2005, or back through time. We see the same pattern. While it makes sense to suggest that competition causes the regression in the left panel, it makes no sense to suggest that competition works backward in time. This is true simply because the correlation is less than one between CFROIs from one period to the next. Regression toward the mean does not rely on the arrow of time. This also demonstrates that competition is not the sole explanation for regression toward the mean.

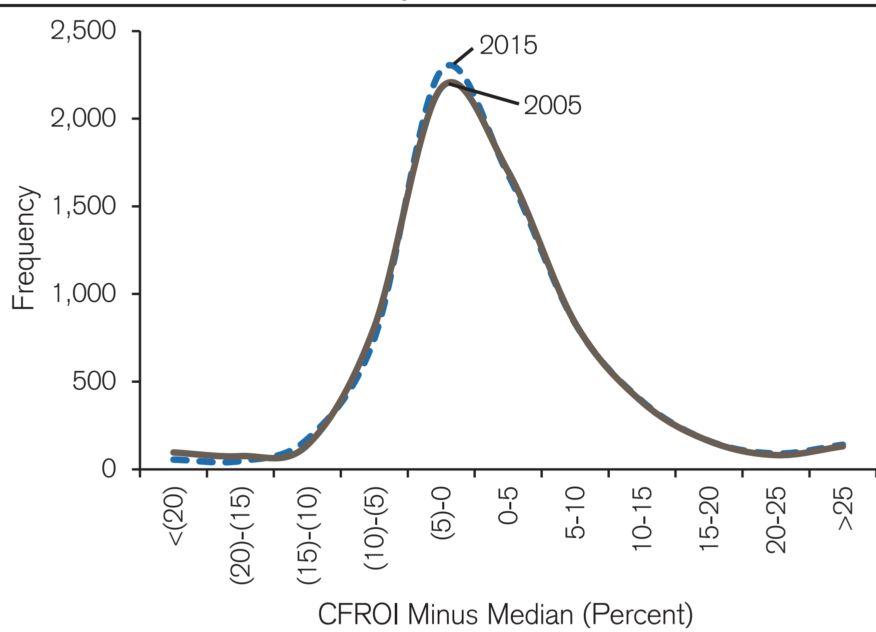
Exhibit 5: Regression toward the Mean for CFROI



Source: Credit Suisse HOLT.
Note: Global companies excluding the financial services and utilities sectors; no size limit; Data reflects fiscal years; updated as of September 19, 2016.

Similar to the heights of fathers and sons, we see in exhibit 6 that the distributions of CFROIs have not changed much over the decade. Common-cause variation, or variation inherent in the system, reshuffles the companies within the distribution, but the overall distribution remains stable over the period we measure.

Exhibit 6: The Distributions of CFROI Are Nearly Identical Over Time

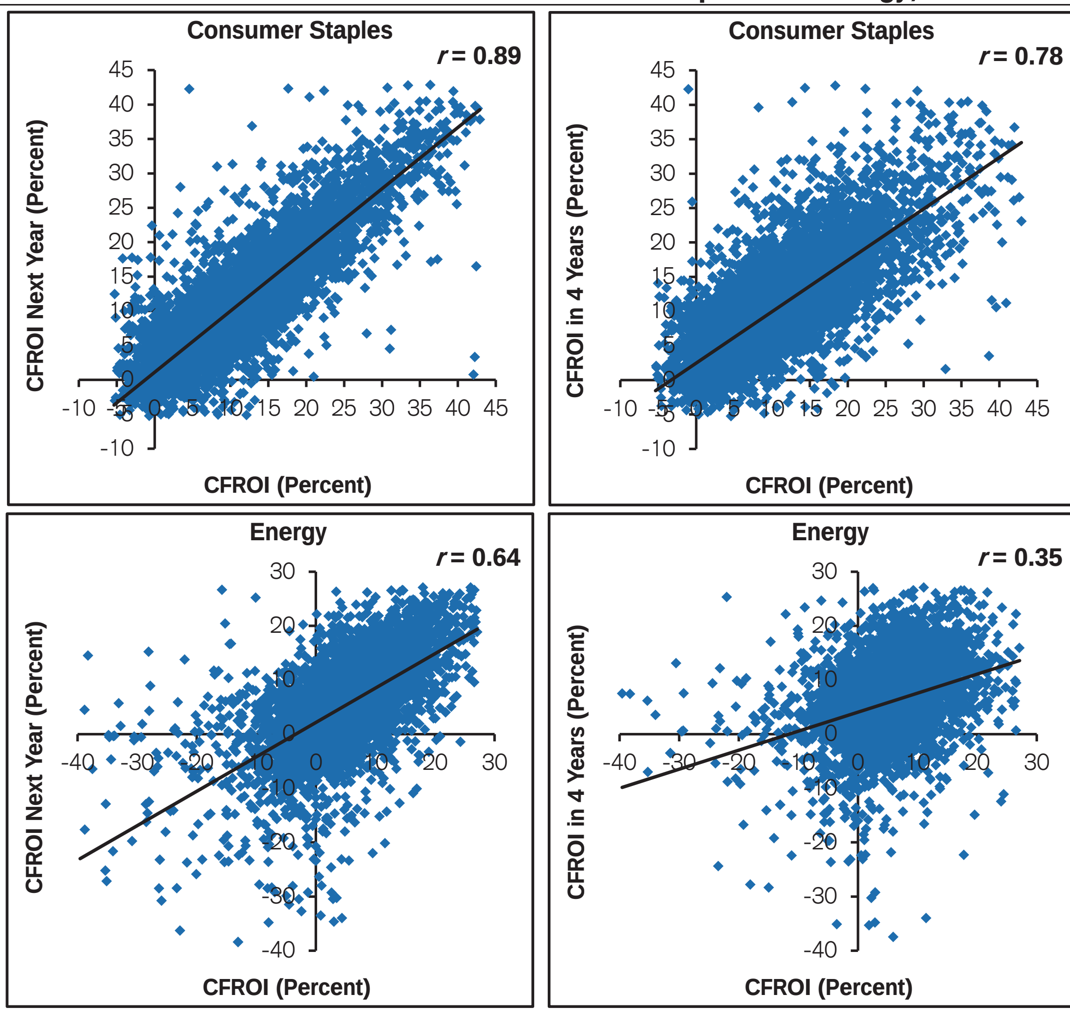


Source: Credit Suisse HOLT.
Note: Global companies excluding the financial services and utilities sectors; no size limit; Data reflects fiscal years; updated as of September 19, 2016.

Now that we have established that regression toward the mean happens, we turn our attention to estimating the rate at which it happens. To do so we calculate the correlation coefficient for each sector and insert it into the equation to estimate the expected outcome. Intuitively, you would expect that a sector with stable demand, such as consumer staples, would have a higher *r* than an industry exposed to commodity markets, such as energy.

Exhibit 7 shows that this relationship is indeed what we see empirically. The top charts examine the CFROI in the consumer staples sector from 1983 to 2015. The left panel shows that the correlation coefficient, *r,* is 0.89 for the year-to-year CFROI. The right panel shows that the *r* for the four-year change is 0.78. The bottom charts consider the same relationships for the energy sector. The one-year *r* for energy is 0.64 and the *r* for the four-year change is 0.35. This shows that you should expect slower regression toward the mean in consumer staples than in energy.

Exhibit 7: Correlation Coefficients for CFROI in Consumer Staples and Energy, 1983-2015



Source: Credit Suisse HOLT.
Note: Global companies, live and dead, with market capitalizations of $250 million-plus scaled; Winsorized at 1st and 99th percentiles.

Note that the correlation coefficient for the four-year change in CFROI is higher than what you would expect by looking solely at the *r* for the one-year change. Take consumer staples as an illustration. Say a company has a CFROI that is 10 percentage points above average. Using the one-year *r*, you'd forecast the excess CFROI spread in 4 years to be 6.3 ($10 * 0.89^4 = 6.3$). But using the four-year *r*, you'd forecast the spread to be 7.8 (0.78 * 10 = 7.8). So using a one-year correlation coefficient overstates the rate of regression toward the mean.

Exhibit 8 shows the average correlation coefficient for the four-year change in CFROI for ten sectors from 1983-2015, as well as the standard deviation for each series. There are two aspects of the exhibit worth emphasizing. The first is the ranking of *r* from the highest to the lowest. This provides a sense of the rate of regression toward the mean by sector. Consumer-oriented sectors are generally at the top of the list and those sectors that have exposure to commodities tend to be at the bottom.

Also important is how the *r* changes from year to year. While the ranking is reasonably consistent through time, there is a large range in the standard deviation of *r* for each sector. For example, the *r* for the consumer staples sector averaged 0.78 from 1983-2015 and had a standard deviation of just 0.04. This means that 68 percent of the observations fell within a range of 0.74 and 0.82. The average *r* for the energy sector, by contrast, was 0.35 and had a standard deviation of 0.12. This means that most observations fell between 0.23 and 0.47. Appendix B shows the one-year and four-year *r* for each of the ten sectors.

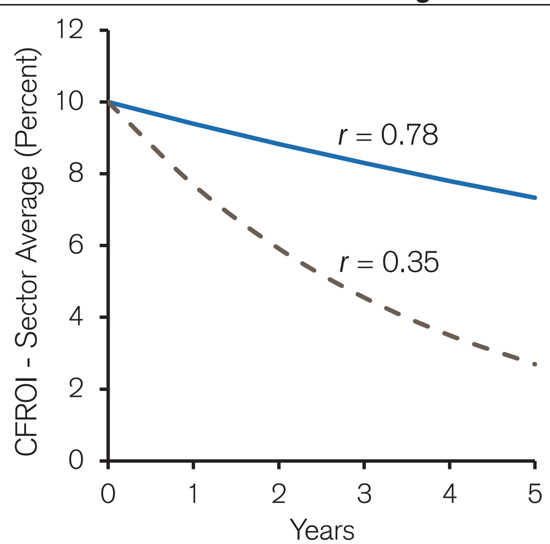
Exhibit 8: Correlation Coefficients for CFROI for Ten Sectors, 1983-2015

Sector	Four-Year Correlation Coefficient	Standard Deviation
Consumer Staples	0.78	0.04
Consumer Discretionary	0.67	0.04
Health Care	0.64	0.08
Industrials	0.62	0.04
Utilities	0.57	0.11
Telecommunication Services	0.55	0.14
Information Technology	0.50	0.10
Financials	0.43	0.10
Materials	0.41	0.07
Energy	0.35	0.12

Source: Credit Suisse HOLT.
Note: Global companies, live and dead, with market capitalizations of $250 million-plus scaled; Winsorized at 1st and 99th percentiles.

Exhibit 9 visually translates *r*'s into the downward slopes for excess CFROIs that they suggest. It shows the rate of regression toward the mean based on four-year *r*'s of 0.78 and 0.35, the numbers that bound our empirical findings. We assume a company is earning a CFROI ten percentage points above the sector average and show how those returns fade given the assumptions.

Exhibit 9: The Rate of Regression toward the Mean Assuming Different Four-Year *r*'s



Source: Credit Suisse.

Here's an application of this approach. Let's look at Microsoft, a technology company primarily in the software business. Microsoft's CFROI was 16.1 percent in the most recent fiscal year, the mean CFROI for the information technology sector was 9.0 percent from 1983-2015, and the four-year *r* for the sector is 0.50. Based on the formula, Microsoft's projected CFROI in four years is 12.6 percent, calculated as follows:

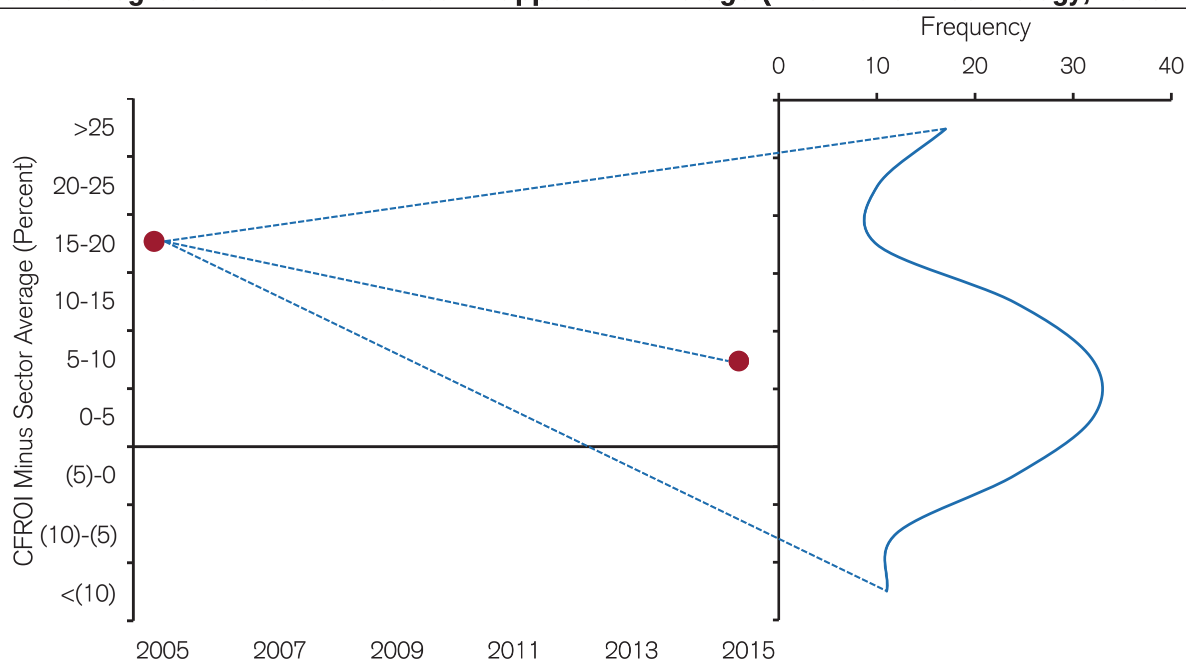
12.6% = 9.0% + ***0.50***(16.1% – 9.0%)

After five years, we can assume that about one-half of Microsoft's excess CFROI will be gone, either as a result of internal or external factors.

It is important to underscore that this is not a specific prediction about Microsoft. More accurately, it is a characterization of what happens on average to a large sample of companies in the same sector that start with similar excess CFROIs. Exhibit 10 shows this graphically. The dot on the left is the average less sector average CFROI for companies in the highest quintile of the information technology sector in 2005. The dot on the right shows the average less sector average CFROI for that same group in 2015.

The exhibit underscores two points. The first is that the average excess CFROI regresses toward the mean for the sector, as you would expect. The second is that the dot on the right summarizes a distribution of CFROIs. Some of the companies with high CFROIs in 2005 had even higher CFROIs in 2015, while others sunk to levels well below the sector average. The use of a dot to capture regression toward the mean belies the richness of the underlying data.

Exhibit 10: Regression toward the Mean Happens on Average (Information Technology, 2005-2015)



Source: Credit Suisse HOLT.
Note: Global companies; no size limit; Data reflects fiscal years; updated as of August 16, 2016.

Modeling corporate performance is not simply a matter of plugging in assumptions about regression toward the mean. You may have well-founded reasons to believe that a particular company's results will be better or worse than what a simple model of regression toward the mean suggests, and you should reflect those results in your model. That said, regression toward the mean should always be a consideration in your modeling because it is relevant for a population of companies.

Estimating the Mean to Which Results Regress

The second issue we must address is the mean, or average, to which results regress. For some measures, such as sports statistics and the heights of parents and children, the means remain relatively stable over time. But for other measures, including corporate performance, the mean can change from one period to the next.

In assessing the stability of the mean, you want to answer a couple of questions. The first is: How stable has the mean been in the past? In cases where the average has been consistent over time and the environment isn't expected to change much, you can safely use past averages to anticipate future averages.

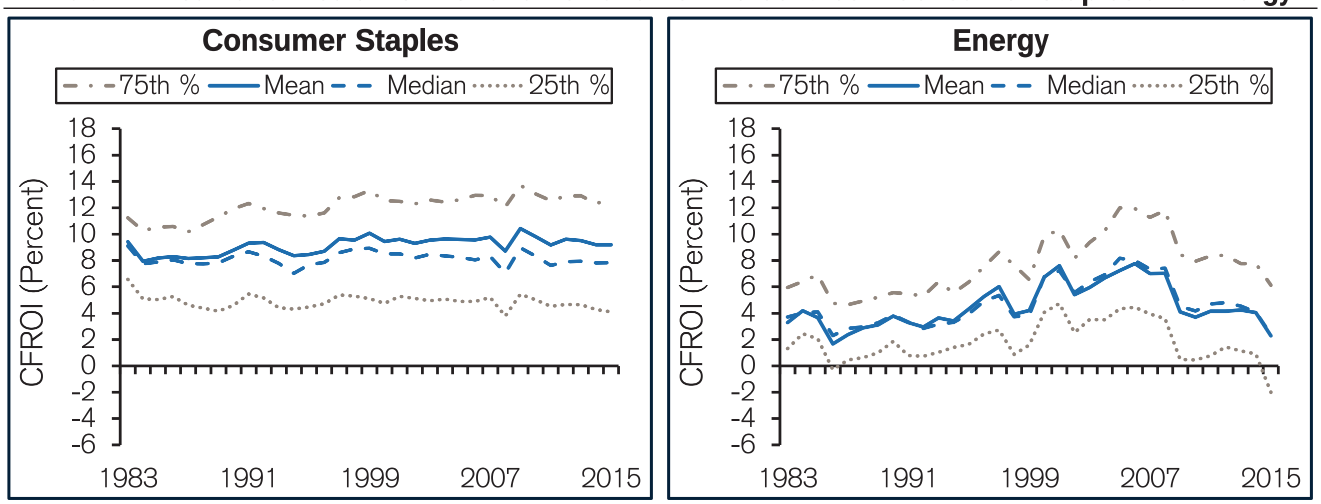
The blue lines in the middle of each chart of exhibit 11 are the mean (solid) and median (dashed) CFROI for each year for the consumer staples and energy sectors. The consumer staples sector had an average CFROI of 9.3 percent from 1983-2015, with a standard deviation of 0.6 percent. The energy sector had an average CFROI of 4.9 percent, with a standard deviation of 1.7 percent over the same period. So the CFROI in the energy sector was lower than that for consumer staples and moved around a lot more.

It comes as no surprise that the CFROI for energy is lower and more volatile than that for consumer staples. This helps explain why regression toward the mean in energy is more rapid than that for consumer staples. You can associate high volatility and low CFROIs with low valuation multiples, and low volatility and high CFROIs with high valuation multiples. This is what we see empirically for these sectors.

Also in exhibit 11 are gray dashed lines that capture the CFROI for the 75th and 25th percentile companies within the sector. If you ranked 100 companies in a sector from 100 (the highest) to 1 (the lowest) based on CFROI, the 75th percentile would be the CFROI of company number 75. So plotting the percentiles allows you to see the dispersion in CFROIs for the sector.

Another way to show dispersion is with the coefficient of variation, which is the standard deviation of the CFROIs divided by the mean of the CFROIs. The coefficient of variation for 1983-2015 was 0.07 for consumer staples and 0.34 for energy. For every 100 basis points of CFROI, there's much more variance in energy than in consumer staples.

Exhibit 11: Mean and Median CFROI and 75th and 25th Percentiles – Consumer Staples and Energy



Source: Credit Suisse HOLT.
Note: Global companies, live and dead, with market capitalizations of $250 million-plus scaled, 1983-2015; Winsorized at 1st and 99th percentiles.

The second question is: What are the factors that affect the mean CFROI? For example, the CFROI for the energy sector might be correlated to swings in oil prices, or returns for the financial sector might be dictated by changes in regulations. Analysts must answer this question sector by sector.

As regression toward the mean is a concept that applies wherever correlations are less than perfect, thinking about this second question can frame debates. Currently, for instance, there's a heated discussion about whether operating profit margins in the U.S. are sustainable. The answer lies in what factors drive the level of profit margins—including labor costs and depreciation expense—and what is happening to each factor.

There is regression toward the mean for the operating profit margins of companies within a sector or industry. The question is whether average operating profit margins will rise, remain stable, or fall in coming years.

We examine base rates for six categories of corporate performance and two categories of stock price movement. For corporate performance, we consider:

- **Sales growth.** This is the most important driver of corporate value. Changes in sales, both in magnitude and composition, have a material influence on profitability and are generally larger than those for cost savings or investment efficiencies. Changes in sales growth rates are particularly important for companies that create shareholder value and have high expectations.

- **Gross profitability.** Gross profitability, defined as gross profit divided by assets, is a measure of a company's ability to make money. Academic research also shows that firms with high gross profitability deliver better total shareholder returns than those with low profitability.

- **Operating leverage.** Analysts are commonly too optimistic about earnings growth and often miss estimates by a wide margin. 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 profit margin.** Operating profit margin, the ratio of operating income to sales, is one of the crucial indicators of profitability. Operating profit is the number from which you subtract cash taxes to calculate a company's net operating profit after tax (NOPAT). NOPAT is the number from which you subtract investments to calculate a company's free cash flow, and the numerator of a return on invested capital (ROIC) calculation.

- **Earnings growth.** Executives and investors perceive that earnings are the best indicator of corporate results. Nearly two-thirds of chief financial officers say that earnings are the most important measure that they report to outsiders, giving it a vastly higher rating than other financial metrics such as revenue growth and cash flow from operations. Investors indicate that disclosure of quarterly earnings is the most significant of all releases.

- **CFROI.** CFROI reflects a company's economic return on capital deployed by considering a company's inflation-adjusted cash flow and operating assets. CFROI removes the vagaries of accounting in order to provide a metric that allows for comparison of corporate performance across a portfolio, a market, or a universe (cross sectional) as well as over time (longitudinal). CFROI shows which companies are creating economic value and allows you to get a sense of market expectations.

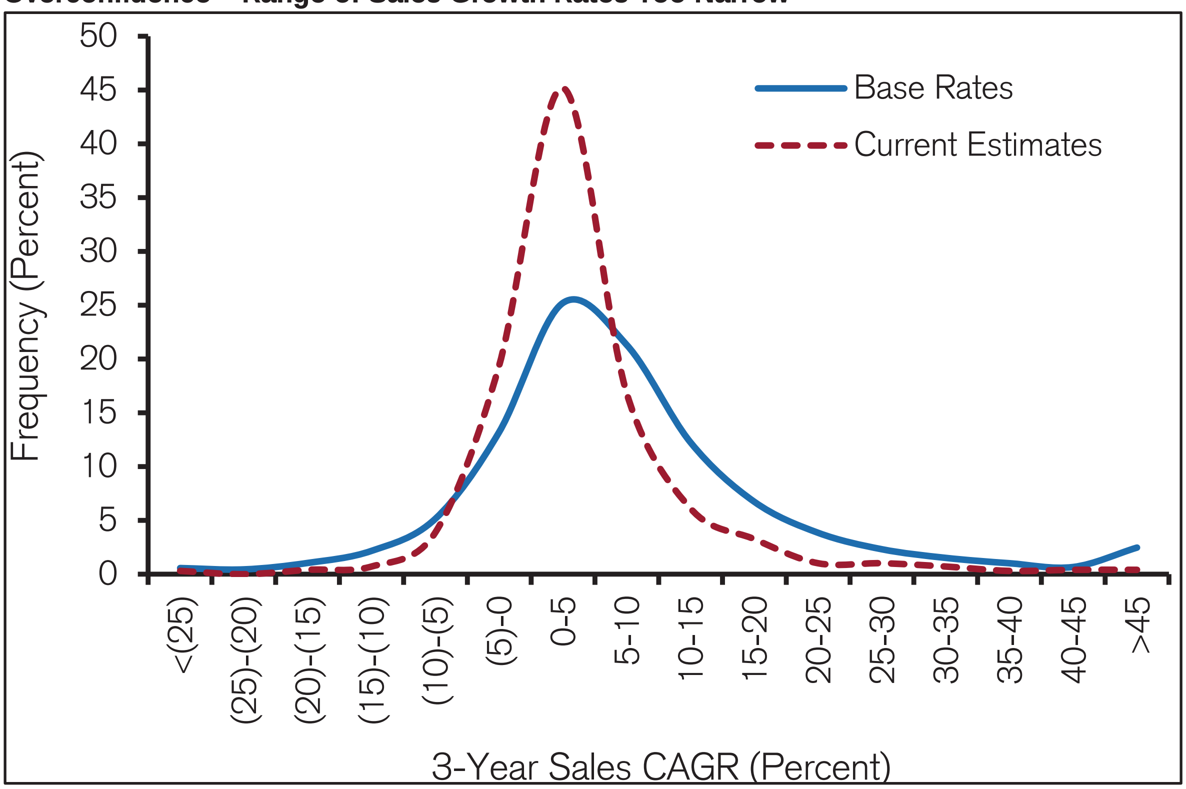
For stock price performance, we consider:

- **Managing the man overboard moment.** This analysis starts with a quarter-century of instances of a stock declining 10 percent or more versus the S&P 500. It then introduces three factors—momentum, valuation, and quality—in order to establish base rates of stock price returns in the 30, 60, and 90 trading days following the event. There are no answers in this analysis, but it establishes a naïve default and provides a foundation for unemotional discussion and debate.

- **Celebrating the summit.** This study considers a quarter-century of instances of when a stock rises 10 percent or more versus the S&P 500, excluding mergers and acquisitions. It then introduces the same factors of momentum, valuation, and quality to look at the base rates of stock price returns in the 30, 60, and 90 trading days following the event. In some cases, knowing when to sell can be more difficult than knowing when to buy.

Sales Growth

Overconfidence – Range of Sales Growth Rates Too Narrow



Source: Credit Suisse HOLT® and FactSet.

Why Sales Growth Is Important

Sales growth is the most important driver of corporate value.[1] Changes in sales, both in magnitude and composition, have a material influence on profitability (see section on operating leverage). Revisions in sales forecasts are generally larger than those for cost savings or investment efficiencies. Changes in sales growth rates are particularly important for companies with high expectations that create shareholder value. Investors and executives are often too optimistic about growth rates companies will achieve.

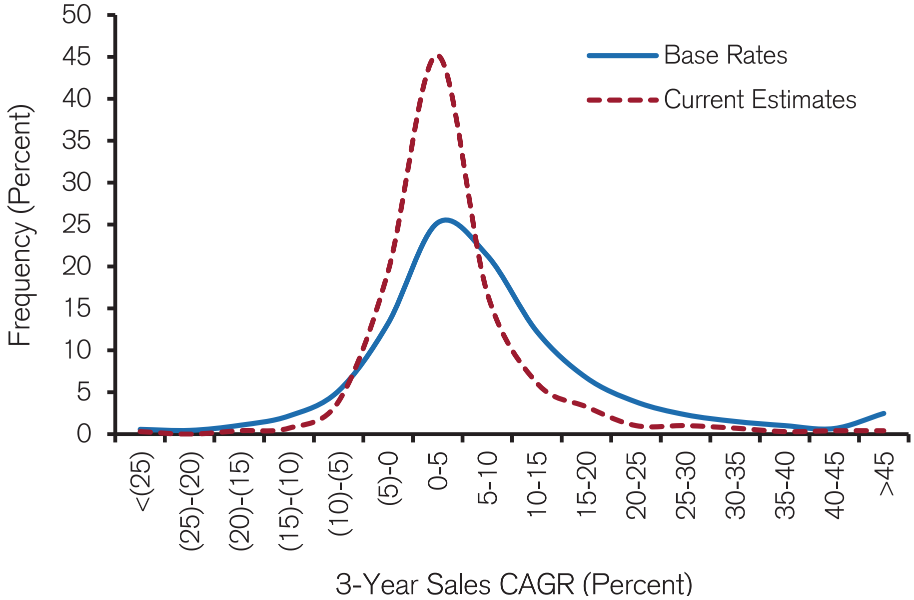
Researchers who study forecasts of this nature find that two biases, optimism and overconfidence, are common. Optimism about personal predictions has value for encouraging perseverance in the face of challenges but distorts assessments of likely outcomes.[2] For example, notwithstanding that only about 50 percent of new businesses survive five or more years, a survey of thousands of entrepreneurs found that more than 8 of 10 of them rated their odds of success at 70 percent or higher, and fully one-third did not allow for any probability of failure at all.[3] The bottom line on optimism: “People frequently believe that their preferred outcomes are more likely than is merited.”[4]

Overconfidence bias also distorts the ability to make sound predictions. This bias reveals itself when an individual’s confidence in his or her subjective judgments is higher than the objective outcomes warrant. For instance, nearly five thousand people answered 50 true-false questions and provided a confidence level for each. They were correct about 60 percent of the time but indicated confidence in their answers of 70 percent.[5] Most people, including financial analysts, place too much weight on their own information.[6]

The classic way that overconfidence shows up in forecasts is with ranges of outcomes that are too narrow. As a case in point, researchers asked chief financial officers to predict the results for the stock market, including high and low growth rates within which the executives were 80 percent sure the results would land. They were correct only one-third of the time.[7]

Exhibit 1 shows how this bias manifests in forecasts. Both are distributions of sales growth rates annualized over three years for roughly 1,000 of the largest companies by market capitalization in the world. The distribution with the lower peak reflects the actual results since 1950, and the distribution with the higher peak is the set of growth rates that analysts are currently forecasting. We adjust both distributions to remove the effect of inflation.

Exhibit 1: Overconfidence – Range of Sales Growth Rates Too Narrow



Source: Credit Suisse HOLT® and FactSet.
Note: I/B/E/S consensus estimates as of September 19, 2016.

Consistent with the overconfidence bias, the range of expected outcomes is narrower than what the results of the past suggest is reasonable. Specifically, the standard deviation of estimates is 8.3 percent versus a standard deviation of 18.7 percent for the past growth rates. Forecasts are commonly too optimistic and too narrow. The best explanations for the pattern of faulty forecasts include behavioral biases and distortions encouraged by incentives.[8]

Base Rates of Sales Growth

We analyze the distribution of sales growth rates for the top 1,000 global companies by market capitalization since 1950. This sample represents roughly 60 percent of the global market capitalization and includes all sectors. The population includes companies that are now "dead." The main reason public companies cease to exist is they merge or are acquired.[9]

We calculate the compound annual growth rates (CAGR) of sales for 1, 3, 5, and 10 years for each firm. We adjust all of the figures to remove the effects of inflation, which translates all of the numbers to 2015 dollars.

Exhibit 2 shows the results for the full sample. In the panel on the left, the rows show sales growth rates and the columns reflect time periods. Say you want to know what percent of the universe grew sales at a CAGR of 15-20 percent for three years. You start with the row marked "15-20" and slide to the right to find the column "3-Yr." There, you'll see that 6.7 percent of the companies achieved that rate of growth. The panel on the right shows the sample sizes for each growth rate and time period, allowing us to see where that percentage comes from: 3,589 instances out of the total of 53,266 (3,589/53,266 = 6.7 percent).

Exhibit 2: Base Rates of Sales Growth, 1950-2015

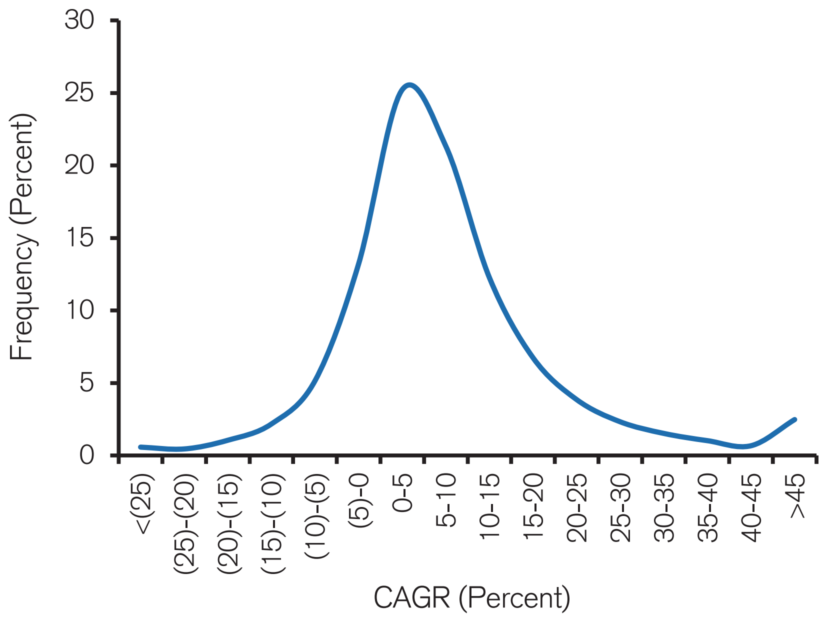
Full Universe	Base Rates			
Sales CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr
<(25)	1.9%	0.6%	0.3%	0.0%
(25)-(20)	1.0%	0.4%	0.3%	0.1%
(20)-(15)	1.7%	1.0%	0.7%	0.3%
(15)-(10)	3.2%	2.2%	1.6%	0.9%
(10)-(5)	6.2%	5.2%	4.2%	3.2%
(5)-0	12.2%	13.2%	12.9%	12.4%
0-5	20.6%	25.2%	28.8%	34.2%
5-10	17.8%	21.3%	24.2%	28.3%
10-15	11.4%	12.3%	12.6%	11.6%
15-20	6.8%	6.7%	6.0%	4.5%
20-25	4.5%	3.9%	3.1%	2.0%
25-30	2.9%	2.3%	1.9%	1.1%
30-35	2.0%	1.5%	1.0%	0.6%
35-40	1.3%	1.0%	0.7%	0.3%
40-45	1.1%	0.7%	0.5%	0.2%
>45	5.5%	2.5%	1.3%	0.3%
Mean	14.8%	8.1%	6.9%	5.8%
Median	5.8%	5.4%	5.2%	4.9%
StDev	275.2%	18.7%	12.3%	8.0%

Full Universe	Observations			
Sales CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr
<(25)	1,073	305	156	15
(25)-(20)	577	239	130	31
(20)-(15)	954	558	337	121
(15)-(10)	1,820	1,156	792	369
(10)-(5)	3,540	2,744	2,076	1,329
(5)-0	6,912	7,037	6,453	5,176
0-5	11,693	13,434	14,386	14,236
5-10	10,137	11,359	12,068	11,799
10-15	6,464	6,530	6,284	4,839
15-20	3,862	3,589	2,971	1,878
20-25	2,570	2,052	1,552	814
25-30	1,666	1,236	934	460
30-35	1,145	809	502	235
35-40	758	543	364	131
40-45	599	357	230	79
>45	3,113	1,318	639	133
Total	56,883	53,266	49,874	41,645

Source: Credit Suisse HOLT®.

Exhibit 3 is the distribution for the three-year sales growth rate. This represents, in a graph, the corresponding column in exhibit 2. The mean, or average, growth rate was 8.1 percent per year and the median growth rate was 5.4 percent. The median is a better indicator of the central location of the results because the distribution is skewed to the right. The standard deviation, 18.7 percent, gives an indication of the width of the bell curve.

Exhibit 3: Three-Year CAGR of Sales, 1950-2015



Source: Credit Suisse HOLT®.

While the data for the full sample are a start, you want to hone the reference class of base rates to make the results more relevant and applicable. One approach is to break the universe into deciles based on a company's sales in the prior year. Within each size decile, we sort the observations of growth rates into bins in increments of five percentage points (except for the tails).

There is a modest survivorship bias because each sample includes only the firms that survived for that specified period. For example, a company in our 10-year sample would have had to have survived for 10 years. About one-half of all public companies cease to exist within ten years of being listed.[10]

The heart of this analysis is exhibit 4, which shows each decile, the total population, and an additional analysis of mega companies (those with sales in excess of $50 billion). Here's how you use the exhibit. Determine the base sales level for the company that you want to model. Then go to the appropriate decile based on that size. You now have the proper reference class and the distribution of growth rates over the various horizons.

Let's use Tesla as an example. In February 2015, Elon Musk, the chief executive officer, said he hoped to grow sales 50 percent per year for the next decade from an estimated sales base of $6 billion.[11] How would you assess the plausibility of that goal? Using the inside view, you would build a bottom-up model of the automobile and battery businesses, considering the size of the markets, how they will likely grow, and what market shares Tesla might achieve.

The outside view simply looks to see if growth at this rate is common in an appropriate reference class. Go to exhibit 4. You must first find the correct reference class, which is the decile that has a sales base of $4.5 - $7 billion. Next you examine the row of growth that is marked ">45," representing sales growth of 45 percent or more. Going to the column "10-Yr," you will see that no companies achieved this feat. Indeed, you have to go down to 30-35 percent growth to see any companies, and even there it is only one-fifth of 1 percent of the sample.

Exhibit 4: Base Rates by Decile, 1950-2015

Sales: $0-325 Mn	Base Rates			
Sales CAGR (%)	**1-Yr**	**3-Yr**	**5-Yr**	**10-Yr**
<(25)	1.5%	0.4%	0.3%	0.0%
(25)-(20)	0.7%	0.2%	0.1%	0.0%
(20)-(15)	1.1%	0.4%	0.3%	0.2%
(15)-(10)	1.7%	1.0%	0.5%	0.5%
(10)-(5)	3.5%	1.8%	1.2%	0.7%
(5)-0	7.2%	5.9%	4.4%	3.5%
0-5	14.3%	15.3%	16.1%	16.7%
5-10	14.8%	19.1%	22.1%	29.3%
10-15	12.2%	15.2%	18.2%	20.4%
15-20	8.9%	10.4%	10.1%	10.5%
20-25	6.6%	6.4%	6.7%	6.2%
25-30	4.1%	4.5%	4.8%	4.2%
30-35	3.7%	3.3%	3.2%	2.7%
35-40	2.4%	2.8%	3.0%	1.8%
40-45	2.2%	2.0%	1.9%	1.1%
>45	15.1%	11.3%	7.2%	2.1%
Mean	61.0%	21.2%	16.8%	12.6%
Median	12.1%	11.7%	11.2%	9.8%
StDev	821.1%	40.0%	21.8%	12.0%

Sales: $325-700 Mn	Base Rates			
Sales CAGR (%)	**1-Yr**	**3-Yr**	**5-Yr**	**10-Yr**
<(25)	0.9%	0.2%	0.1%	0.0%
(25)-(20)	0.4%	0.3%	0.1%	0.0%
(20)-(15)	1.1%	0.6%	0.4%	0.1%
(15)-(10)	2.3%	1.0%	0.7%	0.5%
(10)-(5)	4.0%	2.4%	1.9%	1.6%
(5)-0	8.1%	7.6%	6.6%	5.8%
0-5	17.7%	22.2%	23.3%	24.3%
5-10	17.3%	21.8%	26.4%	32.1%
10-15	12.3%	15.1%	15.2%	14.9%
15-20	7.2%	7.4%	7.2%	5.2%
20-25	5.8%	4.5%	3.5%	2.5%
25-30	3.2%	2.5%	2.1%	1.1%
30-35	1.9%	1.9%	1.5%	0.7%
35-40	1.6%	1.3%	0.8%	0.2%
40-45	1.2%	1.0%	0.7%	0.1%
>45	6.7%	2.9%	1.3%	0.1%
Mean	16.1%	10.7%	9.2%	7.4%
Median	8.2%	7.5%	7.3%	6.7%
StDev	53.5%	15.9%	10.8%	7.0%

Sales: $700-1,250 Mn	Base Rates			
Sales CAGR (%)	**1-Yr**	**3-Yr**	**5-Yr**	**10-Yr**
<(25)	1.6%	0.4%	0.2%	0.2%
(25)-(20)	0.9%	0.3%	0.3%	0.1%
(20)-(15)	1.4%	0.8%	0.5%	0.2%
(15)-(10)	2.7%	1.8%	1.3%	0.8%
(10)-(5)	4.7%	3.5%	3.3%	2.2%
(5)-0	10.2%	9.5%	8.8%	9.2%
0-5	19.5%	23.6%	26.6%	31.9%
5-10	18.3%	23.6%	26.6%	32.1%
10-15	12.3%	14.5%	15.3%	14.8%
15-20	7.9%	8.2%	7.3%	4.9%
20-25	5.2%	4.3%	4.2%	2.0%
25-30	3.1%	2.9%	2.3%	1.1%
30-35	2.8%	1.9%	1.0%	0.3%
35-40	1.8%	1.5%	1.0%	0.1%
40-45	1.4%	0.9%	0.4%	0.0%
>45	6.1%	2.2%	0.9%	0.0%
Mean	12.4%	9.2%	7.9%	6.2%
Median	7.1%	6.8%	6.4%	5.7%
StDev	31.7%	13.5%	10.5%	7.0%

Sales: $1,250-2,000 Mn	Base Rates			
Sales CAGR (%)	**1-Yr**	**3-Yr**	**5-Yr**	**10-Yr**
<(25)	1.4%	0.3%	0.3%	0.0%
(25)-(20)	0.9%	0.4%	0.2%	0.1%
(20)-(15)	1.4%	0.7%	0.4%	0.4%
(15)-(10)	2.7%	1.8%	1.0%	0.7%
(10)-(5)	5.1%	3.9%	3.1%	1.8%
(5)-0	10.1%	10.7%	10.4%	9.8%
0-5	20.6%	25.7%	29.6%	36.8%
5-10	19.6%	23.8%	27.0%	31.2%
10-15	12.4%	13.1%	13.6%	12.3%
15-20	7.4%	7.0%	6.2%	4.0%
20-25	4.1%	4.0%	3.4%	1.6%
25-30	3.4%	2.9%	2.1%	0.7%
30-35	2.2%	1.7%	0.9%	0.3%
35-40	1.6%	1.0%	0.6%	0.1%
40-45	1.5%	0.5%	0.4%	0.2%
>45	5.8%	2.3%	0.7%	0.1%
Mean	12.3%	8.6%	7.2%	5.7%
Median	6.8%	6.2%	5.7%	5.1%
StDev	35.1%	14.0%	10.1%	6.6%

Sales: $2,000-3,000 Mn	Base Rates			
Sales CAGR (%)	**1-Yr**	**3-Yr**	**5-Yr**	**10-Yr**
<(25)	1.4%	0.4%	0.3%	0.0%
(25)-(20)	1.0%	0.3%	0.1%	0.1%
(20)-(15)	1.6%	0.9%	0.4%	0.1%
(15)-(10)	2.8%	1.6%	1.2%	0.4%
(10)-(5)	5.3%	4.8%	3.6%	2.6%
(5)-0	11.1%	12.4%	11.7%	12.1%
0-5	22.1%	27.2%	31.9%	40.0%
5-10	18.7%	22.6%	26.9%	28.8%
10-15	12.2%	12.5%	12.0%	9.8%
15-20	7.1%	6.5%	5.4%	4.1%
20-25	4.8%	4.2%	3.2%	1.1%
25-30	2.9%	2.4%	1.7%	0.8%
30-35	2.0%	1.3%	0.6%	0.1%
35-40	1.4%	0.9%	0.3%	0.1%
40-45	0.8%	0.6%	0.2%	0.1%
>45	4.8%	1.3%	0.4%	0.0%
Mean	10.0%	7.2%	6.2%	5.1%
Median	6.0%	5.4%	5.1%	4.5%
StDev	22.9%	12.1%	8.9%	6.0%

Sales: $3,000-4,500 Mn	Base Rates			
Sales CAGR (%)	**1-Yr**	**3-Yr**	**5-Yr**	**10-Yr**
<(25)	1.6%	0.4%	0.2%	0.0%
(25)-(20)	1.0%	0.4%	0.2%	0.0%
(20)-(15)	1.8%	0.9%	0.7%	0.0%
(15)-(10)	3.5%	2.0%	1.7%	0.8%
(10)-(5)	6.3%	5.0%	3.7%	2.6%
(5)-0	12.4%	14.3%	14.4%	15.0%
0-5	22.1%	26.8%	31.3%	40.1%
5-10	17.9%	22.8%	25.2%	28.1%
10-15	11.4%	11.7%	12.3%	8.7%
15-20	7.0%	7.0%	5.2%	3.2%
20-25	4.7%	3.3%	2.6%	0.8%
25-30	2.9%	2.0%	1.4%	0.4%
30-35	1.6%	1.3%	0.5%	0.0%
35-40	1.2%	0.7%	0.2%	0.0%
40-45	0.7%	0.4%	0.3%	0.0%
>45	4.0%	0.8%	0.2%	0.0%
Mean	8.8%	6.4%	5.4%	4.4%
Median	5.4%	5.0%	4.7%	4.1%
StDev	25.6%	11.1%	8.5%	5.7%

Sales: $4,500-7,000 Mn	Base Rates			
Sales CAGR (%)	**1-Yr**	**3-Yr**	**5-Yr**	**10-Yr**
<(25)	1.8%	0.5%	0.2%	0.0%
(25)-(20)	1.0%	0.7%	0.2%	0.1%
(20)-(15)	1.6%	1.0%	0.6%	0.1%
(15)-(10)	3.8%	2.7%	1.9%	1.0%
(10)-(5)	6.7%	5.6%	4.5%	4.1%
(5)-0	12.9%	14.8%	15.6%	15.5%
0-5	21.8%	28.4%	33.2%	40.8%
5-10	19.0%	20.8%	23.1%	26.5%
10-15	11.2%	11.0%	10.5%	7.7%
15-20	6.4%	6.2%	5.6%	2.7%
20-25	3.8%	3.6%	2.2%	0.8%
25-30	2.8%	1.9%	1.1%	0.5%
30-35	1.7%	1.1%	0.6%	0.2%
35-40	0.9%	0.5%	0.3%	0.0%
40-45	0.8%	0.4%	0.2%	0.0%
>45	3.8%	1.0%	0.3%	0.0%
Mean	7.9%	5.7%	5.0%	3.9%
Median	5.1%	4.4%	4.1%	3.7%
StDev	23.0%	11.6%	8.7%	6.0%

Sales: $7,000-12,000 Mn	Base Rates			
Sales CAGR (%)	**1-Yr**	**3-Yr**	**5-Yr**	**10-Yr**
<(25)	2.0%	0.5%	0.3%	0.0%
(25)-(20)	1.2%	0.5%	0.3%	0.1%
(20)-(15)	1.9%	1.2%	0.7%	0.6%
(15)-(10)	3.6%	3.0%	2.3%	1.0%
(10)-(5)	8.0%	7.2%	6.3%	4.4%
(5)-0	14.4%	16.8%	17.7%	18.5%
0-5	21.9%	27.7%	31.9%	40.8%
5-10	18.4%	20.4%	23.5%	25.1%
10-15	10.9%	10.4%	9.5%	6.3%
15-20	5.5%	5.4%	4.0%	2.1%
20-25	3.7%	3.1%	1.5%	0.7%
25-30	2.2%	1.5%	1.2%	0.3%
30-35	1.6%	1.0%	0.5%	0.1%
35-40	0.9%	0.4%	0.2%	0.0%
40-45	0.8%	0.3%	0.1%	0.0%
>45	3.1%	0.7%	0.1%	0.0%
Mean	6.8%	4.7%	3.9%	3.3%
Median	4.3%	3.7%	3.5%	3.2%
StDev	25.6%	10.9%	8.3%	6.0%

Sales: $12,000-25,000 Mn	Base Rates			
Sales CAGR (%)	**1-Yr**	**3-Yr**	**5-Yr**	**10-Yr**
<(25)	2.6%	0.9%	0.3%	0.0%
(25)-(20)	1.4%	0.6%	0.6%	0.1%
(20)-(15)	2.3%	1.9%	1.2%	0.5%
(15)-(10)	3.8%	2.9%	2.5%	1.4%
(10)-(5)	8.2%	7.7%	6.4%	5.7%
(5)-0	16.5%	19.4%	19.7%	20.2%
0-5	22.5%	27.9%	33.3%	41.7%
5-10	17.5%	19.6%	21.1%	20.8%
10-15	9.5%	8.9%	8.2%	6.3%
15-20	4.9%	4.4%	3.6%	2.5%
20-25	3.0%	2.6%	1.7%	0.6%
25-30	2.3%	1.2%	0.7%	0.1%
30-35	1.4%	0.9%	0.4%	0.1%
35-40	0.8%	0.4%	0.3%	0.0%
40-45	0.5%	0.3%	0.0%	0.0%
>45	2.6%	0.5%	0.1%	0.1%
Mean	5.8%	3.8%	3.3%	2.9%
Median	3.4%	3.0%	2.9%	2.7%
StDev	77.1%	12.3%	8.9%	6.1%

Sales: >$25,000 Mn	Base Rates			
Sales CAGR (%)	**1-Yr**	**3-Yr**	**5-Yr**	**10-Yr**
<(25)	3.6%	1.6%	1.0%	0.1%
(25)-(20)	1.5%	0.8%	0.6%	0.2%
(20)-(15)	2.4%	2.0%	1.5%	0.8%
(15)-(10)	4.8%	3.8%	3.0%	2.5%
(10)-(5)	9.1%	9.0%	8.2%	9.0%
(5)-0	16.6%	19.8%	21.3%	22.9%
0-5	21.8%	26.9%	32.6%	37.1%
5-10	15.9%	18.2%	18.1%	20.2%
10-15	9.0%	9.1%	8.5%	5.8%
15-20	5.6%	4.3%	3.2%	1.3%
20-25	3.2%	2.2%	1.2%	0.2%
25-30	2.3%	1.1%	0.4%	0.0%
30-35	1.1%	0.4%	0.2%	0.0%
35-40	0.7%	0.4%	0.1%	0.0%
40-45	0.5%	0.2%	0.1%	0.0%
>45	1.9%	0.3%	0.0%	0.0%
Mean	3.6%	2.4%	2.1%	1.7%
Median	2.7%	2.2%	2.0%	1.8%
StDev	18.1%	10.9%	8.6%	6.1%

Sales: >$50,000 Mn	Base Rates			
Sales CAGR (%)	**1-Yr**	**3-Yr**	**5-Yr**	**10-Yr**
<(25)	4.0%	2.0%	1.6%	0.0%
(25)-(20)	1.9%	0.8%	1.0%	0.3%
(20)-(15)	2.6%	2.3%	1.5%	1.0%
(15)-(10)	5.0%	4.2%	2.7%	3.1%
(10)-(5)	10.1%	10.7%	9.3%	9.8%
(5)-0	16.9%	21.4%	22.8%	26.9%
0-5	21.8%	26.5%	34.0%	37.8%
5-10	15.0%	16.9%	16.9%	17.2%
10-15	8.6%	9.2%	7.0%	3.0%
15-20	5.1%	3.2%	2.3%	0.9%
20-25	3.3%	1.6%	0.6%	0.0%
25-30	2.3%	0.7%	0.3%	0.0%
30-35	1.1%	0.1%	0.1%	0.0%
35-40	0.6%	0.3%	0.0%	0.0%
40-45	0.4%	0.1%	0.0%	0.0%
>45	1.3%	0.0%	0.0%	0.0%
Mean	2.3%	1.2%	1.0%	0.8%
Median	2.1%	1.5%	1.5%	1.1%
StDev	16.3%	10.3%	8.3%	5.8%

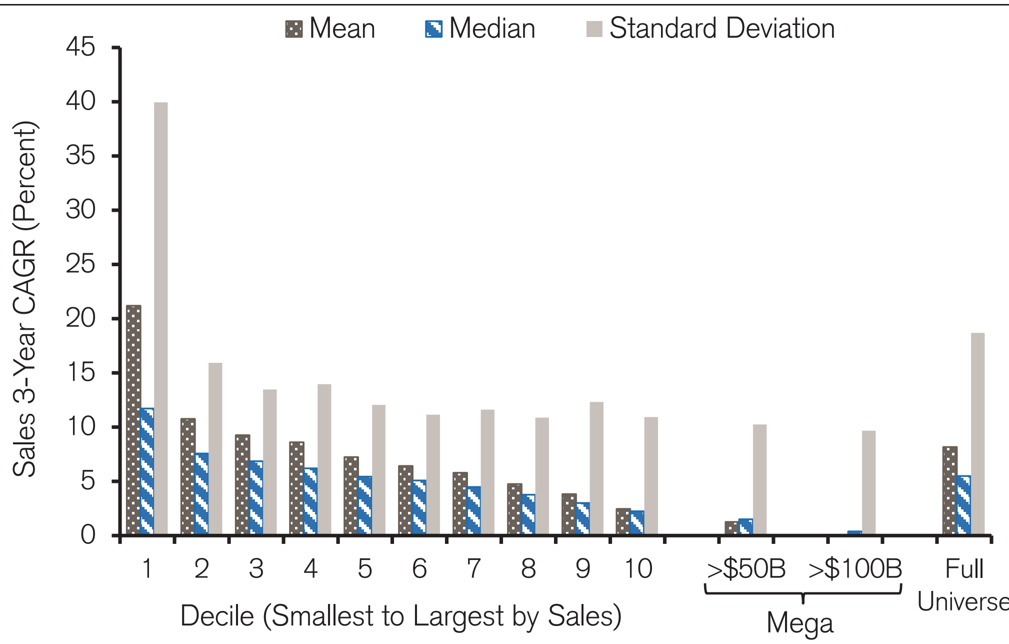
Full Universe	Base Rates			
Sales CAGR (%)	**1-Yr**	**3-Yr**	**5-Yr**	**10-Yr**
<(25)	1.9%	0.6%	0.3%	0.0%
(25)-(20)	1.0%	0.4%	0.3%	0.1%
(20)-(15)	1.7%	1.0%	0.7%	0.3%
(15)-(10)	3.2%	2.2%	1.6%	0.9%
(10)-(5)	6.2%	5.2%	4.2%	3.2%
(5)-0	12.2%	13.2%	12.9%	12.4%
0-5	20.6%	25.2%	28.8%	34.2%
5-10	17.8%	21.3%	24.2%	28.3%
10-15	11.4%	12.3%	12.6%	11.6%
15-20	6.8%	6.7%	6.0%	4.5%
20-25	4.5%	3.9%	3.1%	2.0%
25-30	2.9%	2.3%	1.9%	1.1%
30-35	2.0%	1.5%	1.0%	0.6%
35-40	1.3%	1.0%	0.7%	0.3%
40-45	1.1%	0.7%	0.5%	0.2%
>45	5.5%	2.5%	1.3%	0.3%
Mean	14.8%	8.1%	6.9%	5.8%
Median	5.8%	5.4%	5.2%	4.9%
StDev	275.2%	18.7%	12.3%	8.0%

Source: Credit Suisse HOLT®.

In total, exhibit 4 shows results for 44 reference classes (11 size ranges times 4 time horizons) that should cover the vast majority of possible outcomes for sales growth. The appendix contains the sample sizes for each of the reference classes. Bear in mind that these data are adjusted for inflation and that most forecasts reflect inflation expectations. We will show how to incorporate these base rates into your forecasts for sales growth in a moment. For now, it's useful to acknowledge the utility of these data as an analytical guide and a valuable reality check.

Getting to the proper reference class is crucial, but there are some useful observations about the whole that are worth noting. To begin, as firm size increases the mean and median growth rates decline, as does the standard deviation of the growth rates. This point has been well established empirically.[12] Exhibit 5 shows this pattern for annualized growth rates over three years. The lesson is to temper expectations about sales growth as companies get larger.

Exhibit 5: Growth Rates and Standard Deviations Decline with Size

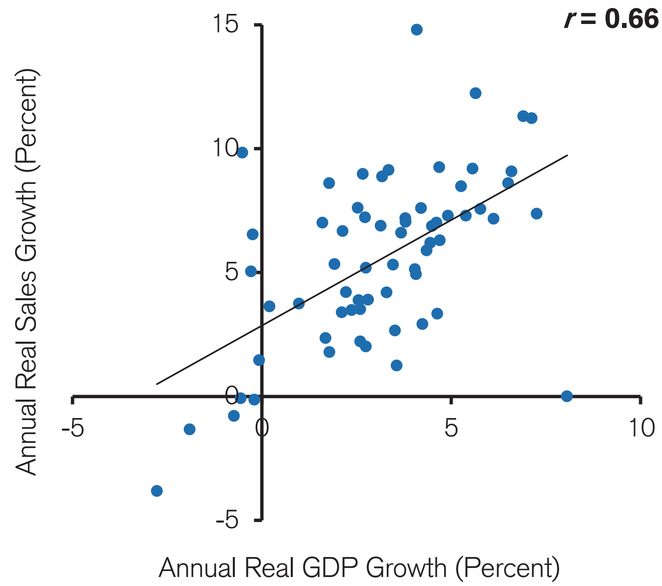


Source: Credit Suisse HOLT®.
Note: Growth rates are annualized over three years.

Exhibit 6 shows that sales growth follows gross domestic product (GDP) reasonably closely. U.S. GDP growth and the median sales growth in the same year have a correlation coefficient of 0.66. (Positive correlations fall in the range of 0 to 1.0, where 0 is random and 1.0 is a perfect correlation.) From 1950-2015, U.S. GDP grew at 3.2 percent per year, adjusted for inflation, with a standard deviation of 2.4 percent.

Corporate sales growth was higher than that of the broader economy for a few reasons. First, companies growing rapidly often need access to capital and hence choose to go public, likely creating a selection bias. Second, some companies, including contract manufacturers, generate growth that is not captured in the GDP figures. Finally, some companies grow outside the U.S., which shows up in sales growth but fails to be reflected in GDP.[13]

Exhibit 6: Median Sales Growth Is Correlated with GDP Growth, 1950-2015



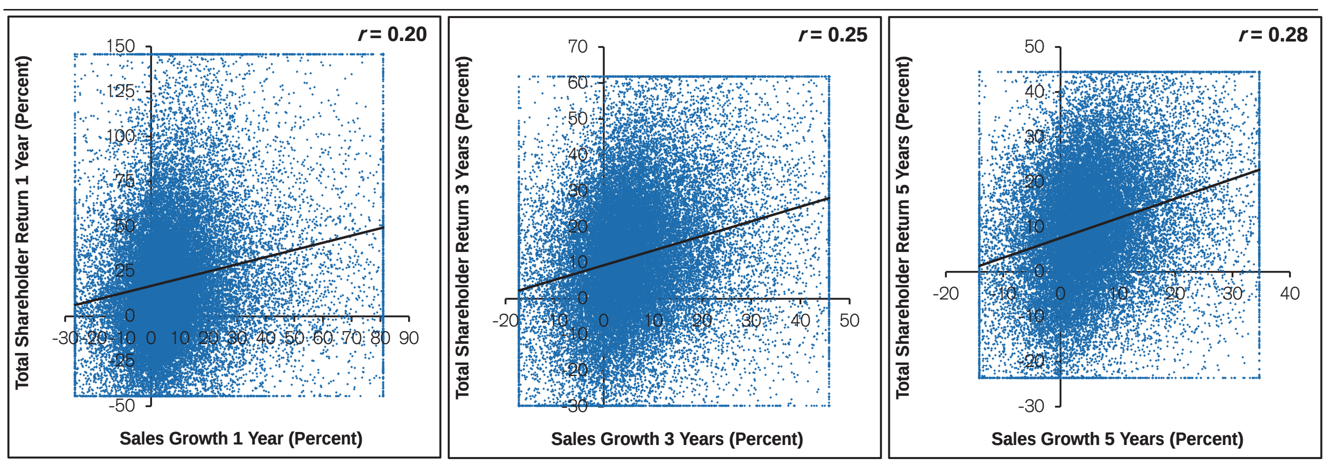
Source: Credit Suisse HOLT® and Bureau of Economic Analysis.
Note: Sales growth is for the top 1,000 global companies by market capitalization in each year.

Finally, notwithstanding our natural tendency to anticipate growth, 23 percent of the companies in the sample had negative sales growth rates for 3 years, after an adjustment for inflation, and 20 percent shrank for 5 years. Whereas a decline in sales need not be bad if it occurs for the right reasons, few analysts or corporate leaders project shrinking sales unless there is a clear strategy of divestiture.[14]

Sales and Total Shareholder Returns

Sales growth is moderately hard to forecast and has only a moderate positive correlation with total shareholder return. Exhibit 7 shows that the correlation coefficient is 0.20 for 1 year, 0.25 for 3 years, and 0.28 for 5 years. It is easier to forecast sales growth than earnings growth, but the payoff to getting earnings right, especially over the long haul, is much larger.

Exhibit 7: Correlation between Sales Growth Rates and Total Shareholder Returns over 1-, 3-, and 5-Year Horizons



Source: Credit Suisse HOLT®.
Note: Calculations use annual data on rolling 1-, 3-, 5-year basis; Winsorized at 2nd and 98th percentiles; Growth rates, TSRs annualized; 1985-2015.

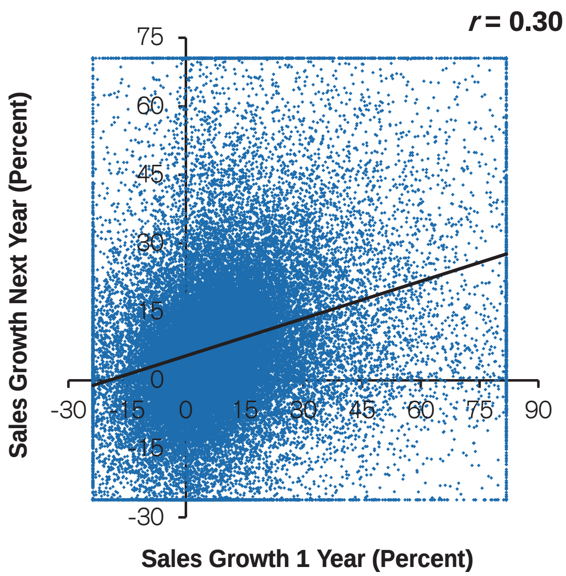
Using Base Rates to Model Sales Growth

Studying base rates for sales growth is logical for two reasons. First, sales growth is the most important driver of value for most companies. Second, sales growth has a higher correlation from year to year than does earnings growth, which is the most commonly discussed item on the income statement.[15] Sales growth is important and more predictable than profit growth.

As we discussed in the introduction, we can examine the correlation coefficient (*r*) to gain insight into the rate of regression toward the mean. In this case, we consider the correlation in sales growth rates over two different periods. Recall that a correlation near zero implies rapid regression toward the mean and a correlation near one implies very modest regression.

Exhibit 8 shows that the correlation coefficient is 0.30 for the year-to-year sales growth rate.[16] This includes the top 1,000 global companies by market capitalization from 1950 to 2015. Roughly 55,000 company years are in the data, and all of the figures are adjusted for inflation.

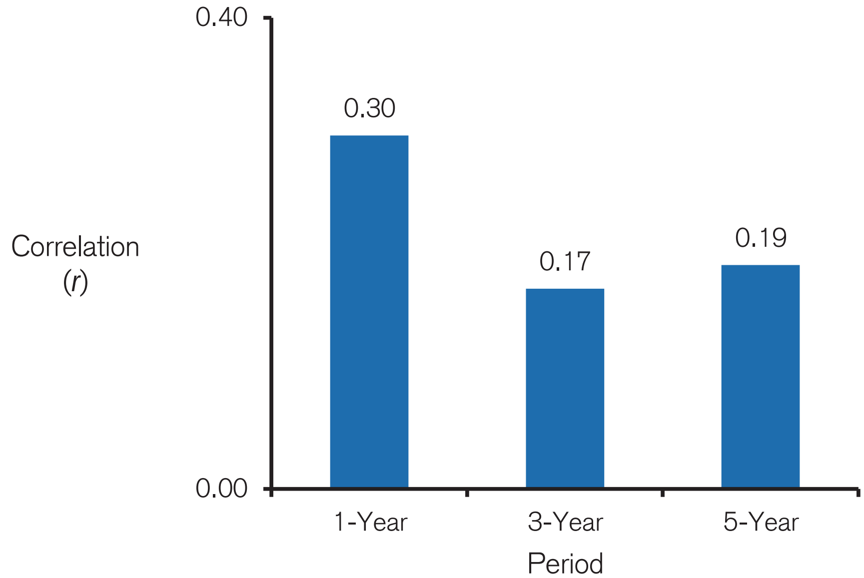
Exhibit 8: Correlation of One-Year Sales Growth Rates



Source: Credit Suisse HOLT® and Credit Suisse.
Note: Data winsorized at 2nd and 98th percentiles.

Not surprisingly, the correlations are lower for longer time periods. Exhibit 9 shows the correlations for one-, three-, and five-year horizons for the full population of companies. The base rate for the reference classes, the median growth rate, should receive the majority of the weight for forecasts of three years or longer. In fact, you might start with the base rate and seek reasons to move away from it.

Exhibit 9: Correlation of Sales Growth Rates for 1-, 3-, and 5-Year Horizons



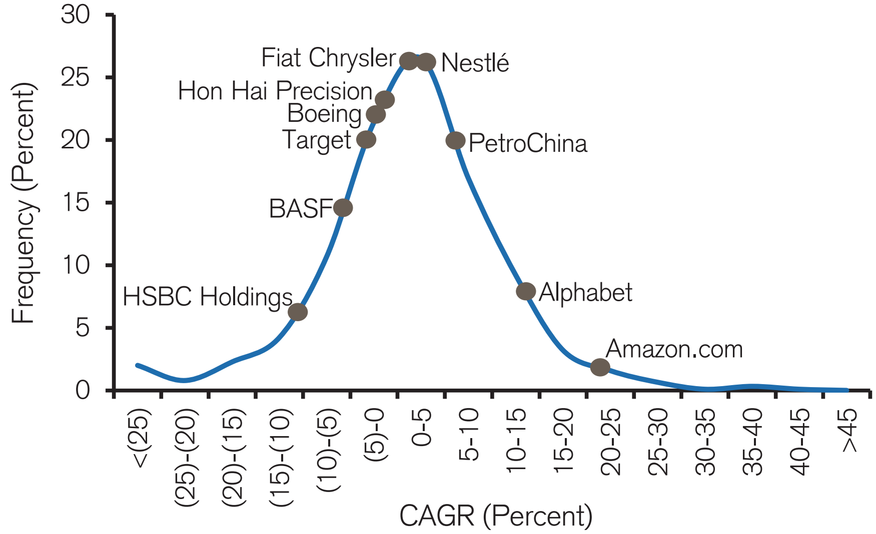
Source: Credit Suisse HOLT® and Credit Suisse.
Note: Calculations use annual data on a rolling 1-, 3-, and 5-year basis; Winsorized at 2nd and 98th percentiles.

This approach to modelling regression toward the mean does not say that some companies will not grow rapidly and others will not shrink. We know that companies will fill the tails of the distribution. What it does say is that the best forecast for a large sample of companies is something close to the median, and that companies that anticipate sales growth well in excess of the median are likely to be disappointed.

Current Expectations

Exhibit 1 shows the current expectations for sales growth over three years for a thousand public companies around the world. The median expected growth rate is 1.7 percent. Exhibit 10 represents the three-year sales growth rates, adjusted for inflation, which analysts expect for ten companies with sales in excess of $50 billion. We superimposed the expected growth rates on the distribution of historical sales growth rates for the reference class of mega companies.

Exhibit 10: Three-Year Expected Sales Growth Rates for Ten Mega Companies



Source: Credit Suisse HOLT® and FactSet Estimates.
Note: I/B/E/S consensus estimates as of September 19, 2016.

Analysts expect negative sales growth for five of the ten. The standard deviation of growth rates for this small sample is 9.4 percent.

Appendix: Observations for Each Base Rate by Decile, 1950-2015

Sales: $0-325 Mn	Observations			
Sales CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr
<(25)	92	27	18	0
(25)-(20)	43	12	8	2
(20)-(15)	67	22	20	14
(15)-(10)	104	60	28	27
(10)-(5)	219	110	70	41
(5)-0	451	360	266	200
0-5	893	928	967	960
5-10	923	1,159	1,322	1,684
10-15	764	919	1,089	1,169
15-20	556	629	605	601
20-25	412	386	400	356
25-30	259	274	289	243
30-35	229	197	189	154
35-40	151	169	177	103
40-45	137	119	114	64
>45	943	686	432	122
Total	6,243	6,057	5,994	5,740

Sales: $325-700 Mn	Observations			
Sales CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr
<(25)	58	13	5	0
(25)-(20)	27	17	5	1
(20)-(15)	66	34	24	6
(15)-(10)	143	61	42	30
(10)-(5)	252	148	111	93
(5)-0	503	459	397	334
0-5	1,104	1,345	1,397	1,395
5-10	1,079	1,321	1,584	1,843
10-15	765	913	911	857
15-20	450	450	434	300
20-25	364	270	209	141
25-30	200	149	126	65
30-35	120	115	87	38
35-40	102	77	49	13
40-45	77	59	40	4
>45	421	178	75	3
Total	5,731	5,609	5,496	5,123

Sales: $700-1,250 Mn	Observations			
Sales CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr
<(25)	85	21	12	7
(25)-(20)	47	15	16	4
(20)-(15)	71	38	25	10
(15)-(10)	140	92	62	36
(10)-(5)	246	177	162	99
(5)-0	531	480	429	407
0-5	1,015	1,189	1,297	1,415
5-10	949	1,188	1,297	1,420
10-15	637	729	746	655
15-20	411	415	355	215
20-25	270	219	204	90
25-30	160	147	110	48
30-35	145	97	49	13
35-40	93	77	47	6
40-45	75	43	20	2
>45	319	112	44	2
Total	5,194	5,039	4,875	4,429

Sales: $1,250-2,000 Mn	Observations			
Sales CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr
<(25)	66	16	15	1
(25)-(20)	42	18	7	2
(20)-(15)	66	34	17	15
(15)-(10)	132	85	46	27
(10)-(5)	250	182	139	73
(5)-0	492	502	465	390
0-5	1,002	1,200	1,330	1,466
5-10	956	1,114	1,213	1,242
10-15	602	614	612	489
15-20	360	327	280	161
20-25	201	185	152	63
25-30	166	137	94	26
30-35	108	81	42	12
35-40	76	46	28	4
40-45	71	24	19	7
>45	284	108	33	3
Total	4,874	4,673	4,492	3,981

Sales: $2,000-3,000 Mn	Observations			
Sales CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr
<(25)	65	19	11	0
(25)-(20)	48	12	5	3
(20)-(15)	77	41	17	3
(15)-(10)	132	72	52	13
(10)-(5)	256	220	153	96
(5)-0	531	563	501	441
0-5	1,061	1,234	1,368	1,462
5-10	898	1,025	1,154	1,055
10-15	587	569	516	360
15-20	341	295	232	150
20-25	228	189	137	40
25-30	139	111	75	28
30-35	98	61	27	4
35-40	65	42	14	2
40-45	39	28	7	2
>45	230	58	18	0
Total	4,795	4,539	4,287	3,659

Sales: $3,000-4,500 Mn	Observations			
Sales CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr
<(25)	82	22	7	1
(25)-(20)	51	18	7	1
(20)-(15)	96	43	32	1
(15)-(10)	180	98	80	31
(10)-(5)	330	246	172	101
(5)-0	646	697	664	574
0-5	1,150	1,311	1,438	1,534
5-10	932	1,113	1,160	1,073
10-15	593	574	565	334
15-20	365	343	241	124
20-25	245	163	118	31
25-30	150	98	66	15
30-35	86	65	22	1
35-40	62	36	7	1
40-45	39	22	12	0
>45	207	41	8	0
Total	5,214	4,890	4,599	3,822

Sales: $4,500-7,000 Mn	Observations			
Sales CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr
<(25)	105	24	11	1
(25)-(20)	58	36	9	5
(20)-(15)	93	54	31	4
(15)-(10)	218	139	89	38
(10)-(5)	378	294	215	160
(5)-0	732	772	747	603
0-5	1,239	1,484	1,595	1,591
5-10	1,080	1,090	1,110	1,034
10-15	634	575	504	299
15-20	363	322	267	104
20-25	215	189	106	33
25-30	159	99	51	20
30-35	98	58	28	6
35-40	53	25	13	0
40-45	43	20	8	0
>45	216	50	15	0
Total	5,684	5,231	4,799	3,898

Sales: $7,000-12,000 Mn	Observations			
Sales CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr
<(25)	132	28	18	2
(25)-(20)	79	30	14	6
(20)-(15)	121	74	37	24
(15)-(10)	233	177	126	42
(10)-(5)	520	429	344	183
(5)-0	934	1,005	968	776
0-5	1,427	1,660	1,739	1,714
5-10	1,196	1,220	1,280	1,052
10-15	707	622	518	264
15-20	357	321	219	87
20-25	241	183	81	30
25-30	140	92	66	11
30-35	103	59	25	5
35-40	60	26	10	2
40-45	51	16	6	0
>45	203	42	7	0
Total	6,504	5,984	5,458	4,198

Sales: $12,000-25,000 Mn	Observations			
Sales CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr
<(25)	176	52	15	1
(25)-(20)	94	37	30	2
(20)-(15)	154	113	67	20
(15)-(10)	257	175	133	53
(10)-(5)	553	468	345	223
(5)-0	1,111	1,172	1,064	789
0-5	1,513	1,685	1,798	1,629
5-10	1,182	1,183	1,140	814
10-15	643	541	442	246
15-20	331	266	195	99
20-25	205	156	90	24
25-30	157	74	39	4
30-35	95	56	23	2
35-40	56	22	14	0
40-45	35	18	1	0
>45	176	29	6	3
Total	6,738	6,047	5,402	3,909

Sales: >$25,000 Mn	Observations			
Sales CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr
<(25)	212	83	44	2
(25)-(20)	88	44	29	5
(20)-(15)	143	105	67	24
(15)-(10)	281	197	134	72
(10)-(5)	536	470	365	260
(5)-0	981	1,027	952	662
0-5	1,289	1,398	1,457	1,070
5-10	942	946	808	582
10-15	532	474	381	166
15-20	328	221	143	37
20-25	189	112	55	6
25-30	136	55	18	0
30-35	63	20	10	0
35-40	40	23	5	0
40-45	32	8	3	0
>45	114	14	1	0
Total	5,906	5,197	4,472	2,886

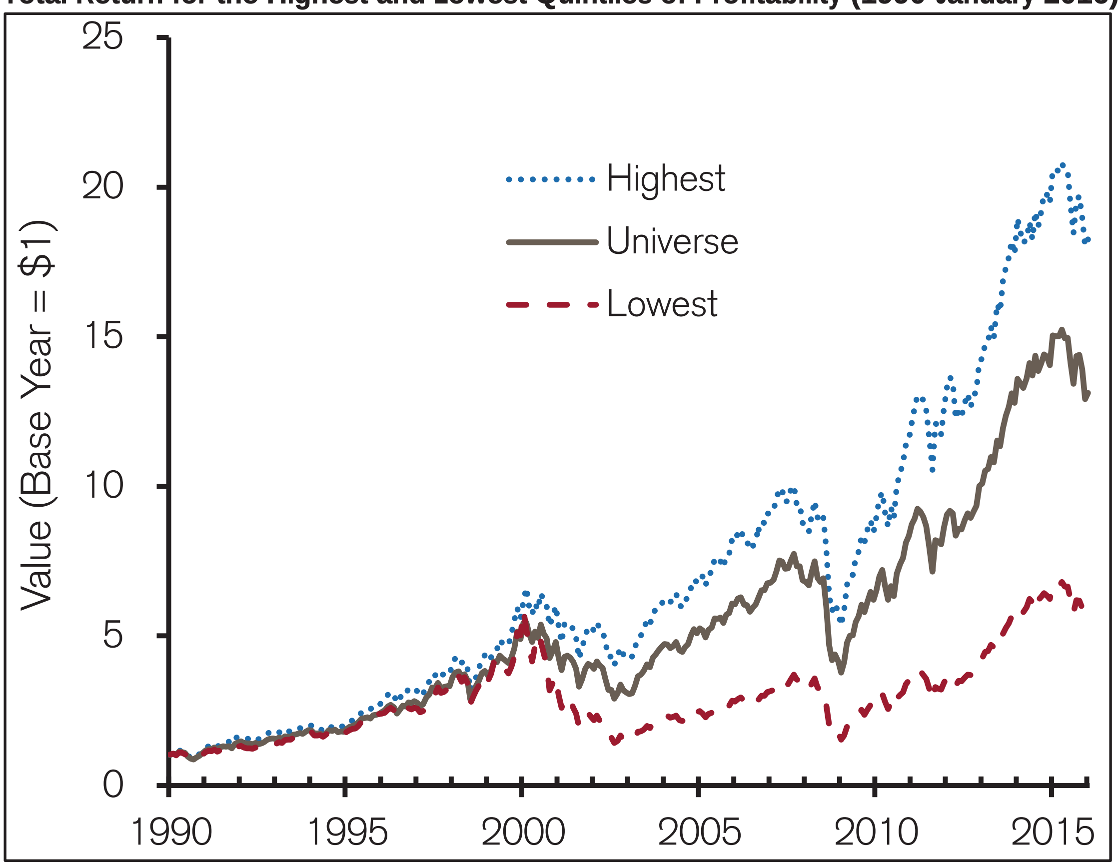
Sales: >$50,000 Mn	Observations			
Sales CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr
<(25)	100	43	29	0
(25)-(20)	48	17	18	3
(20)-(15)	64	49	28	11
(15)-(10)	124	91	49	34
(10)-(5)	251	230	169	108
(5)-0	421	461	412	296
0-5	542	571	616	415
5-10	373	364	305	189
10-15	213	198	126	33
15-20	126	69	41	10
20-25	82	34	11	0
25-30	56	14	5	0
30-35	28	2	1	0
35-40	14	7	0	0
40-45	10	2	0	0
>45	32	0	0	0
Total	2,484	2,152	1,810	1,099

Full Universe	Observations			
Sales CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr
<(25)	1,073	305	156	15
(25)-(20)	577	239	130	31
(20)-(15)	954	558	337	121
(15)-(10)	1,820	1,156	792	369
(10)-(5)	3,540	2,744	2,076	1,329
(5)-0	6,912	7,037	6,453	5,176
0-5	11,693	13,434	14,386	14,236
5-10	10,137	11,359	12,068	11,799
10-15	6,464	6,530	6,284	4,839
15-20	3,862	3,589	2,971	1,878
20-25	2,570	2,052	1,552	814
25-30	1,666	1,236	934	460
30-35	1,145	809	502	235
35-40	758	543	364	131
40-45	599	357	230	79
>45	3,113	1,318	639	133
Total	56,883	53,266	49,874	41,645

Source: Credit Suisse HOLT®

Gross Profitability

Total Return for the Highest and Lowest Quintiles of Profitability (1990-January 2016)



Source: Credit Suisse HOLT®.

Why Gross Profitability Is Important

Benjamin Graham, the father of security analysis, spent some time with an aeronautical engineer named James Rea in the 1970s. Together, they developed a screen to find attractive stocks that had ten criteria. Because it was toward the end of Graham's life, some refer to the list as Graham's "last will."[1] About one-half of the measures were based on valuation, consistent with Graham's value orientation. But the other half addressed quality. So a company that passed the screen would be both statistically cheap and of high quality.

Gross profitability is a measure of a company's ability to make money. Robert Novy-Marx, a professor of finance at the Simon Business School at the University of Rochester, defines gross profitability as revenues minus cost of goods sold, scaled by the book value of total assets. In other words, gross profitability is gross profit divided by assets. Investors can use gross profitability as a proxy for quality and it is not positively correlated with classic measures of value.[2]

Research shows that gross profitability is highly persistent in the short and long run. This means that you can make a reasonable estimate of future profitability based on the past. Academic research also shows that firms with high gross profitability deliver better total shareholder returns than those with low profitability. This is despite the fact that they start with loftier price-to-book ratios.[3]

Many academics and practitioners now incorporate gross profitability into their asset pricing models. For instance, Eugene Fama, a professor at the University of Chicago and a winner of the Nobel Prize, and Kenneth French, a professor of finance at the Tuck School of Business, Dartmouth College, include profitability as one of the factors that helps explain changes in asset prices. The others include beta (a measure of the sensitivity of an asset's returns to market returns), size, valuation, and investment.[4] The definition of profitability that Fama and French use differs somewhat from that of Novy-Marx but captures the same essence.

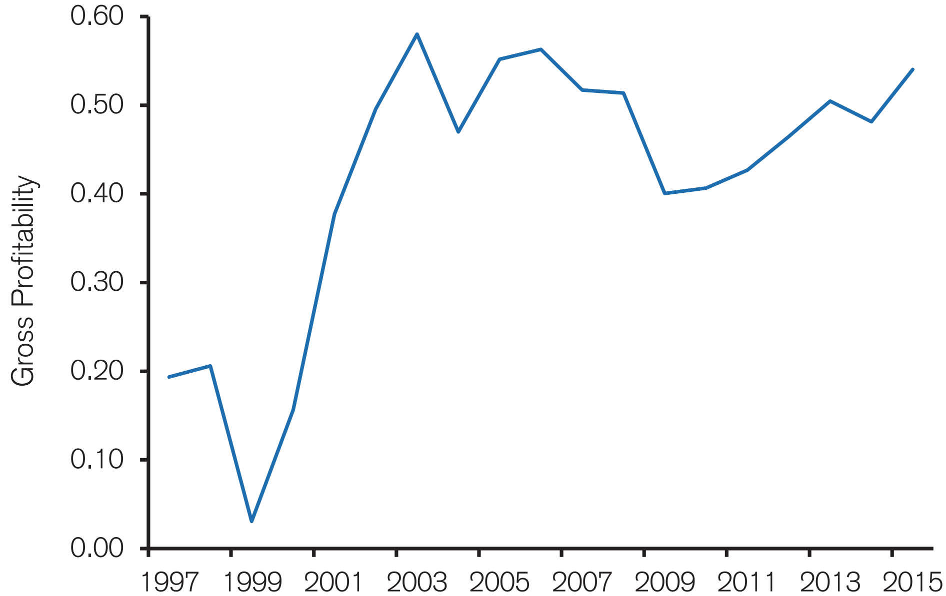
The power of profitability to explain total shareholder returns appears to be a global phenomenon.[5] Using Compustat data (July 1963 to December 2010) and Compustat Global data (July 1990 to October 2009), Novy-Marx found that the stocks of more profitable firms outperformed the stocks of less profitable firms in the United States as well as in developed markets outside the U.S. Both samples exclude stocks of companies in the financial services sector. These results are consistent with a study that examined the effect of gross profitability on total shareholder returns in 41 countries from 1980 to 2010.[6]

Gross profitability may also be a useful factor to screen for in a search for attractive stocks. Profitability can provide a very different signal than a price-earnings (P/E) multiple, which is the most common metric analysts use to value stocks. A stock that appears unattractive using a P/E multiple may look attractive using gross profitability, and a stock that appears unattractive using gross profitability may look attractive using a P/E multiple.

Take Amazon.com as a case. The stock had a trailing P/E multiple of roughly 540 at year-end 2015 based on a price of $676 on December 31 and full-year reported earnings per share of $1.25. For context, the P/E multiple was 20 for the S&P 500 at the same time. Based purely on its P/E multiple, the valuation of Amazon.com appeared high.

The company's gross profitability told a different story. For 2015, Amazon.com's gross profitability was 0.54 (gross profit of $35 billion and total assets of $65 billion). According to Novy-Marx, gross profitability of 0.33 or higher is generally attractive.[7] Not only did Amazon.com's recent gross profitability surpass that level easily, it has been well above that threshold for most of the company's history (see Exhibit 1).

Exhibit 1: Amazon.com's Gross Profitability, 1997-2015



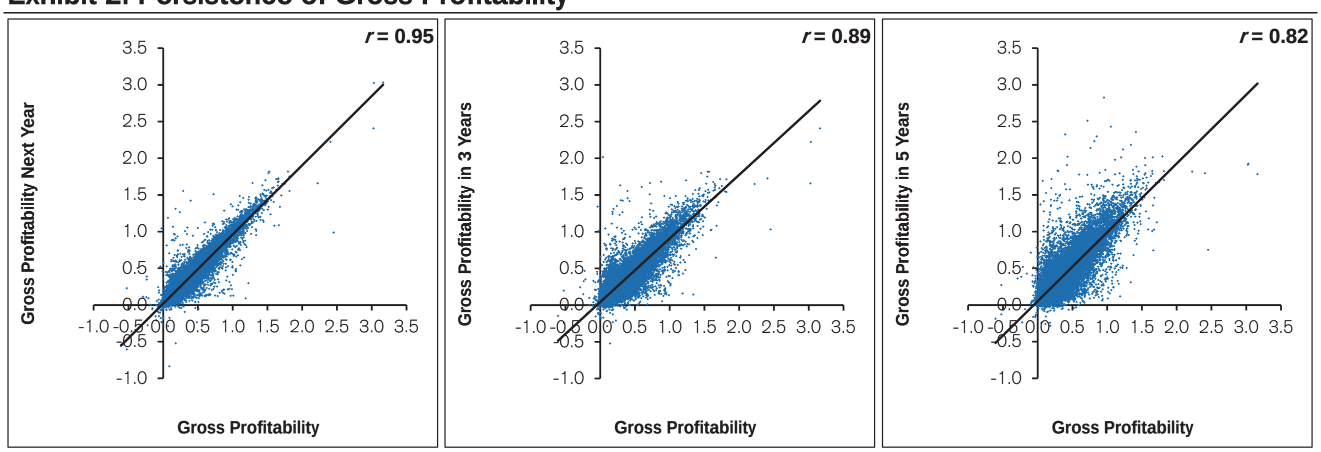
Source: FactSet.

Persistence of Gross Profitability

Exhibit 2 shows that the Novy-Marx definition of gross profitability is very persistent over one-, three-, and five-year periods. For example, the correlation between profitability in the current year and three years in the future has a coefficient, *r*, of 0.89 (middle panel of Exhibit 2). But even the five-year correlation is high at 0.82 (right panel).

This universe includes the top 1,000 firms in the world from 1950 to 2015 as measured by market capitalization. The sample includes dead companies but excludes firms in the financial services and utilities sectors. The data include more than 40,000 company years, and there is no need to take into account inflation because profitability is expressed as a ratio.

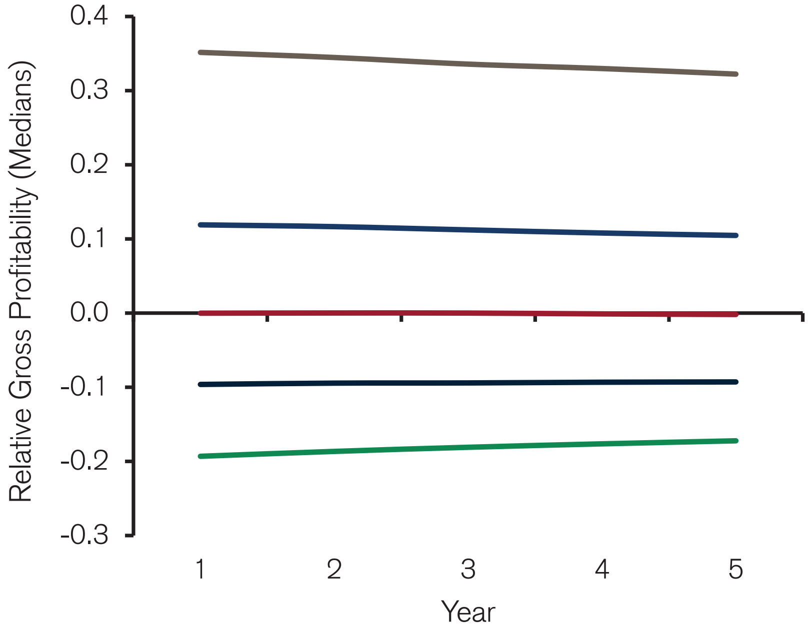
Exhibit 2: Persistence of Gross Profitability



Source: Credit Suisse HOLT®.

Exhibit 3 shows the stability of gross profitability. We start by sorting companies into quintiles based on gross profitability at the beginning of a year. We then follow the gross profitability for each of the five cohorts. There is very little regression toward the mean. The spread from the highest to the lowest quintile shrinks only slightly, from 0.54 to 0.49. Given this stability, a sensible forecast is to start with last year's profitability and seek reasons to move away from it.

Exhibit 3: Regression Toward the Mean for Gross Profitability

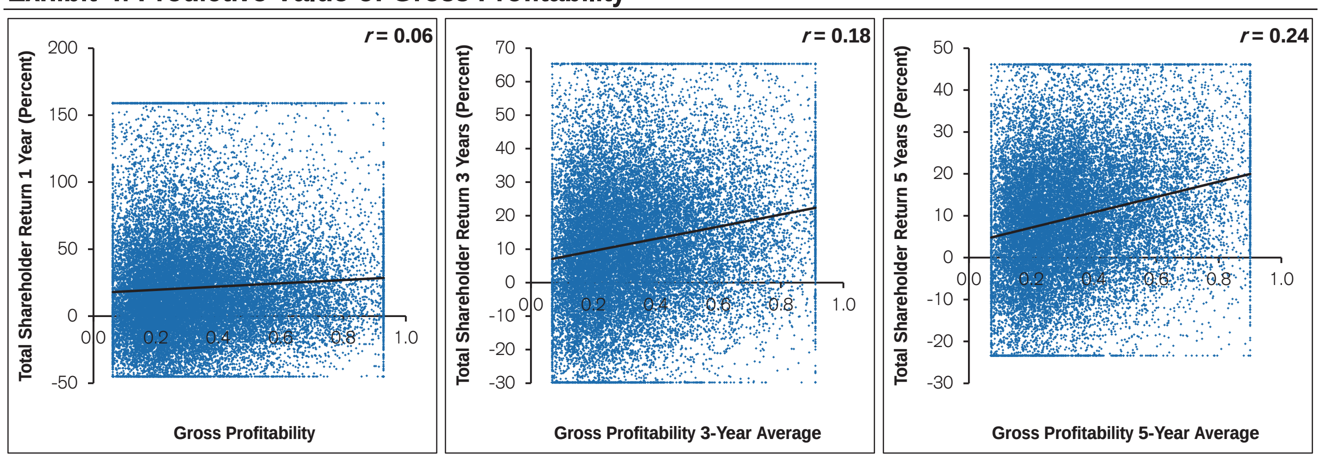


Source: Credit Suisse HOLT®.

Gross Profitability and Total Shareholder Returns

Exhibit 4 shows that the correlation between gross profitability and total shareholder return (TSR) is 0.06 for one year, 0.18 for three years, and 0.24 for five years. However, neither Novy-Marx nor Fama and French recommend a simple correlation between gross profitability and TSR.

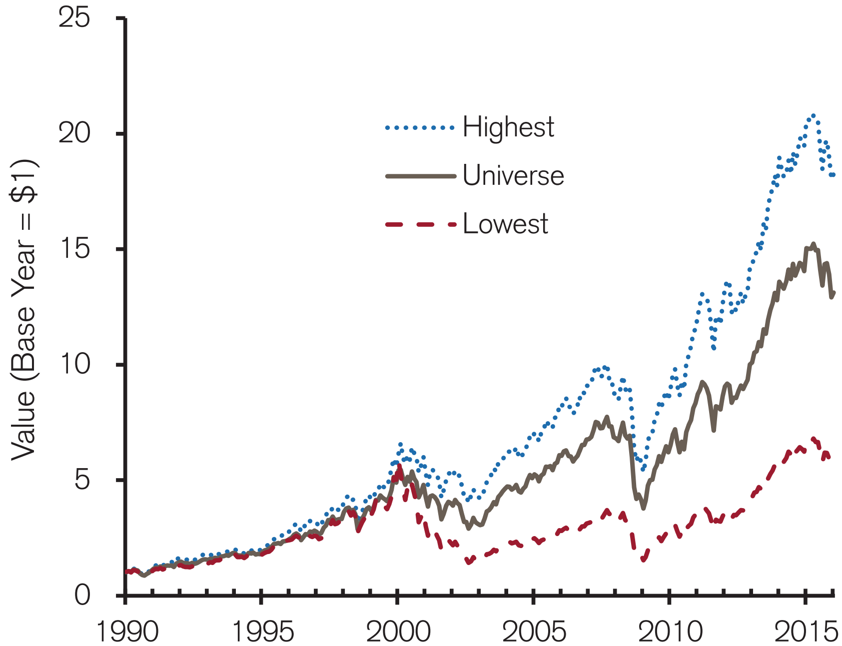
Exhibit 4: Predictive Value of Gross Profitability



Source: Credit Suisse HOLT®.
Note: Winsorized at 2nd and 98th percentiles; TSRs annualized; 1985-2015.

A more effective way to use gross profitability is to rank stocks in quintiles by gross profitability and to build portfolios for each. Exhibit 5 shows the cumulative growth in value of $1 for the quintiles with the highest and lowest ratios of gross profitability, as well as that for the whole universe. The sample includes the largest 1,000 U.S. industrial and service companies from 1990 through January 2016. The portfolios are rebalanced monthly.

Exhibit 5: Total Return for the Highest and Lowest Quintiles of Profitability (1990-January 2016)



Source: Credit Suisse HOLT®.
Note: Gross profitability is calculated using the average of the assets at the beginning and the end of the fiscal year.

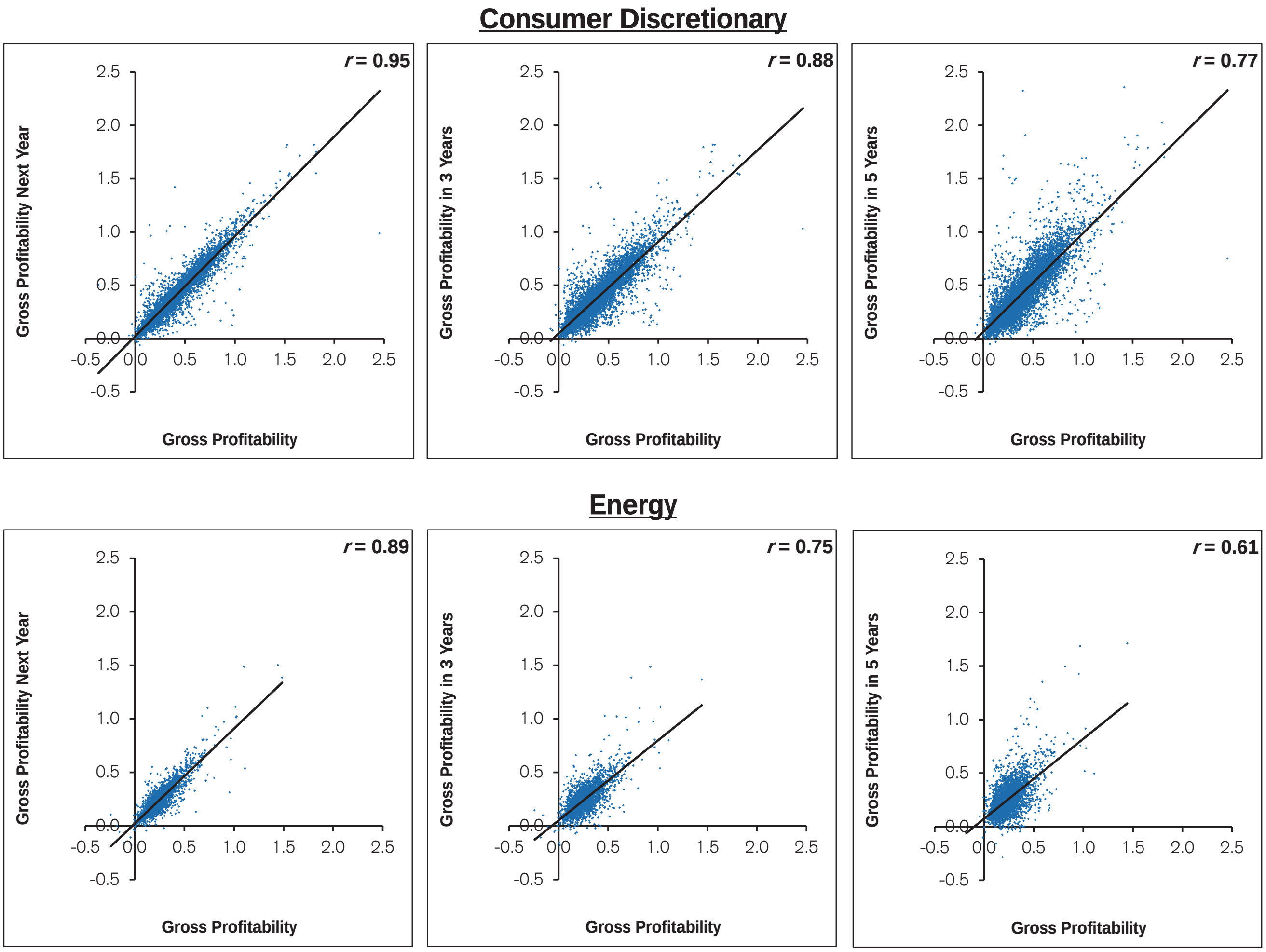
Base Rates of Gross Profitability by Sector

We can refine this analysis by examining gross profitability at the sector level. This reduces the sample size but improves its relevance. We present a guide for calculating the rate of regression toward the mean, as well as the proper mean to use, for eight sectors. We exclude the financial services and utilities sectors.

Exhibit 6 examines gross profitability for two sectors, consumer discretionary and energy. The panels at the top show the persistence of gross profitability for the consumer discretionary sector. On the right, we see that the correlation between gross profitability in the base year and five years in the future is 0.77.

The panels at the bottom of exhibit 6 show the same relationships for the energy sector. On the right, we see that the correlation between gross profitability in the base year and five years in the future is 0.61. This suggests you should expect a slower rate of regression toward the mean in the consumer discretionary sector than in the energy sector.

Exhibit 6: Correlation Coefficients for Gross Profitability in Consumer Discretionary and Energy



Source: Credit Suisse HOLT®.

Exhibit 7 shows the correlation coefficient for five-year changes in gross profitability for eight sectors from 1950 to 2015, as well as the standard deviation for the ranges of recorded correlations. Two aspects of the exhibit are worth highlighting. The first is the ordering of *r* from high to low. This gives you a sense of the rate of regression toward the mean by sector. A high *r* suggests slow regression, and a low *r* means more rapid regression. Consumer-oriented sectors generally have higher *r*'s, and sectors with more exposure to technology or commodities have lower *r*'s.

The second aspect is how the correlations change from year to year. The standard deviation for the consumer discretionary sector was 0.10. With a correlation coefficient of 0.77, that means 68 percent of the observations fell within a range of 0.67 and 0.87. The standard deviation for the energy sector was 0.18. With a correlation coefficient of 0.61, that means 68 percent of the observations fell within a range of 0.43 and 0.79.

Exhibit 7: Correlation Coefficients for Gross Profitability for Eight Sectors, 1950-2015

Sector	Five-Year Correlation Coefficient	Standard Deviation
Consumer Staples	0.86	0.07
Industrials	0.79	0.12
Health Care	0.77	0.12
Consumer Discretionary	0.77	0.10
Materials	0.76	0.14
Information Technology	0.63	0.14
Energy	0.61	0.18
Telecommunication Services	0.59	0.24

Source: Credit Suisse HOLT®.
Note: Figures for telecommunication services reflect 1960-2015.

Estimating the Mean to Which Results Regress

Exhibit 8 presents guidelines on the rate of regression toward the mean, as well as the proper mean to use, for eight sectors based on more than 60 years of data. Keep in mind that regression toward the mean works on a population but not necessarily on every individual company.

The third and fourth columns show the median and mean, or average, gross profitability for each sector. We include medians because the gross profitability in many sectors does not follow a normal distribution. (When the average is higher than the median, the distribution is skewed to the right.) Still, the means are only 5-10 percent higher than the medians.

The two columns at the right show measures of variability. The coefficient of variation, a normalized measure, captures dispersion. The coefficient of variation equals the standard deviation of gross profitability divided by average gross profitability. It is not surprising that gross profitability is higher and less volatile in consumer discretionary than it is in energy.

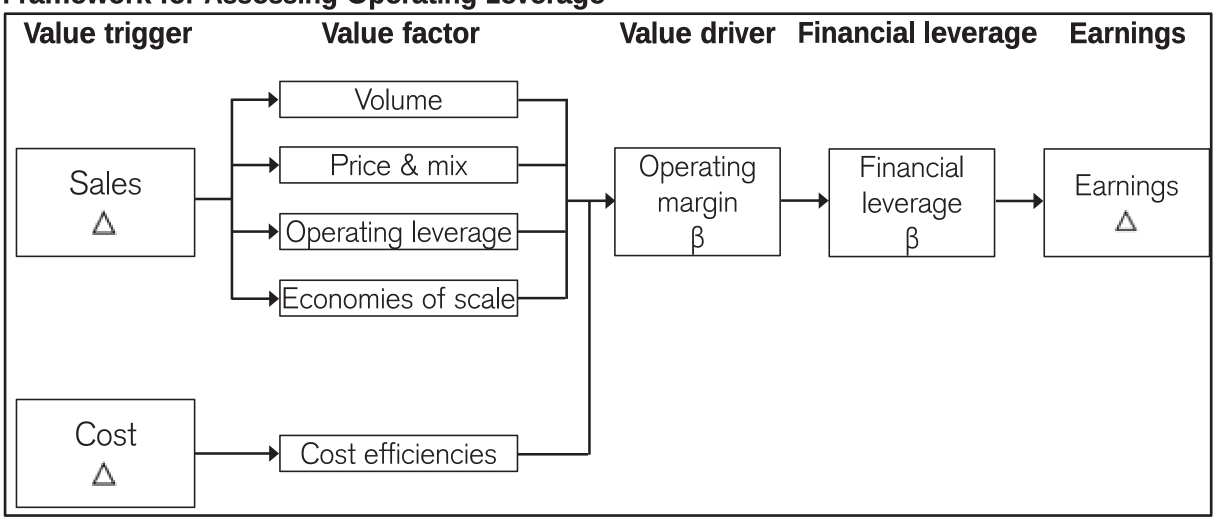
Exhibit 8: Rate of Regression and toward What Mean Gross Profitability Reverts for Eight Sectors

	How *Much* Regression?	Toward *What* Mean?			
Sector	Five-Year Correlation Coefficient	Median	Average	Standard Deviation	Coefficient of Variation
Consumer Staples	0.86	0.49	0.54	0.08	0.14
Industrials	0.79	0.28	0.30	0.07	0.23
Health Care	0.77	0.47	0.49	0.09	0.18
Consumer Discretionary	0.77	0.35	0.39	0.05	0.12
Materials	0.76	0.25	0.28	0.04	0.14
Information Technology	0.63	0.39	0.42	0.06	0.14
Energy	0.61	0.22	0.24	0.04	0.18
Telecommunication Services	0.59	0.24	0.27	0.07	0.26

Source: Credit Suisse HOLT®.
Note: "Standard deviation" is the standard deviation of the annual average gross profitability for the sector.

Operating Leverage

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.*

Why Operating Leverage Is Important

Sources of revisions in expectations include fundamental outcomes (typically earnings revisions) and an assessment of how the market will value those fundamentals (multiple expansion or contraction).[1] 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.[2]

Analysts are commonly too optimistic about earnings growth and often miss estimates by a wide margin.[3] This is especially pronounced for companies that have high operating leverage and surprise the market with weak sales.[4] Buy-side analysts are generally more optimistic and less accurate than sell-side analysts.[5]

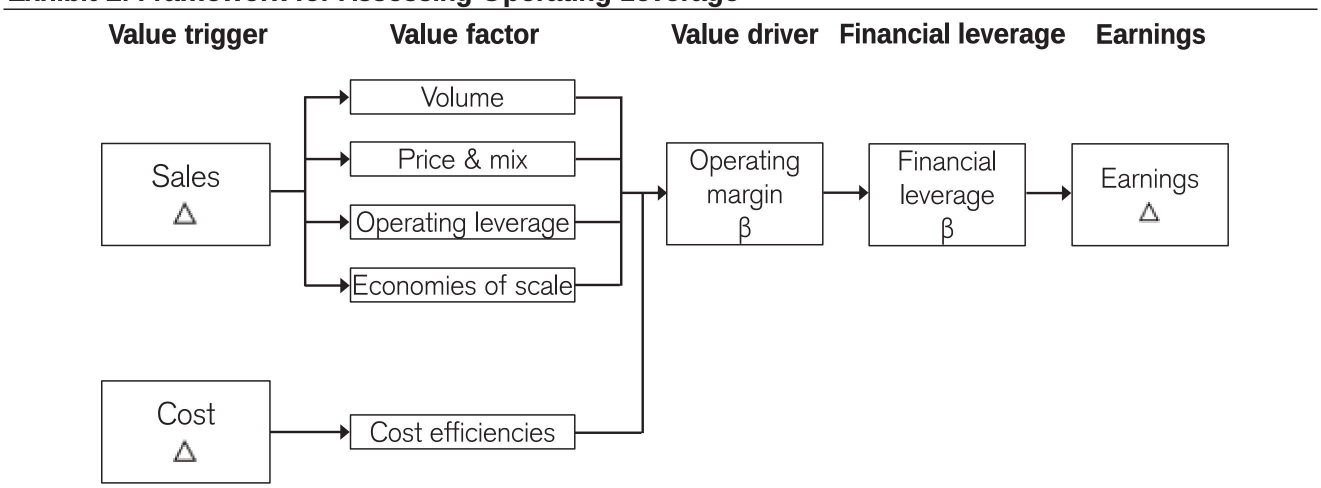
Operating leverage measures the change in operating profit as a function of the change in sales. Operating leverage is high when a company realizes a relatively large change in operating profit for every dollar of change in sales. Operating leverage is low when operating profit is mostly unchanged for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

We outline 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.[6]

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 (β)." 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



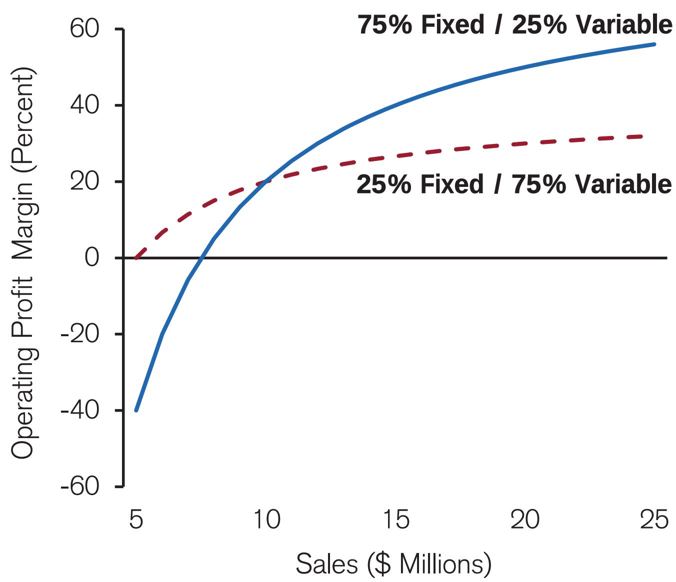
Source: Alfred Rappaport and Michael J. Mauboussin, Expectations Investing: Reading Stock Prices for Better Returns *(Boston, MA: Harvard Business School Press, 2001), 41.*

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.[7]

Variable costs are linked to output. These costs rise and fall in tandem with sales. The commissions a company pays to its sales force are 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.

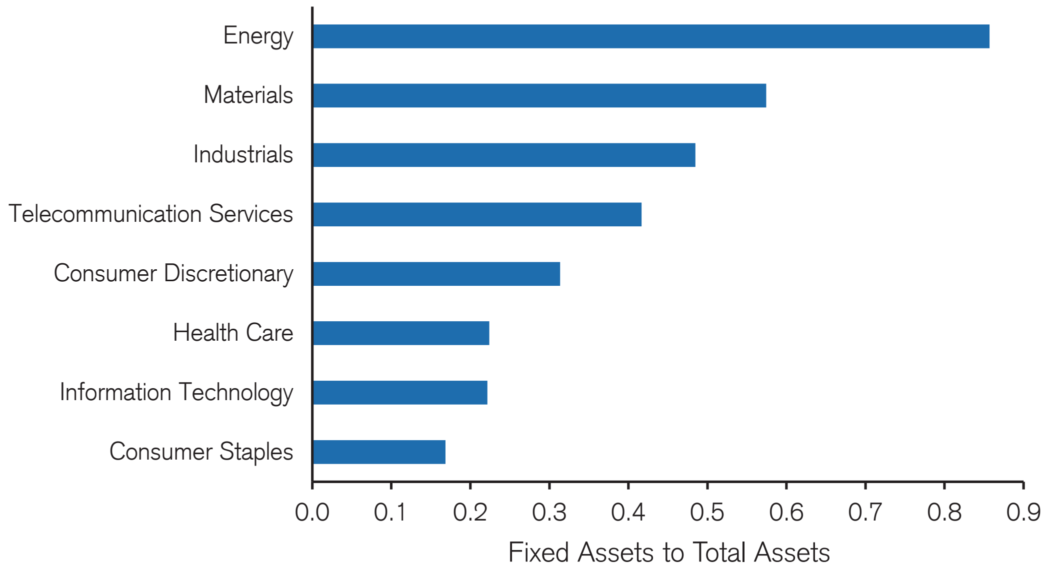
Exhibit 2: Cost Structure Composition and Operating Profit Scalability



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

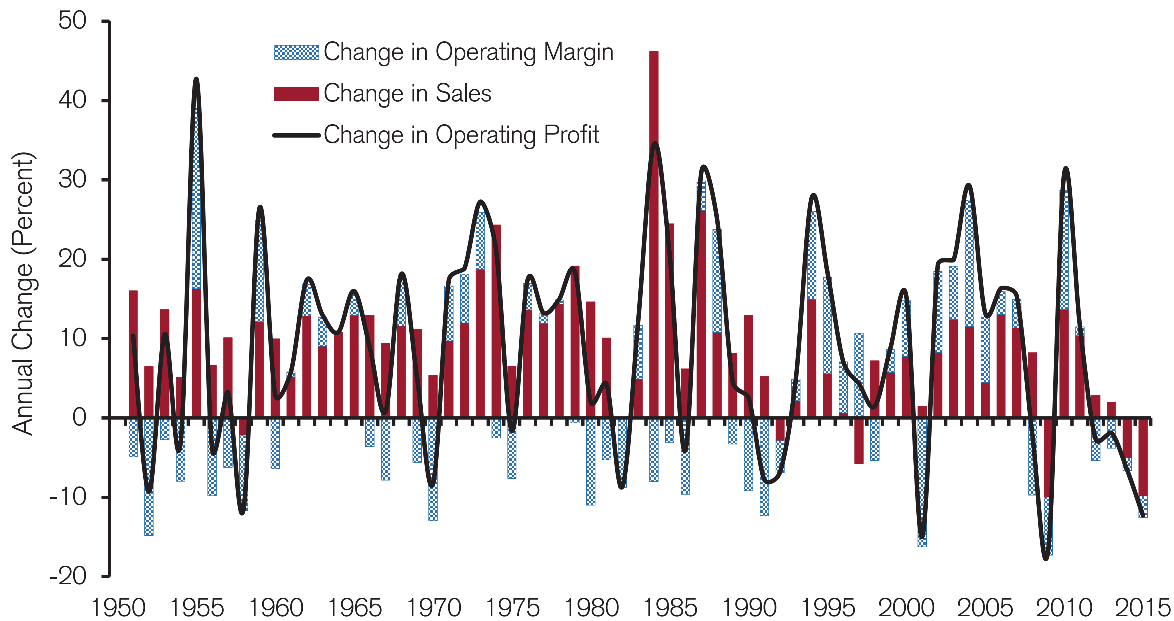


Source: Aswath Damodaran.
Note: Global companies as of January 2016; Fixed-to-total asset ratio for each sector is the average of the industries in that sector.

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.[8] 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.[9]

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, 1950-2015



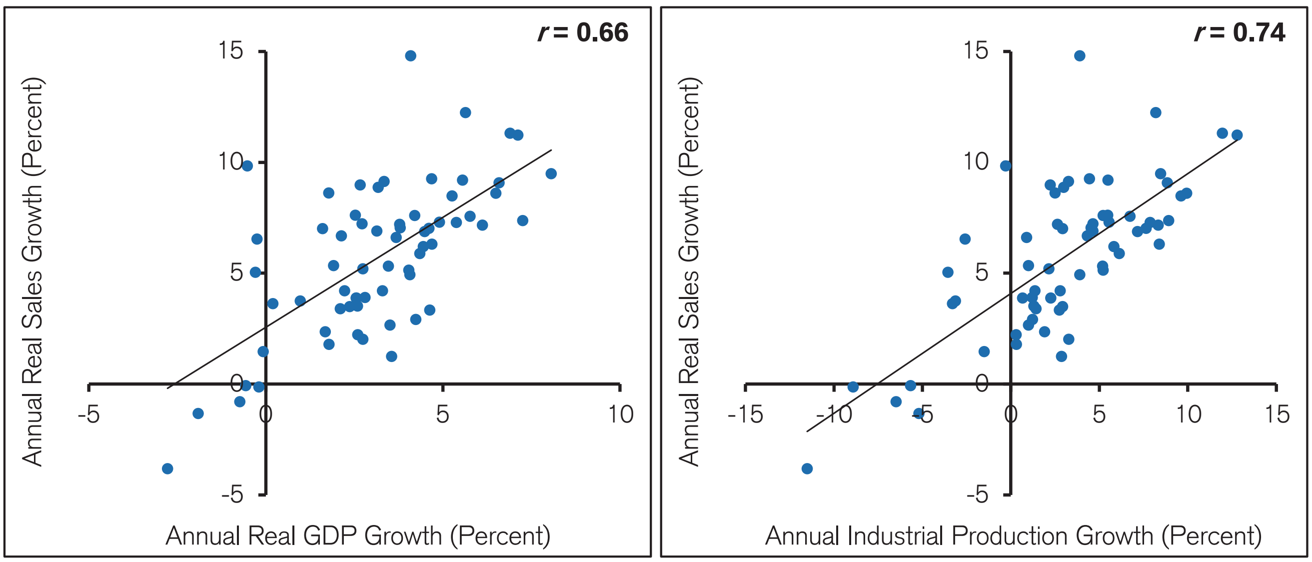
Source: Credit Suisse HOLT®.

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 β, 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.[10]

Sales Growth as an Input

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 1950-2015. 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.

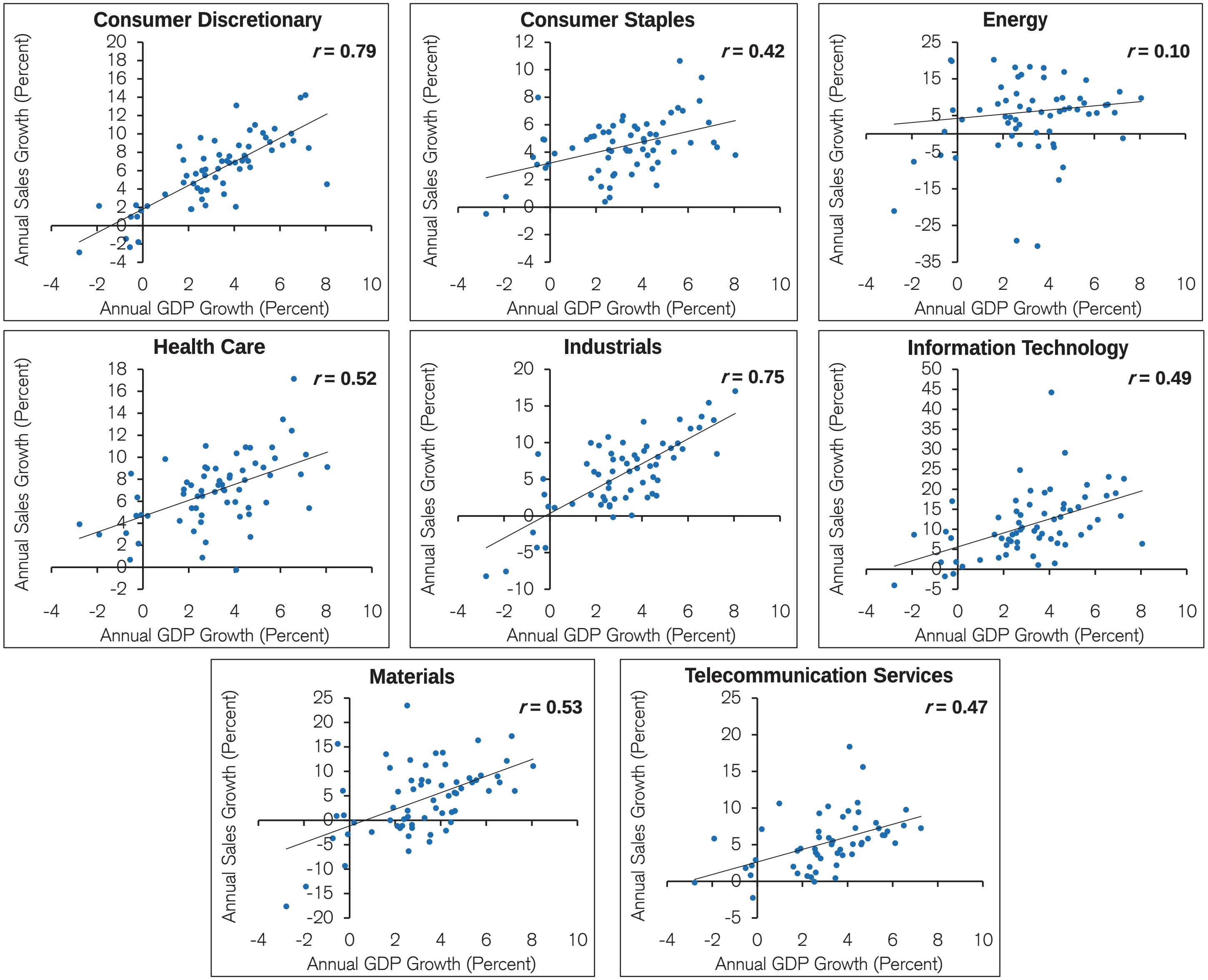
Exhibit 5: Median Sales Growth Is Correlated with GDP and IP Growth, 1950-2015



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, 1950-2015



Source: Credit Suisse HOLT®.
Note: Growth rates are adjusted for inflation. Sector growth rates are calculated using medians. Telecommunication Services includes 1960-2015.

Industry growth is the primary factor that analysts consider when they make sales forecasts.[11] There are a number of issues to consider when assessing industry growth.[12] The first is where the industry is in its life cycle.[13] 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.[14]

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.[15] 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.[16]

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.[17] 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.[18]

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.[22] 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.

The Factors That Determine Operating Leverage

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:[19]

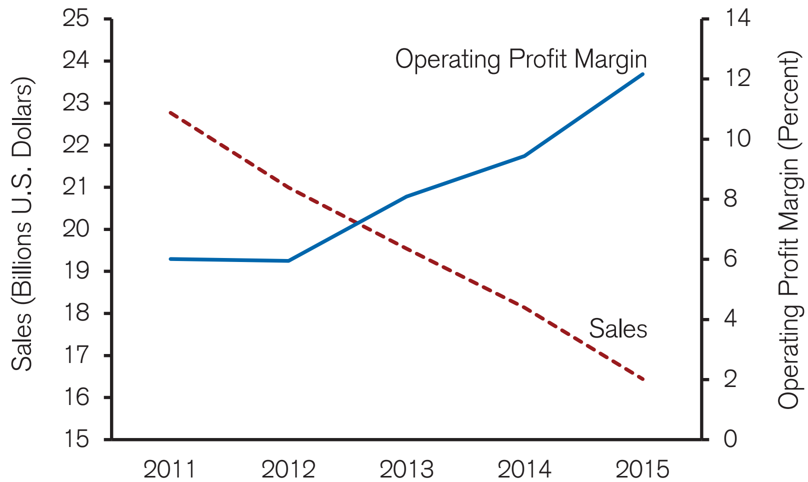
- **Volume.** Volume captures the potential revision in expectations for the number of units a company sells. Volume changes lead to sales changes and can influence operating profit margins through operating leverage and economies of scale.

- **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."[20]

  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.[21]

  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.[22] Exhibit 7 summarizes these figures.

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



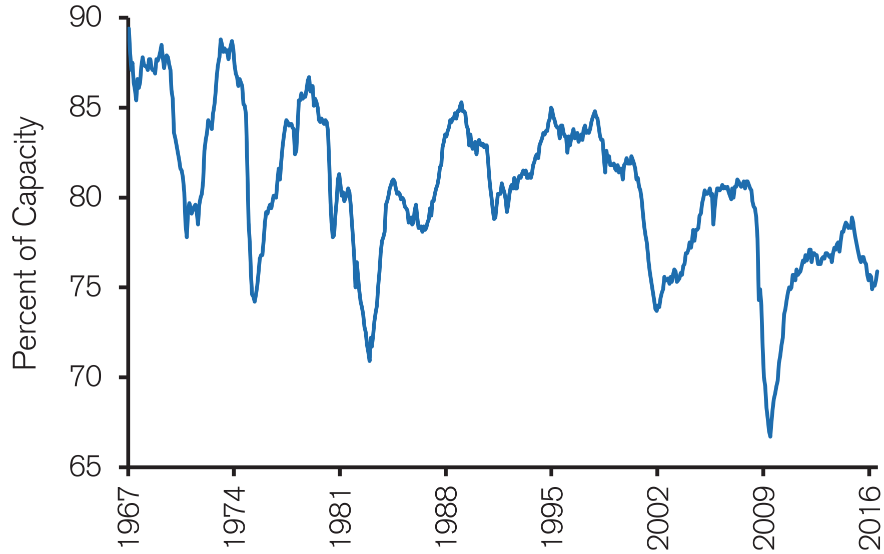
Source: Company reports.

- **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.

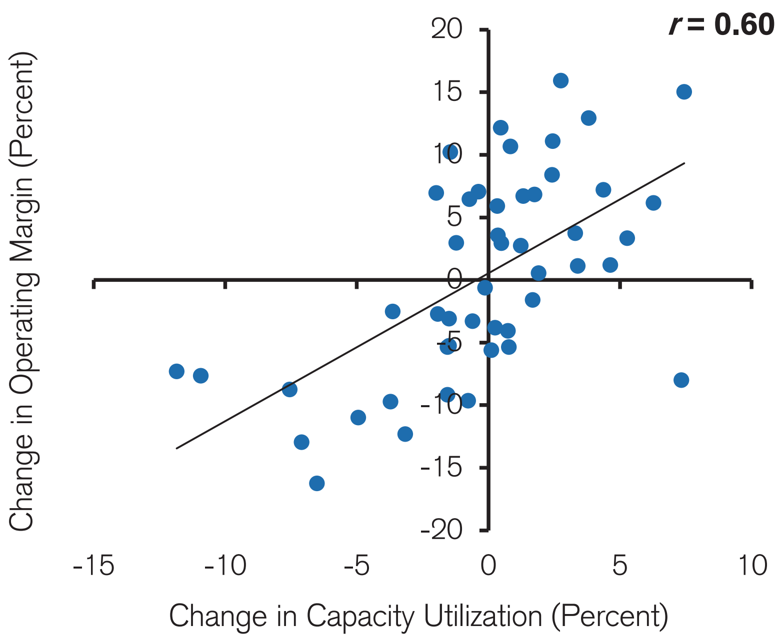
Capacity utilization is one way to assess operating leverage (see Exhibit 8). Operating margins tend to shrink when capacity utilization falls and expand when utilization rises. Exhibit 9 shows this relationship.

Exhibit 8: Capacity Utilization: Total Industry (1967-July 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 (1967-2015)



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 suppliers.

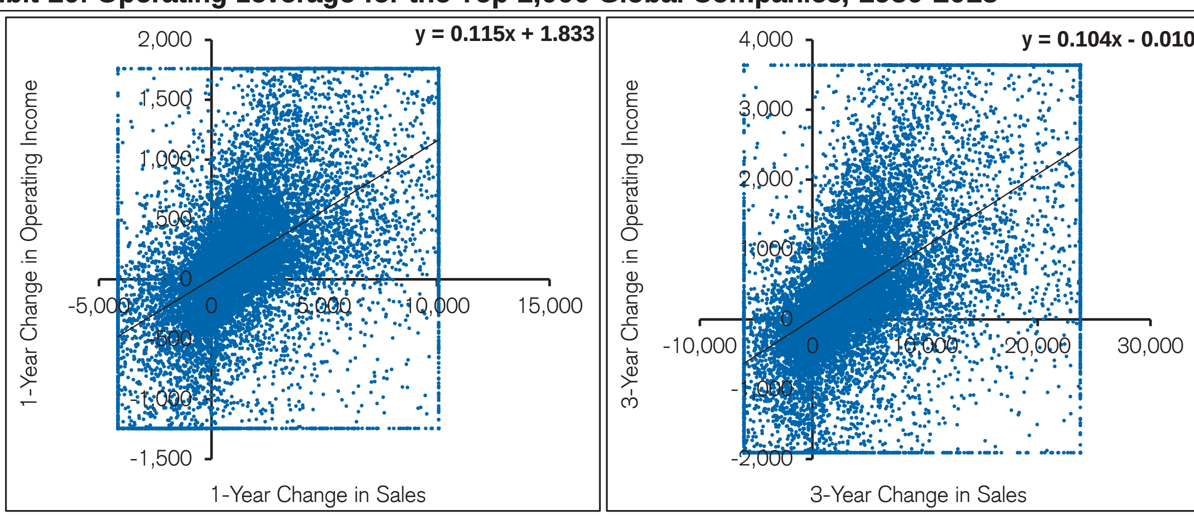
- **Cost Efficiencies.** Cost efficiencies can also affect operating profit margin but are unrelated to sales changes and hence not relevant to a discussion of operating leverage. Still, you must account for operating margin changes as the result of cost efficiencies. These efficiencies come about in two ways. A company can either reduce costs within an activity or it can reconfigure its activities.[23]

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 companies in the financial services and utilities industries, over 1- and 3-year periods from 1950 through 2015. We call the slope of the least-squares regression line the "operating margin beta (β)," and it is a good proxy for the degree of operating leverage. The operating margin β for both periods is about 0.11, and is slightly higher for the one-year change. The way to interpret the β is that for every $1.00 change in sales, operating profit changes by approximately $0.11.

Exhibit 10: Operating Leverage for the Top 1,000 Global Companies, 1950-2015



Source: Credit Suisse HOLT®.
Note: All amounts in 2015 U.S. dollars; winsorized at 2nd and 98th percentiles.

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

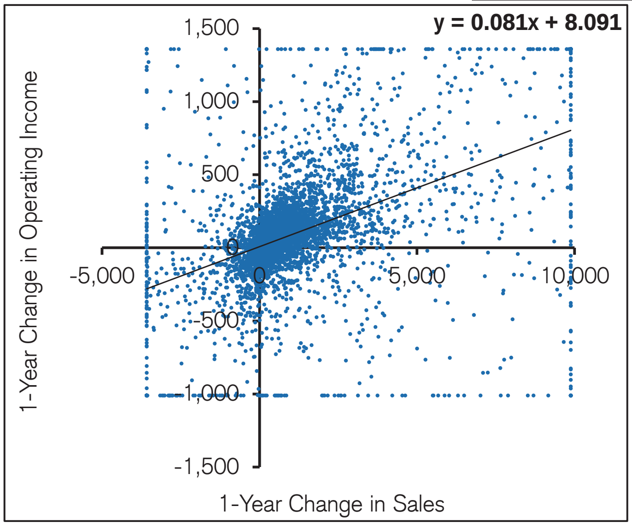
Exhibit 11: Operating Margin Beta by Sector, 1950-2015

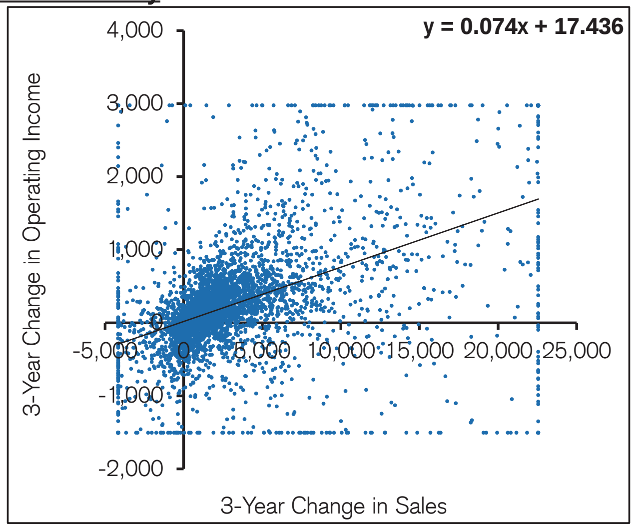
Sector	One-Year Operating Margin Beta	Three-Year Operating Margin Beta
Materials	0.193	0.155
Telecommunication Services	0.174	0.184
Information Technology	0.173	0.158
Energy	0.134	0.103
Health Care	0.115	0.111
Industrials	0.083	0.076
Consumer Discretionary	0.081	0.074
Consumer Staples	0.075	0.071

Source: Credit Suisse HOLT®.

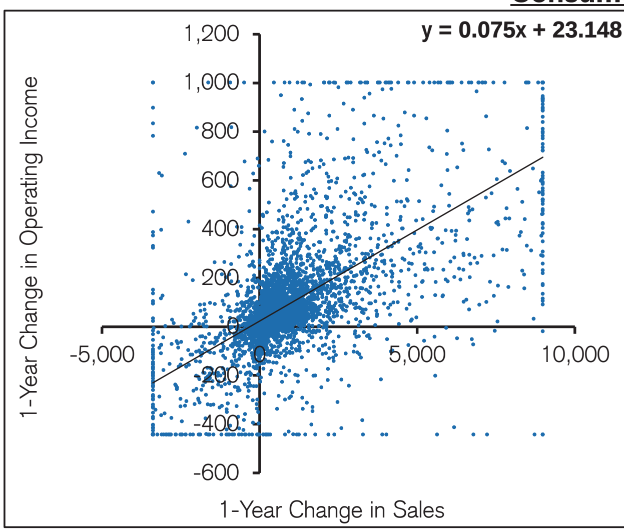
Exhibit 12: Operating Margin Beta by Sector, 1950-2015

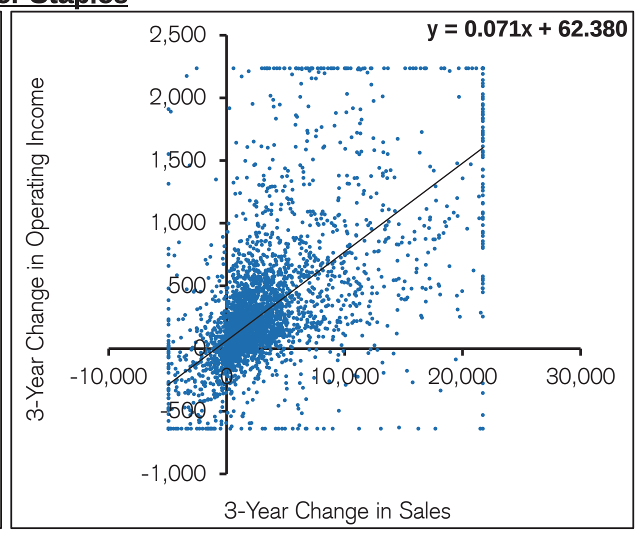
Consumer Discretionary



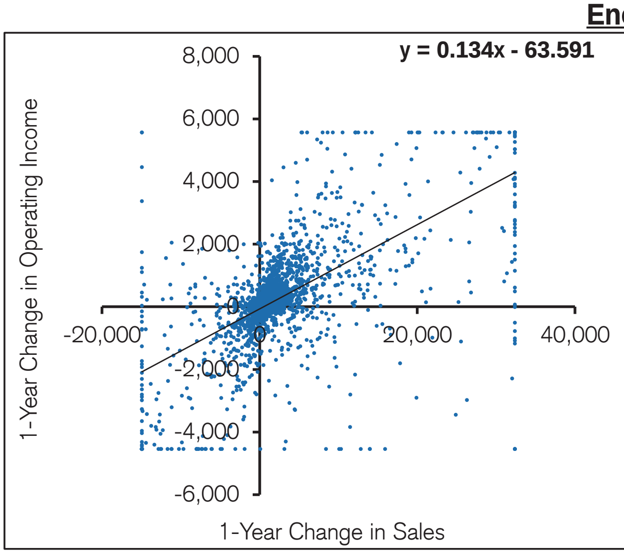


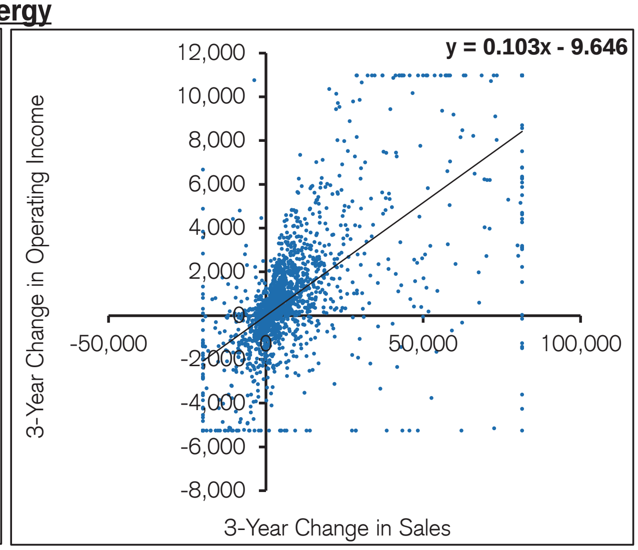
Consumer Staples



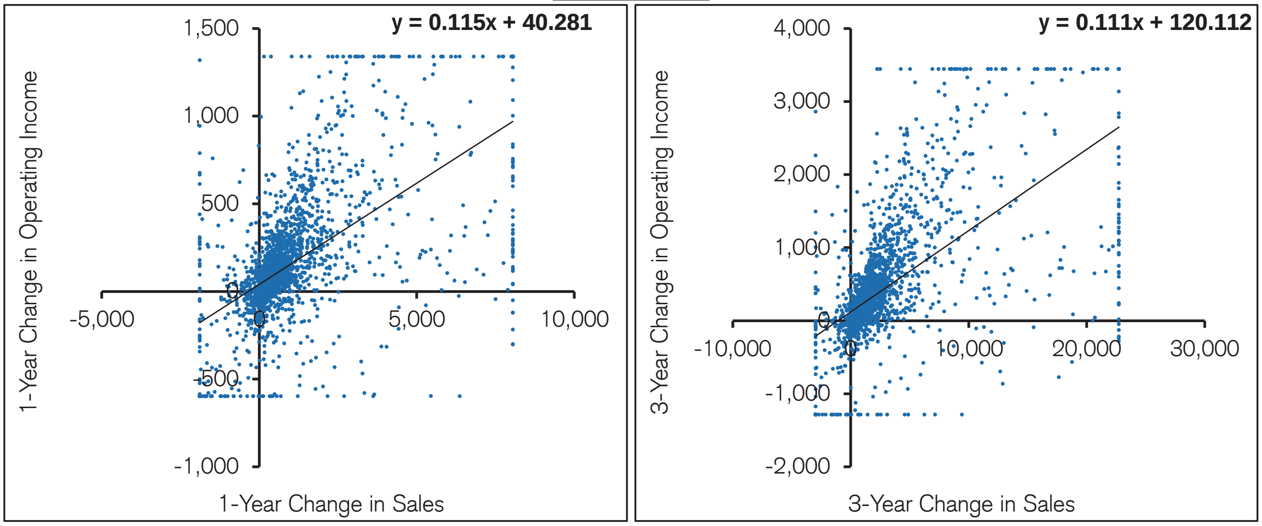


Energy

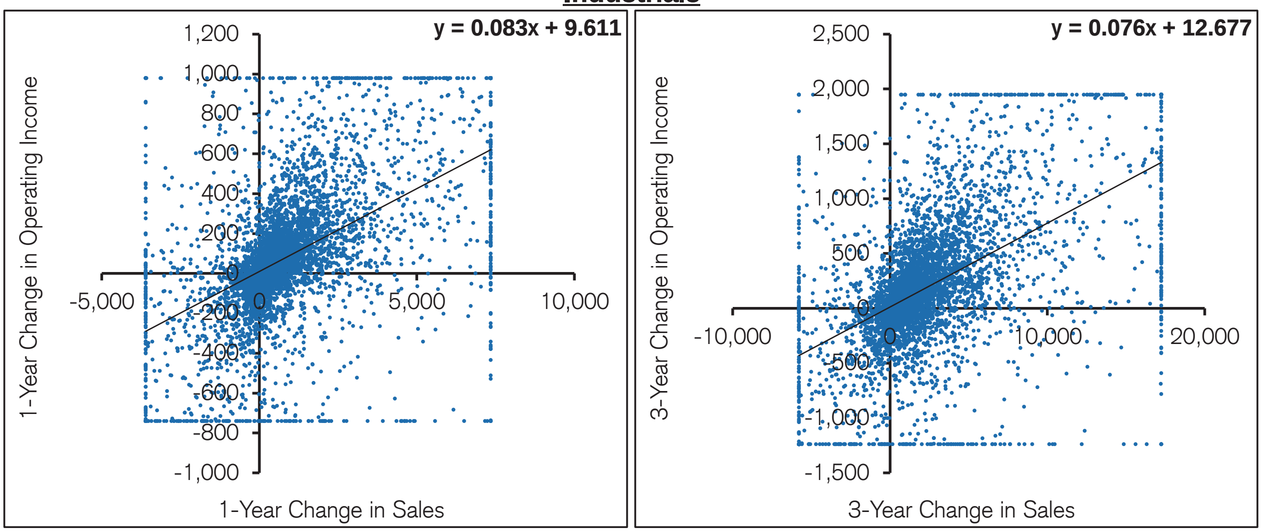




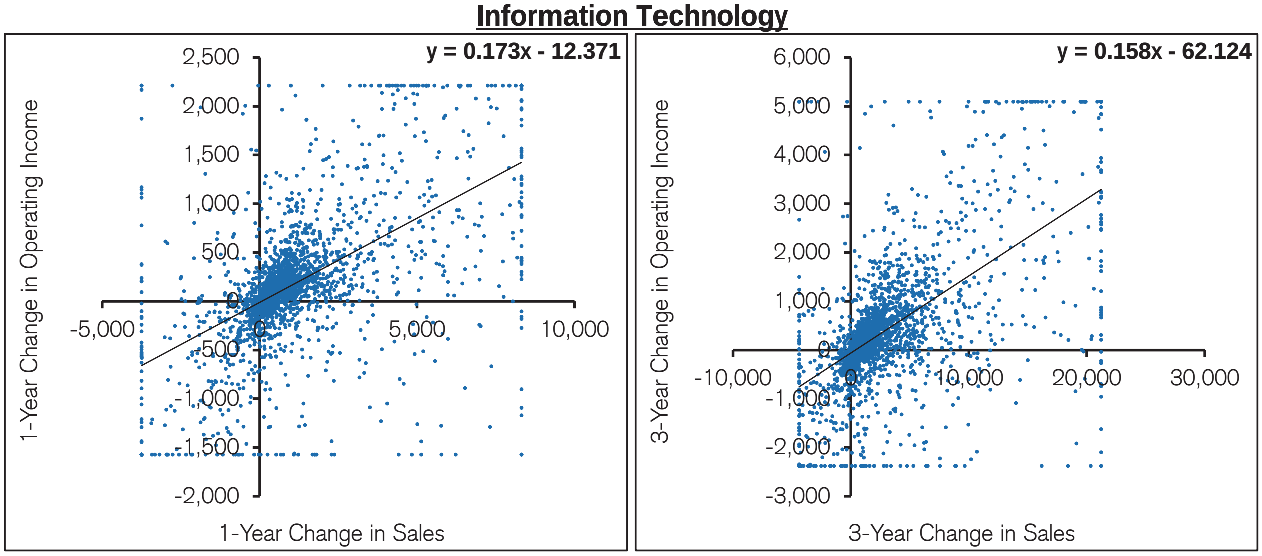
Health Care



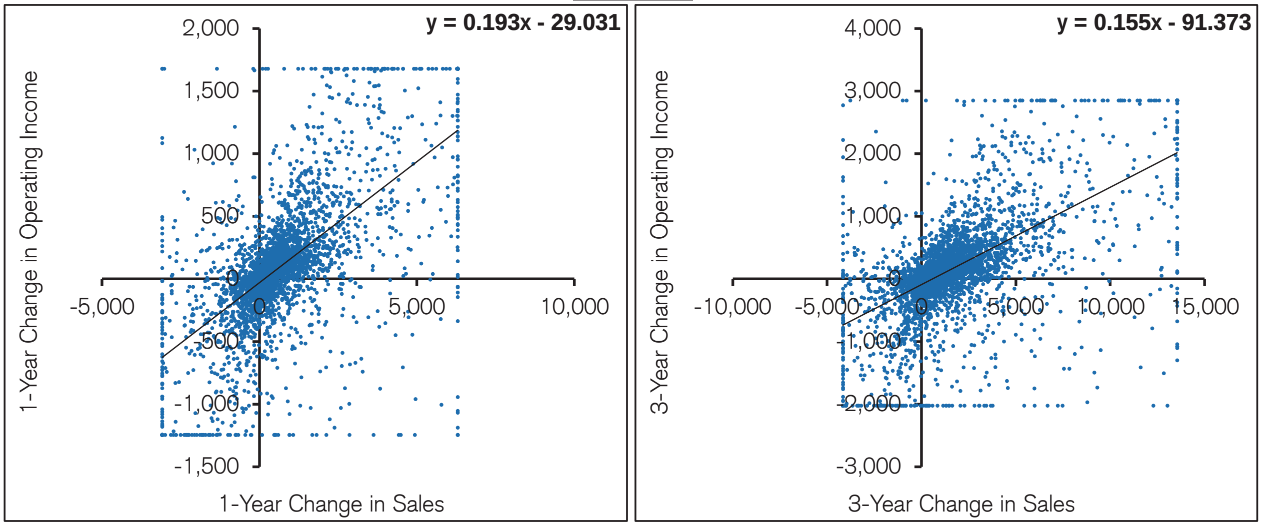
Industrials



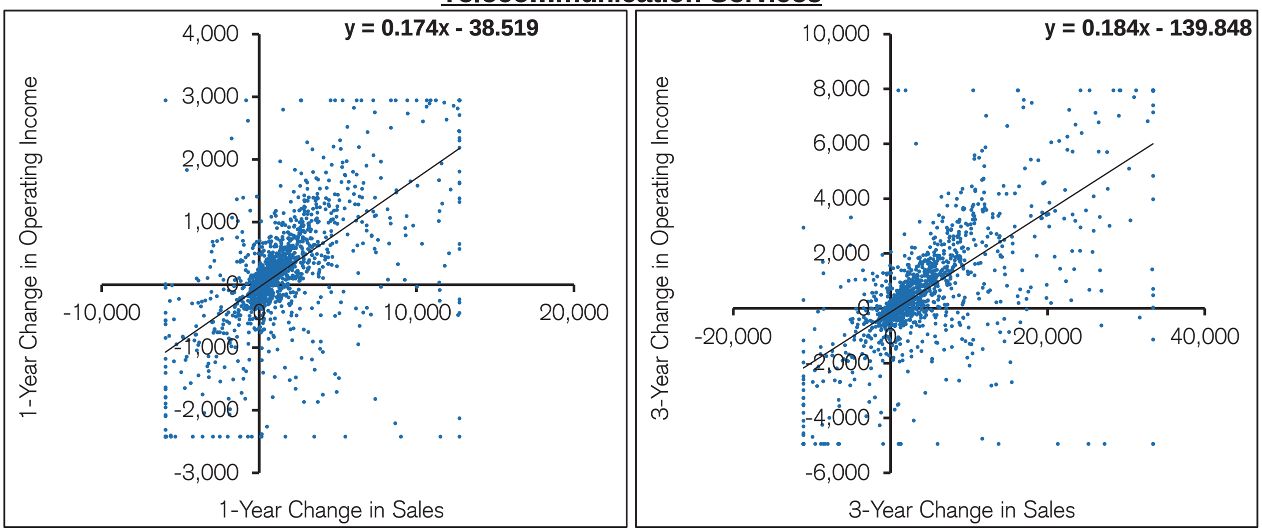
Information Technology



Materials



Telecommunication Services



Source: Credit Suisse HOLT®.
Note: All amounts in 2015 U.S. dollars; winsorized at 2nd and 98th percentiles.

Operating margin β has a few practical uses. The error in analyst forecasts tends to be larger in sectors and industries where the operating margin β is high. For example, earnings surprises are large in the metal industry but small in the food industry.[24] Understanding the full framework for assessing operating leverage is particularly important for sectors and industries with high operating margin β'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.[25]

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 β. 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.[26]

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.

The Role of Financial Leverage in Earnings Volatility

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 (β)."

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

Company A

	Operating profit	Interest expense	Pretax profit
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).

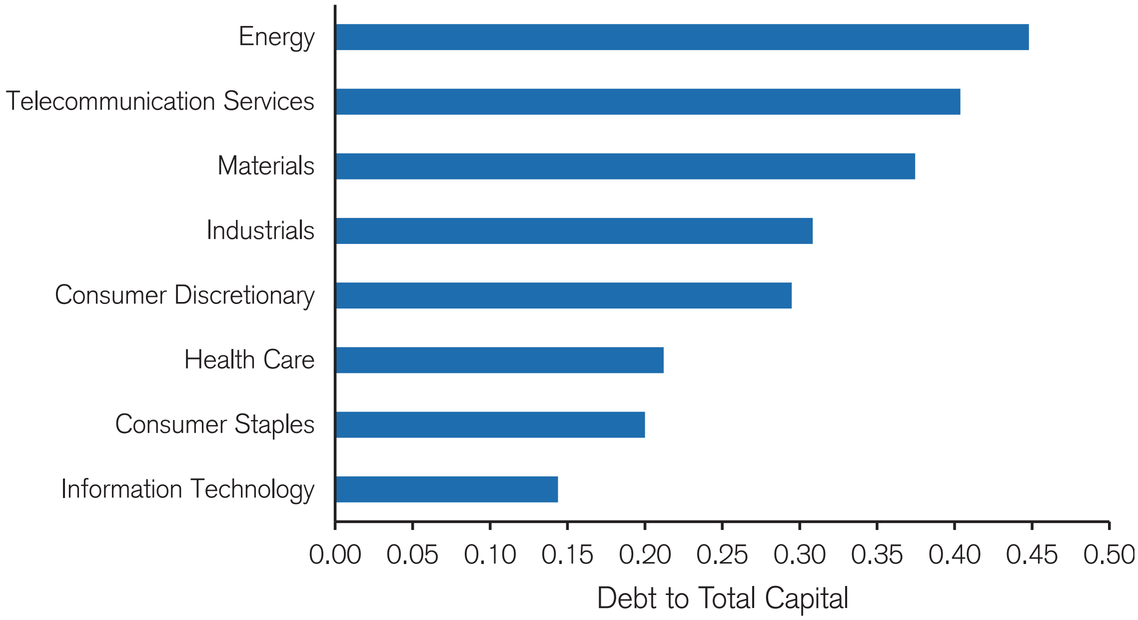
Company B

	Operating profit	Interest expense	Pretax profit
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 and reflects an adjustment for leases. 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 14 percent on June 30, 2016 (debt of $85 billion and market value of equity of $515 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 2016; 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.[27] 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 β 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.[28] 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.

Appendix: 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.[29]

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:

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
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	Free cash flow	Present value of free cash flow	Cumulative present value of free cash flow	Present value of residual value	CUM PV of FCF + PV of residual	Shareholder value added
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.

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

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:

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

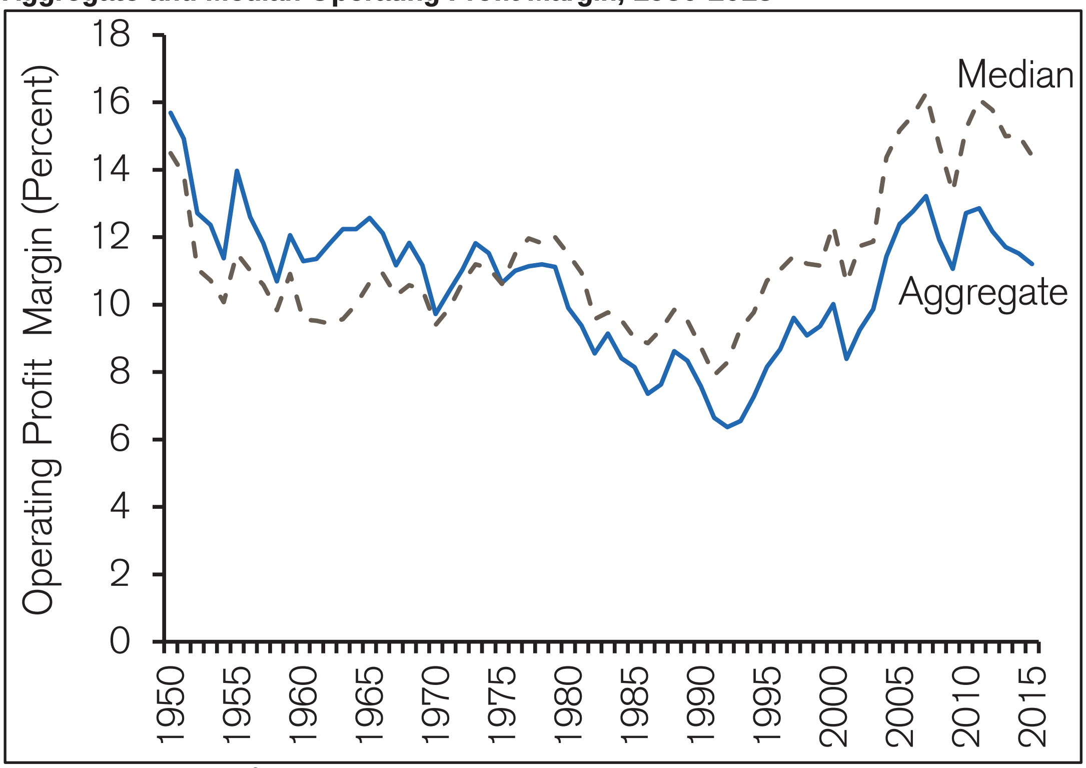
Running the numbers from year 1 to year 2, we see that the threshold margin is also 8.4 percent:

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

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

Operating Profit Margin

Aggregate and Median Operating Profit Margin, 1950-2015



Source: Credit Suisse HOLT®.

Why Operating Profit Margin Is Important

A company creates value when it generates earnings in excess of the opportunity cost of the capital it deploys. Operating profit margin, which is the ratio of operating income to sales, is one of the crucial indicators of profitability. Since our figures capture reported results, the data reflect stock-based compensation only when the accounting rules have required companies to record it as an expense. This occurred around 2005 for most large companies.

Operating profit is the number from which you subtract cash taxes in order to calculate a company's net operating profit after tax (NOPAT). NOPAT is a central figure in valuation. NOPAT is the number from which you subtract investments to calculate a company's free cash flow (FCF). FCF is the cash that is distributable to a company's debtors and equity holders, and hence is the lifeblood of corporate value. NOPAT is also the numerator of a return on invested capital (ROIC) calculation.

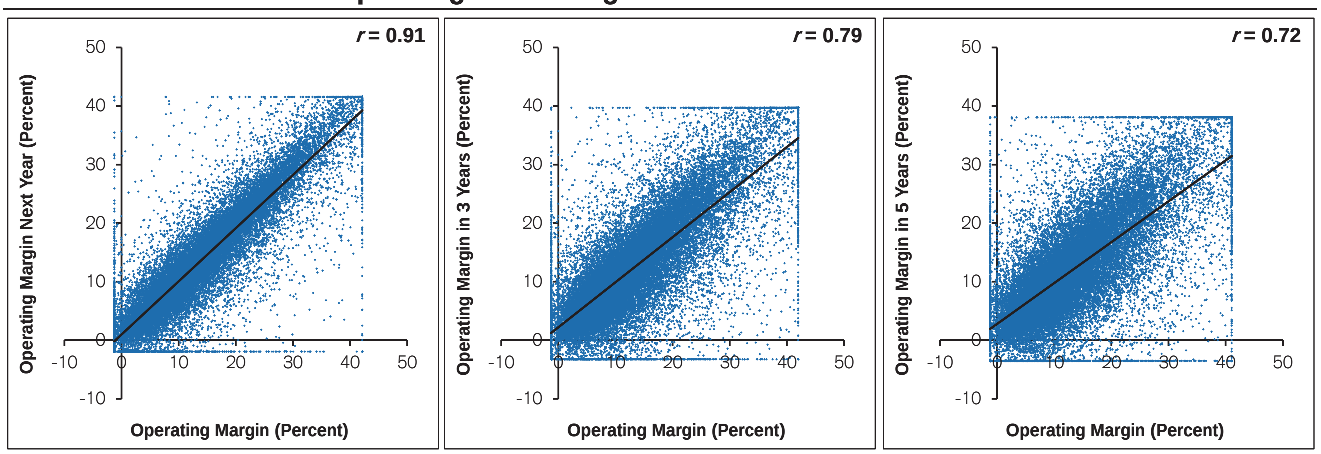
You can decompose ROIC, or a variant such as CFROI, into two parts: profitability (NOPAT/sales) and capital velocity (sales/invested capital). Generally speaking, companies pursuing a cost leadership strategy have low margins and high capital velocity. Think of Wal-Mart Stores as an example. The company does not make much money on each item it sells, but it sells a lot of items. Companies that pursue a differentiation strategy have high margins and low capital velocity. Consider Tiffany & Company, the luxury jewelry retailer, which makes a lot on the items it sells, but does not sell that many items. Operating profit margin is important because it not only measures profitability but it also gives you a sense of a company's competitive positioning.

Persistence of Operating Profit Margin

Exhibit 1 shows that the operating profit margin is very persistent over one-, three-, and five-year periods. For example, the correlation between operating margin in the current year and three years in the future has a coefficient, *r*, of 0.79 (middle panel). But even the five-year correlation is relatively high at 0.72 (right panel).

This universe includes the top 1,000 firms in the world from 1950 to 2015, measured by market capitalization. The sample includes dead companies but excludes firms in the financial and utilities sectors. The data include more than 40,000 company years and there is no need to take into account inflation because operating margin is expressed as a ratio.

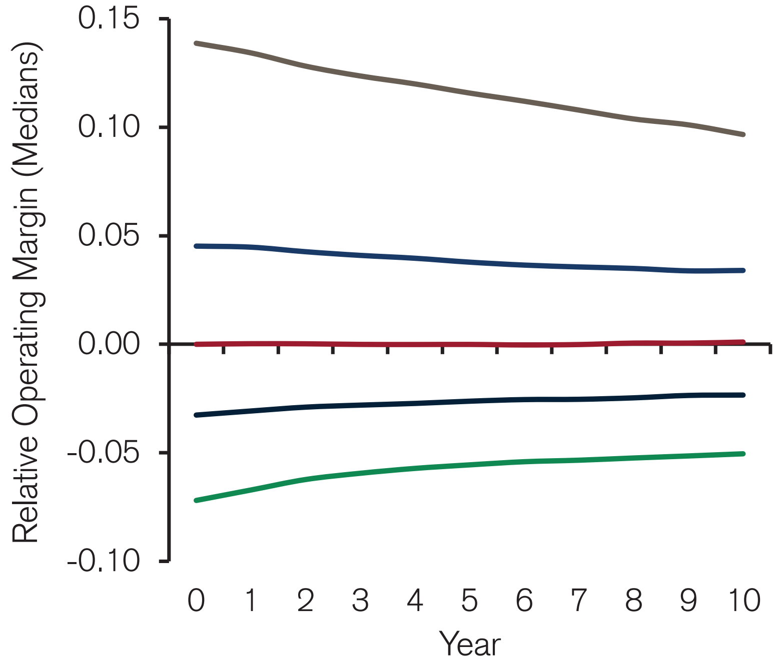
Exhibit 1: Persistence of Operating Profit Margin



Source: Credit Suisse HOLT.
Data winsorized at 2[n] and 98[th] percentile.

Exhibit 2 shows the stability of operating profit margin. We start by sorting companies into quintiles based on operating profit margin at the beginning of a year. For each of the 5 cohorts, we follow the operating profit margin less the median for the full population over 10 years. There is only slight regression toward the mean. The spread from the highest to the lowest quintile only shrinks from 0.21 to 0.15. Given this stability, a sensible approach is to start with last year's operating margin and seek reasons to move away from it.

Exhibit 2: Regression toward the Mean for Operating Profit Margin



Source: Credit Suisse HOLT.

Base Rates of Operating Profit Margin by Sector

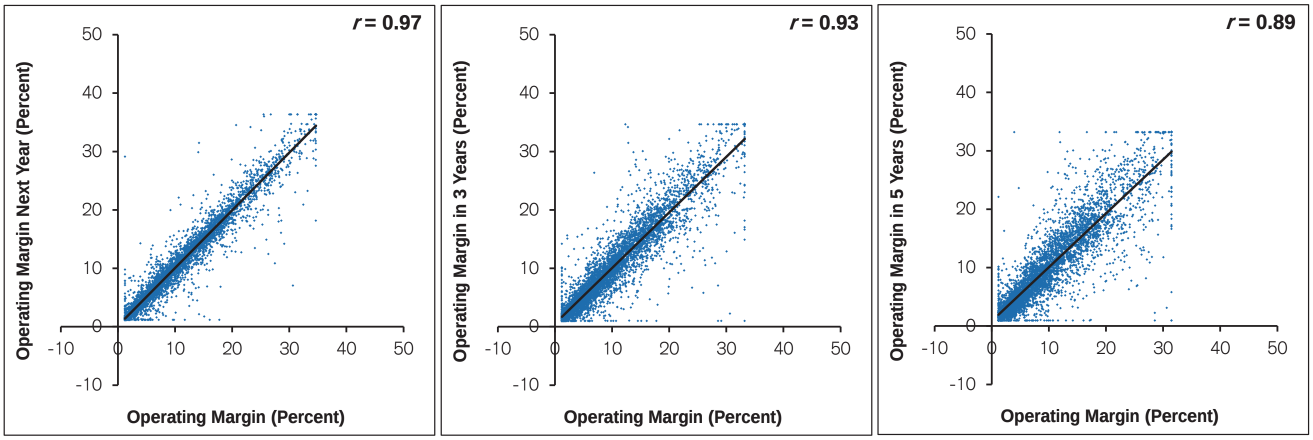
We can refine our analysis by examining operating profit margin at the sector level. This reduces the size of the sample but increases its relevance. We present a guide for calculating the rate of regression toward the mean, as well as the proper mean to use, for eight sectors. We exclude the financial and utilities sectors.

Exhibit 3 examines operating margin in the consumer staples and energy sectors. The panels at the top show the persistence of operating margin for the consumer staples sector. On the right, we see that the correlation between operating margin in the current year and five years in the future is 0.89.

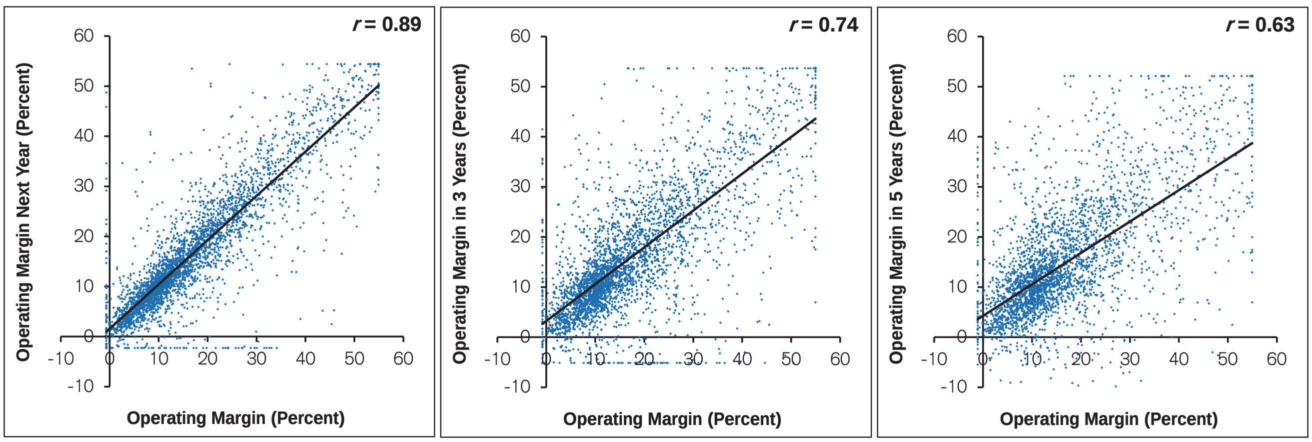
The panels at the bottom of exhibit 3 show the same relationships for the energy sector. On the right, we see that the correlation between operating margin in the current year and five years in the future is 0.63. This suggests that you should expect a slower rate of regression toward the mean in the consumer staples sector than in the energy sector.

Exhibit 3: Correlation Coefficients for Operating Margin in Consumer Staples and Energy

Consumer Staples



Energy



Source: Credit Suisse HOLT.

Exhibit 4 shows the correlation coefficient for five-year changes in operating margin for eight sectors from 1950 to 2015, as well as the standard deviation for the ranges of recorded correlations. Two aspects of the exhibit are worth highlighting. The first is the ordering of *r* from high to low. This gives you a sense of the rate of regression toward the mean by sector. The top half of the list generally consists of consumer-oriented sectors and the bottom half tends to include sectors with more exposure to commodities or technology.

The second aspect is how the correlations change from year to year. The standard deviation for the consumer staples sector was 0.06. With a correlation coefficient of 0.89, that means 68 percent of the observations fell within a range of 0.95 and 0.83. The standard deviation for the energy sector was 0.14. With a correlation coefficient of 0.62, that means 68 percent of the observations fell within a range of 0.48 and 0.76.

Exhibit 4: Correlation Coefficients for Operating Margin for Eight Sectors, 1950-2015

Sector	Five-Year Correlation Coefficient	Standard Deviation
Consumer Staples	0.89	0.06
Health Care	0.74	0.10
Consumer Discretionary	0.73	0.08
Industrials	0.72	0.09
Telecommunication Services	0.63	0.23
Materials	0.62	0.13
Information Technology	0.62	0.13
Energy	0.62	0.14

Source: Credit Suisse HOLT.
Note: Winsorized at 2nd and 98th percentiles—performed at the level of the universe. Average for energy differs slightly compared to exhibit 3, where winsorization was performed at the level of the sector.

Estimating the Mean to Which Results Regress

Exhibit 5 presents guidelines on the rate of regression toward the mean, as well as the mean, for eight sectors. Keep in mind that regression toward the mean works on a population, not necessarily on every individual company.

The third and fourth columns show the median and average operating profit margin for each sector. We also include medians because the operating margin in many sectors does not follow a normal distribution. (When the mean is higher than the median, the distribution is skewed to the right.) Still, the means are only slightly higher than the medians.

The two columns at the right show measures of variability. The coefficient of variation, a normalized measure, measures dispersion. The coefficient of variation equals the standard deviation of operating margin divided by average operating margin. It is not surprising that operating margin is less volatile in consumer staples than it is in energy as energy profits are inherently more volatile.

Exhibit 5: Rate of Regression and toward What Mean Operating Margin Reverts for Eight Sectors, 1950-2015

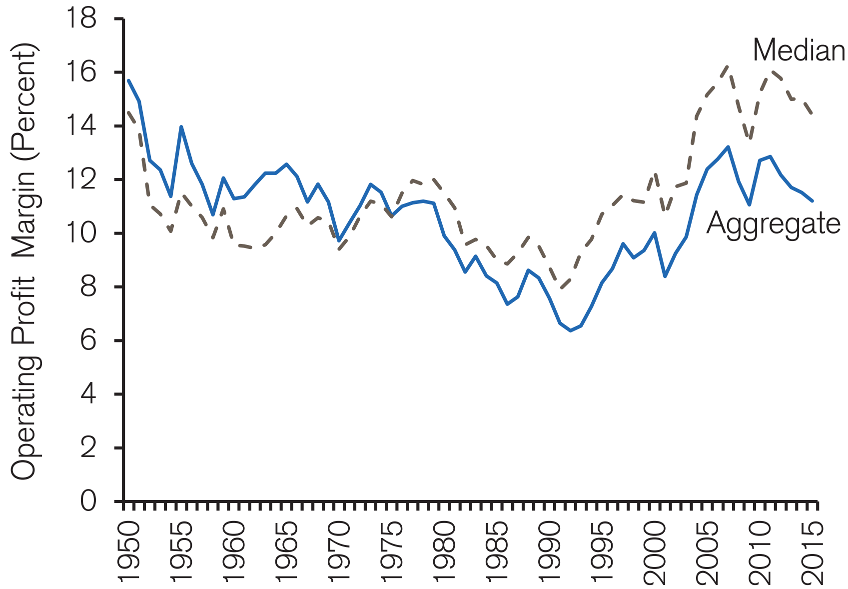
	How *Much* Regression?	Toward *What* Mean?			
Sector	Five-Year Correlation Coefficient	Median	Average	Standard Deviation	Coefficient of Variation
Consumer Staples	0.89	0.09	0.11	0.02	0.21
Health Care	0.74	0.16	0.17	0.02	0.14
Consumer Discretionary	0.73	0.10	0.11	0.01	0.13
Industrials	0.72	0.09	0.11	0.02	0.16
Telecommunication Services	0.63	0.22	0.22	0.04	0.19
Materials	0.62	0.11	0.13	0.03	0.25
Information Technology	0.62	0.13	0.15	0.03	0.23
Energy	0.62	0.14	0.17	0.04	0.24

Source: Credit Suisse HOLT.
Winsorized at 2n and 98th percentile; "Standard deviation" is the standard deviation of the annual average operating margin for the sector.

The Rich Get Richer

Exhibit 6 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. Those businesses tend to have higher operating profit margins than manufacturing businesses.

Exhibit 6: Aggregate and Median Operating Profit Margin, 1950-2015

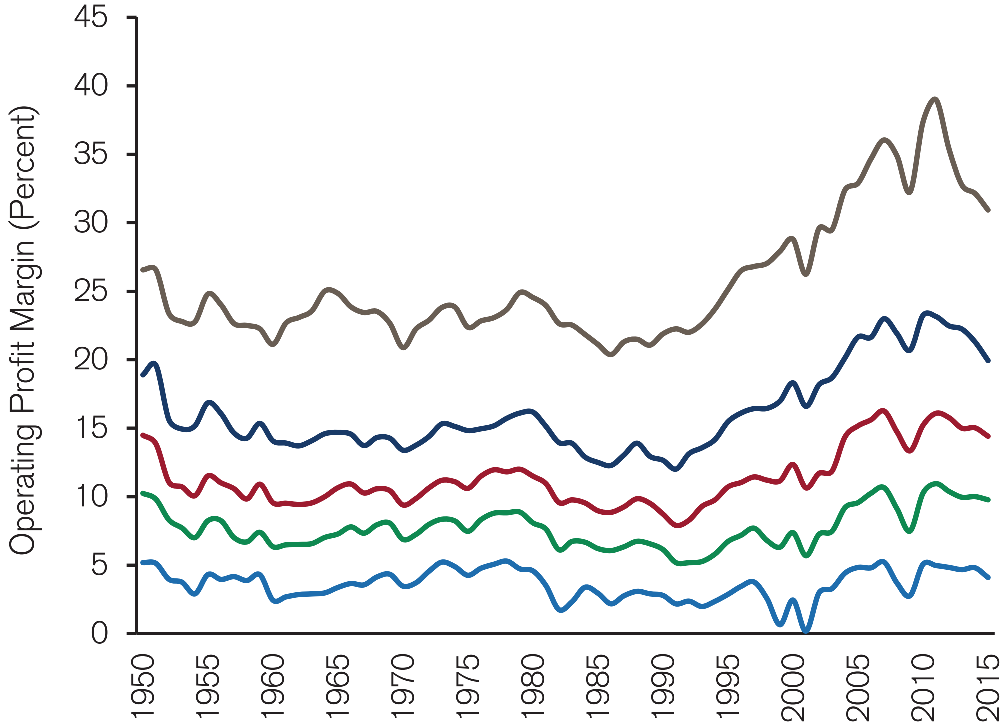


Source: Credit Suisse HOLT®.

Exhibit 7 shows that much of the expansion in aggregate operating profit margin is attributable to the top quintile.[1] 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 profit margins of the bottom three quintiles remain roughly flat. But the top two quintiles, and especially the highest one, show substantial expansion. For example, the operating profit margin for the highest quintile went from 21 percent in 1985 to 31 percent in 2015.

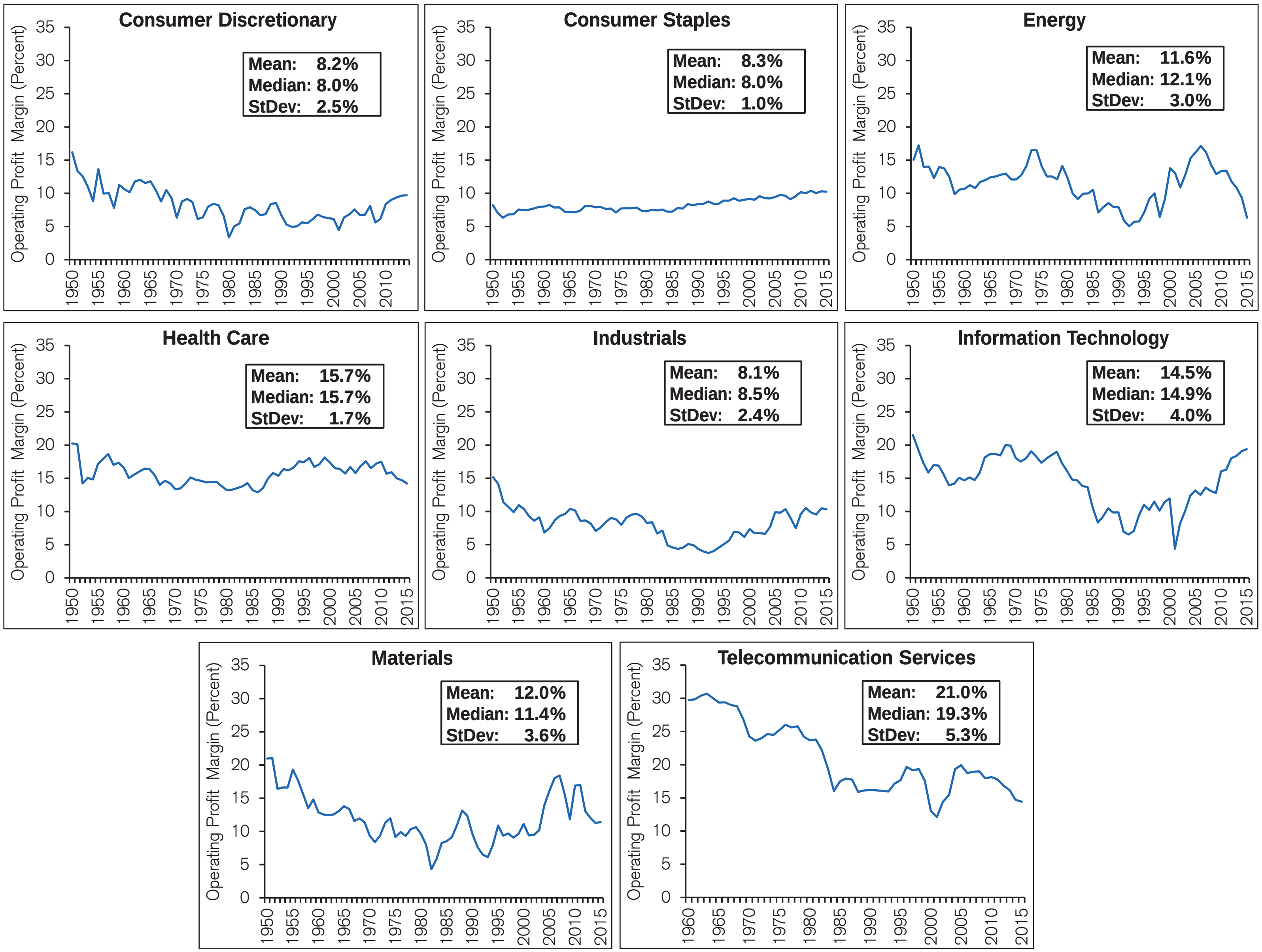
Exhibit 7: Operating Profit Margins on the Rise for the Top 20 Percent, 1950-2015



Source: Credit Suisse HOLT®.

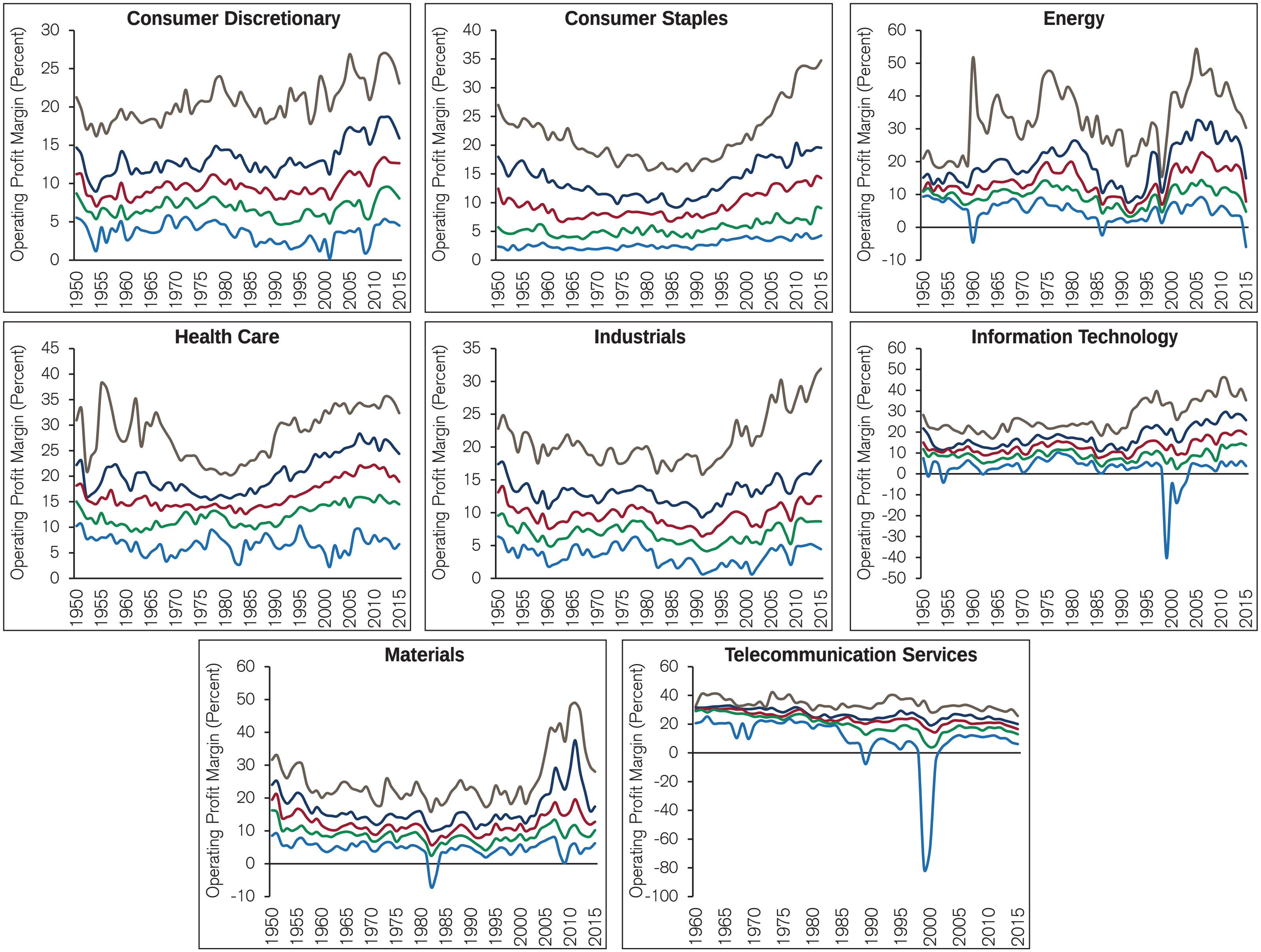
Exhibit 8 shows the trend in operating profit margin for each sector. Note that the relative contribution of each sector changes over time. For example, the energy, materials, and industrial sectors represented 50 percent of the market capitalization of the top 1,500 companies in the U.S. market in 1980, but just 19 percent in 2015. Over the same period, the healthcare and technology sectors went from 18 to 34 percent of the market capitalization. Exhibit 9 shows the operating profit margins by sector broken into quintiles.

Exhibit 8: Operating Profit Margin by Sector, 1950-2015



Source: Credit Suisse HOLT®.

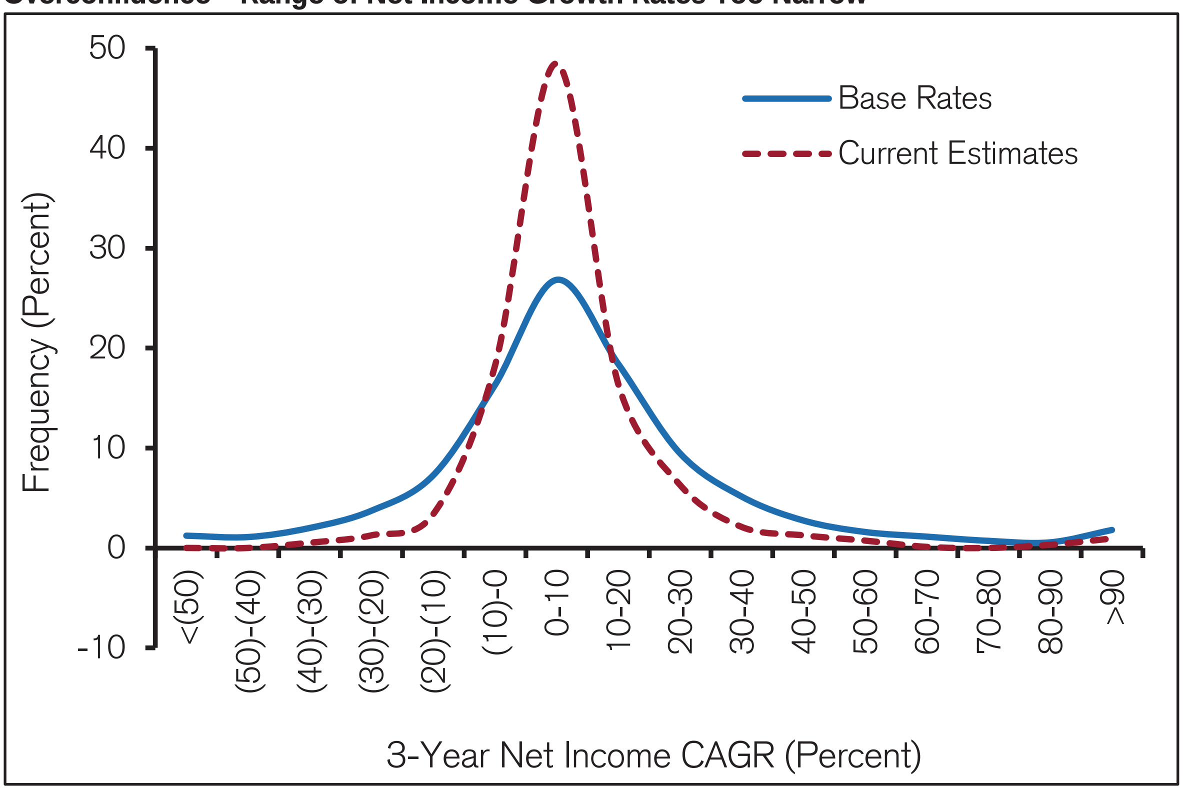
Exhibit 9: Operating Profit Margin by Sector, 1950-2015



Source: Credit Suisse HOLT®.

Earnings Growth

Overconfidence—Range of Net Income Growth Rates Too Narrow



Source: Credit Suisse HOLT® and FactSet.

Why Earnings Growth Is Important

Executives and investors perceive that earnings are the best indicator of corporate results. In a survey of financial executives, nearly two-thirds said that earnings are the most important measure that they report to outsiders and gave it a vastly higher rating than other financial metrics such as revenue growth and cash flow from operations.[1] In a separate survey, a majority of investors indicated that quarterly earnings is the disclosure that is most significant.[2] Consistent with these views, many companies provide some form of earnings guidance, and the price-earnings multiple is the most popular way to assign a value to a company's stock.[3]

Yet earnings have severe limitations as a measure of shareholder value. The main reasons include the fact that management can use alternative accounting methods to calculate earnings, that earnings fail to capture the capital needs of the business, and that earnings don't reflect the cost of capital. As a result, it is possible to increase earnings without creating value.[4]

The popularity of earnings has spawned extensive research on the link between earnings per share (EPS) and stock prices.[5] Studies from the late 1960s show that annual earnings announcements convey information to the market, as measured by a rise in trading volume and stock price volatility.[6] Public companies in the United States were not required to file quarterly income statements, through Form 10-Q, until 1970. Further, companies outside the U.S. realized an increase in the information content of their earnings announcements following the adoption of International Financial Reporting Standards.[7]

Recent work on the impact of earnings not only confirms the original finding, but also shows that the information content of earnings has risen since 2001.[8] One plausible explanation is that since the adoption of Regulation Fair Disclosure in 2000, which ensures that all investors receive financial information at the same time, companies convey less information between earnings reports. Other researchers find that earnings are less relevant today as a result of a broad shift from tangible to intangible investment.[9] To add context to this discussion, researchers estimate that each quarterly earnings announcement reflects one to two percent of the total new information available in each year.[10]

Companies can increase the information content of their earnings disclosure and guidance by providing more detail about the components of earnings. That detail leads to more timely revisions by analysts, more frequent revisions, and a lower dispersion of forecasts among the analysts. Academics have found that about 40 percent of large companies in the U.S. provide no earnings guidance and less than a quarter provide revenue, expense, and earnings forecasts.[11]

Further, studies show that there has been a growing rift between "Street" earnings and earnings based on generally accepted accounting principles (GAAP). In recent decades, companies have been more liberal in excluding "special" or "non-cash items" from GAAP earnings to come up with Street earnings. Potential motivations for emphasizing Street earnings include an effort by managers and investors to boost corporate value and an attempt to remove transitory elements from earnings so as to improve the ability to estimate future cash flows. While it is unclear which motivation is dominant, the research does demonstrate that Street EPS have a higher correlation with stock price movement than GAAP EPS do.[12]

EPS are ubiquitous and provide some information that affect stock prices. Growth in EPS creates shareholder value when a company makes investments that earn a return in excess of the cost of capital. In general, there is a positive correlation between EPS growth and total shareholder return. Indeed, investors who can anticipate earnings in 12 months that are substantially different than today's forecast stand to earn substantial excess returns.[13]

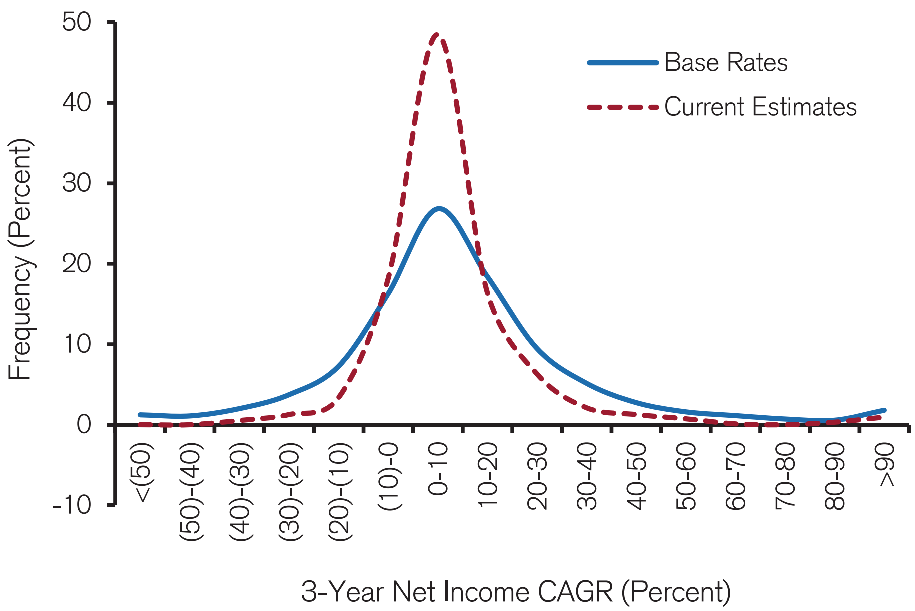
However, earnings growth rates are not very persistent.[14] This suggests that it is hard to predict future growth rates based on the past. You can improve your earnings forecasts by carefully considering accruals. Accruals that are less reliable, such as an estimate for the collection of accounts receivable, are associated with lower earnings persistence than accruals with more persistence such as accounts payable.[15]

The goal of this report is to help guide thinking with regard to earnings growth.[16] This is especially true for growth companies, where analysts tend to be optimistic about the future. Indeed, when sentiment is bullish, earnings forecasts by analysts tend to be optimistic, especially for firms that are difficult to value using conventional measures.[17]

Analysts tend to be too sanguine when they forecast net income growth.[18] Consistent with the overconfidence bias, exhibit 1 shows that the range of expected outcomes is narrower than what the results of the past suggest is reasonable. Both are distributions of net income growth rates annualized over three years for roughly 1,000 of the largest companies by market capitalization in the world. The distribution with the lower peak reflects the actual results since 1950, and the distribution with the higher peak is the set of growth rates that analysts are currently forecasting. We adjust both distributions to remove the effect of inflation.

Specifically, the standard deviation of estimates is 19.2 percent versus a standard deviation of 34.6 percent for the past growth rates. Forecasts are commonly too optimistic and too narrow. The best explanations for the pattern of faulty forecasts include behavioral biases and distortions encouraged by incentives.

Exhibit 1: Overconfidence—Range of Net Income Growth Rates Too Narrow



Source: Credit Suisse HOLT® and FactSet.
Note: I/B/E/S consensus estimates as of September 19, 2016; Sample excludes companies with negative beginning or ending net income.

Base Rates of Earnings Growth

An investor's primary task is to determine whether the expectations for future financial performance, as implied by the stock price, are too optimistic or pessimistic relative to how the company is likely to perform. In other words, the intelligent investor seeks gaps between expectations and fundamentals.[19] This approach does not require forecasts of pinpoint accuracy, but rather only judgments as to whether the expectations embedded in the shares are too high or low.

Sales are the most important driver of corporate value, while earnings are the most common metric to communicate results and to establish value. Sales growth is more persistent than earnings growth, but less predictive of total shareholder return.[20] The sample throughout this report includes the net income growth of the top 1,000 global companies by market capitalization since 1950. These companies currently represent about 60 percent of the global market capitalization. The data include all sectors. The sample size is somewhat smaller than 1,000 in the early years but reaches 1,000 by the late 1960s. The population includes companies that are now dead.

We use a definition of net income that is before extraordinary items. We calculate the compound annual growth rates (CAGR) of net income for 1, 3, 5, and 10 years for each firm. We adjust all of the figures to remove the effects of inflation, which translates all of the numbers to 2015 dollars.

Exhibit 2 shows the results for the full sample. In the panel on the left, the rows show net income growth rates and the columns reflect time periods. Say you want to know what percent of the universe grew net income at a CAGR of 10-20 percent for five years. You start with the row marked "10-20" and slide to the right to find the column "5-Yr." There, you'll see that 20.3 percent of the companies achieved that rate of growth. The panel on the right shows the sample sizes for each growth rate and time period, allowing us to see where the 20.3 percent comes from: 9,087 instances out of the total of 44,874 (9,087/44,874 = 20.3 percent).

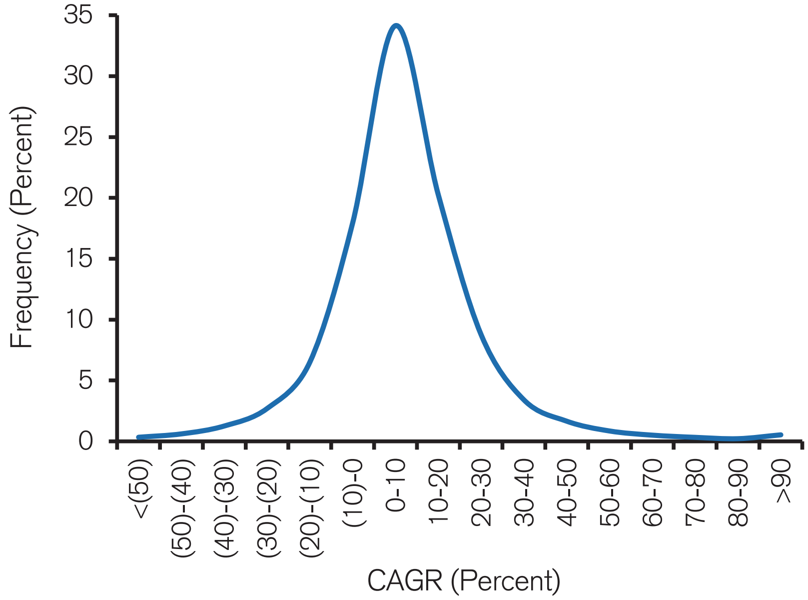
Exhibit 2: Base Rates of Net Income Growth, 1950-2015

Full Universe	Base Rates				Observations			
Net Income CAGR (%)	**1-Yr**	**3-Yr**	**5-Yr**	**10-Yr**	**1-Yr**	**3-Yr**	**5-Yr**	**10-Yr**
<(50)	4.5%	1.2%	0.3%	0.0%	2,374	595	151	5
(50)-(40)	2.1%	1.1%	0.6%	0.1%	1,117	529	275	20
(40)-(30)	3.0%	2.0%	1.3%	0.3%	1,603	969	565	99
(30)-(20)	4.5%	3.7%	2.7%	1.0%	2,362	1,806	1,209	368
(20)-(10)	7.0%	7.3%	6.5%	4.2%	3,679	3,520	2,918	1,577
(10)-0	11.9%	16.3%	17.9%	18.7%	6,310	7,898	8,049	6,976
0-10	18.5%	26.8%	34.1%	47.8%	9,779	13,007	15,322	17,819
10-20	15.0%	18.4%	20.3%	20.5%	7,946	8,924	9,087	7,633
20-30	9.0%	9.5%	8.8%	5.1%	4,762	4,591	3,932	1,899
30-40	5.9%	5.1%	3.4%	1.5%	3,135	2,493	1,528	558
40-50	3.8%	2.7%	1.7%	0.6%	1,999	1,331	743	209
50-60	2.6%	1.6%	0.9%	0.2%	1,393	774	382	69
60-70	1.9%	1.1%	0.5%	0.1%	1,004	548	228	42
70-80	1.5%	0.7%	0.3%	0.0%	803	344	147	13
80-90	1.1%	0.6%	0.2%	0.0%	604	271	98	9
>90	7.6%	1.8%	0.5%	0.0%	4,031	872	240	9
Mean / **Total**	88.8%	10.3%	7.3%	5.8%	52,901	48,472	44,874	37,305
Median	9.2%	6.8%	5.9%	5.2%				
StDev	7842.2%	34.6%	20.2%	11.0%				

Source: Credit Suisse HOLT®.

Exhibit 3 is the distribution for the five-year net income growth rate. This shows, in a graph, what the numbers say in exhibit 2. The mean, or average, growth rate was 7.3 percent per year and the median growth rate was 5.9 percent. The median is a better indicator of the central location of the results because the distribution is skewed to the right. The standard deviation, 20.2 percent, gives an indication of the width of the bell curve.

Exhibit 3: Five-Year CAGR of Net Income, 1950-2015



Source: Credit Suisse HOLT®.

While the data for the full sample are a start, we want to sharpen the reference class of base rates to make the results more relevant and applicable. One way to do that is to break the universe into deciles based on a company's starting annual sales. Within each size decile, we sort the observations of growth rates into bins in increments of 10 percentage points (except for the tails).

The heart of this analysis is exhibit 4, which shows each decile, the total population, and an additional analysis of mega companies (those with sales in excess of $50 billion). Here's how you use the exhibit. Determine the base sales level for the company that you want to model. Then go to the appropriate decile based on that size. You now have the proper reference class and the distribution of growth rates for the various time horizons.

Let's use Alphabet Inc. as an example. As of early September 2016, the consensus for net income growth over the next three years, according to the I/B/E/S consolidated estimate of analysts, is about 15 percent per year after accounting for inflation. We first find the correct reference class. In this case, it's the bin that has a sales base in excess of $50 billion. Next we examine the row of growth that is marked "10-20," representing a net income growth rate of between 10 and 20 percent. Going out to the column under "3-Yr," we see that 15.4 percent of companies achieved this feat.

In total, exhibit 4 shows results for 44 reference classes (11 size ranges times 4 time horizons) that should cover the vast majority of possible outcomes for net income growth. The appendix contains the sample sizes for each of the reference classes. We will show how to incorporate these base rates into your forecasts for net income growth in a moment, but for now it's useful to acknowledge the utility of these data as an analytical guide and a valuable reality check.

Exhibit 4: Base Rates by Decile, 1950-2015

Sales: $0-325 Mn	Base Rates			
Net Income CAGR (%)	**1-Yr**	**3-Yr**	**5-Yr**	**10-Yr**
<(50)	2.7%	0.6%	0.2%	0.0%
(50)-(40)	1.3%	0.7%	0.3%	0.0%
(40)-(30)	1.8%	1.0%	0.7%	0.1%
(30)-(20)	2.9%	2.2%	1.3%	0.5%
(20)-(10)	5.0%	4.9%	3.5%	2.2%
(10)-0	10.1%	12.8%	12.7%	11.0%
0-10	19.2%	25.2%	31.0%	42.5%
10-20	15.2%	19.1%	23.6%	26.6%
20-30	9.7%	12.0%	12.3%	10.2%
30-40	7.7%	6.8%	5.4%	3.7%
40-50	4.8%	4.1%	3.2%	1.9%
50-60	3.1%	2.8%	1.8%	0.6%
60-70	2.2%	1.9%	1.4%	0.5%
70-80	1.9%	1.1%	0.9%	0.1%
80-90	1.5%	1.2%	0.5%	0.1%
>90	10.8%	3.7%	1.4%	0.1%
Mean	63.8%	18.4%	14.3%	10.6%
Median	14.0%	11.1%	10.1%	8.5%
StDev	1260.8%	35.8%	23.0%	13.0%

Sales: $325-700 Mn	Base Rates			
Net Income CAGR (%)	**1-Yr**	**3-Yr**	**5-Yr**	**10-Yr**
<(50)	2.5%	0.6%	0.2%	0.0%
(50)-(40)	1.2%	0.6%	0.4%	0.0%
(40)-(30)	2.3%	1.0%	0.7%	0.2%
(30)-(20)	3.1%	2.4%	1.5%	0.5%
(20)-(10)	6.0%	5.6%	4.5%	2.8%
(10)-0	11.5%	14.4%	14.7%	13.0%
0-10	20.7%	29.3%	35.5%	46.8%
10-20	16.2%	19.6%	21.6%	21.2%
20-30	8.8%	9.6%	9.1%	4.6%
30-40	6.0%	4.9%	3.1%	1.2%
40-50	3.9%	2.3%	1.4%	0.4%
50-60	2.5%	1.6%	0.8%	0.1%
60-70	1.9%	1.2%	0.4%	0.1%
70-80	1.6%	0.6%	0.2%	0.1%
80-90	1.2%	0.4%	0.2%	0.0%
>90	5.4%	1.4%	0.3%	0.0%
Mean	32.1%	11.6%	8.6%	6.6%
Median	10.1%	7.7%	6.8%	6.0%
StDev	277.3%	29.8%	17.3%	9.9%

Sales: $700-1,250 Mn	Base Rates			
Net Income CAGR (%)	**1-Yr**	**3-Yr**	**5-Yr**	**10-Yr**
<(50)	3.2%	0.6%	0.2%	0.0%
(50)-(40)	1.7%	0.7%	0.5%	0.0%
(40)-(30)	2.5%	1.8%	1.1%	0.3%
(30)-(20)	4.5%	3.1%	2.0%	0.9%
(20)-(10)	6.3%	6.8%	5.4%	3.7%
(10)-0	12.1%	15.8%	17.0%	17.4%
0-10	21.1%	28.9%	36.7%	51.1%
10-20	16.3%	20.0%	22.1%	20.5%
20-30	8.8%	9.6%	8.0%	4.7%
30-40	6.4%	5.0%	3.4%	0.9%
40-50	3.9%	2.8%	1.7%	0.3%
50-60	2.8%	1.4%	0.7%	0.1%
60-70	2.1%	1.0%	0.4%	0.0%
70-80	1.3%	0.7%	0.3%	0.0%
80-90	1.2%	0.3%	0.2%	0.0%
>90	5.8%	1.4%	0.3%	0.0%
Mean	134.5%	10.5%	7.5%	5.5%
Median	9.3%	7.2%	6.4%	5.3%
StDev	7566.6%	37.5%	18.6%	9.9%

Sales: $1,250-2,000 Mn	Base Rates			
Net Income CAGR (%)	**1-Yr**	**3-Yr**	**5-Yr**	**10-Yr**
<(50)	3.2%	1.2%	0.4%	0.0%
(50)-(40)	1.7%	0.9%	0.4%	0.1%
(40)-(30)	2.9%	2.1%	1.2%	0.1%
(30)-(20)	4.2%	3.4%	2.2%	0.9%
(20)-(10)	7.3%	7.3%	6.2%	4.0%
(10)-0	12.0%	16.0%	17.1%	18.6%
0-10	19.4%	28.0%	36.8%	51.9%
10-20	16.4%	19.0%	20.5%	19.7%
20-30	9.7%	9.6%	9.1%	3.7%
30-40	6.2%	5.0%	3.1%	0.8%
40-50	3.7%	2.8%	1.7%	0.2%
50-60	2.3%	1.7%	0.5%	0.1%
60-70	2.0%	1.0%	0.2%	0.0%
70-80	1.4%	0.5%	0.3%	0.0%
80-90	0.9%	0.4%	0.1%	0.0%
>90	6.6%	1.1%	0.1%	0.0%
Mean	400.9%	8.9%	6.8%	5.1%
Median	9.6%	6.9%	5.9%	5.0%
StDev	25072.1%	27.0%	23.3%	9.3%

Sales: $2,000-3,000 Mn	Base Rates			
Net Income CAGR (%)	**1-Yr**	**3-Yr**	**5-Yr**	**10-Yr**
<(50)	3.7%	1.1%	0.2%	0.0%
(50)-(40)	1.7%	0.8%	0.7%	0.1%
(40)-(30)	2.8%	1.9%	1.2%	0.4%
(30)-(20)	3.9%	3.4%	3.0%	1.1%
(20)-(10)	7.6%	6.7%	6.1%	4.8%
(10)-0	12.5%	17.0%	18.7%	21.2%
0-10	19.8%	28.7%	36.9%	50.8%
10-20	15.7%	19.1%	18.6%	17.2%
20-30	9.3%	8.9%	8.5%	3.4%
30-40	5.4%	5.8%	3.1%	0.8%
40-50	3.7%	2.0%	1.3%	0.2%
50-60	2.6%	1.4%	0.5%	0.1%
60-70	1.9%	1.0%	0.3%	0.0%
70-80	1.3%	0.4%	0.2%	0.0%
80-90	1.1%	0.5%	0.2%	0.0%
>90	6.8%	1.4%	0.4%	0.1%
Mean	42.2%	9.6%	6.2%	4.2%
Median	8.8%	6.6%	5.3%	4.2%
StDev	1041.3%	35.8%	17.7%	9.9%

Sales: $3,000-4,500 Mn	Base Rates			
Net Income CAGR (%)	**1-Yr**	**3-Yr**	**5-Yr**	**10-Yr**
<(50)	4.6%	1.4%	0.5%	0.0%
(50)-(40)	2.2%	0.8%	0.5%	0.1%
(40)-(30)	3.0%	2.3%	1.3%	0.1%
(30)-(20)	4.6%	4.0%	2.9%	1.1%
(20)-(10)	7.4%	7.0%	7.4%	4.7%
(10)-0	11.9%	18.0%	20.2%	20.9%
0-10	18.7%	27.3%	34.8%	50.0%
10-20	15.1%	17.9%	19.3%	18.5%
20-30	9.6%	9.4%	7.6%	3.0%
30-40	5.6%	4.8%	2.9%	0.9%
40-50	3.5%	2.4%	1.0%	0.4%
50-60	2.7%	1.3%	0.6%	0.1%
60-70	1.7%	0.9%	0.3%	0.0%
70-80	1.4%	0.6%	0.1%	0.0%
80-90	0.9%	0.5%	0.1%	0.0%
>90	7.0%	1.4%	0.4%	0.0%
Mean	32.9%	8.5%	5.4%	4.5%
Median	8.8%	6.2%	4.7%	4.3%
StDev	267.0%	28.8%	17.7%	9.8%

Sales: $4,500-7,000 Mn	Base Rates			
Net Income CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr
<(50)	4.5%	1.5%	0.4%	0.1%
(50)-(40)	2.2%	1.5%	0.7%	0.1%
(40)-(30)	3.1%	2.1%	1.2%	0.4%
(30)-(20)	4.8%	4.0%	2.7%	1.4%
(20)-(10)	8.0%	7.8%	7.5%	4.9%
(10)-0	11.6%	17.2%	20.4%	23.0%
0-10	18.4%	26.8%	34.8%	46.7%
10-20	14.6%	18.4%	18.9%	17.8%
20-30	9.3%	9.0%	7.1%	3.9%
30-40	5.0%	4.5%	2.9%	1.1%
40-50	3.7%	2.2%	1.1%	0.4%
50-60	2.8%	1.4%	1.0%	0.1%
60-70	1.7%	0.9%	0.3%	0.0%
70-80	1.7%	0.6%	0.2%	0.0%
80-90	1.2%	0.6%	0.3%	0.0%
>90	7.3%	1.6%	0.4%	0.0%
Mean	77.1%	9.1%	5.7%	4.3%
Median	8.7%	6.0%	4.8%	4.3%
StDev	2177.6%	38.3%	18.6%	10.7%

Sales: $7,000-12,000 Mn	Base Rates			
Net Income CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr
<(50)	5.6%	1.7%	0.6%	0.0%
(50)-(40)	2.7%	1.1%	0.7%	0.1%
(40)-(30)	3.6%	2.4%	1.6%	0.2%
(30)-(20)	4.9%	4.5%	3.5%	1.1%
(20)-(10)	6.8%	8.1%	7.8%	4.9%
(10)-0	12.5%	17.4%	18.2%	21.6%
0-10	16.9%	26.7%	34.1%	46.9%
10-20	14.3%	16.3%	18.6%	18.6%
20-30	8.6%	9.0%	8.0%	4.6%
30-40	5.9%	4.9%	3.3%	1.3%
40-50	3.7%	2.8%	1.6%	0.3%
50-60	2.7%	1.5%	0.7%	0.1%
60-70	1.9%	0.9%	0.4%	0.1%
70-80	1.4%	0.7%	0.3%	0.0%
80-90	0.9%	0.5%	0.2%	0.1%
>90	7.6%	1.6%	0.4%	0.0%
Mean	42.1%	8.5%	5.8%	4.9%
Median	8.1%	5.5%	4.9%	4.4%
StDev	745.4%	35.0%	19.7%	10.9%

Sales: $12,000-25,000 Mn	Base Rates			
Net Income CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr
<(50)	6.5%	1.8%	0.4%	0.0%
(50)-(40)	2.9%	1.6%	0.9%	0.1%
(40)-(30)	3.8%	2.3%	1.9%	0.6%
(30)-(20)	5.7%	4.7%	3.6%	1.5%
(20)-(10)	7.5%	8.8%	8.0%	5.7%
(10)-0	12.9%	17.6%	21.3%	22.4%
0-10	15.6%	24.3%	29.9%	43.3%
10-20	12.7%	17.4%	19.1%	19.2%
20-30	8.5%	8.2%	8.2%	4.5%
30-40	5.2%	4.6%	2.9%	1.6%
40-50	3.3%	2.8%	1.3%	0.5%
50-60	2.4%	1.3%	0.7%	0.2%
60-70	1.8%	1.1%	0.7%	0.1%
70-80	1.4%	0.9%	0.3%	0.1%
80-90	1.1%	0.6%	0.1%	0.1%
>90	8.6%	2.0%	0.8%	0.0%
Mean	64.8%	8.9%	5.8%	4.6%
Median	7.2%	5.2%	4.4%	4.3%
StDev	837.9%	37.6%	21.7%	11.7%

Sales: >$25,000 Mn	Base Rates			
Net Income CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr
<(50)	7.7%	1.9%	0.3%	0.0%
(50)-(40)	3.4%	2.2%	1.2%	0.0%
(40)-(30)	4.2%	3.4%	1.9%	0.2%
(30)-(20)	5.8%	5.7%	5.0%	1.6%
(20)-(10)	7.6%	9.7%	9.8%	6.7%
(10)-0	11.6%	16.7%	20.4%	24.0%
0-10	14.6%	21.9%	28.9%	41.8%
10-20	13.4%	16.4%	17.0%	18.3%
20-30	7.4%	8.6%	8.0%	5.3%
30-40	5.4%	4.8%	3.1%	1.7%
40-50	3.2%	2.8%	1.8%	0.2%
50-60	2.2%	1.4%	1.1%	0.1%
60-70	1.7%	1.2%	0.5%	0.0%
70-80	1.5%	0.8%	0.3%	0.0%
80-90	1.1%	0.5%	0.3%	0.0%
>90	9.2%	2.0%	0.4%	0.0%
Mean	40.8%	7.3%	4.7%	4.3%
Median	6.8%	4.7%	4.0%	4.1%
StDev	487.5%	36.5%	20.4%	11.2%

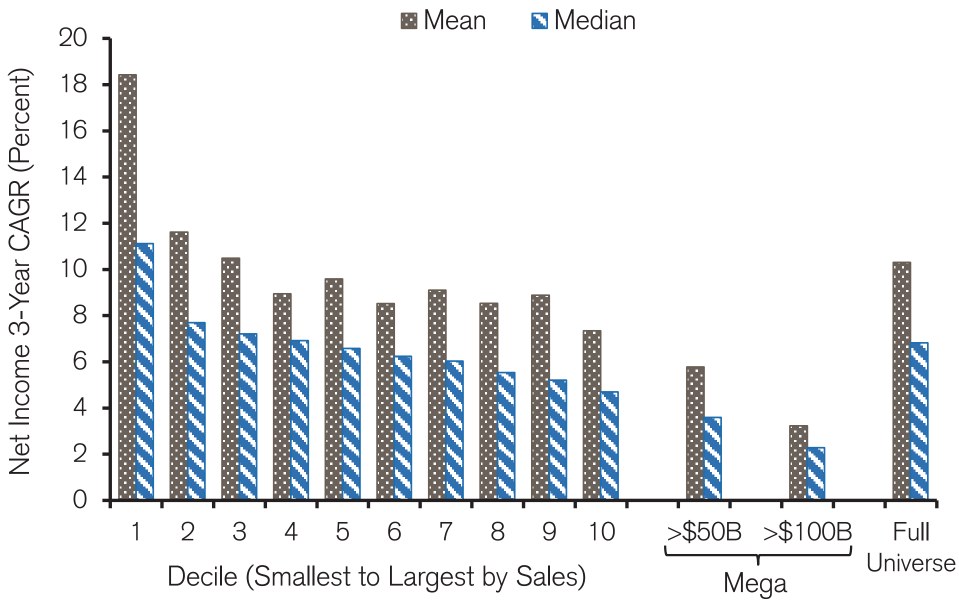
Sales: >$50,000 Mn	Base Rates			
Net Income CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr
<(50)	8.8%	2.1%	0.2%	0.0%
(50)-(40)	3.6%	2.9%	1.4%	0.0%
(40)-(30)	5.1%	4.5%	2.0%	0.2%
(30)-(20)	5.9%	5.6%	5.4%	1.9%
(20)-(10)	8.2%	10.2%	10.4%	6.2%
(10)-0	11.2%	17.3%	22.3%	27.6%
0-10	15.1%	21.2%	29.6%	41.7%
10-20	12.1%	15.4%	14.8%	14.1%
20-30	7.0%	7.5%	6.0%	6.1%
30-40	4.8%	3.9%	3.1%	1.9%
40-50	2.9%	3.3%	1.8%	0.2%
50-60	2.3%	1.4%	1.6%	0.1%
60-70	1.5%	1.3%	0.4%	0.0%
70-80	1.4%	1.0%	0.4%	0.0%
80-90	1.0%	0.6%	0.3%	0.0%
>90	9.0%	2.0%	0.3%	0.0%
Mean	34.6%	5.8%	3.6%	3.8%
Median	5.3%	3.6%	2.5%	3.3%
StDev	346.5%	33.3%	19.9%	11.2%

Full Universe	Base Rates			
Net Income CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr
<(50)	4.5%	1.2%	0.3%	0.0%
(50)-(40)	2.1%	1.1%	0.6%	0.1%
(40)-(30)	3.0%	2.0%	1.3%	0.3%
(30)-(20)	4.5%	3.7%	2.7%	1.0%
(20)-(10)	7.0%	7.3%	6.5%	4.2%
(10)-0	11.9%	16.3%	17.9%	18.7%
0-10	18.5%	26.8%	34.1%	47.8%
10-20	15.0%	18.4%	20.3%	20.5%
20-30	9.0%	9.5%	8.8%	5.1%
30-40	5.9%	5.1%	3.4%	1.5%
40-50	3.8%	2.7%	1.7%	0.6%
50-60	2.6%	1.6%	0.9%	0.2%
60-70	1.9%	1.1%	0.5%	0.1%
70-80	1.5%	0.7%	0.3%	0.0%
80-90	1.1%	0.6%	0.2%	0.0%
>90	7.6%	1.8%	0.5%	0.0%
Mean	88.8%	10.3%	7.3%	5.8%
Median	9.2%	6.8%	5.9%	5.2%
StDev	7842.2%	34.6%	20.2%	11.0%

Source: Credit Suisse HOLT®.

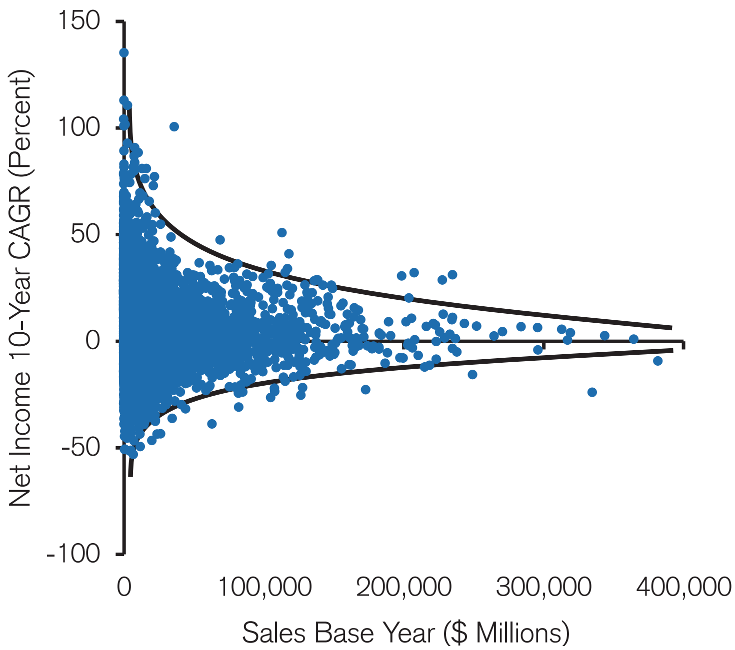
While the value of these data is in the details, there are some useful observations about the whole that are worth keeping in mind. The first is that the median growth rates tend to decline as firm size increases, as does the standard deviation of the growth rates. This point has been well established empirically.[21] Exhibit 5 shows this pattern for annualized net income growth rates over three years. Exhibit 6 reveals that the variance in net income growth rates for ten years declines with size, underscoring that it is sensible to temper expectations about net income growth for large companies.

Exhibit 5: Three-Year Median Net Income Growth Rates Decline with Size



Source: Credit Suisse HOLT®.
Note: Growth rates are annualized over three years.

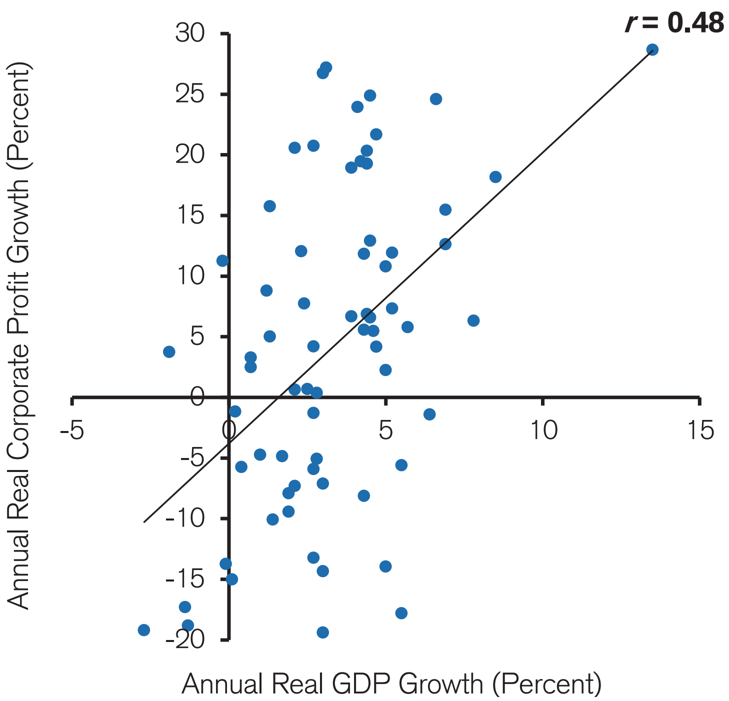
Exhibit 6: Variances in Ten-Year Net Income Growth Rates Decline with Size



Source: Credit Suisse HOLT®.
Note: Base year sales are in 2015 U.S. Dollars.

Next, net income growth follows gross domestic product (GDP) growth reasonably closely in the U.S. (see Exhibit 7). The correlation coefficient is 0.48 between annual GDP growth and after-tax corporate profit from the national income and product accounts (NIPA). Over the 69-year period from 1947 to 2015, U.S. GDP grew 3.2 percent per year, adjusted for inflation, with a standard deviation of 2.6 percent. Net income, also adjusted for inflation, grew at 3.2 percent with a standard deviation of 13.1 percent.

Exhibit 7: Net Income Growth Rate Is Correlated with GDP Growth (1947-2015)



Source: U.S. Bureau of Economic Analysis, retrieved from FRED, Federal Reserve Bank of St. Louis, September 8, 2016: Real Gross Domestic Product, Corporate Profits After Tax (without IVA and CCAdj), and Gross Domestic Product: Implicit Price Deflator.

Warren Buffett, the chairman and CEO of Berkshire Hathaway, admonishes companies to avoid predicting rapid growth. Here's what he wrote in his letter to shareholders in 2000:[22]

> Charlie [Munger] and I think it is both deceptive and dangerous for CEOs to predict growth rates for their companies. They are, of course, frequently egged on to do so by both analysts and their own investor relations departments. They should resist, however, because too often these predictions lead to trouble.
>
> It's fine for a CEO to have his own internal goals and, in our view, it's even appropriate for the CEO to publicly express some hopes about the future, if these expectations are accompanied by sensible caveats. But for a major corporation to predict that its per-share earnings will grow over the long term at, say, 15% annually is to court trouble.
>
> That's true because a growth rate of that magnitude can only be maintained by a very small percentage of large businesses. Here's a test: Examine the record of, say, the 200 highest earning companies from 1970 or 1980 and tabulate how many have increased per-share earnings by 15% annually since those dates. You will find that only a handful have. I would wager you a very significant sum that fewer than 10 of the 200 most profitable companies in 2000 will attain 15% annual growth in earnings-per-share over the next 20 years.

We ran a version of Buffett's test. We started by identifying the 200 companies with the highest net income in 1990. By 2000, only 162 of those companies were still around (mergers and acquisitions claimed most of the others). Of those, less than 9 percent (14 of 162) grew net income at a rate of 15 percent or more from 1990-1999. None of those 14 companies grew at higher than a 15 percent rate for the decade ended in 2009. Buffett's sense of the base rate is accurate.

The reason that unrealistic expectations are worrisome is that executives may start to change their behavior for the worse. His letter continues:

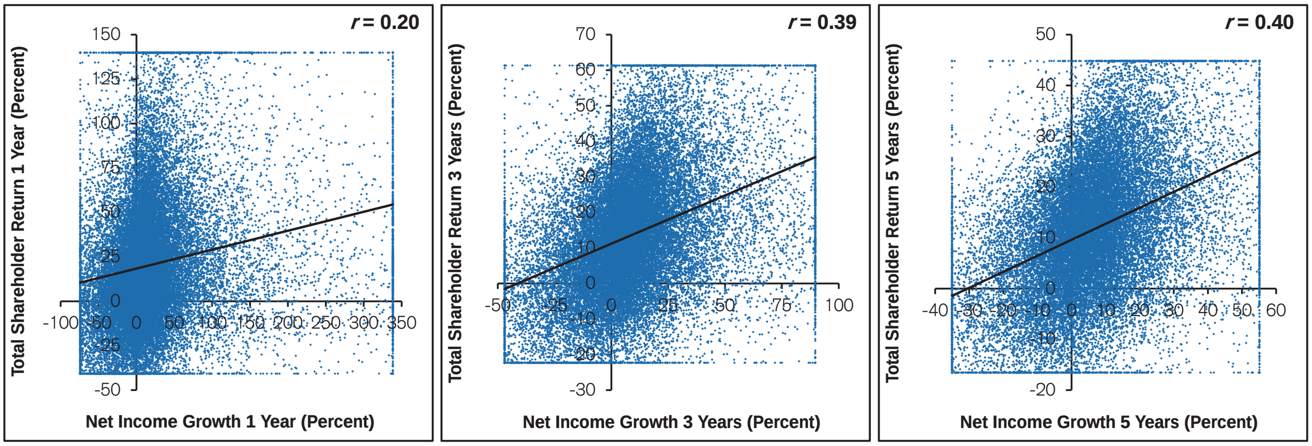
> The problem arising from lofty predictions is not just that they spread unwarranted optimism. Even more troublesome is the fact that they corrode CEO behavior. Over the years, Charlie and I have observed many instances in which CEOs engaged in uneconomic operating maneuvers so that they could meet earnings targets they had announced. Worse still, after exhausting all that operating acrobatics would do, they sometimes played a wide variety of accounting games to "make the numbers." These accounting shenanigans have a way of snowballing: Once a company moves earnings from one period to another, operating shortfalls that occur thereafter require it to engage in further accounting maneuvers that must be even more "heroic." These can turn fudging into fraud. (More money, it has been noted, has been stolen with the point of a pen than at the point of a gun.)
>
> Charlie and I tend to be leery of companies run by CEOs who woo investors with fancy predictions. A few of these managers will prove prophetic — but others will turn out to be congenital optimists, or even charlatans. Unfortunately, it's not easy for investors to know in advance which species they are dealing with.

Finally, notwithstanding our natural tendency to anticipate growth, 33 percent of the companies in the sample had a negative growth rate in net income year over year, after an adjustment for inflation. Further, 31 percent of the firms realized lower net income for 3 years, 29 percent for 5 years, and 24 percent for 10 years.

Earnings and Total Shareholder Returns

Net income is hard to forecast but there is a solid positive correlation between net income growth and total shareholder return. Exhibit 8 shows that the correlation coefficient is 0.20 for 1 year, 0.39 for 3 years, and 0.40 for 5 years. So there is a potential payoff from successfully predicting net income growth, but the ability to do so is challenging.

Exhibit 8: Correlation between Net Income Growth Rates and Total Shareholder Returns over 1-, 3-, and 5-Year Horizons



Source: Credit Suisse HOLT®.
Note: Calculations use annual data on rolling 1-, 3-, 5-year basis; Winsorized at 2nd and 98th percentiles; Growth rates, TSRs annualized; 1985-2015.

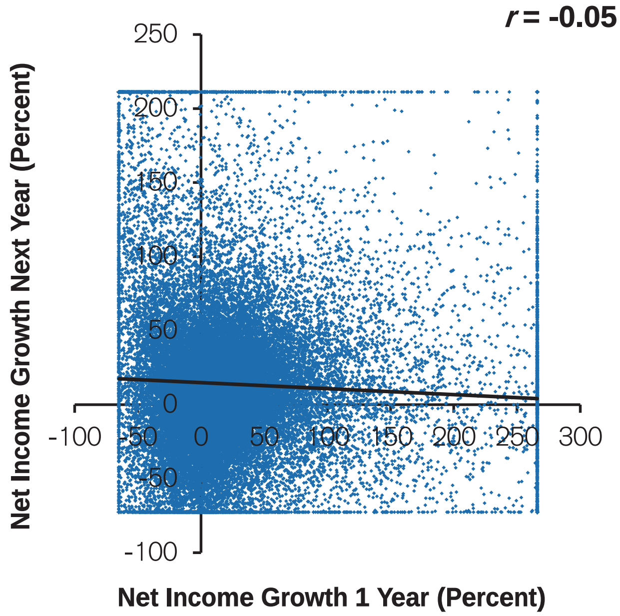
Using Base Rates to Model Earnings Growth

Studying base rates for net income growth is logical for three reasons. First, net income growth, despite its flaws, is the most popular measure of corporate results. Second, net income growth does have a decent correlation with total shareholder return. Net income growth is not persistent, but it is predictive of changes in stock price. Finally, earnings are a significant component of many incentive compensation programs.

Exhibit 9 shows that the correlation coefficient is -0.05 for the year-to-year net income growth rate. This includes the top 1,000 global companies by market capitalization from 1950 to 2015. Nearly 50,000 company years are in the data, and all of the figures are adjusted for inflation.

You can interpret this result as follows: for a population of companies with net income growth that is far from average in a particular year, the expected value of the next year's net income growth is close to the average. For companies with high growth, the expected value is actually slightly below the average growth rate, and for companies with low growth the expected value is slightly above the average growth rate. You can refine this analysis by examining sectors and industries, which shrinks the sample size but increases its relevance.

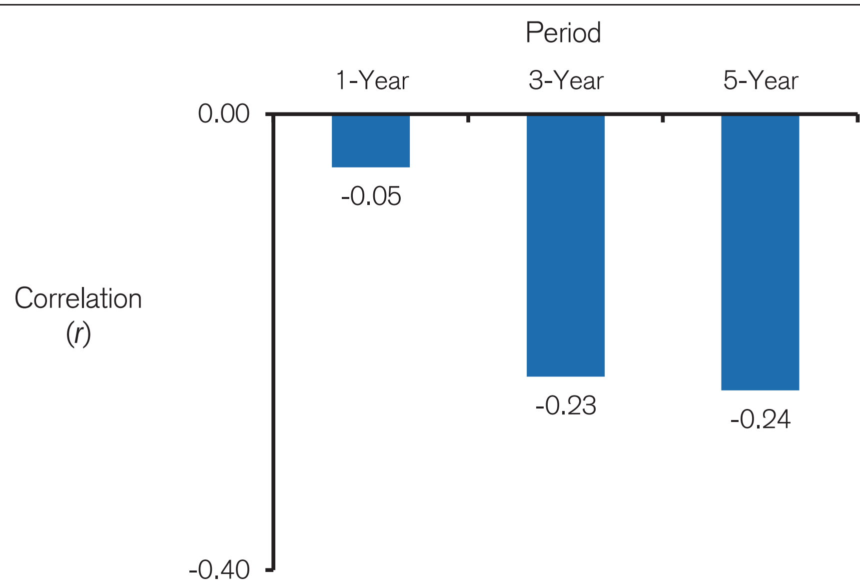
Exhibit 9: Correlation of One-Year Net Income Growth Rates



Source: Credit Suisse HOLT®.
Note: Winsorized at 2nd and 98th percentiles.

The correlations decline as we consider longer time periods, which is not surprising. Exhibit 10 shows the correlation coefficients for 1-, 3-, and 5-year horizons for the full population of companies. The lesson is that the base rate for the reference classes, the median net income growth rate, should receive the majority of the weight for forecasts of three years or longer. In fact, you might start with the base rate and seek reasons to move away from it. In addition, companies with net income growth above the average have a slight tendency to swing to growth below the average, and vice versa.

Exhibit 10: Correlation of Net Income Growth Rates for 1-, 3-, and 5-Year Horizons



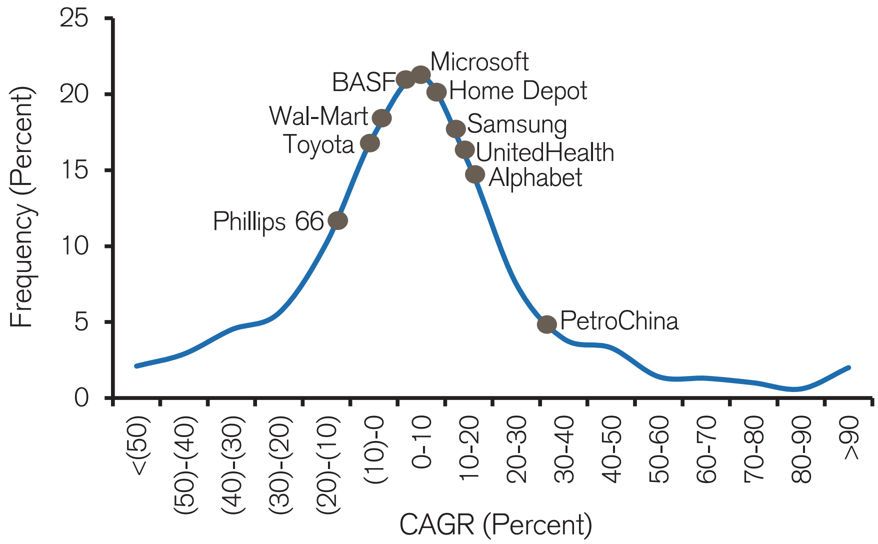
Source: Credit Suisse HOLT®.
Note: Calculations use annual data on a rolling 1-, 3-, and 5-year basis; Winsorized at 2nd and 98th percentiles.

Current Expectations

Exhibit 1 showed the current expectations for net income growth over three years for the largest thousand public companies in the world. The median expected growth rate is seven percent, which is roughly consistent with GDP growth of two to three percent.

Exhibit 11 shows the three-year net income growth rates, adjusted for inflation, which analysts expect for ten companies with sales in excess of $50 billion. We superimposed the expected growth rates on the distribution of historical net income growth rates for mega companies.

Exhibit 11: Three-Year Expected Net Income Growth Rates for Ten Mega Companies



Source: Credit Suisse HOLT® and FactSet.
Note: I/B/E/S consensus estimates as of September 19, 2016.

Appendix: Observations for Each Base Rate by Decile, 1950-2015

Sales: $0-325 Mn	Observations			
Net Income CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr
<(50)	158	33	10	0
(50)-(40)	77	37	15	0
(40)-(30)	107	58	37	7
(30)-(20)	170	120	71	26
(20)-(10)	289	273	190	115
(10)-0	586	714	694	574
0-10	1,117	1,401	1,698	2,224
10-20	883	1,061	1,293	1,390
20-30	562	666	671	535
30-40	447	378	297	195
40-50	277	227	174	100
50-60	181	156	98	33
60-70	127	107	75	25
70-80	112	62	49	4
80-90	90	64	27	3
>90	625	207	76	4
Total	5,808	5,564	5,475	5,235

Sales: $325-700 Mn	Observations			
Net Income CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr
<(50)	145	34	10	2
(50)-(40)	68	34	20	2
(40)-(30)	135	57	36	9
(30)-(20)	181	133	84	25
(20)-(10)	347	312	244	144
(10)-0	667	800	803	683
0-10	1,202	1,632	1,945	2,452
10-20	942	1,090	1,183	1,110
20-30	513	534	498	242
30-40	346	274	170	61
40-50	228	130	76	21
50-60	143	87	42	5
60-70	111	65	21	4
70-80	92	35	12	3
80-90	71	22	11	0
>90	316	78	18	0
Total	5,507	5,317	5,173	4,763

Sales: $700-1,250 Mn	Observations			
Net Income CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr
<(50)	158	30	11	0
(50)-(40)	84	34	24	1
(40)-(30)	127	86	50	13
(30)-(20)	222	148	91	35
(20)-(10)	313	322	247	150
(10)-0	602	753	773	710
0-10	1,051	1,376	1,671	2,079
10-20	813	951	1,006	836
20-30	441	457	364	190
30-40	318	237	155	38
40-50	196	134	78	11
50-60	140	66	30	4
60-70	104	48	18	1
70-80	66	34	12	0
80-90	59	15	7	0
>90	291	66	15	1
Total	4,985	4,757	4,552	4,069

Sales: $1,250-2,000 Mn	Observations			
Net Income CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr
<(50)	148	51	18	0
(50)-(40)	77	40	18	2
(40)-(30)	135	91	50	5
(30)-(20)	197	150	90	31
(20)-(10)	341	320	258	144
(10)-0	555	701	710	677
0-10	902	1,226	1,531	1,892
10-20	763	833	852	717
20-30	450	419	380	134
30-40	290	217	128	28
40-50	173	122	72	7
50-60	109	74	19	4
60-70	91	44	10	1
70-80	65	21	11	0
80-90	42	19	5	0
>90	305	46	5	0
Total	4,643	4,374	4,157	3,642

Sales: $2,000-3,000 Mn	Observations			
Net Income CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr
<(50)	168	47	9	0
(50)-(40)	77	35	27	2
(40)-(30)	128	78	48	13
(30)-(20)	175	141	118	36
(20)-(10)	344	283	239	159
(10)-0	568	712	734	700
0-10	896	1,204	1,445	1,679
10-20	710	801	728	569
20-30	422	374	334	111
30-40	245	242	123	26
40-50	169	86	50	8
50-60	117	59	19	2
60-70	86	41	12	1
70-80	60	18	6	0
80-90	52	20	7	0
>90	310	58	16	2
Total	4,527	4,199	3,915	3,308

Sales: $3,000-4,500 Mn	Observations			
Net Income CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr
<(50)	226	62	19	1
(50)-(40)	106	37	21	3
(40)-(30)	148	102	56	5
(30)-(20)	224	182	120	38
(20)-(10)	363	314	309	160
(10)-0	584	810	838	710
0-10	920	1,226	1,446	1,703
10-20	744	804	804	631
20-30	474	424	318	103
30-40	277	217	122	32
40-50	173	108	41	13
50-60	134	60	23	2
60-70	84	42	11	1
70-80	67	27	6	1
80-90	45	22	5	0
>90	343	61	18	0
Total	4,912	4,498	4,157	3,403

Sales: $4,500-7,000 Mn	Observations			
Net Income CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr
<(50)	239	69	15	2
(50)-(40)	119	70	32	3
(40)-(30)	162	99	52	14
(30)-(20)	254	190	117	48
(20)-(10)	421	370	319	169
(10)-0	615	814	873	789
0-10	975	1,271	1,484	1,597
10-20	775	870	807	609
20-30	492	428	305	133
30-40	266	212	123	36
40-50	196	105	48	15
50-60	148	65	42	5
60-70	92	43	14	1
70-80	91	27	10	1
80-90	63	29	11	1
>90	385	78	17	0
Total	5,293	4,740	4,269	3,423

Sales: $7,000-12,000 Mn	Observations			
Net Income CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr
<(50)	330	88	29	0
(50)-(40)	160	60	31	4
(40)-(30)	212	126	76	9
(30)-(20)	291	239	165	39
(20)-(10)	404	427	369	178
(10)-0	743	922	865	790
0-10	1,001	1,412	1,620	1,714
10-20	846	865	883	678
20-30	507	476	378	169
30-40	348	258	158	46
40-50	218	149	75	11
50-60	160	77	34	4
60-70	111	48	17	5
70-80	84	38	15	1
80-90	56	28	9	3
>90	452	83	21	1
Total	5,923	5,296	4,745	3,652

Sales: $12,000-25,000 Mn	Observations			
Net Income CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr
<(50)	396	95	20	0
(50)-(40)	173	84	41	2
(40)-(30)	230	121	88	19
(30)-(20)	346	250	165	51
(20)-(10)	457	464	372	192
(10)-0	780	929	986	751
0-10	947	1,281	1,385	1,451
10-20	768	916	885	643
20-30	514	431	379	152
30-40	315	242	133	53
40-50	201	146	59	18
50-60	147	68	34	8
60-70	110	56	31	3
70-80	86	45	16	3
80-90	67	30	6	2
>90	520	107	38	0
Total	6,057	5,265	4,638	3,348

Sales: >$25,000 Mn	Observations			
Net Income CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr
<(50)	406	86	10	0
(50)-(40)	176	98	46	1
(40)-(30)	219	151	72	5
(30)-(20)	302	253	188	39
(20)-(10)	400	435	371	166
(10)-0	610	743	773	592
0-10	768	978	1,097	1,028
10-20	702	733	646	450
20-30	387	382	305	130
30-40	283	216	119	43
40-50	168	124	70	5
50-60	114	62	41	2
60-70	88	54	19	0
70-80	80	37	10	0
80-90	59	22	10	0
>90	484	88	16	1
Total	5,246	4,462	3,793	2,462

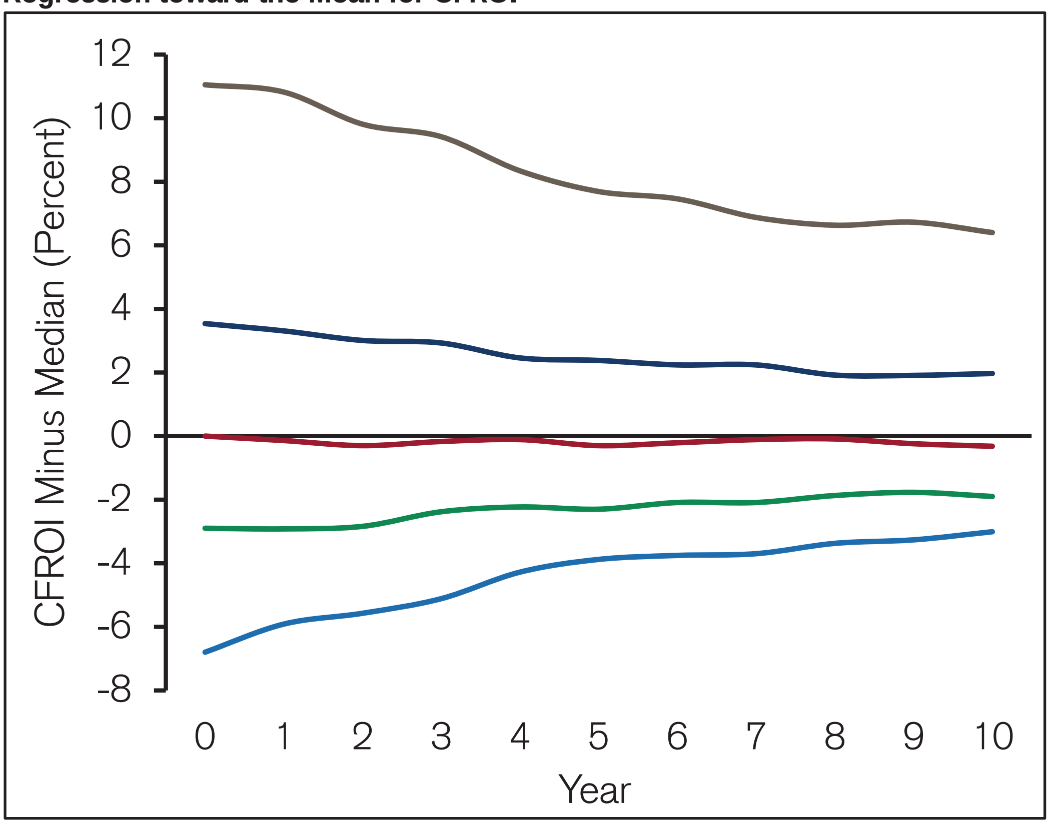
Sales: >$50,000 Mn	Observations			
Net Income CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr
<(50)	195	39	3	0
(50)-(40)	79	53	21	0
(40)-(30)	112	82	30	2
(30)-(20)	131	104	83	18
(20)-(10)	181	188	159	58
(10)-0	246	318	340	259
0-10	334	390	452	392
10-20	268	283	226	133
20-30	154	138	92	57
30-40	105	72	48	18
40-50	63	60	27	2
50-60	51	26	25	1
60-70	34	24	6	0
70-80	31	18	6	0
80-90	23	11	5	0
>90	199	36	4	0
Total	2,206	1,842	1,527	940

Full Universe	Observations			
Net Income CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr
<(50)	2,374	595	151	5
(50)-(40)	1,117	529	275	20
(40)-(30)	1,603	969	565	99
(30)-(20)	2,362	1,806	1,209	368
(20)-(10)	3,679	3,520	2,918	1,577
(10)-0	6,310	7,898	8,049	6,976
0-10	9,779	13,007	15,322	17,819
10-20	7,946	8,924	9,087	7,633
20-30	4,762	4,591	3,932	1,899
30-40	3,135	2,493	1,528	558
40-50	1,999	1,331	743	209
50-60	1,393	774	382	69
60-70	1,004	548	228	42
70-80	803	344	147	13
80-90	604	271	98	9
>90	4,031	872	240	9
Total	52,901	48,472	44,874	37,305

Source: Credit Suisse HOLT®.

Cash Flow Return on Investment (CFROI)

Regression toward the Mean for CFROI



Source: Credit Suisse HOLT.

Why CFROI Is Important

Cash Flow Return on Investment (CFROI) reflects a company's economic return on capital deployed by considering a company's inflation-adjusted cash flow and operating assets. CFROI aims to remove the vagaries of accounting figures in order to provide a metric that allows for comparison of corporate performance across a portfolio, a market, or a universe (cross sectional) as well as over time (longitudinal).[1]

CFROI is important for a few reasons. First, it shows which companies are creating value using a sound economic framework. The model also allows you to get a sense of market expectations, or what is priced into the shares. Finally, CFROI provides for direct comparability across time, industries, and geographies.

The calculation of CFROI starts with a measure of inflation-adjusted gross cash flows available to all capital owners and compares that to the inflation-adjusted gross investment made by the capital owners. It then translates this ratio into an internal rate of return by recognizing the finite economic life of depreciating assets and the residual value of non-depreciating assets.

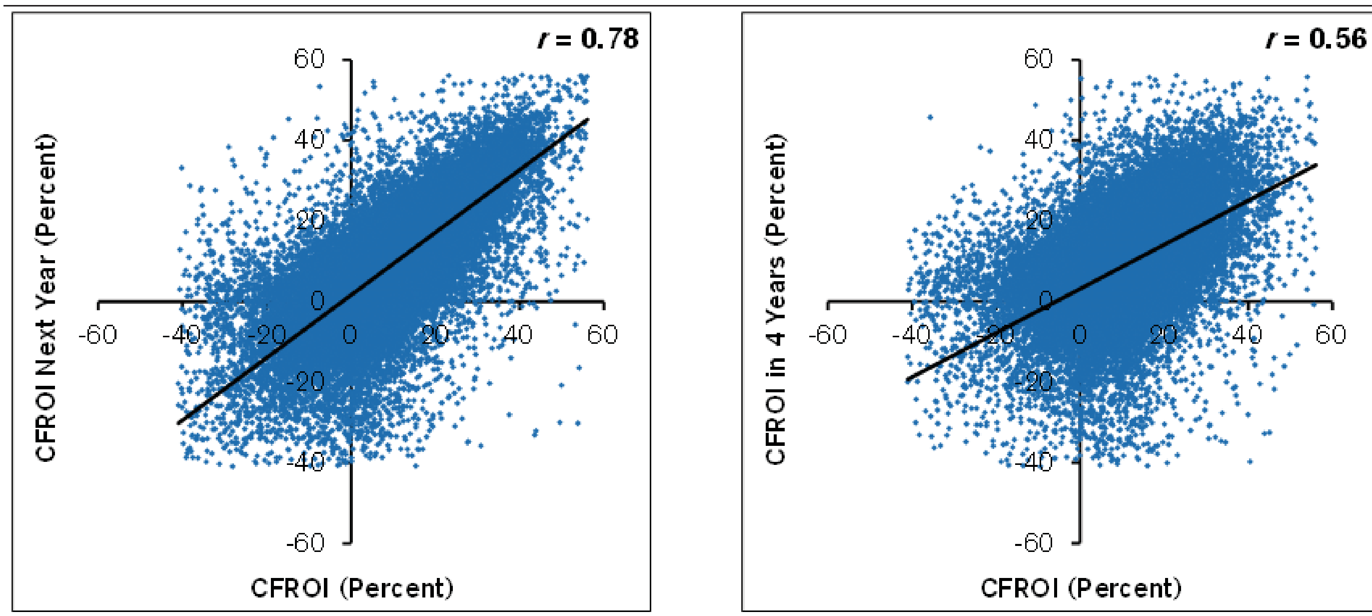
CFROI is appropriate for industrial and service firms. However, Cash Flow Return on Equity (CFROE®) is a better measure for financial companies. Similar to CFROI, CFROE reflects economic adjustments but also reflects that lenders utilize the liability side of the balance sheet to generate value.

Persistence of CFROI

Exhibit 1 shows that CFROI is reasonably persistent over one- and four-year periods. The correlation between CFROI in the current year and four years in the future has a coefficient, *r*, of 0.56 (right panel of Exhibit 1). The one-year correlation is even higher, at 0.78 (left panel).

This universe includes global companies with a market cap of $250 million scaled over time and covers the years 1983-2015. The sample includes dead companies.

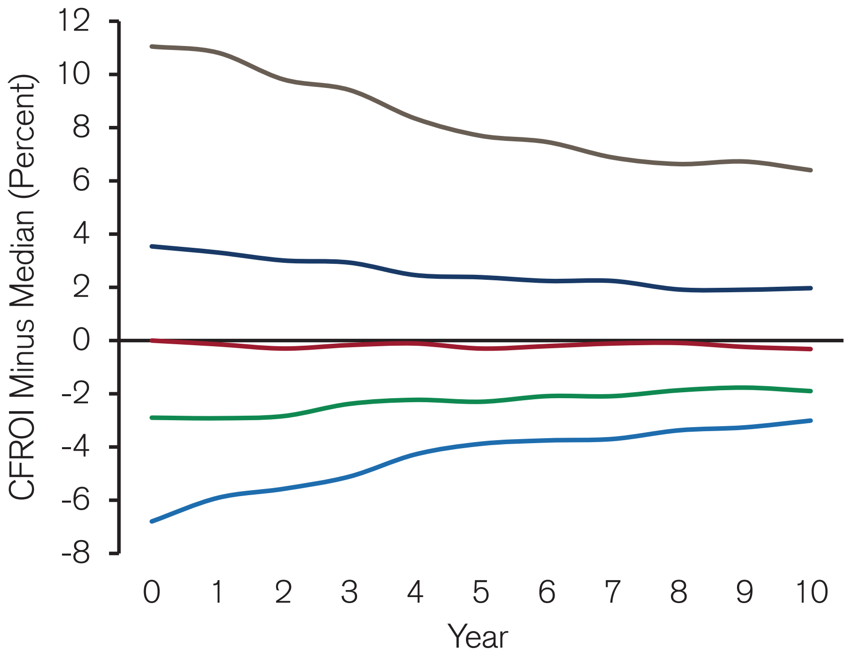
Exhibit 1: Persistence of CFROI, 1983-2015



Source: Credit Suisse HOLT.
Note: Global companies, live and dead, with market capitalizations of $250 million-plus scaled; Winsorized at 1st and 99th percentiles.

Exhibit 2 shows the stability of CFROI.[2] We start by sorting companies into quintiles based on CFROI minus the median of the universe at the beginning of a year. For example, if a company has a 17 percent CFROI and the median is 6 percent, the spread would be 11 percentage points and the company would be in the highest quintile. We then follow the CFROI for each of the 5 cohorts for 10 years. There is modest regression toward the mean. The spread from the highest to the lowest quintile shrinks from 18 to 9 percentage points.

Exhibit 2: Regression toward the Mean for CFROI



Source: Credit Suisse HOLT.
Note: Global companies excluding the financial services and utilities sectors; no size limit; Data reflects fiscal years; updated as of September 19, 2016.

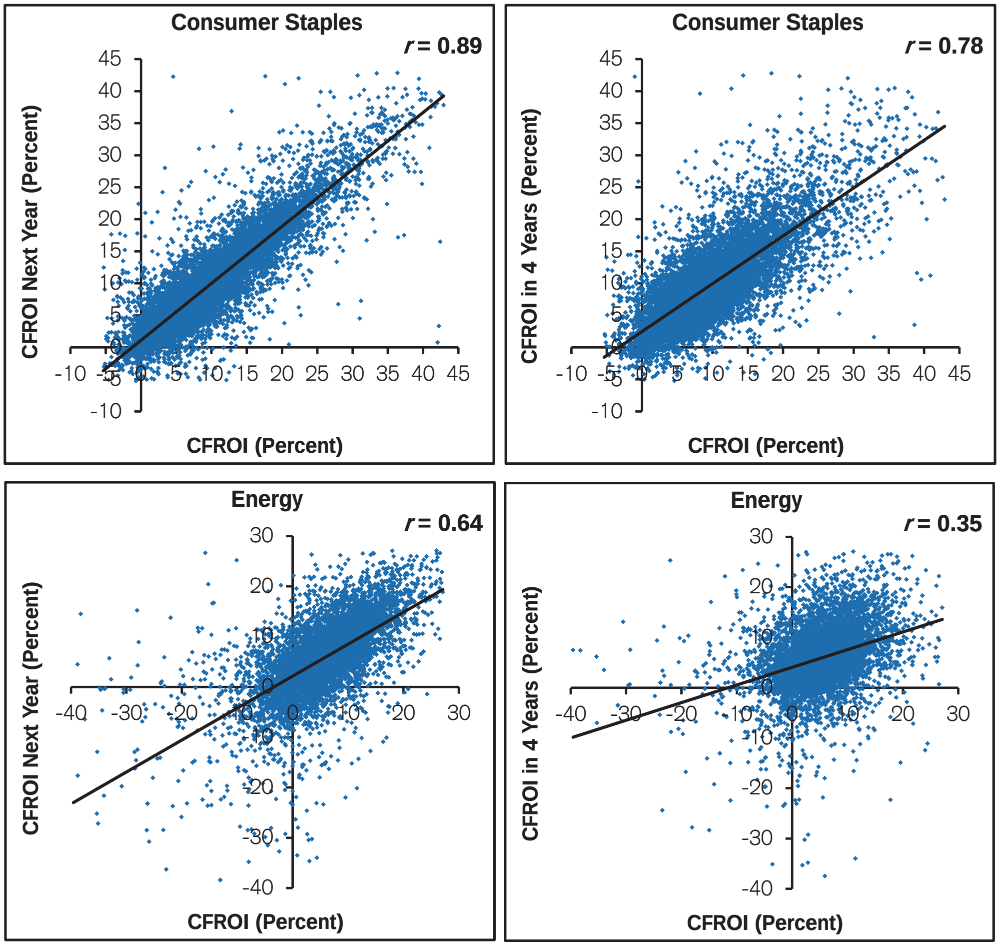
Base Rates of CFROI by Sector

We can refine our analysis by examining CFROI at the sector level. This reduces the size of the sample but increases its relevance. We present a guide for calculating the rate of regression toward the mean, as well as the proper mean to use, for ten sectors.

Exhibit 3 examines operating margin in the consumer staples and energy sectors. The panels at the top show the persistence of CFROI for the consumer staples sector. On the left, we see that the correlation coefficient (*r*) between CFROI from one year to the next is 0.89, and on the right we observe that the correlation between the current year and four years in the future is 0.78.

The panels at the bottom of exhibit 3 show the same relationships for the energy sector. On the left, we see that the correlation between CFROI from one year to the next is 0.64, and on the right we observe that the correlation between the current year and four years in the future is just 0.35. Intuitively, you would expect that a sector with stable demand, such as consumer staples, would have a higher *r* than an industry exposed to commodity markets, such as energy. This is precisely what the data show.

Exhibit 3: Correlation Coefficients for CFROI in Consumer Staples and Energy, 1983-2015



Source: Credit Suisse HOLT.
Note: Global companies, live and dead, with market capitalizations of $250 million-plus scaled; Winsorized at 1st and 99th percentiles.

Note that the correlation coefficient for the four-year change in CFROI is higher than what you would expect by looking solely at the *r* for the one-year change. Take consumer staples as an illustration. Say a company has a CFROI that is 10 percentage points above average. Using the one-year *r*, you'd forecast the excess CFROI spread in 4 years to be 6.3 ($0.89^4 * 10 = 6.3$). But using the four-year *r*, you'd forecast the spread to be 7.8 (0.78 * 10 = 7.8). So using a one-year correlation coefficient overstates the rate of regression toward the mean.[3]

Exhibit 4 shows the average correlation coefficient for the four-year change in CFROI for ten sectors from 1983-2015, as well as the standard deviation for each series. There are two aspects of the exhibit worth emphasizing. The first is the ranking of *r* from the highest to the lowest. This provides a sense of the rate of regression toward the mean by sector. Consumer-oriented sectors are generally at the top of the list, and those sectors that have exposure to commodities tend to be at the bottom.

Also important is how the *r*'s change from year to year. While the ranking is reasonably consistent through time, there is a large range in the standard deviation of *r* for each sector. For example, the *r* for the consumer staples sector was 0.78 from 1983-2015 and had a standard deviation of just 0.04. This means that 68 percent of the observations fell within a range of 0.74 and 0.82. The *r* for the energy sector, by contrast, was

0.35 and had a standard deviation of 0.12. This means that most observations fell between 0.23 and 0.47. Appendix A shows all of the one-year and four-year *r*'s for each of the ten sectors.

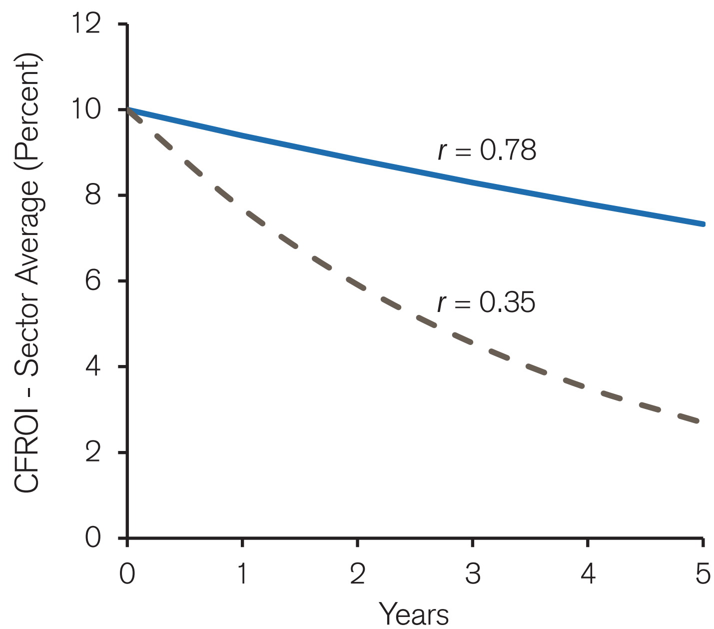
Exhibit 4: Correlation Coefficients for CFROI for Ten Sectors, 1983-2015

Sector	Four-Year Correlation Coefficient	Standard Deviation
Consumer Staples	0.78	0.04
Consumer Discretionary	0.67	0.04
Health Care	0.64	0.08
Industrials	0.62	0.04
Utilities	0.57	0.11
Telecommunication Services	0.55	0.14
Information Technology	0.50	0.10
Financials	0.43	0.10
Materials	0.41	0.07
Energy	0.35	0.12

Source: Credit Suisse HOLT.
Note: Global companies, live and dead, with market capitalizations of $250 million-plus scaled; Winsorized at 1st and 99th percentiles.

Exhibit 5 visually translates *r*'s into the downward slopes for excess CFROIs that they suggest. It shows the rate of regression toward the mean based on four-year *r*'s of 0.78 and 0.35, the numbers that bound our empirical findings. We assume a company is earning a CFROI ten percentage points above the sector average, and show how those returns fade given the assumptions.[15]

Exhibit 5: The Rate of Regression toward the Mean Assuming Different Four-Year *r*'s



Source: Credit Suisse.

Estimating the Mean to Which Results Regress

The second issue we must address is the mean, or average, to which results regress. For some measures, such as sports statistics and the heights of parents and children, the means remain relatively stable over time. But for other measures, including corporate performance, the mean can change from one period to the next.

In assessing the stability of the mean, you want to answer two questions. The first is: How stable has the mean been in the past? In cases where the average has been consistent over time and the environment isn't expected to change much, you can safely use past averages to anticipate future averages.

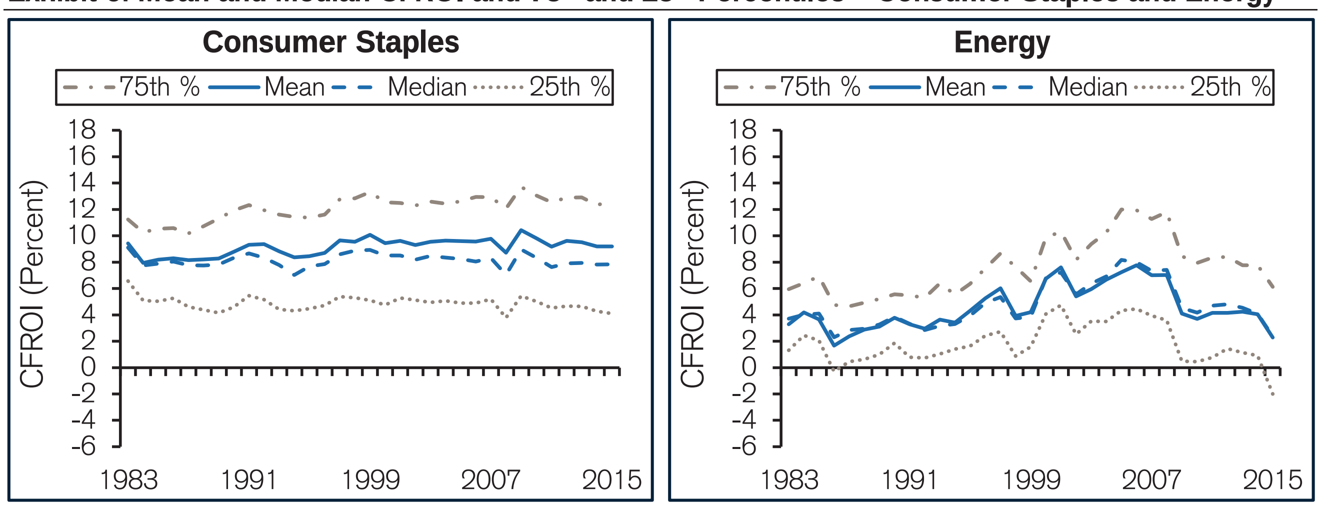
The blue lines in the middle of each chart of exhibit 6 are the mean (solid) and median (dashed) CFROI for each year for the consumer staples and energy sectors. The consumer staples sector had an average CFROI of 9.3 percent from 1983-2015, with a standard deviation of 0.6 percent. The energy sector had an average CFROI of 4.9 percent, with a standard deviation of 1.7 percent over the same period. So the CFROI in the energy sector was lower than that for consumer staples and moved around a lot more.

It comes as no surprise that the CFROI for energy is lower and more volatile than that for consumer staples. This helps explain why regression toward the mean in energy is more rapid than that for consumer staples. You can associate high volatility and low CFROIs with low valuation multiples, and low volatility and high CFROIs with high valuation multiples. This is what we see empirically for these sectors.

Also in exhibit 6 are gray dashed lines that capture the CFROI for the 75th and 25th percentile companies within the sector. If you ranked 100 companies in a sector from 100 (the highest) to 1 (the lowest) based on CFROI, the 75th percentile would be the CFROI of company number 75. So plotting the percentiles allows you to see the dispersion in CFROIs for the sector. Appendix B shows the same chart for all ten sectors.

Another way to show dispersion is with the coefficient of variation, which is the standard deviation of the CFROIs divided by the mean of the CFROIs. The coefficient of variation for 1983-2015 was 0.07 for consumer staples and 0.34 for energy. For every 100 basis points of CFROI, there's much more variance in energy than in consumer staples.

Exhibit 6: Mean and Median CFROI and 75th and 25th Percentiles – Consumer Staples and Energy



Source: Credit Suisse HOLT.
Note: Global companies, live and dead, with market capitalizations of $250 million-plus scaled; Winsorized at 1st and 99th percentiles.

The second question is: What are the factors that affect the mean CFROI? For example, the CFROI for the energy sector might be correlated to swings in oil prices, or returns for the financial sector might be dictated by changes in regulations. Analysts must answer this question sector by sector.

As regression toward the mean is a concept that applies wherever correlations are less than perfect, thinking about this second question can frame debates. Currently, for instance, there's a contested debate about whether operating profit margins in the U.S. are sustainable.[16] The answer lies in what factors drive the level of profit margins—including labor costs, depreciation expense, financing costs, and tax rates—and what is happening to each. There will obviously be regression toward the mean for the operating profit margins of companies within a sector or industry. The question is whether aggregate profit margins will decline in coming years following a strong rise since the depths of the recession.

Exhibit 7 presents guidelines on the rate of regression toward the mean, as well as the proper mean to use, for ten sectors based on more than twenty years of data.

Exhibit 7: Rate of Regression and toward What Mean CFROIs Revert for Ten Sectors, 1983-2015

	How *Much* Regression?	Toward *What* Mean?			
Sector	**Four-Year Correlation Coefficient**	**Median (%)**	**Average (%)**	**Standard Deviation (%)**	**Coefficient of Variation**
Consumer Staples	0.78	8.1	9.3	0.6	0.07
Consumer Discretionary	0.67	8.0	9.1	0.6	0.07
Health Care	0.64	8.3	7.6	1.1	0.15
Industrials	0.62	6.7	7.6	1.0	0.12
Utilities	0.57	3.5	4.1	0.8	0.20
Telecommunication Services	0.55	5.7	5.3	1.4	0.27
Information Technology	0.50	8.5	9.0	1.6	0.18
Financials	0.43	7.5	8.3	1.5	0.18
Materials	0.41	4.6	4.7	0.9	0.19
Energy	0.35	5.0	4.9	1.7	0.34

Source: Credit Suisse HOLT.
Note: "Standard deviation" is the standard deviation of the annual average CFROI for the sector; Includes global companies, live and dead, with market capitalizations of $250 million-plus scaled; Winsorized at 1st and 99th percentiles.

The second column shows the average correlation coefficient, *r*, based on four-year changes in CFROI for each sector from 1983-2015. These correlations tend to be reasonably stable and hence are a useful approximation for the rate of regression toward the mean over a multi-year period. You can plug these *r*'s into the formula to forecast expected outcomes. Remember that regression works on a population, not necessarily on every individual company.

The third and fourth columns of the exhibit show the historical medians and means, and the fifth column shows the standard deviation of the annual means. We show medians as well as means because the CFROIs in many of these sectors do not match a normal distribution. Still, you can use the means and medians interchangeably in most cases as they tend to be close to one another.

In some sectors, including consumer staples and consumer discretionary, the mean CFROIs are stable. Others, including information technology and telecommunication services, have a great deal of volatility. For sectors with CFROIs that have a low standard deviation, it is reasonable to assume that the historical mean is the number to which CFROIs regress.

For sectors that are volatile, you should assess where the sector is in its cycle and aim to shade the historical average up or down to reflect mid-cycle profitability. Note that even mid-cycle profitability changes if the structure of the sector improves or deteriorates.

The column on the right shows the coefficient of variation, the ratio of the standard deviation to the mean, for each sector based on data from 1983-2015. This is a measure of how much variance there is in the distribution of returns for the sector.

Appendix A: Historical Correlation Coefficients for All Sectors

Exhibit 8 shows the average correlation coefficient for the year-over-year change in CFROI for ten sectors from 1983-2015, as well as the standard deviation for each series. Exhibit 9 shows the average correlation coefficient for the four-year change in CFROI for ten sectors from 1983-2015, as well as the standard deviation for each series.

Exhibit 8: Year-over-Year Correlation Coefficients for CFROI in Ten Sectors, 1983-2015

	Consumer Staples	Consumer Discretionary	Health Care	Industrials	Utilities	Telecommunication Services	Information Technology	Financials	Materials	Energy
1984	0.87	0.84	0.71	0.83	0.79	0.86	0.68	0.68	0.73	0.65
1985	0.92	0.87	0.63	0.79	0.39	0.94	0.52	0.73	0.73	0.42
1986	0.79	0.87	0.67	0.81	0.68	0.48	0.79	0.72	0.67	0.39
1987	0.80	0.76	0.78	0.82	0.67	0.66	0.81	0.78	0.68	0.48
1988	0.88	0.85	0.90	0.83	0.71	0.83	0.73	0.71	0.79	0.59
1989	0.90	0.82	0.87	0.81	0.76	0.87	0.83	0.67	0.78	0.64
1990	0.89	0.81	0.82	0.83	0.80	0.71	0.82	0.64	0.64	0.78
1991	0.91	0.88	0.92	0.81	0.75	0.84	0.86	0.72	0.70	0.71
1992	0.93	0.86	0.82	0.79	0.74	0.85	0.83	0.82	0.74	0.65
1993	0.93	0.87	0.82	0.82	0.80	0.90	0.79	0.73	0.70	0.68
1994	0.90	0.87	0.78	0.82	0.78	0.91	0.85	0.73	0.69	0.65
1995	0.89	0.89	0.88	0.82	0.79	0.83	0.76	0.74	0.66	0.58
1996	0.89	0.83	0.80	0.82	0.80	0.84	0.75	0.81	0.70	0.68
1997	0.89	0.81	0.85	0.83	0.78	0.77	0.77	0.78	0.73	0.51
1998	0.89	0.84	0.82	0.84	0.82	0.82	0.66	0.69	0.72	0.58
1999	0.87	0.86	0.84	0.84	0.75	0.80	0.77	0.71	0.72	0.48
2000	0.87	0.79	0.87	0.80	0.76	0.61	0.66	0.73	0.63	0.55
2001	0.87	0.82	0.86	0.79	0.74	0.76	0.59	0.66	0.69	0.71
2002	0.91	0.85	0.88	0.78	0.71	0.76	0.67	0.66	0.70	0.51
2003	0.89	0.85	0.89	0.81	0.80	0.74	0.78	0.61	0.68	0.54
2004	0.90	0.88	0.82	0.81	0.81	0.87	0.78	0.75	0.75	0.67
2005	0.89	0.87	0.87	0.84	0.87	0.85	0.80	0.71	0.77	0.69
2006	0.89	0.89	0.90	0.86	0.81	0.89	0.81	0.73	0.71	0.72
2007	0.90	0.87	0.88	0.86	0.79	0.86	0.83	0.70	0.74	0.75
2008	0.90	0.86	0.84	0.83	0.72	0.83	0.77	0.52	0.64	0.61
2009	0.86	0.86	0.85	0.77	0.69	0.85	0.81	0.55	0.54	0.54
2010	0.92	0.87	0.83	0.80	0.78	0.87	0.79	0.70	0.67	0.71
2011	0.90	0.88	0.84	0.84	0.84	0.91	0.81	0.67	0.78	0.69
2012	0.91	0.88	0.85	0.87	0.72	0.86	0.86	0.67	0.70	0.62
2013	0.91	0.90	0.87	0.89	0.76	0.89	0.84	0.71	0.70	0.69
2014	0.90	0.90	0.88	0.88	0.81	0.91	0.84	0.75	0.74	0.68
2015	0.90	0.87	0.86	0.87	0.80	0.78	0.84	0.82	0.69	0.41
Average	**0.89**	**0.86**	**0.83**	**0.83**	**0.76**	**0.82**	**0.77**	**0.71**	**0.70**	**0.61**
St. Dev.	**0.03**	**0.03**	**0.06**	**0.03**	**0.08**	**0.10**	**0.08**	**0.07**	**0.05**	**0.10**

Source: Credit Suisse HOLT.
Note: Global companies, live and dead, with market capitalizations of $250 million-plus scaled; Winsorized at 1st and 99th percentiles.

Exhibit 9: Four-Year Correlation Coefficients for CFROI in Ten Sectors, 1983-2015

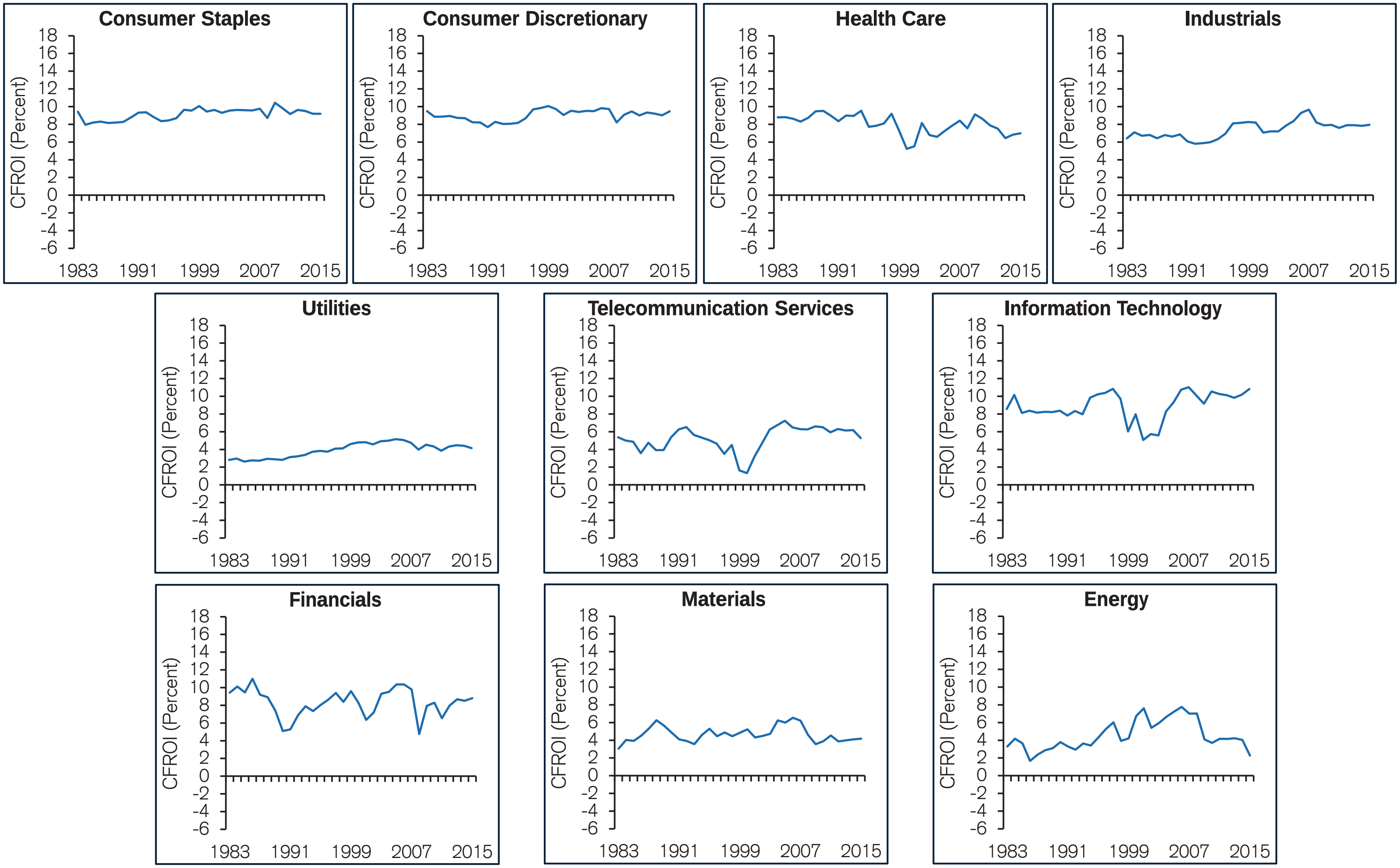
	Consumer Staples	Consumer Discretionary	Health Care	Industrials	Utilities	Telecommunication Services	Information Technology	Financials	Materials	Energy
1987	0.84	0.63	0.65	0.58	0.39	0.76	0.32	0.31	0.64	0.20
1988	0.87	0.71	0.41	0.53	0.25	0.29	0.42	0.28	0.47	0.34
1989	0.70	0.67	0.68	0.61	0.47	0.52	0.56	0.42	0.40	0.32
1990	0.77	0.66	0.71	0.64	0.37	0.49	0.65	0.31	0.33	0.13
1991	0.76	0.59	0.51	0.63	0.32	0.61	0.61	0.25	0.51	0.45
1992	0.80	0.67	0.43	0.63	0.62	0.65	0.63	0.29	0.49	0.39
1993	0.80	0.70	0.58	0.60	0.53	0.47	0.48	0.39	0.34	0.53
1994	0.81	0.78	0.61	0.60	0.44	0.69	0.50	0.45	0.51	0.42
1995	0.79	0.71	0.71	0.55	0.57	0.63	0.50	0.63	0.40	0.46
1996	0.82	0.68	0.59	0.55	0.62	0.32	0.46	0.63	0.59	0.37
1997	0.80	0.67	0.59	0.59	0.68	0.59	0.45	0.57	0.41	0.15
1998	0.69	0.68	0.53	0.60	0.48	0.58	0.49	0.44	0.45	0.08
1999	0.73	0.66	0.59	0.70	0.56	0.55	0.42	0.49	0.44	0.24
2000	0.78	0.60	0.68	0.65	0.49	0.49	0.40	0.45	0.40	0.24
2001	0.79	0.64	0.63	0.61	0.69	0.61	0.31	0.44	0.53	0.33
2002	0.78	0.71	0.59	0.58	0.68	0.28	0.46	0.40	0.52	0.36
2003	0.77	0.64	0.68	0.57	0.67	0.36	0.48	0.47	0.44	0.41
2004	0.79	0.66	0.67	0.61	0.55	0.46	0.40	0.51	0.42	0.36
2005	0.80	0.68	0.65	0.59	0.60	0.32	0.43	0.47	0.40	0.41
2006	0.76	0.64	0.66	0.61	0.55	0.69	0.46	0.43	0.46	0.32
2007	0.81	0.63	0.61	0.66	0.48	0.74	0.48	0.41	0.49	0.13
2008	0.81	0.67	0.71	0.59	0.56	0.64	0.55	0.32	0.44	0.24
2009	0.75	0.65	0.64	0.56	0.67	0.53	0.58	0.37	0.41	0.24
2010	0.79	0.63	0.70	0.63	0.61	0.68	0.59	0.53	0.44	0.46
2011	0.77	0.70	0.65	0.67	0.53	0.54	0.61	0.41	0.42	0.42
2012	0.78	0.73	0.68	0.67	0.46	0.66	0.65	0.40	0.41	0.42
2013	0.84	0.69	0.69	0.64	0.61	0.69	0.60	0.47	0.45	0.41
2014	0.80	0.69	0.61	0.66	0.52	0.72	0.57	0.59	0.45	0.38
2015	0.77	0.70	0.62	0.71	0.54	0.66	0.63	0.59	0.28	0.27
Average	**0.78**	**0.67**	**0.62**	**0.61**	**0.53**	**0.56**	**0.51**	**0.44**	**0.45**	**0.33**
St. Dev.	**0.04**	**0.04**	**0.08**	**0.04**	**0.11**	**0.14**	**0.10**	**0.10**	**0.07**	**0.12**

Source: Credit Suisse HOLT.
Note: Global companies, live and dead, with market capitalizations of \$250 million-plus scaled; Winsorized at 1st and 99th percentiles.

Appendix B: Historical CFROIs for All Sectors

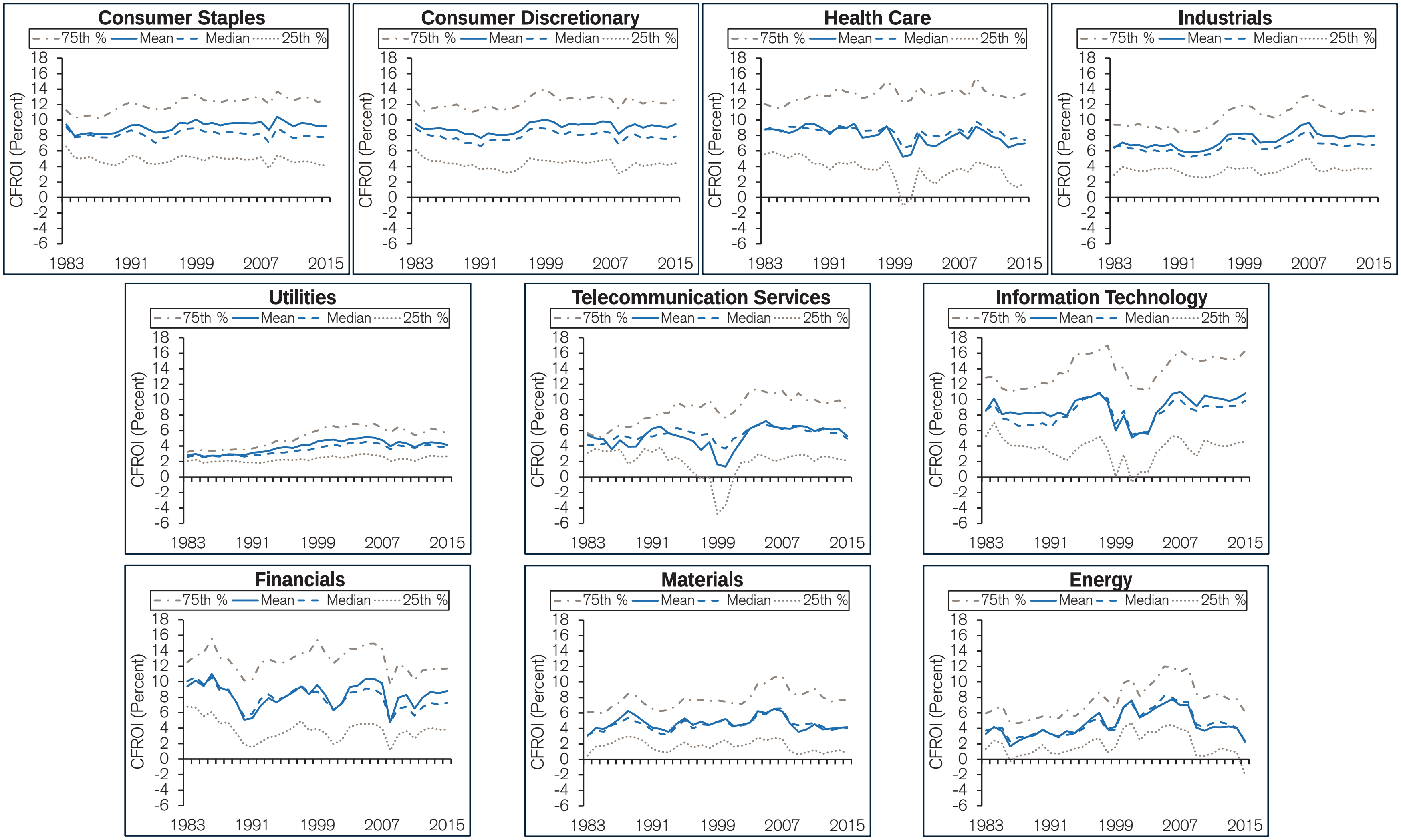
The charts in exhibit 10 show the average CFROI for each sector from 1983-2015. The charts in exhibit 11 portray the CFROI trends. The blue lines in the middle are the mean (solid) and median (dashed) CFROI. The gray dashed lines capture the CFROI for the 75^{th} and 25^{th} percentile companies within the sector, with the 100^{th} percentile being the highest. Plotting the percentiles allows you to see the dispersion in CFROI for the sector.

Exhibit 10: Mean CFROI for All Sectors, 1983-2015



Source: Credit Suisse HOLT.
Note: Global companies, live and dead, with market capitalizations of $250 million-plus scaled; Winsorized at 1st and 99th percentiles.

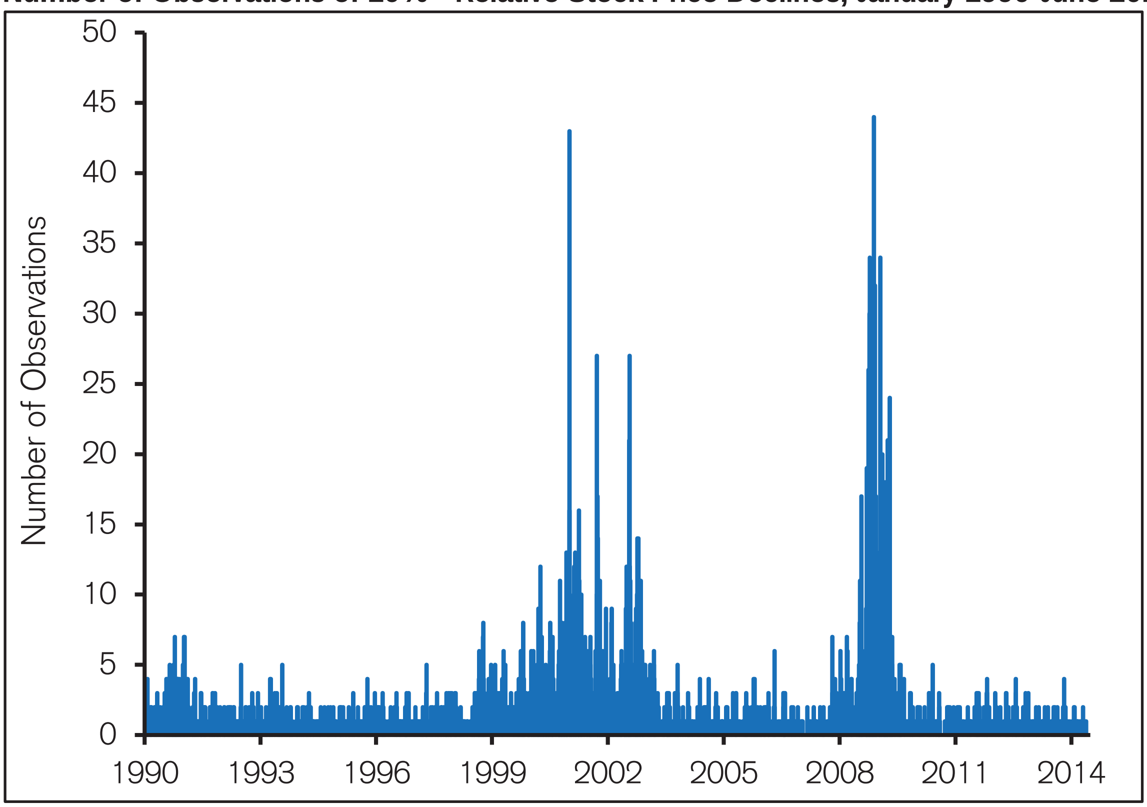
Exhibit 11: Mean and Median CFROI and 75th and 25th Percentiles for All Sectors, 1983-2015



Source: Credit Suisse HOLT.
Note: Global companies, live and dead, with market capitalizations of $250 million-plus scaled; Winsorized at 1st and 99th percentiles.

Managing the Man Overboard Moment

Number of Observations of 10%+ Relative Stock Price Declines, January 1990-June 2014



Source: Credit Suisse HOLT.

The Value of a Framework under Adversity

A key part of successful investing is the ability to keep emotions in check in the face of adversity. One example, the focus of this report, is when one of the stocks in your portfolio drops sharply. If you are the portfolio manager, you might feel frustrated, upset about the hit to returns, and worried about the business implications. If you are the analyst, you might feel anger, disappointment, and shame. None of those feelings are conducive to good decision making.

This kind of event precipitates what has been called a "man overboard" moment.[1] These moments demand immediate attention, are stressful, and require swift action. In an investment firm it is common for a number of professionals to stop what they are doing in order to discern a suitable course of action.

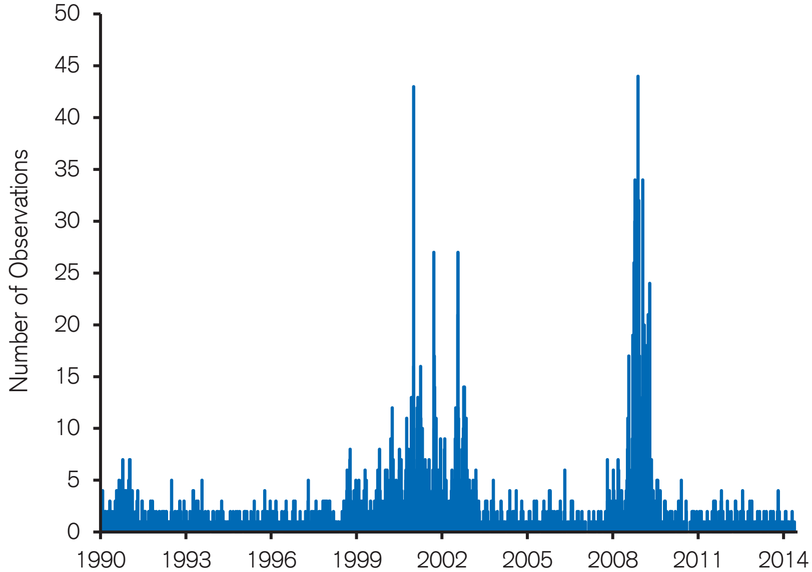
The use of a checklist is one approach to making good decisions under pressure. In his superb book, ***The Checklist Manifesto***, Dr. Atul Gawande describes two types of checklists.[2] The first is called DO-CONFIRM. Here you do your job from memory but pause periodically to make sure that you have done everything you're supposed to do. The second is called READ-DO. Here, you simply read the checklist and do what it says. READ-DO checklists are particularly helpful in stressful situations because they prevent you from being overcome by emotion as you decide how to act.

You can think of your emotional state and the ability to make good decisions as sitting on opposite sides of a seesaw. If your state of emotional arousal is high, your capacity to decide well is low. A checklist helps take out the emotion and moves you toward a proper choice. It also keeps you from succumbing to decision paralysis. A psychologist studying emergency checklists in aviation said the goal is to "minimize the need for a lot of effortful analysis when time may be limited and workload is high."[3]

The goal of this report is to provide you with analytical guidance if one of your stocks declines 10 percent or more, relative to the S&P 500, in one day. More directly, we want to answer the question of whether you should buy, hold, or sell the stock following one of these big down moves.

Exhibit 1 shows the number of such observations from January 1990 through mid-2014. There were more than 5,400 occurrences in all, with clusters around the deflating of the dot-com bubble in the early 2000s and the financial crisis in 2008-2009. The bubble periods contain about 40 percent of the observations. These sharp drops happen frequently enough that they deserve a thoughtful process to deal with them but infrequently enough that few investment firms have developed such a process.

Exhibit 1: Number of Observations of 10%+ Relative Stock Price Declines, January 1990-June 2014



Source: Credit Suisse HOLT.

Base Rates of Large Drawdowns in Stock Price

We use base rates to show how stocks perform after they have dropped sharply. To do this, we calculate the "cumulative abnormal return" for the 30, 60, and 90 trading days after the time of the decline. An abnormal return is the difference between the total shareholder return and the expected return. A stock's expected return reflects the change in a broader stock market index, the S&P 500 in our case, adjusted for risk. The cumulative abnormal return, then, is simply the sum of the abnormal returns during the period we measure.

We refine the large sample into relevant categories in an effort to increase the usefulness of the base rates.[4] The first refinement is to segregate earnings and non-earnings announcements. Earnings releases constitute about one-quarter of our sample. Non-earnings announcements include releases of information that are scheduled, such as same-store sales updates, as well as unanticipated announcements, including a change in management or an earnings warning. In general, the cumulative abnormal returns following disappointing earnings releases are worse than for other announcements.

The second refinement is the introduction of three factors—momentum, valuation, and quality—that consider corporate fundamentals and stock market measures. All companies receive a score for each factor. The scores are relative to a company's peers in the same sector. You can find a detailed definition of the factors in Appendix A, but here's a quick summary:

- **Momentum** predominantly considers two drivers, change in cash flow return on investment (CFROI) as the result of earnings revisions, and stock price momentum. Good momentum is associated with rising CFROI and strong stock price appreciation.
- **Valuation** reflects the gap between the current stock price and the warranted value in the HOLT® model. Valuation also incorporates adjusted measures of price-to-earnings and price-to-book ratios. Together, these metrics help assess whether a stock is relatively cheap or expensive.
- **Quality** captures the company's recent level of CFROI and whether the company has consistently made investments that create value. Firms with high CFROIs and strong value creation score well on quality.

The final refinement is a separation between the full sample and the periods excluding the bubbles. We show the full sample including all events in exhibits 2 and 3, and the narrower sample excluding the bubble periods in exhibits 12 and 13. The bubble periods correlate with high volatility in the market, as measured by the Chicago Board Options Exchange Market Volatility Index (VIX). When you compare the full sample to the ex-bubble sample for earnings announcements, you will see that the average stock price changes for the equivalent branches are directionally the same more than 80 percent of the time. For the other events, the directional overlap is close to 90 percent.

The upside of adding refinements is that you can find a base rate that closely matches the case you are considering. The downside is that the sample size (N) shrinks with each refinement. We have tried to maintain healthy sample sizes even in the end branches, and we display the Ns along the way so that you can assess the trade-off between fit and prior occurrences.

We are almost ready to turn to the checklist and numbers, but we need to cover one additional item. All of our summary exhibits show the average, or mean, stock price return. That average represents a full distribution of results. For most of the distributions, the median return—the return that separates the top half from the bottom half of the sample—is less than the mean, which suggests the distributions have a right skew.

Further, the standard deviations of most of the distributions are in the range of 35-45 percent. While our summary figures show a tidy average, recognize that the figure belies a rich distribution. Appendix B shows the distributions for a handful of events. The base rate data can be extremely helpful in making a sound decision even if the outcome is probabilistic.

We're now ready to turn to the checklist and the numbers that show the base rates.

The Checklist

You come into the office and one of the stocks in your portfolio is down 10 percent or more relative to the S&P 500. Here's what you do:

☐ **Earnings or non-earnings.** Determine whether the precipitating announcement is an earnings release or a non-earnings disclosure and go to the appropriate exhibit;

☐ **Momentum.** Check the HOLT Lens™ screen to determine if the stock had strong, weak, or neutral momentum going into the announcement. You can either go to the momentum section of the exhibit or continue;

☐ **Valuation.** Check to see if the valuation is cheap, expensive, or neutral. You can either go to the section in the exhibit that combines momentum and valuation or continue;

☐ **Quality.** Check to see if the quality is high, low, or neutral. Go to section in the exhibit that incorporates all of the factors.

We have two detailed case studies that we'll present in a moment, but let's run through an example to see how this works. The first item is to determine whether the announcement was a scheduled earnings release or not. Let's say it was an earnings event. That means we would refer to the data in exhibit 2.

Step two is to assess the momentum. We'll assume that momentum is strong. If you look at the left side of the exhibit you'll see the section that reflects momentum. If you focus on the results of the companies with strong momentum, you'll see a few figures. You'll notice that the 408 stocks in that reference class declined 14.9 percent, on average, the day of the event. You'll also see that those stocks modestly underperformed the market, with a cumulative abnormal return of -1.6 percent, in the prior 30 trading days.

You'll also see that the stocks in that class struggled in the subsequent quarter, with cumulative abnormal returns of -1.5 percent in the next 30 trading days, -1.9 percent in 60 trading days, and -0.6 percent in 90 trading days. We selected 90 trading days as the extent of this analysis because we felt it is a sufficient amount of time for an investment team to thoroughly reassess the stock's merit. We designed the READ-DO checklist to provide immediate guidance.

We now turn to valuation, which you can find in the middle of the exhibit, to see if we can sharpen the analysis. Let's assume the valuation was expensive. If we look 60 days out, we see that the 167 stocks in this group have an average cumulative abnormal return of -4.5 percent.

As a final check, we consider quality, which you can find on the right of the exhibit. Let's say quality is high. We've now shrunk our sample size to 62, and see that the 60-day cumulative abnormal return is -3.5 percent.

Exhibit 2: Earnings Event – Cumulative Abnormal Returns

Momentum: Strong

Momentum	Days -30	Event	N =	Days +30	+60	+90
Strong	-1.6%	-14.9%	408	-1.5%	-1.9%	-0.6%

Valuation	Days -30	Event	N =	Days +30	+60	+90
Cheap	-2.6%	-14.4%	123	-0.6%	1.4%	3.6%
Neutral	-1.0%	-14.6%	118	-1.3%	-1.6%	-1.4%
Expensive	-1.2%	-15.4%	167	-2.4%	-4.5%	-3.2%

Valuation	Quality	Days -30	Event	N =	Days +30	+60	+90
Cheap	High	-4.2%	-14.2%	42	-1.1%	0.8%	4.6%
Cheap	Neutral	-0.9%	-14.6%	23	-3.1%	3.2%	4.5%
Cheap	Low	-2.2%	-14.5%	58	0.7%	1.1%	2.5%
Neutral	High	-2.4%	-15.9%	44	-0.2%	3.4%	3.6%
Neutral	Neutral	-1.2%	-13.5%	29	-1.7%	-4.0%	-5.0%
Neutral	Low	0.6%	-14.1%	45	-2.3%	-5.0%	-4.0%
Expensive	High	0.4%	-14.8%	62	-3.2%	-3.5%	-3.1%
Expensive	Neutral	-3.1%	-17.0%	49	-0.7%	-3.7%	-5.3%
Expensive	Low	-1.3%	-14.6%	56	-2.9%	-6.3%	-1.4%

Momentum: Neutral

Momentum	Days -30	Event	N =	Days +30	+60	+90
Neutral	-2.8%	-14.7%	434	0.8%	2.4%	4.0%

Valuation	Days -30	Event	N =	Days +30	+60	+90
Cheap	-4.6%	-15.2%	162	2.9%	5.0%	7.1%
Neutral	-1.8%	-14.4%	146	0.8%	2.4%	4.8%
Expensive	-1.7%	-14.4%	126	-1.7%	-1.0%	-0.9%

Valuation	Quality	Days -30	Event	N =	Days +30	+60	+90
Cheap	High	-5.9%	-16.8%	51	7.2%	10.2%	11.4%
Cheap	Neutral	-3.7%	-14.6%	59	0.8%	4.1%	7.7%
Cheap	Low	-4.3%	-14.5%	52	1.2%	0.9%	2.3%
Neutral	High	-3.1%	-14.6%	43	-0.3%	1.6%	6.7%
Neutral	Neutral	-0.5%	-14.6%	38	1.4%	5.4%	5.7%
Neutral	Low	-1.7%	-14.2%	65	1.1%	1.2%	3.0%
Expensive	High	-3.3%	-14.3%	48	-4.1%	-4.8%	-0.7%
Expensive	Neutral	-1.2%	-13.9%	39	-2.2%	3.1%	6.2%
Expensive	Low	-0.2%	-14.9%	39	1.6%	-0.5%	-3.1%

Momentum: Weak

Momentum	Days -30	Event	N =	Days +30	+60	+90
Weak	-1.0%	-14.9%	600	2.7%	5.1%	8.4%

Valuation	Days -30	Event	N =	Days +30	+60	+90
Cheap	-3.4%	-15.1%	299	3.7%	5.5%	10.9%
Neutral	0.8%	-14.8%	177	0.5%	3.3%	3.5%
Expensive	2.3%	-14.7%	124	3.5%	6.8%	9.4%

Valuation	Quality	Days -30	Event	N =	Days +30	+60	+90
Cheap	High	-1.4%	-16.1%	79	5.5%	7.7%	14.1%
Cheap	Neutral	-2.3%	-15.3%	111	2.2%	4.1%	10.4%
Cheap	Low	-5.9%	-14.3%	109	3.9%	5.4%	9.2%
Neutral	High	2.5%	-13.7%	59	-2.5%	1.3%	1.3%
Neutral	Neutral	-0.7%	-14.8%	38	-0.9%	7.3%	9.0%
Neutral	Low	0.2%	-15.5%	80	3.3%	2.9%	2.5%
Expensive	High	1.3%	-15.6%	34	0.8%	8.8%	11.0%
Expensive	Neutral	6.9%	-15.7%	33	4.7%	9.5%	9.1%
Expensive	Low	0.1%	-13.5%	57	4.5%	4.1%	8.7%

Source: Credit Suisse HOLT.
Note: The abnormal return for the event reflects only the day of the event.

Exhibit 3: Non-Earnings Event – Cumulative Abnormal Returns

Momentum	Valuation	Quality	Days -30	Event	N =	Days +30	Days +60	Days +90
Strong			-4.6%	-13.8%	1,041	3.7%	4.9%	6.2%
	Cheap		-8.5%	-13.7%	280	5.1%	10.1%	14.3%
		High	-11.7%	-13.8%	99	4.9%	9.9%	16.7%
		Neutral	-8.1%	-15.7%	83	3.2%	6.5%	9.7%
		Low	-5.5%	-11.8%	98	7.0%	13.4%	15.6%
	Neutral		-5.0%	-14.2%	289	4.7%	6.8%	7.9%
		High	-8.4%	-14.0%	79	5.3%	7.7%	10.2%
		Neutral	-7.3%	-15.1%	109	3.5%	6.8%	2.7%
		Low	0.2%	-13.4%	101	5.5%	6.0%	11.6%
	Expensive		-2.0%	-13.7%	472	2.2%	0.8%	0.4%
		High	-4.5%	-13.4%	225	1.9%	-2.8%	-3.2%
		Neutral	4.8%	-14.4%	107	2.9%	3.0%	-0.3%
		Low	-3.0%	-13.5%	140	2.1%	4.7%	6.8%
Neutral			-5.9%	-14.4%	1,067	4.7%	9.4%	11.3%
	Cheap		-9.3%	-14.6%	395	7.5%	17.1%	18.7%
		High	-14.1%	-15.3%	140	7.9%	21.7%	20.9%
		Neutral	-13.9%	-15.2%	121	8.9%	13.6%	20.5%
		Low	-0.2%	-13.4%	134	5.8%	15.4%	14.6%
	Neutral		-4.6%	-13.8%	328	6.4%	9.8%	12.2%
		High	-5.5%	-13.5%	127	3.0%	7.5%	9.8%
		Neutral	-5.7%	-14.3%	93	5.1%	10.6%	11.5%
		Low	-2.6%	-13.8%	108	11.5%	11.8%	15.5%
	Expensive		-3.1%	-14.6%	344	-0.2%	0.1%	2.0%
		High	-7.0%	-14.5%	132	-2.5%	-4.5%	-3.7%
		Neutral	3.8%	-14.8%	83	1.0%	2.5%	5.4%
		Low	-3.6%	-14.6%	129	1.5%	3.3%	5.7%
Weak			-6.2%	-14.2%	1,867	11.1%	17.0%	18.8%
	Cheap		-9.5%	-14.3%	1,008	13.9%	19.1%	22.1%
		High	-11.0%	-15.1%	282	10.4%	14.9%	23.0%
		Neutral	-5.8%	-13.8%	295	15.9%	23.3%	26.0%
		Low	-10.9%	-14.2%	431	14.7%	18.9%	18.8%
	Neutral		-2.6%	-14.4%	457	4.9%	11.2%	12.0%
		High	-8.7%	-14.6%	127	4.6%	11.2%	11.7%
		Neutral	2.1%	-13.8%	154	6.6%	14.4%	15.5%
		Low	-2.4%	-14.7%	176	3.7%	8.4%	9.1%
	Expensive		-2.0%	-13.8%	402	11.2%	18.5%	18.1%
		High	-4.5%	-12.8%	127	18.1%	25.7%	27.1%
		Neutral	-1.3%	-14.8%	98	10.3%	22.3%	24.7%
		Low	-0.6%	-14.0%	177	6.9%	11.2%	8.1%

Source: Credit Suisse HOLT.
Note: The abnormal return for the event reflects only the day of the event.

Case Studies

We now turn to two case studies that provide detail about the analysis.

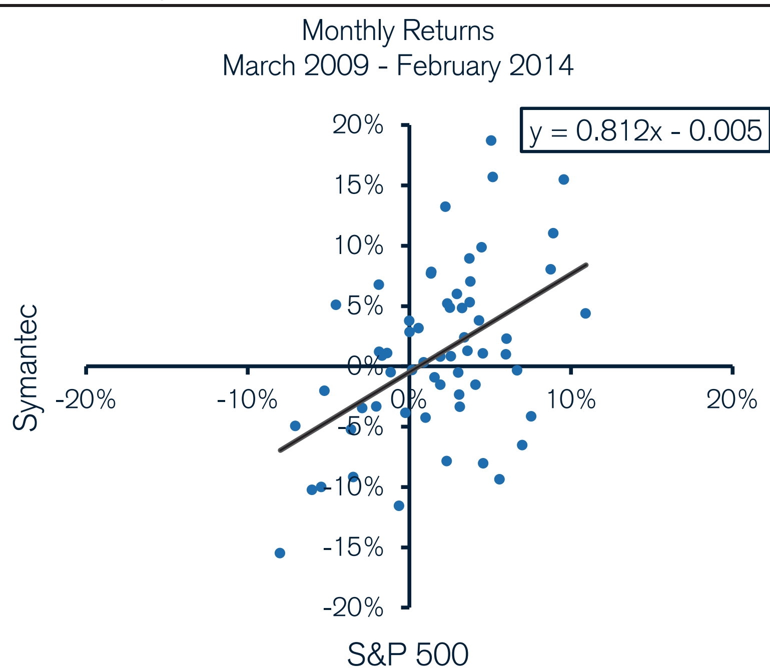
Symantec Corporation

Symantec Corporation announced that it fired its president and chief executive officer, Steve Bennett, after the stock market closed on March 20, 2014. The following day, March 21, the stock declined from $20.905 to $18.20, or 12.9 percent. The S&P 500 was down 0.3 percent. This was a non-earnings event.

Since we use cumulative abnormal return (CAR) for all of the stock performance data, it is worth taking a moment to explain the methodology. We calculate daily abnormal return using a simplified market model, which compares the actual return of a stock to its expected return. The expected return equals the total shareholder return of the benchmark, the S&P 500, times the stock's beta. The abnormal return is the difference between the actual return and the expected return.

We calculate beta by doing a regression analysis with the S&P 500's total returns as the independent variable (x-axis) and Symantec's total returns as the dependent variable (y-axis). We use monthly total returns for the prior 60 months. Beta is the slope of the best-fit line. Exhibit 4 shows that the beta for Symantec for the 60 months ended February 2014 was about 0.8. This is the beta we use for our calculations of daily abnormal returns during the month of March 2014.

Exhibit 4: Beta Calculation for Symantec



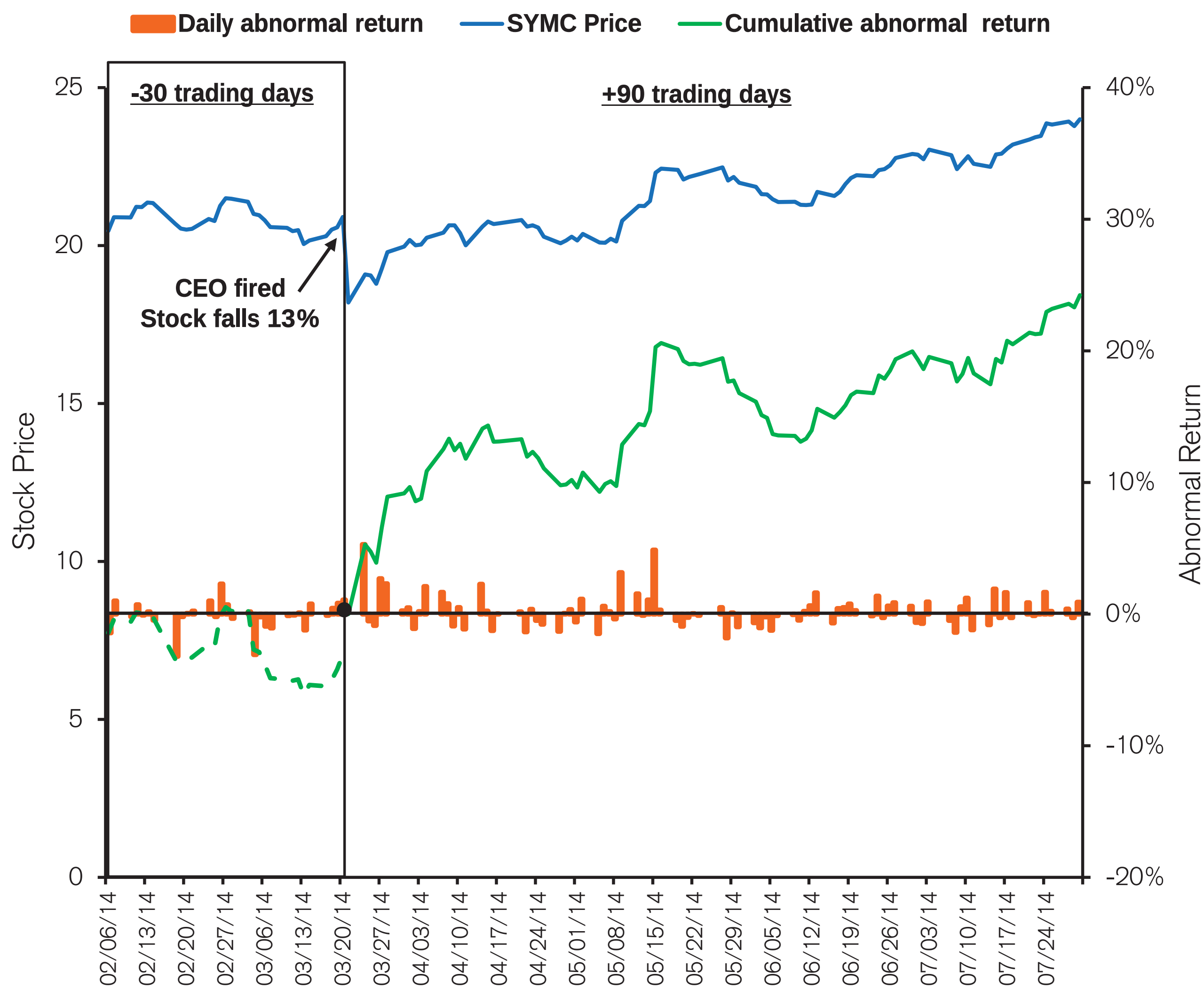
Source: Credit Suisse.

Using the 30 trading days following the event, we calculate a CAR of 9.3 percent as follows:

CAR = Actual return – expected return
= 10.3% - (Beta * Market Return)
= 10.3% - (0.8 * 1.2%)
CAR = 10.3% - 1.0% = 9.3%

Exhibit 5 shows the chart of the stock's performance for the 30 trading days prior to the event through 90 trading days following the event. The top line shows the stock price itself. The middle line is the cumulative abnormal return. We reset the cumulative abnormal return to zero on the event date. The bars are the daily abnormal returns. It's evident that buying Symantec on the day after this event would have yielded good returns in the subsequent 90 days. Let's go through the checklist to see how we would have assessed the situation in real time.

Exhibit 5: Symantec Stock Price and Cumulative Abnormal Returns (February 6 – July 30, 2014)



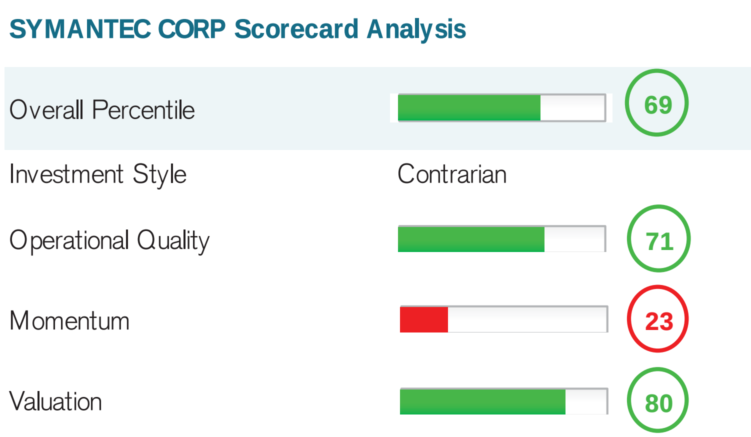
Source: Credit Suisse.

The first item on the checklist is the determination of whether the event was a scheduled earnings release. We know that this is an event not related directly to an earnings announcement, so we refer to exhibit 3 for guidance.

The next step is determining how the stock scores with regard to momentum, valuation, and quality through HOLT Lens. (Please contact your HOLT or Credit Suisse representative if you do not have access to Lens and would like to use it.) At the welcome page, search for the company of the stock under consideration. This takes you to the homepage for that company, which includes a Relative Wealth Chart. Toward the top of the page you will find a link called "Scorecard Percentile." If you click on it, you will see numerical scores, from 0 to 100, on momentum, valuation, and operational quality, among other items.

To best align with the base rates, which reflect factor scores from before the price gain, it is appropriate to use the Scorecard on the day of the event as opposed to the days afterwards. On the day of the event, the factors do not yet incorporate the price gain—HOLT makes those adjustments overnight. For the purposes of this analysis, a score of 66 or more reflects strong momentum, cheap valuation, and high quality. A score of 33 or less means weak momentum, expensive valuation, and low quality. Numbers from 34 to 65 are neutral for the factors. Exhibit 6 shows you what this screen looked like for Symantec.

Exhibit 6: Symantec's Factor Scores



Source: HOLT Lens.

We see that momentum is weak (23), valuation is cheap (80), and quality is high (71). This allows us to follow the relevant branches in exhibit 3. Exhibit 7 extracts the branches that are relevant for Symantec.

Exhibit 7: The Branches that Lead to Symantec's Appropriate Reference Class

Momentum

	Days -30	Event	N =	Days +30	+60	+90
Weak	-6.2%	-14.2%	1,867	11.1%	17.0%	18.8%

Valuation

	Days -30	Event	N =	Days +30	+60	+90
Cheap	-9.5%	-14.3%	1,008	13.9%	19.1%	22.1%

Quality

	Days -30	Event	N =	Days +30	+60	+90
High	-11.0%	-15.1%	282	10.4%	14.9%	23.0%

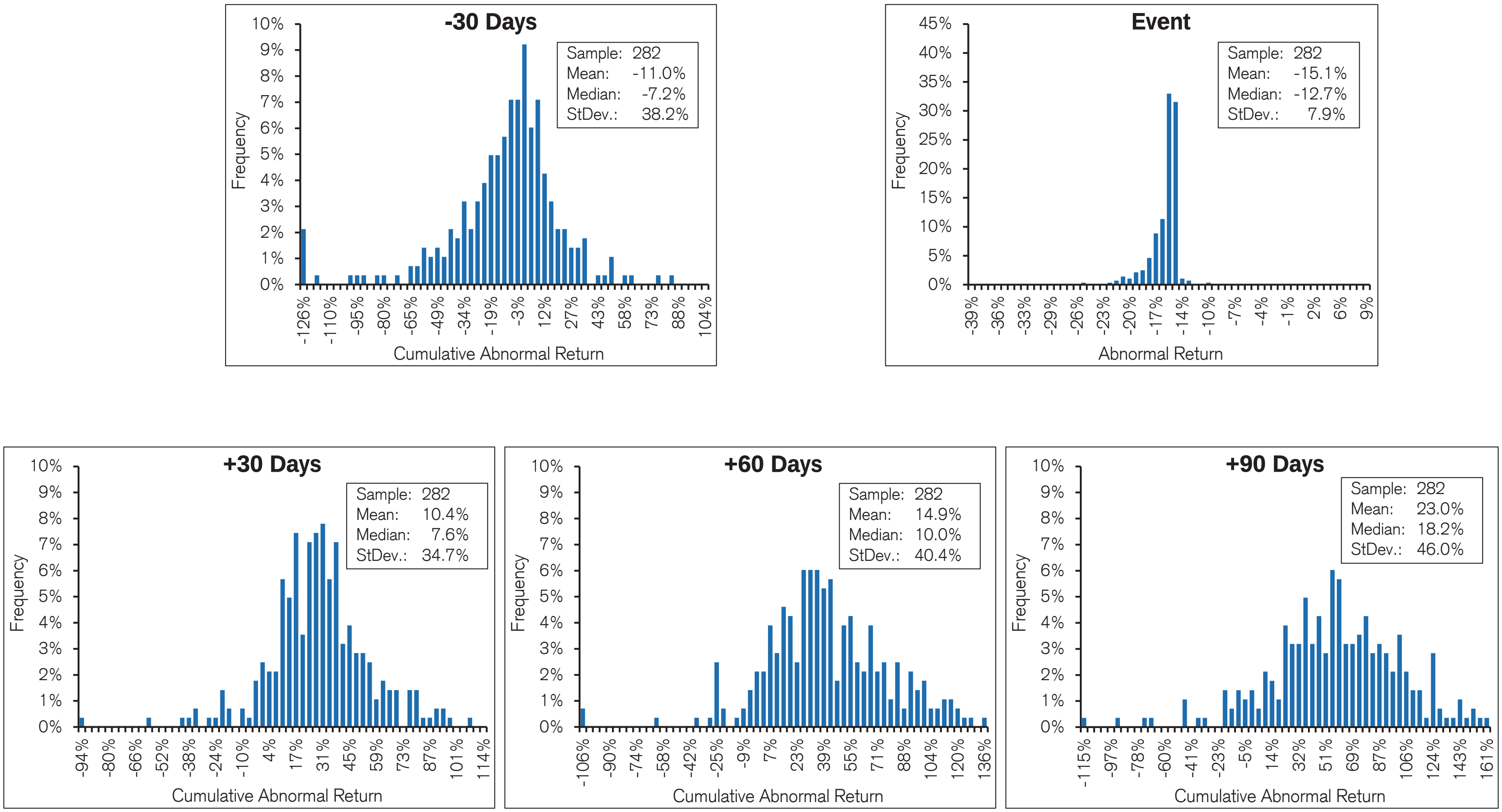
Source: Credit Suisse HOLT.

The cumulative abnormal returns are consistently positive for each branch of the tree for all of the time periods we measure. The final branch, with a sample size of 282 events, shows a 10.4 percent CAR for 30 days, 14.9 percent for 60 days, and 23.0 percent for 90 days. In this case, the base rates would suggest buying the stock on the day following the decline.

We can compare those base rates with what actually happened. The CAR for Symantec shares was 9.3 percent in the 30 trading days following the event, 15.4 percent for 60 days, and 24.2 percent for 90 days. The line for CAR in exhibit 5 also shows these returns.

While the results are consistent with the base rate, we must reiterate that the averages belie a more complex distribution. Exhibit 8 shows the distribution of stock price returns for the 282 companies in Symantec's reference class. For each of the return distributions that follow the event (+30, +60, and +90 days), the mean, or average, was greater than the median. The standard deviations are high at about 35 percent for 30 days, 40 percent for 60 days, and 45 percent for 90 days.

Exhibit 8: Distributions for Non-Earnings Events that have Weak Momentum, Cheap Valuation, High Quality



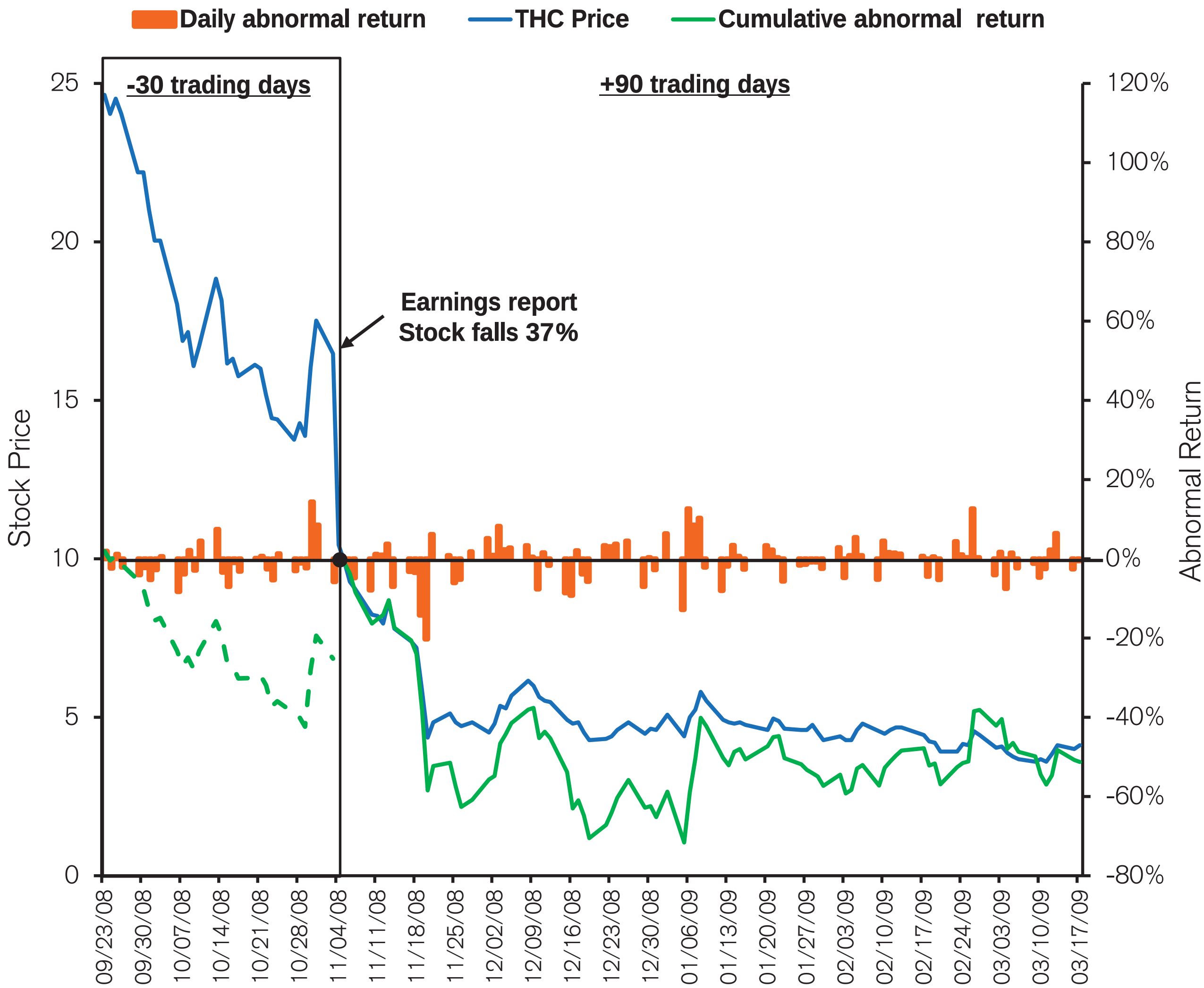
Source: Credit Suisse HOLT.

Tenet Healthcare Corporation

Before the stock market opened on the morning of November 4, 2008, Tenet Healthcare Corporation reported disappointing earnings. This was a scheduled earnings event and the stock declined 36.7 percent. The S&P 500 was up 4.1 percent.

Exhibit 9 shows the chart of Tenet Healthcare's stock performance for the 30 trading days prior to the event through 90 trading days following the event. The top line starting on the left shows the stock price, which not only drops precipitously on the day of the disappointing earnings release but also shows a steep decline before the announcement (-25.2 percent cumulative abnormal return). The stock continued to drift lower after the release. The bars in the middle of the exhibit are the daily abnormal return, and the line at the bottom is the cumulative abnormal return. This is a case where selling Tenet Healthcare stock, notwithstanding the weak results, would have made sense. Let's go through the checklist to see how we would have assessed the situation as it occurred.

Exhibit 9: Tenet Healthcare Stock Price and CAR, September 23, 2008 – March 17, 2009



Source: Credit Suisse.

The first item on the checklist is the determination of whether the event was an earnings release. We know that it was scheduled, so we refer to exhibit 2 for guidance.

The next step is to determine the scores with regard to momentum, valuation, and operational quality. To do so, we go to the link, "Scorecard Percentile," on HOLT Lens. Exhibit 10 shows the scores.

Exhibit 10: Tenet Healthcare's Factor Scores

TENET HEALTHCARE CORP Scorecard Analysis

Overall Percentile	8
Investment Style	Momentum Trap
Operational Quality	4
Momentum	66
Valuation	9

Source: HOLT Lens.

For Tenet Healthcare, we see that momentum is at the low end of strong (66), valuation is expensive (9), and quality is low (4). Despite Tenet Healthcare's weak stock price in the short term, the overall momentum score remained strong because of excellent stock price results, relative to peers, in the 52 weeks leading up to the announcement. While the momentum factor barely qualified as strong, scores for valuation and quality are unattractive. Exhibit 11 shows the branches in exhibit 2 that are relevant for Tenet Healthcare.

Exhibit 11: The Branches that Lead to Tenet Healthcare's Appropriate Reference Class

Factor	Branch	Days -30	Event	N =	Days +30	Days +60	Days +90
Momentum	Strong	-1.6%	-14.9%	408	-1.5%	-1.9%	-0.6%
Valuation	Expensive	-1.2%	-15.4%	167	-2.4%	-4.5%	-3.2%
Quality	Low	-1.3%	-14.6%	56	-2.9%	-6.3%	-1.4%

Source: Credit Suisse HOLT.

The cumulative abnormal returns are consistently negative for each branch of the tree for all of the time periods we consider. The final branch, with a sample size of 56 events, shows a -2.9 percent CAR for 30 days, -6.3 percent for 60 days, and -1.4 percent for 90 days. In this case, the base rate would suggest selling the stock on the day following the decline.

We can compare these base rates with what actually happened. The CAR for Tenet Healthcare's shares was -60.9 percent in the 30 trading days following the event, -54.4 percent for 60 days, and -51.2 percent for 90 days. Exhibit 9 reflects these returns. Once again, note that there is a distribution of returns for that reference class, and the best we can do is make a probabilistic assessment.

Summary: Buy, Sell, or Hold

The goal of this analysis is to provide you with useful base rates in the case that you see a sharp drop—a "man overboard" moment—in one of the stocks in your portfolio. These base rates are meant to offer some guidance in determining whether you should buy, sell, or do nothing the day following the event. You should keep this report handy, and when an event occurs you can pull it out and follow the steps in the checklist. The results contained here are a useful complement to fundamental analysis.

Because these events tend to be infrequent, most investors don't have a systematic approach, or data, to make a sound judgment. Further, large price drops almost always evoke a strong emotional reaction, which complicates the process of decision making even more.

Our examination of exhibits 2 and 3 suggests that the following characteristics are consistent with buy and sell signals:

Buy. For earnings releases, there is a clear and convincing buy signal for stocks with weak momentum prior to the event. This buy signal is strengthened if the stock has a cheap valuation and is of high quality.

The buy signal for stocks with weak momentum is even more pronounced for non-earnings events than it is for earnings releases, although these stocks had worse shareholder returns leading up to the event. This signal is stronger for stocks that have a cheap valuation, and is further amplified if the companies are of high or neutral quality. Symantec, the subject of our first case study, was a non-earnings event with weak momentum, cheap valuation, and high quality, and hence the data suggested a buy.

Sell. For earnings releases, momentum alone does not indicate a strong buy or sell pattern. But there is a fairly strong sell signal for stocks that have the combination of strong momentum and expensive valuation. The sell signal holds for stocks with strong momentum, expensive valuation, and any quality score. Tenet Healthcare, our second case, had strong momentum, expensive valuation, and low quality—factors that suggested selling the shares.

For non-earnings events, the cumulative abnormal returns following an event are largely positive. But we must note that these stocks as a group performed poorly prior to the event, down more than five percentage points relative to the market. There are a couple of combinations that suggest selling the stock. The strongest sell signal is for companies that combine strong or neutral momentum, expensive valuation, and high quality. Strong or neutral momentum and expensive valuation alone do not indicate a sell signal.

Making decisions in the face of uncertainty is always a challenge, but it is inherent to investing. Deciding what to do with a stock following a sharp decline is particularly difficult because emotions tend to run high after those events. This report provides grounding in the form of base rates in an effort to better inform decisions.

Exhibit 12: Ex-Bubble Earnings Event – Cumulative Abnormal Returns

Momentum	Valuation	Quality	Days -30	Event	N =	Days +30	Days +60	Days +90
Strong			-1.5%	-14.7%	322	-1.4%	-2.0%	-1.1%
	Cheap		-3.1%	-14.2%	100	-0.5%	-0.3%	0.9%
		High	-3.9%	-13.8%	34	-0.2%	-2.4%	0.0%
		Neutral	-3.9%	-15.2%	17	-6.5%	-0.3%	2.7%
		Low	-2.2%	-14.1%	49	1.5%	1.1%	0.9%
	Neutral		-1.9%	-14.8%	93	-1.2%	-1.5%	-0.2%
		High	-2.6%	-16.0%	37	-0.2%	4.1%	4.0%
		Neutral	-3.6%	-13.7%	20	-1.3%	-3.2%	-1.6%
		Low	-0.2%	-14.1%	36	-2.1%	-6.2%	-3.8%
	Expensive		0.0%	-15.0%	129	-2.2%	-3.8%	-3.3%
		High	0.9%	-14.8%	45	-1.1%	-1.9%	-0.6%
		Neutral	-1.3%	-16.7%	36	-2.3%	-2.5%	-8.0%
		Low	0.0%	-13.9%	48	-3.1%	-6.5%	-2.4%
Neutral			-2.9%	-14.2%	320	0.0%	-0.4%	1.4%
	Cheap		-4.9%	-14.2%	120	-0.4%	-0.8%	2.5%
		High	-6.9%	-15.0%	40	0.1%	-0.5%	2.5%
		Neutral	-3.2%	-14.1%	44	1.0%	0.8%	5.2%
		Low	-4.6%	-13.5%	36	-2.6%	-2.9%	-1.0%
	Neutral		-1.8%	-14.2%	109	0.9%	0.9%	2.2%
		High	-1.1%	-14.9%	32	-1.4%	-1.7%	-2.4%
		Neutral	-1.3%	-14.0%	29	1.7%	4.2%	7.2%
		Low	-2.7%	-13.9%	48	2.0%	0.7%	2.2%
	Expensive		-1.5%	-14.1%	91	-0.7%	-1.4%	-1.1%
		High	-3.1%	-14.3%	38	-2.6%	-3.1%	3.0%
		Neutral	-0.6%	-13.7%	25	0.0%	2.5%	2.0%
		Low	0.0%	-14.2%	28	1.3%	-2.6%	-9.4%
Weak			-0.9%	-14.6%	436	1.4%	1.9%	3.9%
	Cheap		-4.3%	-14.5%	215	3.2%	2.8%	6.8%
		High	-6.3%	-15.0%	53	3.8%	6.3%	0.7%
		Neutral	-2.6%	-14.9%	84	2.0%	2.2%	6.4%
		Low	-4.6%	-13.7%	78	4.1%	1.2%	4.5%
	Neutral		1.0%	-14.8%	125	-1.0%	-0.5%	-1.0%
		High	2.7%	-14.2%	39	-1.5%	1.8%	3.8%
		Neutral	-0.8%	-14.2%	29	-3.8%	-2.0%	-1.2%
		Low	0.7%	-15.5%	57	0.9%	-1.2%	-4.3%
	Expensive		4.3%	-14.5%	96	0.6%	3.1%	4.1%
		High	3.7%	-15.5%	23	-3.9%	2.5%	2.0%
		Neutral	8.0%	-15.5%	26	1.6%	4.8%	3.5%
		Low	2.5%	-13.5%	47	2.4%	2.4%	5.4%

Source: Credit Suisse HOLT.

Exhibit 13: Ex-Bubble Non-Earnings Event – Cumulative Abnormal Returns

Momentum

Momentum	Days -30	Event	N =	Days +30	Days +60	Days +90
Strong	-2.6%	-14.5%	631	2.1%	2.1%	1.5%
Neutral	-4.7%	-15.0%	605	0.7%	1.8%	3.0%
Weak	-5.4%	-15.1%	921	5.0%	8.0%	8.0%

Valuation

Momentum	Valuation	Days -30	Event	N =	Days +30	Days +60	Days +90
Strong	Cheap	-8.8%	-15.3%	153	4.4%	10.3%	12.8%
Strong	Neutral	-1.5%	-14.6%	169	3.7%	3.5%	3.1%
Strong	Expensive	-0.1%	-14.0%	309	0.1%	-2.8%	-4.9%
Neutral	Cheap	-8.9%	-15.4%	202	2.1%	4.8%	7.9%
Neutral	Neutral	-4.9%	-14.1%	189	0.6%	1.9%	2.9%
Neutral	Expensive	-0.5%	-15.3%	214	-0.3%	-1.1%	-1.3%
Weak	Cheap	-8.9%	-15.0%	473	6.2%	9.3%	8.1%
Weak	Neutral	-3.6%	-15.2%	255	1.2%	4.9%	7.3%
Weak	Expensive	0.7%	-15.0%	193	7.2%	9.0%	8.6%

Quality

Momentum	Valuation	Quality	Days -30	Event	N =	Days +30	Days +60	Days +90
Strong	Cheap	High	-6.8%	-14.2%	50	5.1%	8.1%	11.6%
Strong	Cheap	Neutral	-14.4%	-18.3%	48	-0.1%	4.3%	6.3%
Strong	Cheap	Low	-5.8%	-13.7%	55	7.7%	17.5%	19.5%
Strong	Neutral	High	-4.2%	-15.0%	47	3.8%	2.7%	2.8%
Strong	Neutral	Neutral	-1.8%	-15.3%	67	5.0%	7.3%	3.4%
Strong	Neutral	Low	1.0%	-13.5%	55	2.1%	-0.5%	3.0%
Strong	Expensive	High	-2.8%	-13.4%	153	-0.1%	-7.6%	-8.0%
Strong	Expensive	Neutral	5.7%	-15.8%	65	3.3%	5.7%	-0.4%
Strong	Expensive	Low	0.5%	-13.6%	91	-1.8%	-0.7%	-2.8%
Neutral	Cheap	High	-10.8%	-16.0%	73	2.8%	6.0%	6.5%
Neutral	Cheap	Neutral	-9.0%	-15.7%	70	2.8%	6.2%	11.4%
Neutral	Cheap	Low	-6.4%	-14.4%	59	0.3%	1.7%	5.4%
Neutral	Neutral	High	-7.2%	-13.7%	73	-0.5%	0.4%	0.8%
Neutral	Neutral	Neutral	-1.9%	-14.0%	55	-0.2%	3.1%	4.4%
Neutral	Neutral	Low	-4.8%	-14.7%	61	2.6%	2.6%	4.0%
Neutral	Expensive	High	-2.3%	-15.7%	74	-4.3%	-8.8%	-11.0%
Neutral	Expensive	Neutral	4.9%	-15.5%	52	2.6%	4.7%	5.0%
Neutral	Expensive	Low	-2.1%	-14.8%	88	1.2%	2.1%	3.0%
Weak	Cheap	High	-8.9%	-16.1%	143	5.2%	8.9%	9.5%
Weak	Cheap	Neutral	-7.6%	-14.1%	143	4.8%	9.3%	10.3%
Weak	Cheap	Low	-9.7%	-14.8%	187	7.9%	9.6%	5.2%
Weak	Neutral	High	-8.8%	-16.8%	73	1.7%	7.1%	9.4%
Weak	Neutral	Neutral	2.9%	-14.3%	81	1.9%	7.0%	11.8%
Weak	Neutral	Low	-5.0%	-14.8%	101	0.5%	1.7%	2.2%
Weak	Expensive	High	-2.0%	-14.6%	45	3.4%	4.6%	1.7%
Weak	Expensive	Neutral	4.5%	-16.9%	45	11.8%	16.9%	18.7%
Weak	Expensive	Low	0.2%	-14.4%	103	6.9%	7.5%	7.2%

Source: Credit Suisse HOLT.

Appendix A: Definition of the Factors

Momentum: Momentum is a gauge of market sentiment. Stocks that score well have rising levels of expected CFROI as the result of upward earnings revisions, positive stock price momentum, and good liquidity.

- **CFROI Key Momentum, 13-week (60%)** - CFROI Key Momentum measures change in the level of expected CFROI following revisions in consensus earnings per share.
- **Price Momentum (52-week) (30%)** - Price Momentum is based on the percentage change in market value over the past 52 weeks.
- **Daily Liquidity Average (10%)** - Daily Liquidity Average reflects the number of shares traded in the last quarter, divided by 63 trading days, multiplied by the stock price at the end of the most recent week, divided by market capitalization.

Valuation: Valuation assesses the difference between the stock's warranted value, based on the HOLT framework®, and the stock's current market price. Stocks with the most upside are cheap, and those with the least upside, or downside, are expensive.

- **Percentage Change to Best Price (50%)** - Percentage Change to Best Price measures the difference between HOLT's warranted value and the current stock price. By using a discounted cash flow approach that standardizes financial figures, the HOLT model generates values that allow for the comparison of firms across regions, sectors, and accounting standards.
- **Economic P/E (30%)** – Economic P/E is HOLT's version of a price-to-earnings ratio. You can compare Economic P/E across companies and industries because the value-to-cost ratio is divided by CFROI, normalizing results. Specifically, Economic P/E = (Enterprise Value / Inflation Adjusted Net Assets) / CFROI.
- **Value-to-Cost Ratio (10%)** – Value-to-Cost Ratio is analogous to price/book value, but reflects a number of adjustments that reduce volatility and better reflect firm value. These include inflation adjustments for old plant and inventory in gross investment, capitalized research and development (R&D), capitalized operating leases, the reflection of the contingent claim for stock options in debt, pension debt, preferred stock, and liabilities related to capitalized operating leases. The Value-to-Cost Ratio = (Market Value of Equity + Minority Interest + HOLT Debt) / Inflation Adjusted Net Assets
- **Dividend Yield (10%)** – Dividend Yield is the dividends paid in the last 12 months divided by the most recent share price.

Quality: Quality measures a company's record of generating cash and managing growth, independent of expectations about the future. Firms that score well have high CFROIs and have shown the ability to grow profitable businesses or the willingness to shrink unprofitable ones.

- **CFROI Last Fiscal Year (50%)** - CFROI Last Fiscal Year is the ratio of gross cash flow to gross investment and is expressed as an internal rate of return. We use the CFROI for the last reported fiscal year.
- **Managing for Value (30%)** - Managing for Value equals the spread between CFROI and the Discount Rate, multiplied by the inflation-adjusted gross investment. This allows us to determine whether the company's growth creates value and is sustainable. Growth in businesses that earn a CFROI in excess of the cost of capital is value creating, while growth in businesses with a negative spread destroys value.
- **Change in Value Creation (20%)** - Change in Value Creation measures the improvement in economic profit in the most recent fiscal year. A positive value indicates the company either increased the spread between CFROI and the discount rate, or grew in a business with a positive spread. Change in Value Creation = (CFROI – Discount Rate * Growth Rate) – Prior Fiscal Year Spread.

Once on HOLT Lens, you can find the scores on the homepage of each company by clicking on "Scorecard Percentile." For more detail on the scores, you can select "More Information." You will see a screen similar to exhibit 14.

Exhibit 14: Detailed Breakdown of Symantec's Factor Scores

HOLT Scorecard Metholdology

Enter Ticker: SYMC

Enter Date: 2/28/2014

SYMANTEC CORP

Operational Quality	Value	Percentile	Weight
CFROI LFY	22.4	74	50%
Managing For Value	300.2	89	30%
Change in Value Creation	-4.6	10	20%

Momentum	Value	Percentile	Weight
CFROI Revisions (13Wk)	-0.3	33	60%
Price Momentum (52Wk)	-1.7	11	30%
Size Relative Daily Liq. Avg %	1.0	59	10%

Valuation	Value	Percentile	Weight
% Upside / Downside	24.7	62	50%
Economic PE	14.4	81	30%
Dividend Yield	2.8	92	10%
HOLT Price to Book	3.3	55	10%

	Value	Weight
Operational Quality	66	33%
Percentile	71	
Momentum	29	33%
Percentile	23	
Valuation	70	34%
Percentile	80	

	Value
Overall	55
Percentile	69

Source: HOLT Lens.

Appendix B: Distributions of Stock Price Changes

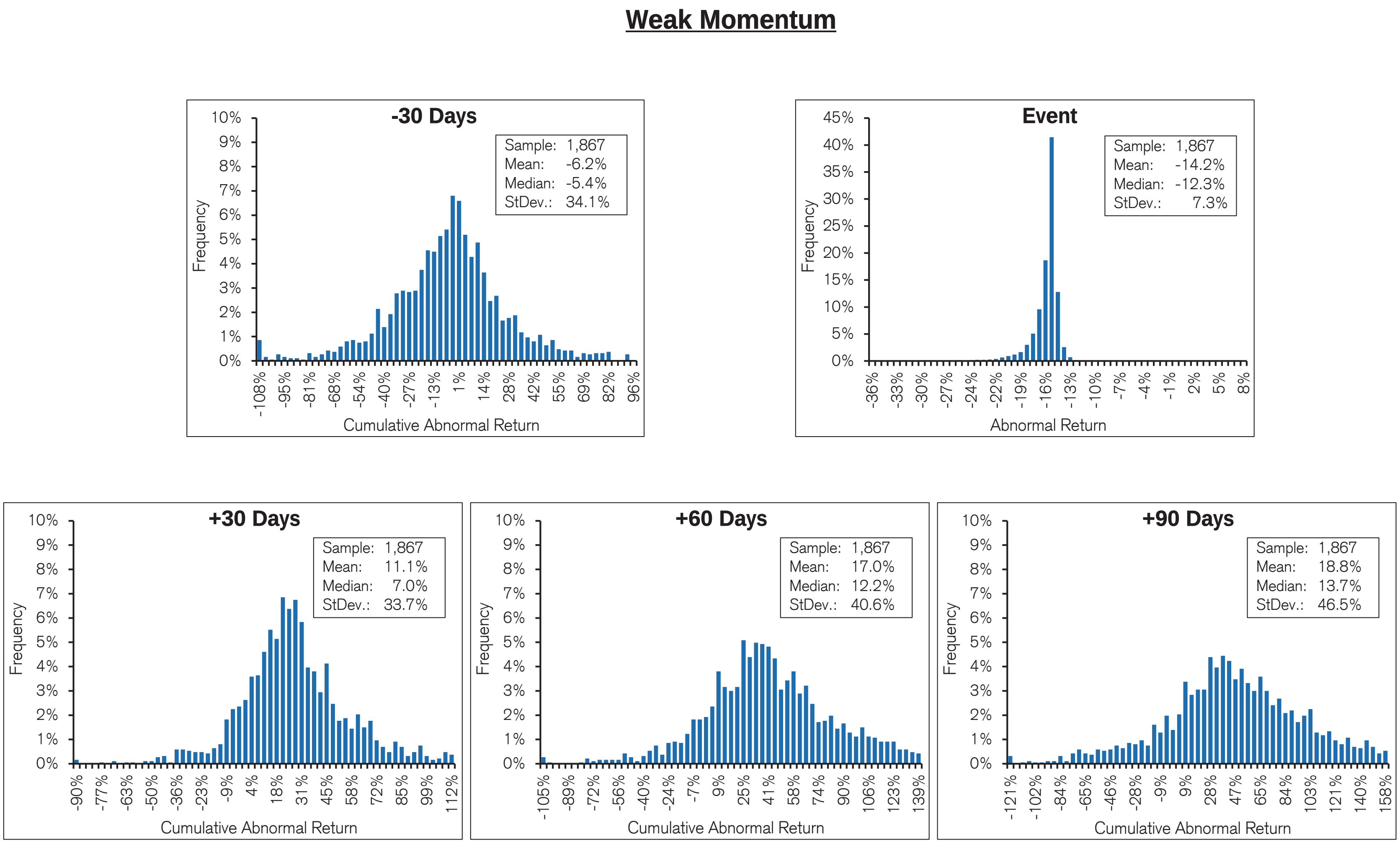
This appendix reviews the distributions that apply to Symantec, one of our case studies. These distributions reflect non-earnings announcements and contain all events, including the bubble periods. We also provide some statistical properties for each distribution, including the sample size, mean, median, and standard deviation.

Exhibit 15 shows all the cases with weak momentum and displays five distributions of cumulative abnormal returns, including the 30 trading days prior to the event, the event itself, and the cumulative abnormal returns for the 30, 60, and 90 trading days subsequent to the event. This is the first branch of the Symantec case study.

Exhibit 16 shows weak momentum and cheap valuation, which trims the sample size by nearly one-half. Here again we include the 30 trading days prior to the event, the event itself, and the cumulative abnormal returns for the 30, 60, and 90 trading days after the event. This is the second branch of the Symantec case study.

Exhibit 17 shows the final branch in the Symantec case study: weak momentum, cheap valuation, and high quality. The sample size is just over one-quarter of the prior branch. You can see the 30 trading days prior to the event, the event itself, and the cumulative abnormal returns for the 30, 60, and 90 trading days after the event.

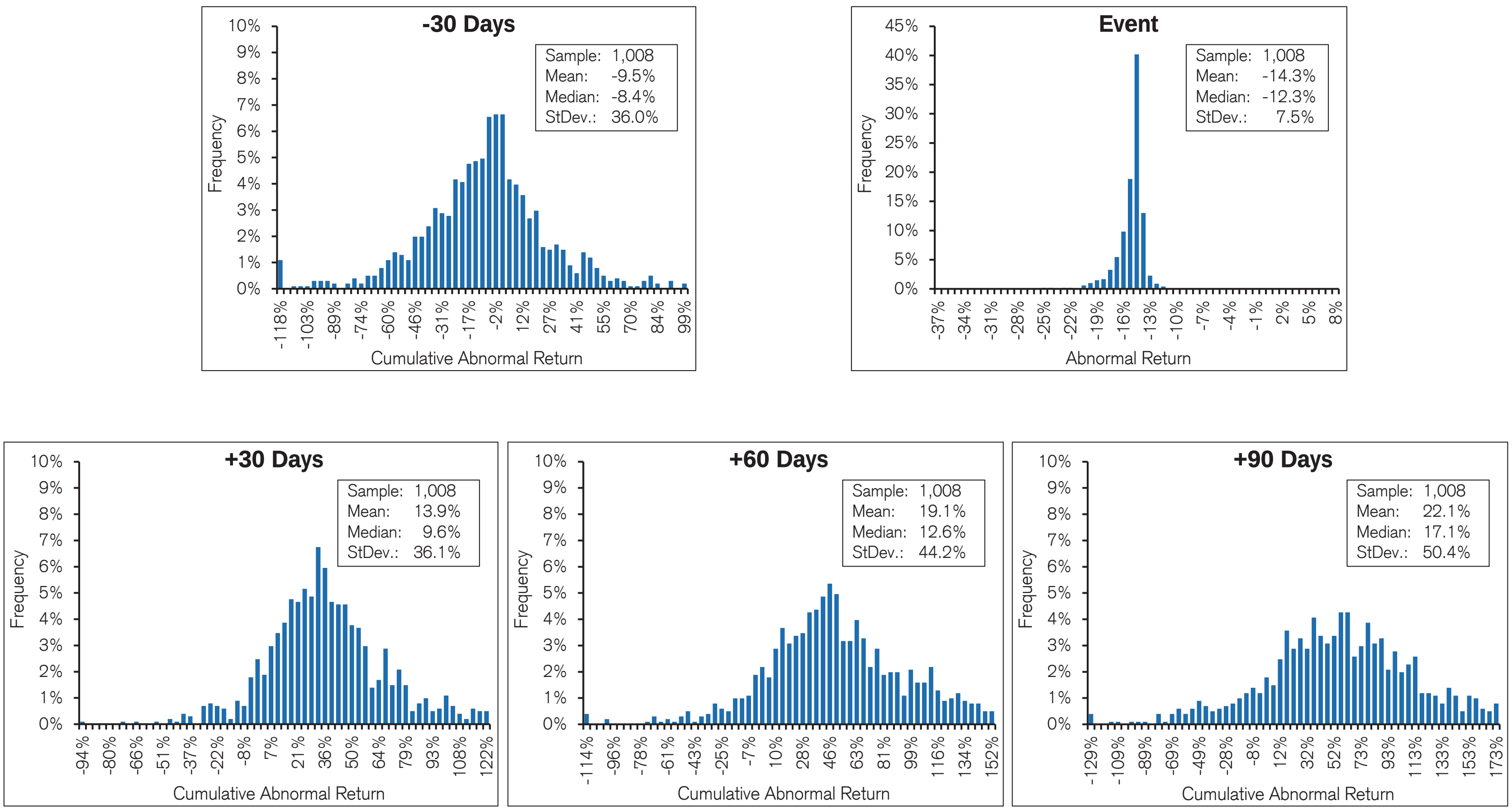
Exhibit 15: Distributions for the First Branch of the Symantec Case Study



Source: Credit Suisse HOLT.

Exhibit 16: Distributions for the Second Branch of the Symantec Case Study

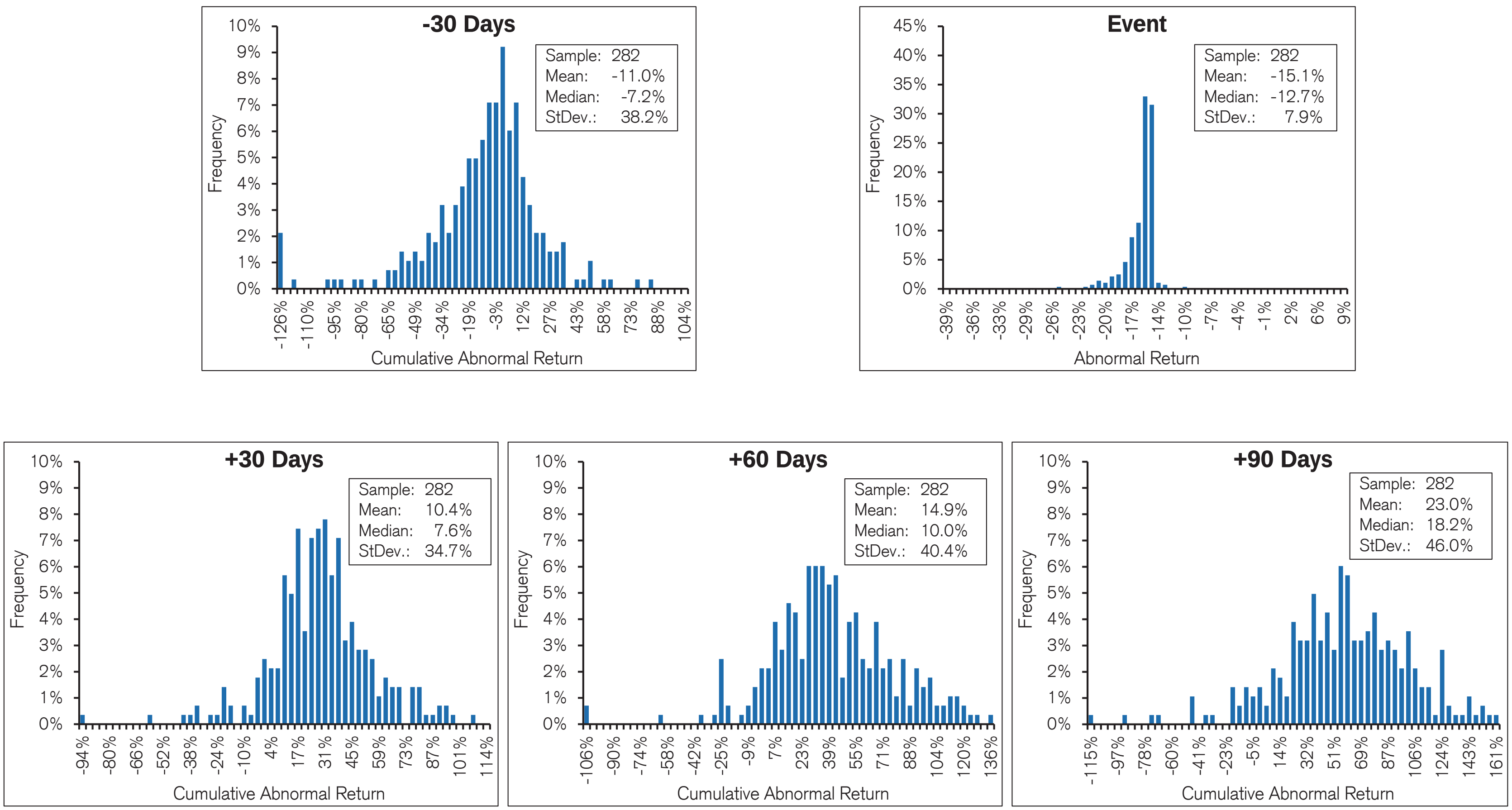
Weak Momentum, Cheap Valuation



Source: Credit Suisse HOLT.

Exhibit 17: Distributions for the Third Branch of the Symantec Case Study

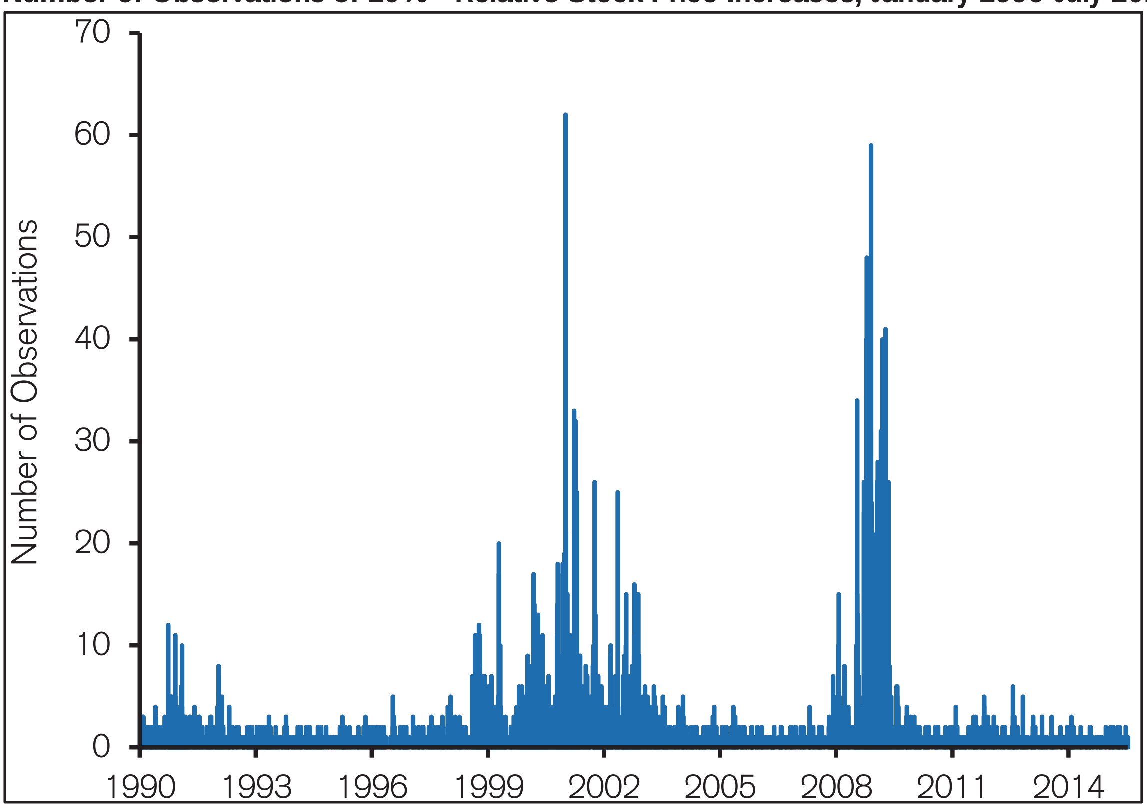
Weak Momentum, Cheap Valuation, High Quality



Source: Credit Suisse HOLT.

Celebrating the Summit

Number of Observations of 10%+ Relative Stock Price Increases, January 1990-July 2015



Source: Credit Suisse HOLT.

The Value of a Framework under Success

A key to investing successfully is the ability to manage emotions in the face of highs and lows. The focus of this report is when one of the stocks in your portfolio rises sharply relative to the market and is not an acquisition target. As a portfolio manager you are likely to be pleased about the boost to investment returns and flush with a sense of success. As the analyst you might feel proud and self-assured. Enjoying achievement is fine to a point. But high emotional arousal is not conducive to good decision making.

A big winner can create what we call a "celebrating the summit" moment.[1] The idea comes from Laurence Gonzales, an author and expert on survival in extreme situations, who warns against excessive congratulation after reaching a goal.[2] He points out that mountain climbers commonly celebrate too much at the peak. This causes them to let their guard down just as they are approaching the part of the expedition that may be the most challenging. Gonzales points out that descent is technically more difficult than ascent and that most mountaineering accidents occur on the way down. Likewise, selling can be harder than buying.

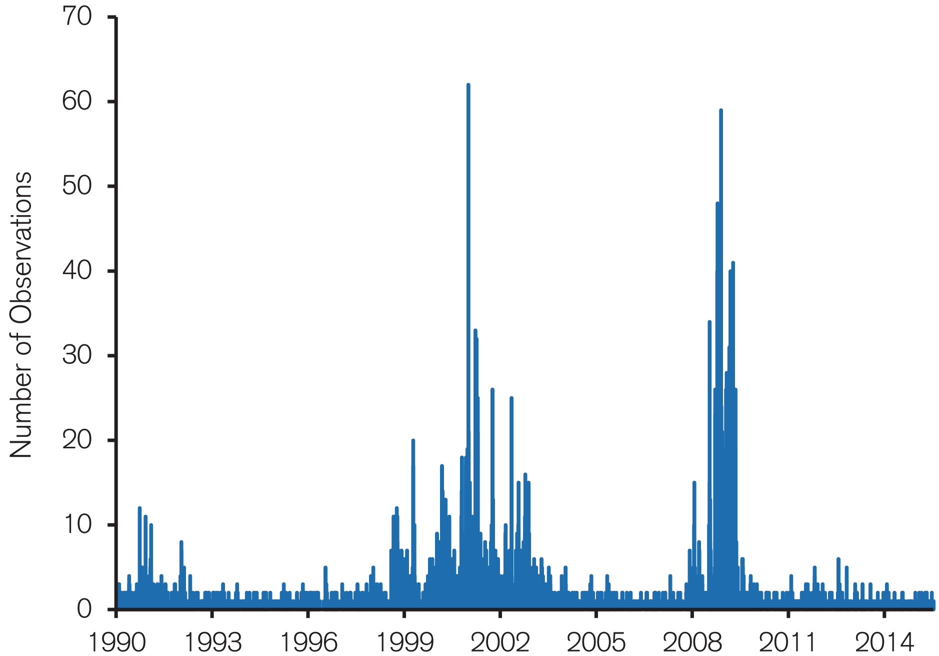
You can use a checklist to help make good decisions when emotions are running high. Atul Gawande describes two types of checklists in his book, *The Checklist Manifesto*.[3] The first is called DO-CONFIRM. Here you do your job from memory but pause periodically to make sure that you have done everything you are supposed to do. The second is called READ-DO. Here, you simply read the checklist and do what it says. READ-DO checklists are particularly helpful when you are in the state of high emotional arousal because they prevent you from being overcome by emotion as you decide how to act.

You can think of your emotional state and the ability to make good decisions as sitting on opposite sides of a seesaw. If your state of emotional arousal is high, your capacity to decide well is low. A checklist helps take out the emotion and moves you toward a proper choice. It also keeps you from succumbing to decision paralysis. A psychologist studying emergency checklists in aviation said the goal is to "minimize the need for a lot of effortful analysis when time may be limited and workload is high."[4]

This report provides you with analytical guidance if one of your stocks rises 10 percent or more in one day relative to the S&P 500. We limit the analysis to stock price rises unrelated to announced mergers and acquisitions (M&A). More directly, we want to answer the question of whether you should buy, hold, or sell the stock following one of these big moves to the upside.

Exhibit 1 shows the number of such observations for the S&P 500 from January 1990 through mid-2015. There were roughly 6,800 occurrences, with noteworthy clusters around the dot-com bubble and the financial crisis in 2008-2009. The bubble periods contain 36 percent of the observations. These sharp gains happen frequently enough that they deserve a thoughtful process to deal with them but infrequently enough that few investment firms have developed such a process. Assuming an average number of stock holdings in a mutual fund that is benchmarked against the S&P 500, a portfolio manager of a typical mutual fund would encounter 5-15 "celebrating the summit" moments per year in low volatility years (e.g., 1994-1997 and 2012-2015) and more than 100 such moments in high volatility years (2000-2002 and 2008-2009).

Exhibit 1: Number of Observations of 10%+ Relative Stock Price Increases, January 1990-July 2015



Source: Credit Suisse HOLT.

Base Rates of Large Gains in Stock Price

We use base rates to show how stocks perform after they have risen sharply. To do this, we calculate the "cumulative abnormal return" for the 30, 60, and 90 trading days after the time of the increase. An abnormal return is the difference between the total shareholder return and the expected return. A stock's expected return reflects the change in a broader stock market index, the S&P 500 in our case, adjusted for risk. The cumulative abnormal return, then, is simply the sum of the abnormal returns during the period that we measure.

Exhibit 2 shows the results for the full sample. The first thing to note is that weak relative stock price results generally precede the large positive moves. The stocks in the sample rose nearly 14 percentage points versus the S&P 500 on the event date, but fell almost 6 percentage points relative to the market in the 30 days prior to the event. Second, the excess returns following a large price gain are on average strongly positive.

Exhibit 2: Full Sample – Cumulative Abnormal Returns

	Days -30	Event	N =	Days +30	Days +60	Days +90
Full Sample	-5.9%	13.8%	6,797	3.5%	6.1%	7.0%
Earnings	-3.3%	14.5%	1,505	2.7%	3.7%	4.1%
Non-Earnings	-6.6%	13.6%	5,292	3.8%	6.8%	7.9%

Source: Credit Suisse HOLT.

We refine the large sample into relevant categories in an effort to increase the usefulness of the base rates.[5] The first refinement, which exhibit 2 shows, is segregation between earnings and non-earnings events.

The full sample of cumulative abnormal returns for earnings events, which constitute about one-fifth of our sample, is in exhibit 3. Cumulative abnormal returns for non-earnings announcements, which include releases of information that are scheduled, such as same-store sales updates, as well as unanticipated announcements, including a change in management or an earnings update, are found in exhibit 4. On balance, returns subsequent to non-earnings announcements are greater than those following earnings releases.

There is strong evidence in the U.S. markets for "post-earnings-announcement drift."[6] This is a positive relationship between announced earnings surprises and subsequent stock price changes. For companies that report an upside earnings surprise, cumulative abnormal returns tend to continue to drift up.

The second refinement is the application of three factors—momentum, valuation, and quality—that consider corporate fundamentals and stock market measures. All companies receive a score for each factor. The scores are relative to a company's peers in the same sector. You can find a detailed definition of the factors in Appendix A of the "Managing the Man Overboard Section" of this book, but here's a quick summary:

- **Momentum** predominantly considers two drivers, change in cash flow return on investment (CFROI) forecasts and stock price momentum. Good momentum is associated with rising CFROI forecasts and strong relative stock price appreciation.

- **Valuation** reflects the gap between the current stock price and the warranted value in the HOLT® valuation model. Valuation also incorporates adjusted measures of price-to-earnings and price-to-book ratios. Together, these metrics help assess whether a stock is relatively cheap or expensive.

- **Quality** captures the company's recent level of CFROI and whether the company has consistently made investments that create value. Firms with high CFROIs and strong value creation score well on quality.

The upside of adding refinements is that you can find a base rate that closely matches the case you are considering. The downside is that the sample size (N) shrinks with each refinement. We have tried to maintain healthy sample sizes even in the end branches, and we display the Ns along the way so that you can assess the trade-off between fit and prior occurrences.

We are almost ready to turn to the checklist and numbers, but we need to cover one additional item. All of our summary exhibits show the average, or mean, abnormal shareholder return. That average represents a full distribution of results. For most of the distributions, the median return, the return that separates the top half from the bottom half of the sample, is less than the mean, which tells you that the distributions are skewed to the right.

Further, the standard deviations of most of the distributions are in the range of 30-45 percent. While our summary figures show a tidy average, recognize that the figure belies a rich distribution. The appendix shows the distributions for a handful of events. The base rate data can be extremely helpful in making a sound decision even if the outcome is probabilistic.

We're now ready to turn to the checklist and the base rates.

The Checklist

You come into the office and one of the stocks in your portfolio is up 10 percent or more relative to the S&P 500. The move is unrelated to announced M&A. Here's what you do:

☐ **Earnings or non-earnings.** Determine whether the precipitating announcement is an earnings release or a non-earnings disclosure and go to the appropriate exhibit;

☐ **Momentum.** Check the appropriate HOLT Lens™ page to determine if the stock had strong, weak, or neutral momentum going into the announcement. You can either go to the momentum section of the exhibit or continue;

☐ **Valuation.** Check to see if the valuation is cheap, expensive, or neutral. You can either go to the section in the exhibit that combines momentum and valuation or continue;

☐ **Quality.** Check to see if the quality is high, low, or neutral. Go to section in the exhibit that incorporates all of the factors.

We have two detailed case studies that we'll present in a moment, but let's run through an example to see how this works. The first item is to determine whether the announcement was a scheduled earnings release or not. Let's say it was an earnings event. That means we would refer to the data in exhibit 3.

Step two is to assess the momentum. We'll assume that momentum is weak. If you look at the left side of the exhibit you'll see the section that reflects momentum. If you focus on the results of the companies with weak momentum, you'll see a few figures. You'll notice that the 665 stocks in that reference class increased 15.2 percent, on average, the day of the event. You will also see that those stocks greatly underperformed the market, with a cumulative abnormal return of -5.7 percent in the prior 30 trading days.

You'll also see that the stocks in that class did well in the subsequent period, with cumulative abnormal returns of 4.1 percent in the next 30 trading days, 4.7 percent in 60 trading days, and 5.2 percent in 90 trading days. We selected 90 trading days as the extent of this analysis because we felt it is a sufficient amount of time for an investment team to thoroughly reassess the stock's merit. We designed the READ-DO checklist to provide immediate guidance.

We now turn to valuation, which you can find in the middle of the exhibit, to see if we can sharpen the analysis. Let's assume the valuation was expensive. If we look 60 days out, we see that the 164 instances in this group have an average cumulative abnormal return of 5.7 percent.

As a final check, we consider quality, which you can find on the right of the exhibit. Let's say quality is low. We've now shrunk our sample size to 72, and see that the 60-day cumulative abnormal return is 12.6 percent.

Exhibit 3: Earnings Event – Cumulative Abnormal Returns

Momentum: Strong

Momentum	Days -30	Event	N =	+30	Days +60	+90
Strong	-1.3%	13.9%	411	1.1%	1.9%	2.3%

Valuation	Days -30	Event	N =	+30	Days +60	+90
Cheap	-3.2%	14.2%	109	3.5%	6.6%	8.0%
Neutral	-1.2%	14.0%	149	1.0%	1.7%	3.3%
Expensive	0.0%	13.7%	153	-0.6%	-1.4%	-2.8%

Quality	Days -30	Event	N =	+30	Days +60	+90
High	-5.9%	14.6%	37	0.2%	4.4%	9.4%
Neutral	-3.6%	13.9%	27	3.7%	5.4%	7.5%
Low	-0.7%	14.0%	45	6.1%	9.0%	7.1%

Quality	Days -30	Event	N =	+30	Days +60	+90
High	-0.9%	13.3%	48	0.3%	0.5%	0.1%
Neutral	-3.6%	14.4%	44	2.3%	0.0%	1.9%
Low	0.4%	14.2%	57	0.5%	4.1%	7.1%

Quality	Days -30	Event	N =	+30	Days +60	+90
High	-0.6%	13.8%	65	-2.3%	-1.7%	-6.0%
Neutral	-0.4%	13.5%	32	1.5%	-0.6%	-1.8%
Low	0.9%	13.8%	56	0.1%	-1.5%	0.5%

Momentum: Neutral

Momentum	Days -30	Event	N =	+30	Days +60	+90
Neutral	-1.6%	14.1%	429	2.1%	3.9%	4.2%

Valuation	Days -30	Event	N =	+30	Days +60	+90
Cheap	-3.7%	14.4%	147	3.5%	5.1%	6.0%
Neutral	-1.3%	13.3%	137	2.3%	5.0%	4.0%
Expensive	0.2%	14.5%	145	0.6%	1.7%	2.6%

Quality	Days -30	Event	N =	+30	Days +60	+90
High	-6.3%	15.6%	51	2.5%	9.0%	8.0%
Neutral	-1.7%	13.0%	41	4.7%	8.8%	8.2%
Low	-2.8%	14.1%	55	3.6%	-1.3%	2.5%

Quality	Days -30	Event	N =	+30	Days +60	+90
High	-3.5%	12.7%	47	2.0%	3.7%	1.9%
Neutral	0.9%	13.0%	40	0.3%	2.5%	1.6%
Low	-0.9%	14.0%	50	4.3%	8.3%	7.8%

Quality	Days -30	Event	N =	+30	Days +60	+90
High	2.4%	14.8%	45	2.0%	5.9%	8.0%
Neutral	0.3%	14.3%	45	-0.8%	-0.7%	1.5%
Low	-1.6%	14.4%	55	0.5%	0.3%	-0.9%

Momentum: Weak

Momentum	Days -30	Event	N =	+30	Days +60	+90
Weak	-5.7%	15.2%	665	4.1%	4.7%	5.2%

Valuation	Days -30	Event	N =	+30	Days +60	+90
Cheap	-9.8%	15.9%	304	5.9%	3.7%	5.2%
Neutral	-3.5%	14.5%	197	2.3%	5.5%	5.8%
Expensive	-0.8%	14.7%	164	2.7%	5.7%	4.5%

Quality	Days -30	Event	N =	+30	Days +60	+90
High	-11.2%	15.0%	109	4.1%	1.6%	5.5%
Neutral	-5.6%	14.6%	86	2.4%	3.2%	4.4%
Low	-11.7%	18.0%	109	10.4%	6.1%	5.4%

Quality	Days -30	Event	N =	+30	Days +60	+90
High	-0.7%	13.5%	54	1.2%	3.7%	6.4%
Neutral	-3.3%	13.2%	57	2.2%	3.3%	0.1%
Low	-5.3%	15.9%	86	3.2%	8.1%	9.1%

Quality	Days -30	Event	N =	+30	Days +60	+90
High	-1.1%	14.6%	44	-1.0%	0.9%	-0.1%
Neutral	5.0%	13.9%	48	1.6%	-0.4%	0.9%
Low	-4.6%	15.3%	72	5.7%	12.6%	9.7%

Source: Credit Suisse HOLT.
Note: The abnormal return for the event reflects only the day of the event.

Exhibit 4: Non-Earnings Event – Cumulative Abnormal Returns

Momentum | **Valuation** | **Quality**

Momentum	Days -30	Event	N =	Days +30	+60	+90
Strong	-7.5%	12.7%	1,137	1.2%	1.5%	1.7%

Valuation	Days -30	Event	N =	Days +30	+60	+90
Cheap	-9.8%	12.6%	347	3.4%	6.7%	8.6%
Neutral	-5.7%	12.8%	334	0.5%	4.4%	5.5%
Expensive	-7.0%	12.8%	456	0.0%	-4.5%	-6.2%

Quality	Days -30	Event	N =	Days +30	+60	+90
High	-15.2%	12.8%	122	7.3%	10.9%	10.2%
Neutral	-8.1%	12.6%	98	-3.2%	1.6%	4.5%
Low	-6.0%	12.5%	127	4.7%	6.6%	10.3%

Quality	Days -30	Event	N =	Days +30	+60	+90
High	-9.7%	12.4%	105	-0.5%	1.7%	1.4%
Neutral	-4.2%	12.9%	94	-0.7%	3.3%	1.3%
Low	-3.6%	13.1%	135	2.1%	7.3%	11.5%

Quality	Days -30	Event	N =	Days +30	+60	+90
High	-10.7%	12.9%	209	0.0%	-7.0%	-7.9%
Neutral	-2.3%	13.0%	116	-0.6%	-4.7%	-9.4%
Low	-5.5%	12.4%	131	0.5%	-0.4%	-0.7%

Momentum	Days -30	Event	N =	Days +30	+60	+90
Neutral	-7.5%	13.5%	1,383	2.8%	6.2%	7.1%

Valuation	Days -30	Event	N =	Days +30	+60	+90
Cheap	-13.0%	14.1%	543	4.7%	10.0%	10.4%
Neutral	-4.6%	12.8%	373	2.3%	4.3%	3.8%
Expensive	-3.2%	13.6%	467	1.1%	3.5%	5.8%

Quality	Days -30	Event	N =	Days +30	+60	+90
High	-13.9%	13.9%	187	4.0%	9.3%	7.9%
Neutral	-19.7%	14.3%	183	6.3%	15.0%	19.5%
Low	-5.1%	14.0%	173	3.8%	5.3%	3.6%

Quality	Days -30	Event	N =	Days +30	+60	+90
High	-5.9%	12.5%	128	2.7%	4.7%	6.1%
Neutral	-1.6%	12.3%	103	-1.1%	1.3%	0.0%
Low	-5.6%	13.3%	142	4.4%	6.1%	4.4%

Quality	Days -30	Event	N =	Days +30	+60	+90
High	-3.8%	13.1%	120	-0.3%	4.2%	4.3%
Neutral	1.8%	13.2%	147	1.1%	7.4%	11.0%
Low	-6.7%	14.2%	200	1.9%	0.1%	3.0%

Momentum	Days -30	Event	N =	Days +30	+60	+90
Weak	-5.8%	14.0%	2,772	5.3%	9.1%	10.8%

Valuation	Days -30	Event	N =	Days +30	+60	+90
Cheap	-10.5%	14.4%	1,270	7.6%	11.4%	13.5%
Neutral	-3.8%	13.9%	810	4.5%	8.9%	10.9%
Expensive	0.5%	13.2%	692	2.1%	5.4%	5.5%

Quality	Days -30	Event	N =	Days +30	+60	+90
High	-12.4%	14.4%	370	5.9%	9.4%	13.1%
Neutral	-7.7%	14.4%	445	9.0%	13.3%	15.4%
Low	-11.6%	14.3%	455	7.6%	11.0%	12.0%

Quality	Days -30	Event	N =	Days +30	+60	+90
High	-7.7%	13.1%	217	5.6%	11.7%	11.9%
Neutral	1.9%	14.1%	232	5.1%	8.9%	12.5%
Low	-5.1%	14.4%	361	3.6%	7.3%	9.3%

Quality	Days -30	Event	N =	Days +30	+60	+90
High	0.1%	12.6%	149	0.3%	4.4%	3.1%
Neutral	4.9%	13.7%	175	4.7%	9.3%	12.6%
Low	-1.5%	13.1%	368	1.6%	3.9%	3.0%

Source: Credit Suisse HOLT.
Note: The abnormal return for the event reflects only the day of the event.

Case Studies

We now turn to two case studies that provide detail about the analysis.

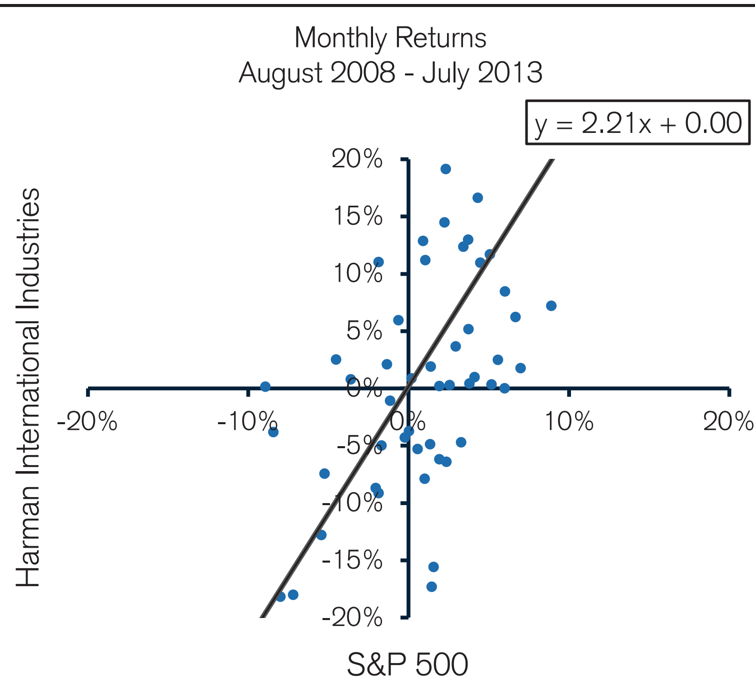
Harman International Industries, Incorporated

At an investors' day on August 8, 2013, Harman International Industries, Inc. provided guidance for sales, earnings before interest, taxes, depreciation, and amortization (EBITDA), and earnings per share for the 2014 and 2016 fiscal years (ended June 30). The stock rose 10.7 percent that day, from $58.62 to $64.90. The S&P 500 was down 0.4 percent. This was a non-earnings event.

Since we use cumulative abnormal return (CAR) for all of the stock performance data, it is worth taking a moment to explain how we do the calculation. We determine daily abnormal return using a simplified market model, which compares the actual return of a stock to its expected return. The expected return equals the total shareholder return of the benchmark, the S&P 500, times the stock's beta. The abnormal return is the difference between the actual return and the expected return.

We calculate beta by doing a regression analysis with the S&P 500's total returns as the independent variable (x-axis) and Harman's total returns as the dependent variable (y-axis). We use monthly total returns for the prior 60 months. Beta is the slope of the best-fit line. Exhibit 5 shows that the beta for Harman for the 60 months ended July 2013 was 2.2. This is the beta we use for our calculations of daily abnormal returns during the month of August 2013. Similarly, the beta for September 2013 would use returns for the 60 months ended August 2013.

Exhibit 5: Beta Calculation for Harman



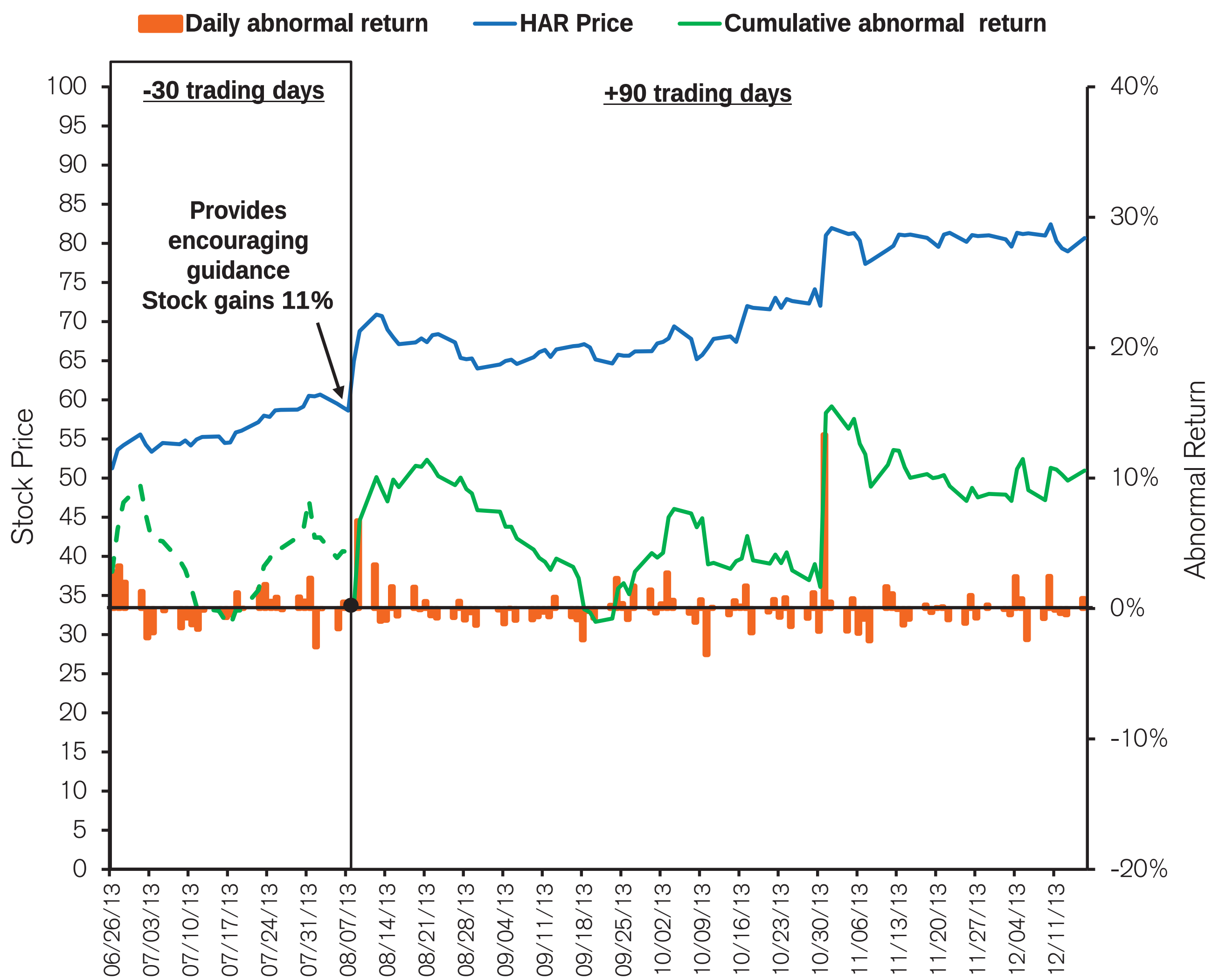
Source: Credit Suisse.

Using the 90 trading days following the event, we calculate a CAR of 11.8 percent as follows:

CAR = Actual return – expected return
= 25.3% - (Beta * Market Return)
= 25.3% - (2.2 * 6.1%)
CAR = 25.3% - 13.5% = 11.8%

Exhibit 6 shows the chart of the stock's performance for the 30 trading days prior to the event through 90 trading days following the event. The top line shows the stock price itself. The middle line is the cumulative abnormal return. We reset the cumulative abnormal return to zero on the event date. The bars are the daily abnormal returns. It's evident that buying Harman on the day after this event would have yielded good returns in the subsequent 90 days. Let's go through the checklist to see how we would have assessed the situation in real time.

Exhibit 6: Harman Stock Price and Cumulative Abnormal Returns, June 26 – December 16, 2013



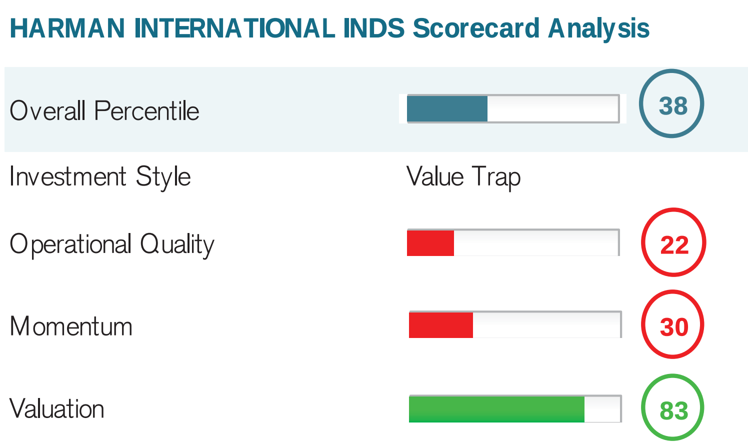
Source: Credit Suisse.

The first item on the checklist is the determination of whether the event was a scheduled earnings release. We know that this is an event not related directly to an earnings announcement, so we refer to exhibit 4.

The next step is determining how the stock scores with regard to momentum, valuation, and quality through HOLT Lens. (Please contact your HOLT or Credit Suisse representative if you do not have access to Lens and would like to use it.) At the welcome page, search for the company of the stock under consideration. This takes you to the summary page for that company, which includes a Relative Wealth Chart. Toward the top of the page you will find a link called "Scorecard Percentile." If you click on it, you will see numerical scores, from 0 to 100, for momentum, valuation, and operational quality, among other items.

To best align with the base rates, which reflect factor scores from before the price gain, it is appropriate to use the Scorecard on the day of the event as opposed to the days afterwards. On the day of the event, the factors do not yet incorporate the price gain—HOLT makes those adjustments overnight. For the purposes of this analysis, a score of 67 or more reflects strong momentum, cheap valuation, and high quality. A score of 33 or less means weak momentum, expensive valuation, and low quality. Numbers from 34 to 66 are neutral for the factors. Exhibit 7 shows you this screen for Harman on the date of the event.

Exhibit 7: Harman's Factor Scores



Source: HOLT Lens.

We see that momentum is weak (30), valuation is cheap (83), and quality is low (22). This allows us to follow the relevant branches in exhibit 4. Exhibit 8 extracts the branches that are relevant for Harman.

Exhibit 8: The Branches That Lead to Harman's Reference Class

Momentum

	Days -30	Event	N =	Days +30	+60	+90
Weak	-5.8%	14.0%	2,772	5.3%	9.1%	10.8%

Valuation

	Days -30	Event	N =	Days +30	+60	+90
Cheap	-10.5%	14.4%	1,270	7.6%	11.4%	13.5%

Quality

	Days -30	Event	N =	Days +30	+60	+90
Low	-11.6%	14.3%	455	7.6%	11.0%	12.0%

Source: Credit Suisse HOLT.

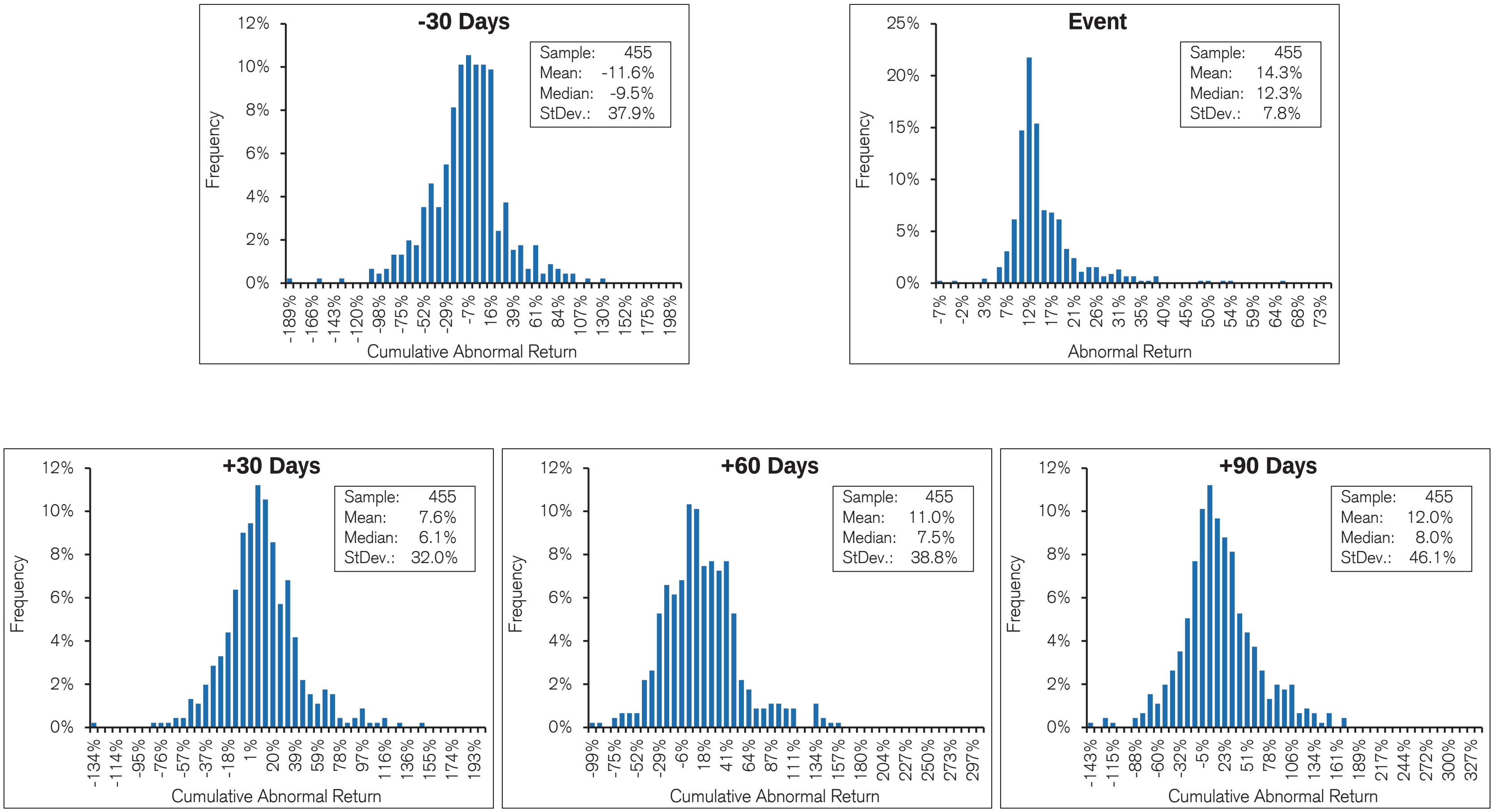
The cumulative abnormal returns are consistently positive for each branch of the tree for all of the time periods we measure. The final branch, with a sample size of 455 events, shows a 7.6 percent CAR for 30 days, 11.0

percent for 60 days, and 12.0 percent for 90 days. In this case, the base rates would suggest buying the stock on the day following the increase.

We can compare those base rates with what actually happened. The CAR for Harman shares was -1.0 percent in the 30 trading days following the event, 15.5 percent for 60 days, and 10.5 percent for 90 days. The line for CAR in exhibit 6 also shows these returns.

While the results are consistent with the base rate, we must reiterate that the averages belie a more complex distribution. Exhibit 9 shows the distribution of stock price returns for the 455 companies in Harman's reference class. For each of the return distributions that follow the event (+30, +60, and +90 days), the mean, or average, was greater than the median. The standard deviations are high at about 30 percent for 30 days, 40 percent for 60 days, and 45 percent for 90 days.

Exhibit 9: Distributions for Non-Earnings Events That Have Weak Momentum, Cheap Valuation, Low Quality



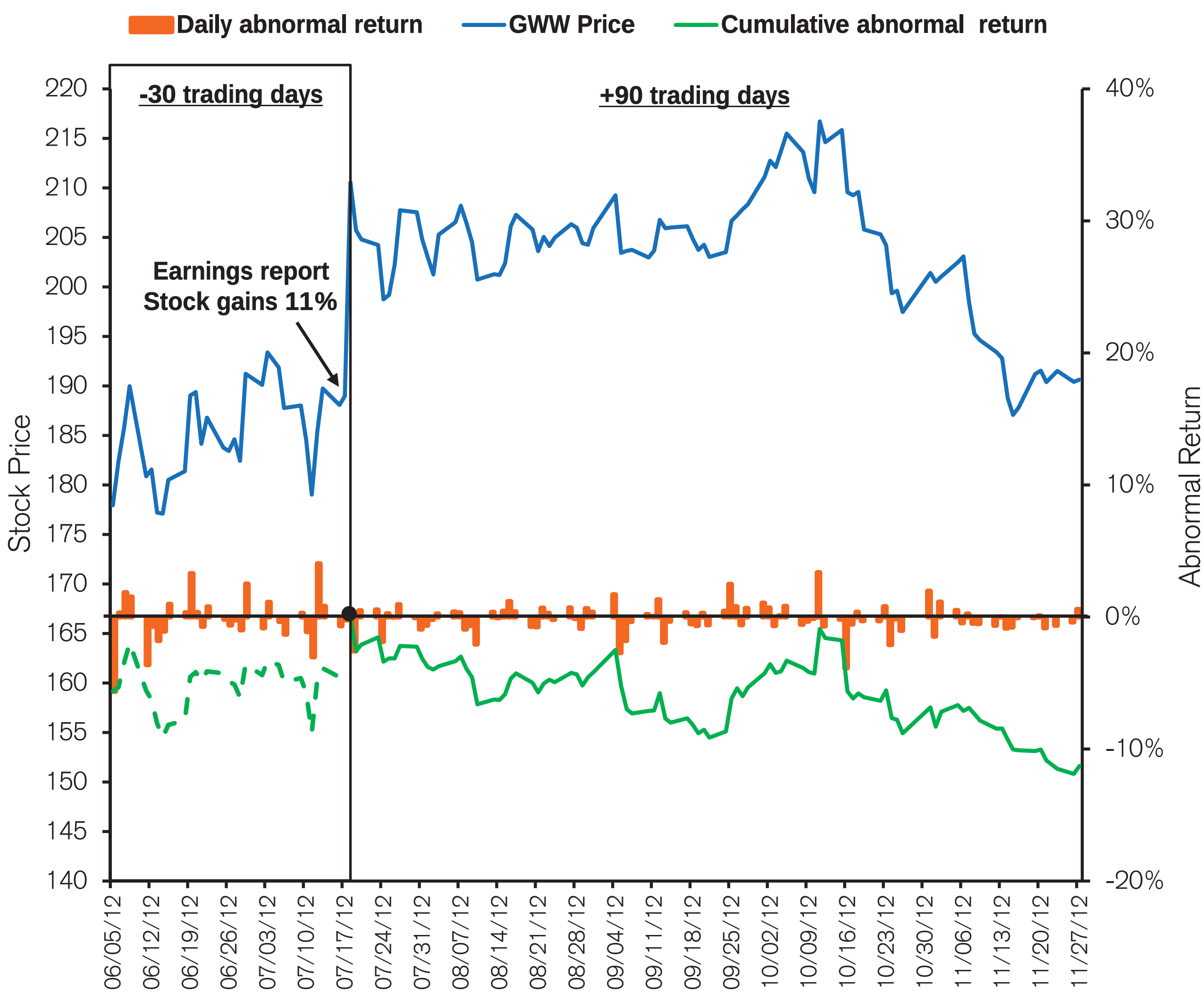
Source: Credit Suisse HOLT.

W.W. Grainger

On the morning of July 18, 2012, W.W. Grainger reported strong earnings. This was a scheduled earnings event and the stock increased 11.4 percent. The S&P 500 was up 0.7 percent.

Exhibit 10 shows the chart of W.W. Grainger's stock performance for the 30 trading days prior to the event through 90 trading days following the event. The top line starting on the left shows the stock price, which spikes on the day of the earnings release, then stays in a holding pattern for the next 60 trading days, and then eventually declines sharply over the full 90 days. The bars in the middle of the exhibit are the daily abnormal return, and the line at the bottom is the cumulative abnormal return. This is a case where selling W.W. Grainger stock would have made sense. Let's go through the checklist to see how we would have assessed the situation as it occurred.

Exhibit 10: W.W. Grainger's Stock Price and CAR, June 5, 2012 – November 27, 2012

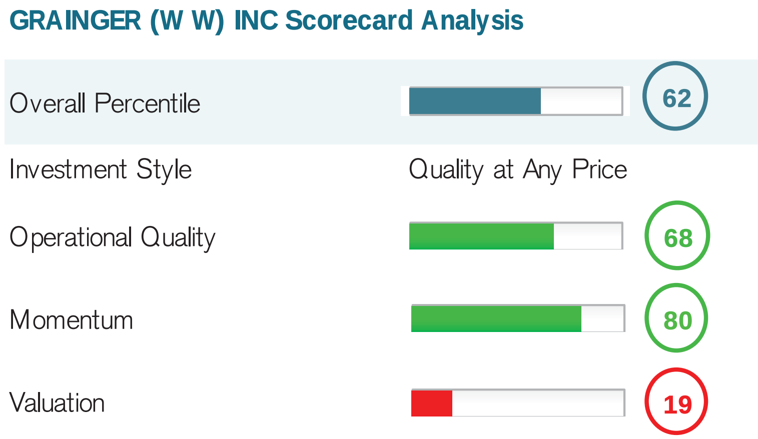


Source: Credit Suisse.

The first item on the checklist is the determination of whether the event was an earnings release. We know that it was scheduled, so we refer to exhibit 3.

The next step is to determine the scores with regard to momentum, valuation, and operational quality. To do so, we go to the link, "Scorecard Percentile," on HOLT Lens. Exhibit 11 shows the scores.

Exhibit 11: W.W. Grainger's Factor Scores



Source: HOLT Lens.

For W.W. Grainger, we see that momentum is strong (80), valuation is expensive (19), and quality is high (68). Exhibit 12 shows the branches in exhibit 3 that are relevant for W.W. Grainger.

Exhibit 12: The Branches That Lead to W.W. Grainger's Reference Class

Factor		Days -30	Event	N =	Days +30	+60	+90
Momentum	Strong	-1.3%	13.9%	411	1.1%	1.9%	2.3%
Valuation	Expensive	0.0%	13.7%	153	-0.6%	-1.4%	-2.8%
Quality	High	-0.6%	13.8%	65	-2.3%	-1.7%	-6.0%

Source: Credit Suisse HOLT.

The cumulative abnormal returns are consistently negative for each branch of the tree for all of the time periods we consider. The final branch, with a sample size of 65 events, shows a -2.3 percent CAR for 30 days, -1.7 percent for 60 days, and -6.0 percent for 90 days. In this case, the base rates would suggest selling the stock on the day following the decline.

We can compare these base rates with what actually happened. The CAR for W.W. Grainger's shares was -5.2 percent in the 30 trading days following the event, -0.9 percent for 60 days, and -11.3 percent for 90 days. Exhibit 10 reflects these returns. Once again, note that there is a distribution of returns for this reference class, and the best we can do is make a probabilistic assessment.

Summary: Buy, Sell, or Hold

The goal of this analysis is to provide you with useful base rates in the case that you see a sharp gain in one of the stocks in your portfolio. Mountain climbers run a risk of "celebrating the summit," enjoying the pleasure without considering the rest of the journey. Likewise, investors should not bask in their success but rather consider their next action.

The base rates in this report offer guidance in determining whether you should buy, sell, or do nothing in the days following the event. You should keep this report handy, and when an event occurs you can pull it out and follow the steps in the checklist. The results contained here are a useful complement to fundamental analysis.

Because these events tend to be infrequent, most investors don't have a systematic approach, or data, to make a sound judgment. Further, large price increases almost always evoke a strong emotional reaction, which complicates the process of decision making even more.

Our examination of exhibits 3 and 4 suggests that the following characteristics are consistent with buy and sell signals:

Buy. For earnings releases, there is a clear and convincing buy signal for stocks with weak or neutral momentum prior to the event. This buy signal is strengthened if the stock has a cheap or neutral valuation.

The buy signal for stocks with weak momentum is even more pronounced for non-earnings events than it is for earnings releases. This signal is stronger for stocks that have a cheap valuation, and is further amplified if the companies are of high or neutral quality, although the returns for low quality are still very high. Harman, the subject of our first case study, was a non-earnings event with weak momentum, cheap valuation, and low quality, and hence the data suggested a buy.

Sell. For earnings releases, momentum alone does not indicate a strong buy or sell pattern. But there is a fairly strong sell signal for stocks that have the combination of strong momentum and expensive valuation. The sell signal holds for stocks with strong momentum, expensive valuation, and high or neutral quality. W.W. Grainger, our second case, had strong momentum, expensive valuation, and high quality—factors that suggested selling the shares.

For non-earnings events, the cumulative abnormal returns following an event are largely positive. But we must note that these stocks as a group performed poorly prior to the event, down nearly seven percentage points relative to the market. There are a couple of combinations that suggest selling the stock. The strongest sell signal is for companies that combine strong momentum and expensive valuation. That signal is further amplified if the companies are of high or neutral quality.

Making decisions in the face of uncertainty is always a challenge, but it is inherent to investing. Deciding what to do with a stock following a sharp increase is particularly difficult because emotions tend to run high after these events. This report provides grounding in the form of base rates in an effort to better inform decision making.

Appendix: Distributions of Stock Price Changes

This appendix reviews the distributions that apply to Harman, one of our case studies. These distributions reflect non-earnings announcements and contain all events, including the bubble periods. We also provide some statistical properties for each distribution, including the sample size, mean, median, and standard deviation.

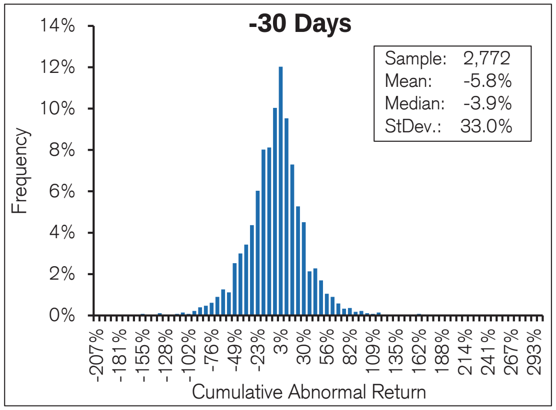
Exhibit 13 shows all the cases with weak momentum and displays five distributions of cumulative abnormal returns, including the 30 trading days prior to the event, the day of the event itself, and the 30, 60, and 90 trading days subsequent to the event. This is the first branch of the Harman case study.

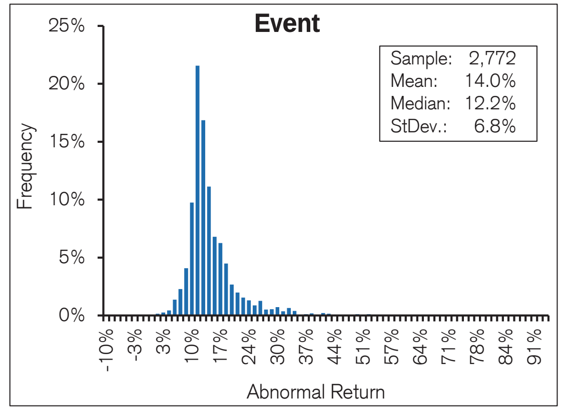
Exhibit 14 shows weak momentum and cheap valuation, which trims the sample size by more than one-half. Here again we include the 30 trading days prior to the event, the day of the event itself, and the 30, 60, and 90 trading days after the event. This is the second branch of the Harman case study.

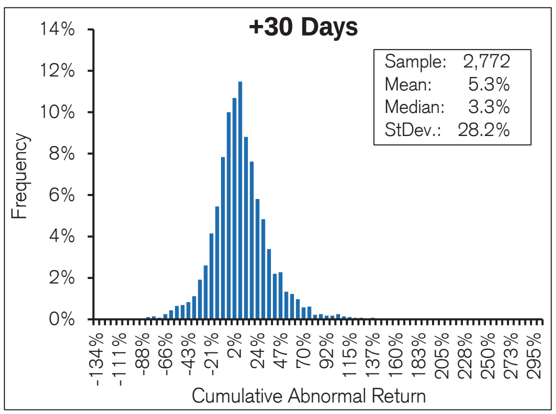
Exhibit 15 shows the final branch in the Harman case study: weak momentum, cheap valuation, and low quality. The sample size is just over one-third of the prior branch. You can see the 30 trading days prior to the event, the day of the event itself, and the 30, 60, and 90 trading days after the event.

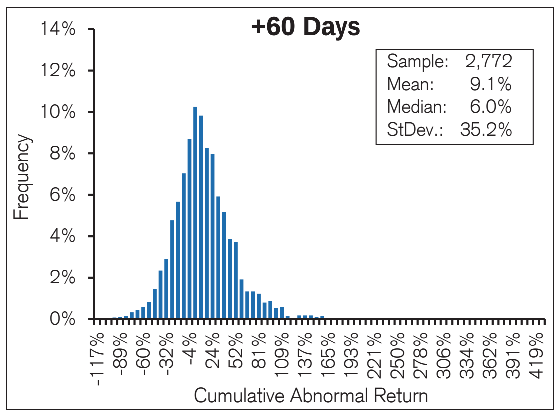
Exhibit 13: Distributions for the First Branch of the Harman Case Study

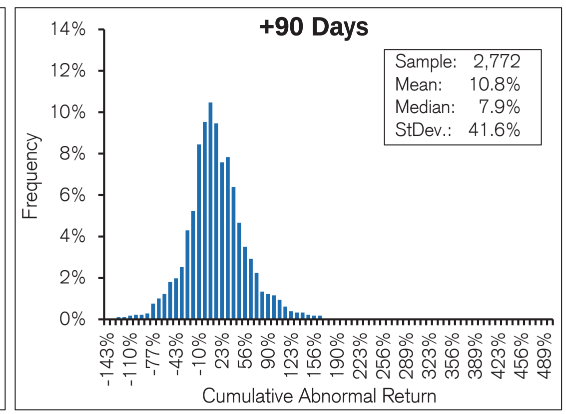
Weak Momentum







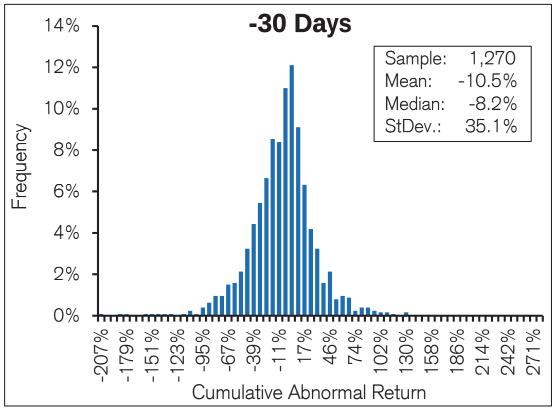


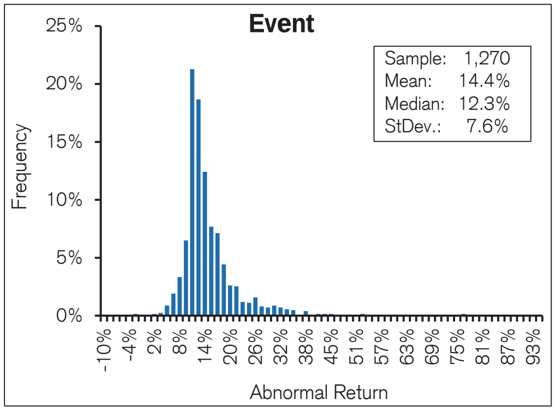


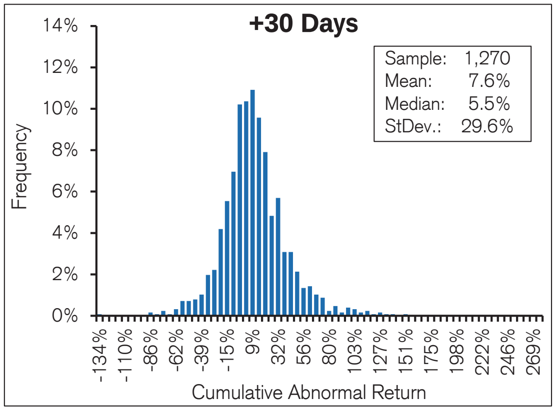
Source: Credit Suisse HOLT.

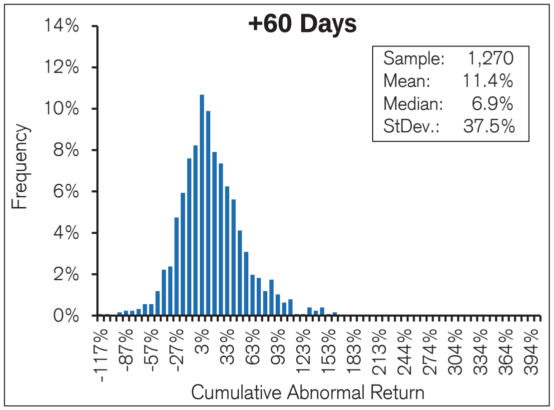
Exhibit 14: Distributions for the Second Branch of the Harman Case Study

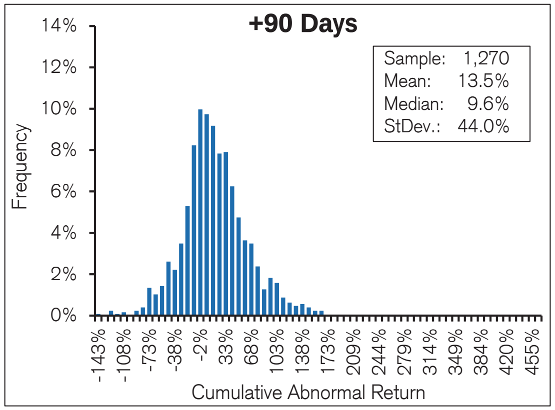
Weak Momentum, Cheap Valuation







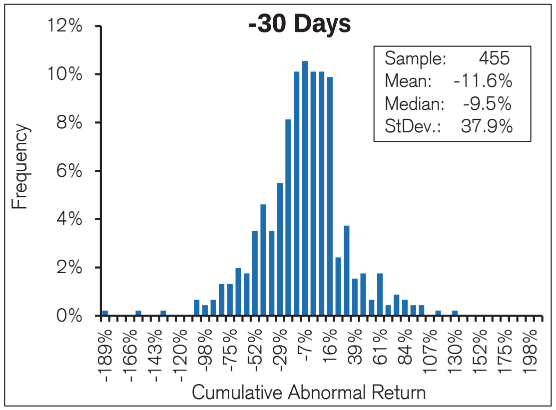


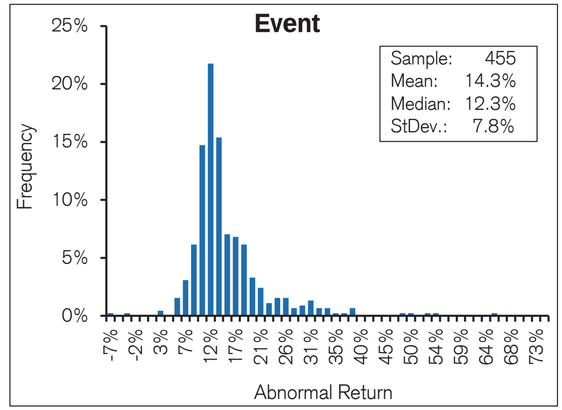


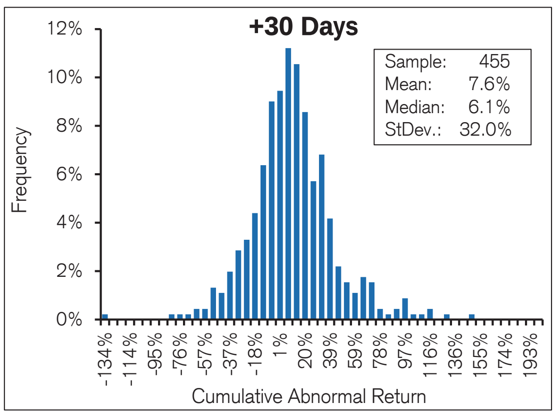
Source: Credit Suisse HOLT.

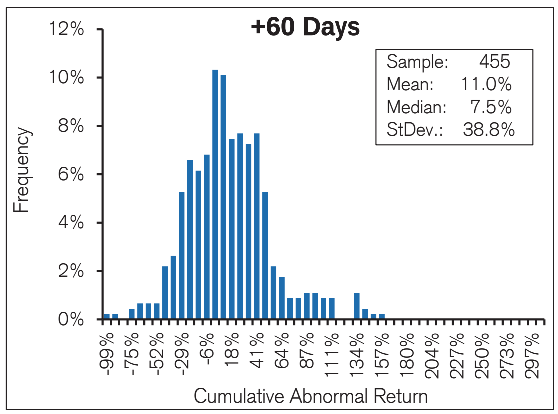
Exhibit 15: Distributions for the Third Branch of the Harman Case Study

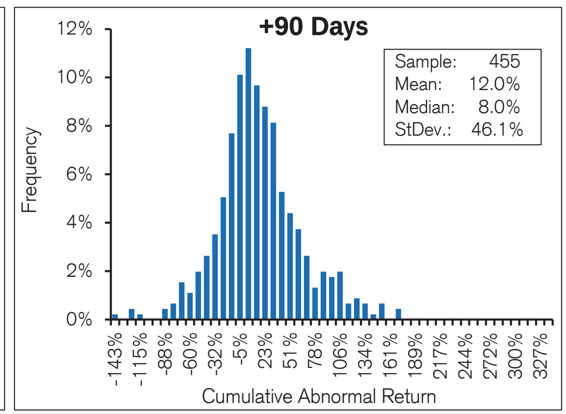
Weak Momentum, Cheap Valuation, Low Quality











Source: Credit Suisse HOLT.

Endnotes

Cover and Introduction

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