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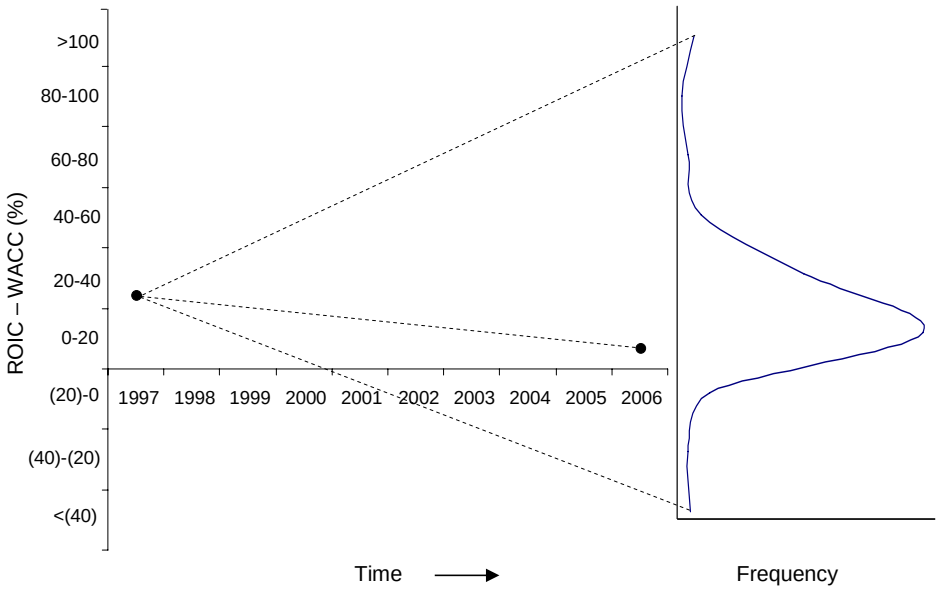
December 14, 2007

Death, Taxes, and Reversion to the Mean

ROIC Patterns: Luck, Persistence, and What to Do About It

Hegel was right when he said that we learn from history that man can never learn anything from history.

George Bernard Shaw



Source: LMCM analysis.

- **Analysts modeling future corporate financial performance should use past ROIC patterns, including a strong tendency toward mean reversion, as an appropriate reference class but rarely do. Full consideration of the difficulty in sustaining high returns should temper the optimism inherent in many models.**
- **Some companies do post persistently high or low returns beyond what chance dictates. But the ROIC data incorporate much more randomness than most analysts realize.**
- **We had little luck in identifying the factors behind sustainably high returns.**
- **This analysis has concrete implications for modeling. We unveil some of the common errors in discounted cash flow models and offer some thoughts on how to improve them.**

The Inside-Outside View

Company financial models are often a cornerstone of the stock selection process for fundamental investors. The model forecasts are based on crucial value drivers like sales growth rates, operating profit margins, investment capital needs, and economic returns. When done properly, detailed long-term models are laborious because they require input from a wide range of areas, including historical corporate performance, firm-specific issues, competitive positioning, and the broader macroeconomic backdrop.

Despite earnest and diligent study, analysts often produce company models that are wildly off the mark, usually erring on the side of optimism. Even analysts who consider ranges of value outcomes attach probabilities to favorable scenarios that are too high. Some researchers attribute this inaccuracy to overconfidence, but that is only part of the story. [1]

Another way to understand the challenge is based on what renowned psychologist Daniel Kahneman calls the inside-outside view. [2] An inside view considers a problem by focusing on the specific task and the information at hand, and predicts based on that unique set of inputs. This is the approach analysts most often use in their modeling, and indeed is common for all forms of planning.

In contrast, an outside view considers the problem as an instance in a broader reference class. Rather than seeing the problem as unique, the outside view asks if there are similar situations that can provide useful calibration for modeling. Kahneman notes this is a very unnatural way to think precisely because it forces analysts to set aside all of the cherished information they have unearthed about a company. This is why people use the outside view so rarely.

This report seeks to shed light on an important reference class for company modelers: patterns of return on invested capital (ROIC). Companies create shareholder value when they generate returns on investment in excess of the cost of capital. A positive spread between a company's ROIC and cost of capital is a fundamental indicator of value creation.

Earnings growth by itself gives no indication about value creation prospects—a company growing rapidly but earning only its cost of capital will not enjoy a premium valuation. [3] More accurately, growth amplifies: higher growth makes positive-spread companies more valuable, and, symmetrically, higher growth makes negative-spread companies less valuable.

Assumptions about future corporate ROICs are embedded in analyst models, although they are rarely explicit. More often than not, analysts are too optimistic in their assessment of future ROICs, in part because they are unaware of how hard it is to sustain high returns. The goal of this report is to make financial modelers aware of a broad reference class—the outside view—that unequivocally shows the rarity of generating high returns for a long time in a free market system. This awareness should temper the optimism embedded in many models.

Here are some of the report's broad conclusions:

- *Reversion to the mean is a powerful force*. As has been well documented by numerous studies, ROIC reverts to the cost of capital over time. This finding is consistent with microeconomic theory, and is evident in all time periods researchers have studied. However, investors and executives should be careful not to over interpret this result because reversion to the mean is evident in any system with a great deal of randomness. We can explain much of the mean reversion series by recognizing the data are noisy.

- *Persistence does exist*. Academic research shows that some companies do generate persistently good, or bad, economic returns. The challenge is finding explanations for that persistence, if they exist.

- *Explaining persistence*. It's not clear that we can explain much persistence beyond chance. But we investigated logical explanatory candidates, including growth, industry

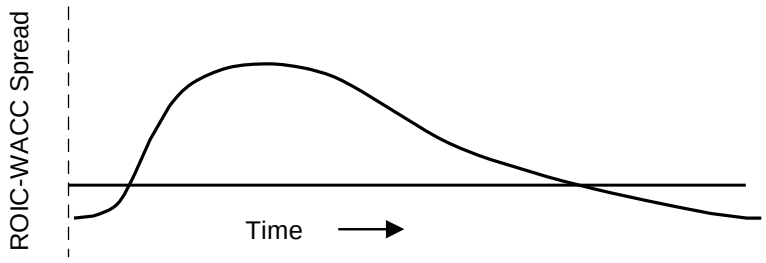
representation, and business models. Business model difference appears to be a promising explanatory factor.

- *Implications for modeling*. The vast majority of models—especially discounted cash flow models—are uninformed by the outside view of ROIC patterns. This outside view addresses a number of important aspects of modeling, including assumptions about growth rates, capital needs, and terminal values.

Death, Taxes, and Reversion to the Mean

Researchers have convincingly showed that industries and companies follow an economic life cycle (see Exhibit 1). [4] Young companies often apply substantial resources to their business without immediate payoff, hence generating returns below the cost of capital. In mid-life, companies earn excess returns as their investments bear fruit. Finally, competitive forces and/or shifts in the marketplace drive returns down to the cost of capital. In situations where returns sink below the cost of capital, bankruptcy, consolidation, and disinvestment often serve to lift returns back to cost-of-capital levels. Empirical research shows that manufacturing companies, on average, generate excess returns for shorter periods than they did in the past. [5]

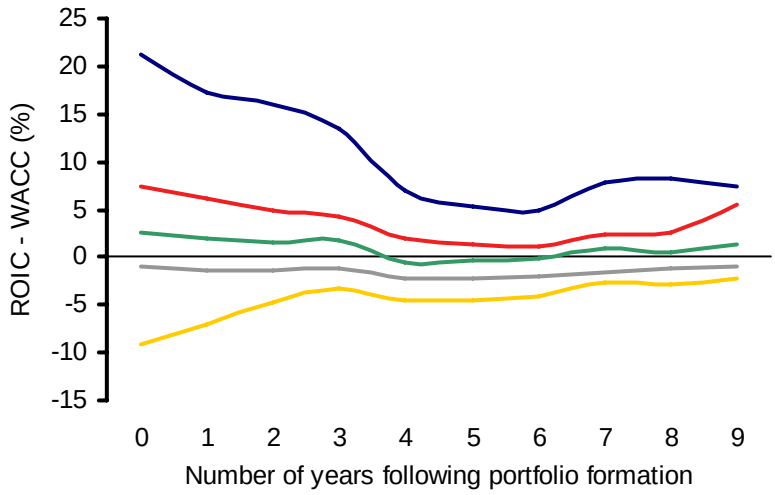
Exhibit 1: Generic Life Cycle



Source: LMCM analysis.

Various studies conducted over multiple decades document this reversion-to-the-mean pattern. [6] We have reproduced the results here, using data from over 1000 non-financial companies from 1997 to 2006. (See Appendix A for details on the sample and methodology.) Exhibit 2 shows this process. We start by ranking companies into quintiles based on their 1997 ROIC. We then follow the median ROIC for the five cohorts through 2006. While all of the returns do not settle at the cost of capital (roughly eight percent) in 2006, they clearly migrate toward that level.

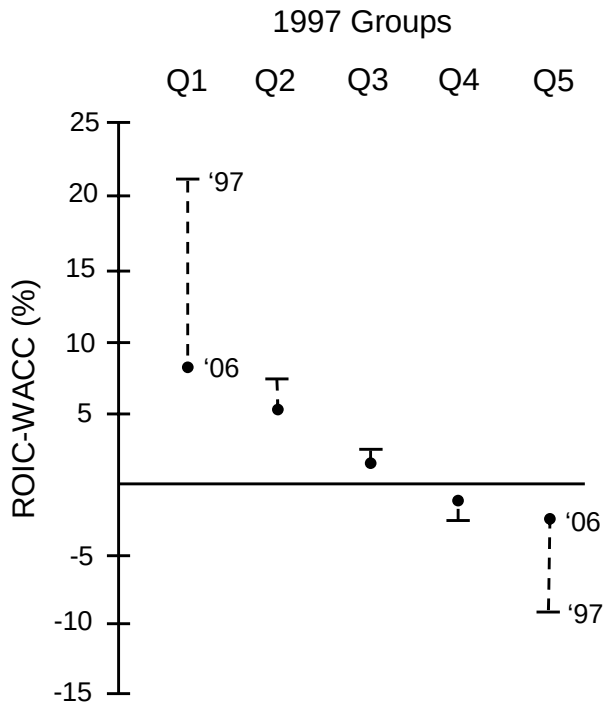
Exhibit 2: Median ROIC Reversion



Source: LMCM analysis.

The gap between the median ROICs from the best to the worst quintiles is 30.5 percentage points in 1997. That gap narrows significantly to 8.6 percentage points in 2006. Further, as the reversion model would predict, the top quintiles saw declines in median ROICs and the bottom quintiles saw improvement (see Exhibit 3). While nine years may not be a sufficient amount of time for returns of all quintiles to converge on the cost of capital, it's clear that the process is well under way.

Exhibit 3: Change in Median ROIC by Quintile



Source: LMCM analysis.

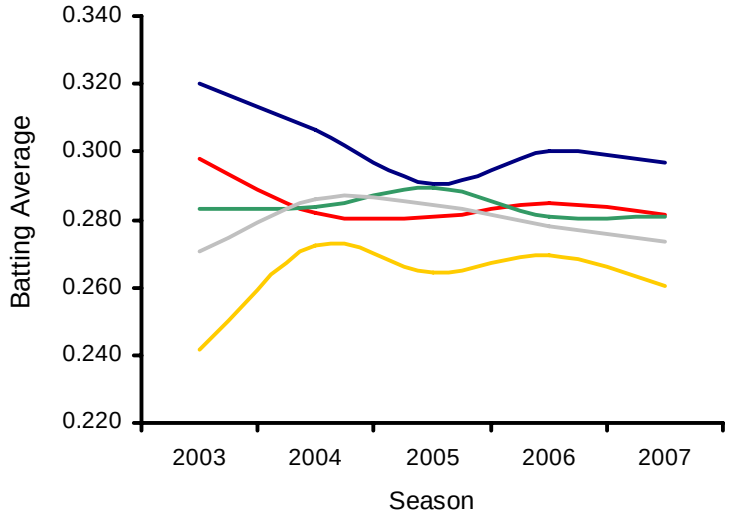
This result, however, requires careful interpretation. Any system that combines skill and luck will exhibit mean reversion over time. [7] Francis Galton demonstrated this point in his 1889 book, *Natural Inheritance*, using the heights of adults. [8] Galton showed, for example, that children of tall parents have a tendency to be tall, but are often not as tall as their parents. Likewise, children of short parents tend to be short, but not as short as their parents. Heredity plays a role, but over time adult heights revert to the mean.

The basic idea is outstanding performance combines strong skill and good luck. Abysmal performance, in contrast, reflects weak skill and bad luck. Even if skill persists in subsequent periods, luck evens out across the participants, pushing results closer to average. So it's not that the standard deviation of the whole sample is shrinking; rather, luck's role diminishes over time.

Separating the relative contributions of skill and luck is no easy task. Naturally, sample size is crucial because skill only surfaces with a large number of observations. For example, statistician Jim Albert estimates that a baseball player's batting average over a full season is a fifty-fifty combination between skill and luck. Batting averages for 100 at-bats, in contrast, are 80 percent luck. [9]

To illustrate this skill and luck mix, we analyzed the batting averages of 100 major league baseball players who had at least 250 at-bats for each of the past five seasons (see Exhibit 4). These results likely show some survivorship bias, as the average career of a major leaguer is only 5.6 years.

Exhibit 4: Mean Reversion in Major League Baseball Player Batting Averages



Source: Baseball Prospectus and LMCM analysis.

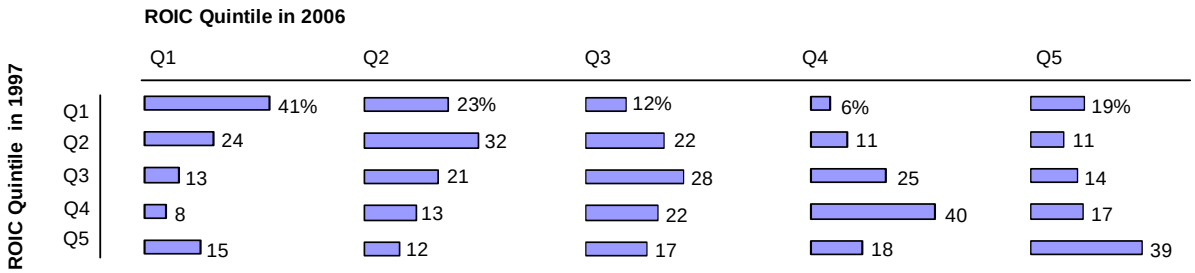
The 80 basis point gulf between the best and worst quintile (a .320 versus a .240 average) is cut in half by the final year (.300 versus .260). [10] This does not mean that the skill level of the players mean reverted, just that luck evened out over time. For a company, skill is the equivalent of sustainable value creation, including industry effects and managerial capability. Luck captures external factors, including competition, business cycles, regulatory shifts, and technological change.

Defying Gravity: Persistence in the ROIC Data

The next question is whether any companies buck the reversion-to-the-mean trend and sustain high (or low) ROICs throughout the sample period. To answer, we need to measure persistence—the likelihood a company will stay in the same quintile throughout the measured time frame. To state the obvious, staying in the top quintile is generally desirable, as it means the company is successfully fending off competition. [11] Conversely, dwelling in the lowest quintile is unwelcome.

Exhibit 5 shows one measure of persistence: the degree of quintile migration. [12] This exhibit shows where companies starting in one quintile (the vertical axis) ended up after nine years (the horizontal axis). Most of the percentages in the exhibit are unremarkable, but two stand out. First, a full 41 percent of the companies that started in the top quintile were there nine years later, while 39 percent of the companies in the cellar-dweller quintile ended up there. Independent studies of this persistence reveal a similar pattern. So it appears there is persistence with some subset of the best and worst companies. Academic research confirms that some companies do show persistent results. Studies also show that companies rarely go from very high to very low performance or vice versa. [13]

Exhibit 5: ROIC Persistence



Source: LMCM analysis.

Before going too far with this result, we need to consider two issues. First, this persistence analysis solely looks at where companies start and finish, without asking what happens in between. As it turns out, there is a lot of action in the intervening years. For example, less than half of the 41 percent of the companies that start and end in the first quintile stay in the quintile the whole time. This means that less than four percent of the total-company sample remains in the highest quintile of ROIC for the full nine years.

The second issue is serial correlation, the probability a company stays in the same ROIC quintile from year to year. As Exhibit 5 suggests, the highest serial correlations (over 80 percent) are in Q1 and Q5. The middle quintile, Q3, has the lowest correlation of roughly 60 percent, while Q2 and Q4 are similar at about 70 percent.

This result may seem counterintuitive at first, as it suggests results for really good and really bad companies (Q1 and Q5) are more likely to persist than for average companies (Q2, Q3, and Q4). But this outcome is a product of the methodology: since each year's sample is broken into quintiles, and the sample is roughly normally distributed, the ROIC ranges are much narrower for the middle three quintiles than for the extreme quintiles. So, for instance, a small change in ROIC level can move a Q3 company into a neighboring quintile, whereas a larger absolute change is necessary to shift a Q1 and Q5 company. Having some sense of serial correlations by quintile, however, provides useful perspective for investors building company models.

To summarize, while the results reflect a lot of randomness, some companies appear to demonstrate persistence of high returns above and beyond what we can attribute solely to chance. [14] But similar to the challenge in active investing, the question is, can we identify the persistent value-creating companies ahead of time?

Can We Explain Persistence?

Up to this point our results, while useful and instructive, are reasonably well known in the academic literature. The real question for an investor is whether we can explain ROIC persistence *ex ante*. We explore this question by looking at three variables that appear as good candidates to explain persistence: corporate growth, the industry in which a company competes, and the company's business model. One of the virtues of these variables is they are to a large degree tractable. But clearly other variables may be relevant, including management quality. As such, the variables we investigate may be more proximate than causal.

Let's start with growth, where there is good news and bad news. The good news is there appears to be some correlation between growth and persistence. Companies that start and end in the top two quintiles enjoy average growth just above the 9.4 percent for the full sample. The four growth rates closest to the upper-left corner in Exhibit 6 show this.

Similarly, the companies that start and end in the bottom two quintiles—the four rates near the bottom-right corner of the exhibit—grew at a well-below-average five percent rate. We can say much less about companies that went from good to bad (upper-right corner) or companies that went from bad to good (bottom-left corner) because the sample sizes are substantially smaller than the rest of the exhibit. [15]

Exhibit 6: Earnings Growth by Quintile

EBIT Growth (10-Year CAGR)

ROIC Quintile in 1997	ROIC Quintile in 2006 Q1	Q2	Q3	Q4	Q5
Q1	8%	10%	15%	6%	16%
Q2	11%	9%	14%	10%	19%
Q3	12%	8%	8%	11%	16%
Q4	6%	14%	8%	9%	-6%
Q5	9%	8%	6%	6%	12%

Source: LMCM analysis.

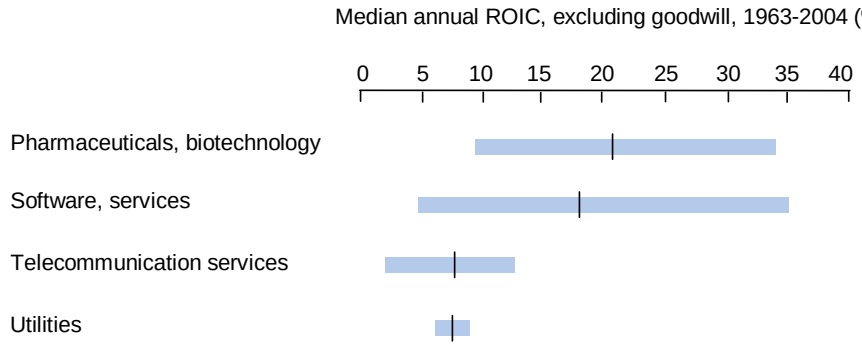
It is important to emphasize that we cannot infer cause and effect from these results. We don't know whether growth allows the company to sustain high returns or whether the growth is a consequence of the high returns. But it is safe to say that high returns appear difficult to sustain over time without satisfactory growth. Further, the exhibit shows that growth by itself does little to assure attractive economic returns; the companies that ended in the fifth quintile generated aggregate growth faster than the total sample.

The bad news about growth, especially for modelers, is it is extremely difficult to forecast. While there is some evidence for sales persistence, the evidence for earnings growth persistence is scant. As some researchers recently summarized, "All in all, the evidence suggests that the odds of an investor successfully uncovering the next stellar growth stock are about the same as correctly calling coin tosses." [16] This observation has important implications for modeling.

Industry effects are another candidate to explain persistent excess returns. One approach is to simply see which industries are overrepresented in the highest return quintile throughout our measured period. Industries that satisfy this requirement include pharmaceuticals/biotechnology and software. This approach is flawed, however, because it fails to consider the full industry populations. For industries with large-variance ROIC distributions, some companies will look good simply by virtue of that distribution. Looking solely at the successful companies in these large-variance industries paints a misleading picture of performance. [17] And, unfortunately, selecting successful companies and attaching attributes to them is a common practice in research. [18]

Let's go back to our overrepresented industries, pharmaceuticals/biotechnology and software. It turns out these industries are not only represented in the highest quintile, but are also overrepresented in the *lowest* quintile. Further, other industries—utilities and telecom services—have little representation in the best or worst quintiles. We can explain this by examining the ROIC distribution variance (see Exhibit 7). Wide-variance industries have high- and low-performing companies, while the narrow-variance industries are clustered in the middle ROIC quintiles. The main point is to avoid selection bias when seeking explanations for persistent returns.

Exhibit 7: Some Industry Success a Result of Industry ROIC Variance



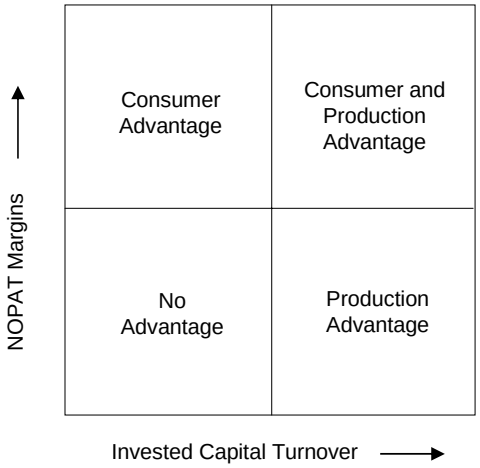
Source: Bin Jiang and Timothy M. Koller, "Data Focus: A Long-Term Look at ROIC," *The McKinsey Quarterly*, 1, 2006. Used with permission.

Another strand of research considers the regularities in abnormal profits, both good and bad. [19] This work suggests industry effects are more important than firm-specific effects for high-performing companies, while the opposite is true for low-performing companies. This descriptive work suggests positive, sustainable ROICs emerge from a good strategic position within a generally favorable industry. So industry does matter for explaining persistence, especially for sustainable above-average returns. More accurately, persistent high ROICs, on average, combine an attractive industry with a good business model. There is also good strategy research on the threats to sustainable superior performance. [20]

This leads to a closer look at business models. Michael Porter introduced two generic sources of competitive advantage: differentiation and low-cost production. These are also known as consumer and production advantages. [21] We can relate these generic strategies to ROIC by breaking ROIC into its two prime components, net operating profit after tax (NOPAT) margin and invested capital turnover. NOPAT margin equals NOPAT/sales, and invested capital turnover equals sales/invested capital. ROIC is the product of NOPAT margin and invested capital turnover.

Generally speaking, differentiated companies with a consumer advantage generate attractive returns mostly via high margins and modest invested capital turnover. Consider the successful jewelry store that generates large profits per unit sold (high margins) but doesn't sell in large volume (low turnover). In contrast, a low-cost company with a production advantage will generate relatively low margins and relatively high invested capital turnover. Think of a classic discount retailer, which doesn't make much money per unit sold (low margins) but enjoys great inventory velocity (high turnover). Exhibit 8 consolidates these ideas in a simple matrix.

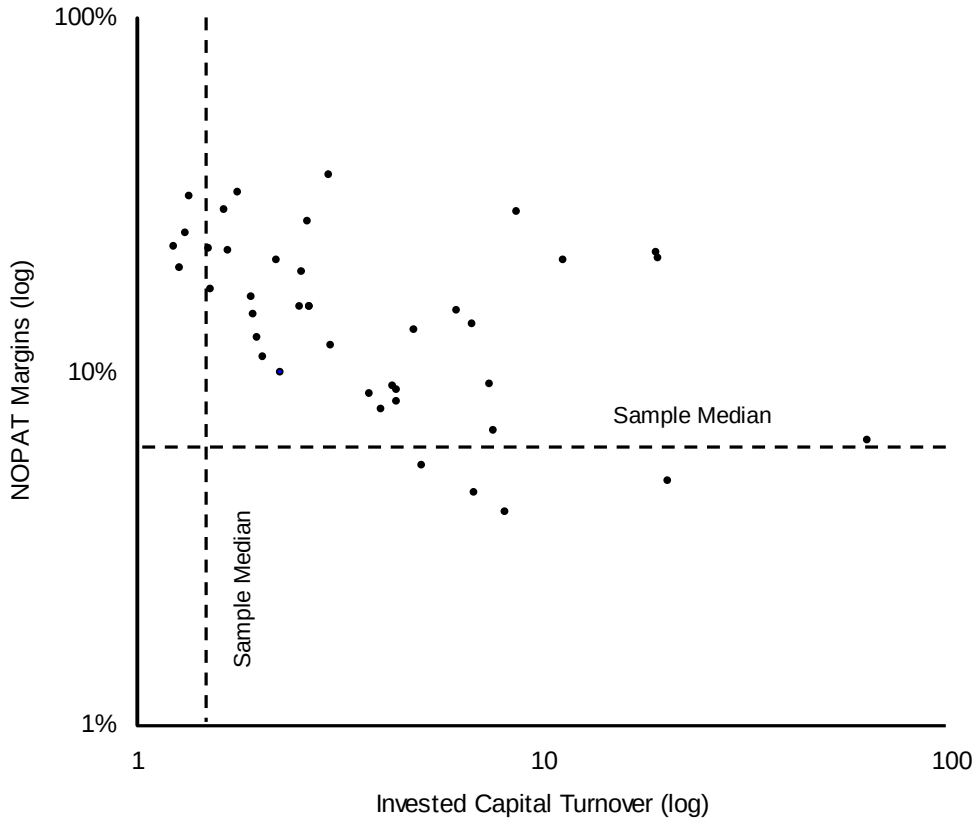
Exhibit 8: Linking Competitive Advantage to ROIC Components



Source: LMCM analysis.

We looked at the 42 companies that stayed in the first quintile throughout the measured period to see whether they leaned more toward a consumer or production advantage (see Exhibit 9). Not surprisingly, this group outperformed the broader sample on both NOPAT margin and invested capital turnover, but the impact of margin differential (2.4 times the median) was greater on ROIC than the capital turnover differential (1.9 times). While equivocal, these results suggest the best companies may have a tilt toward consumer advantage.

Exhibit 9: ROIC Components for High-Performing Companies

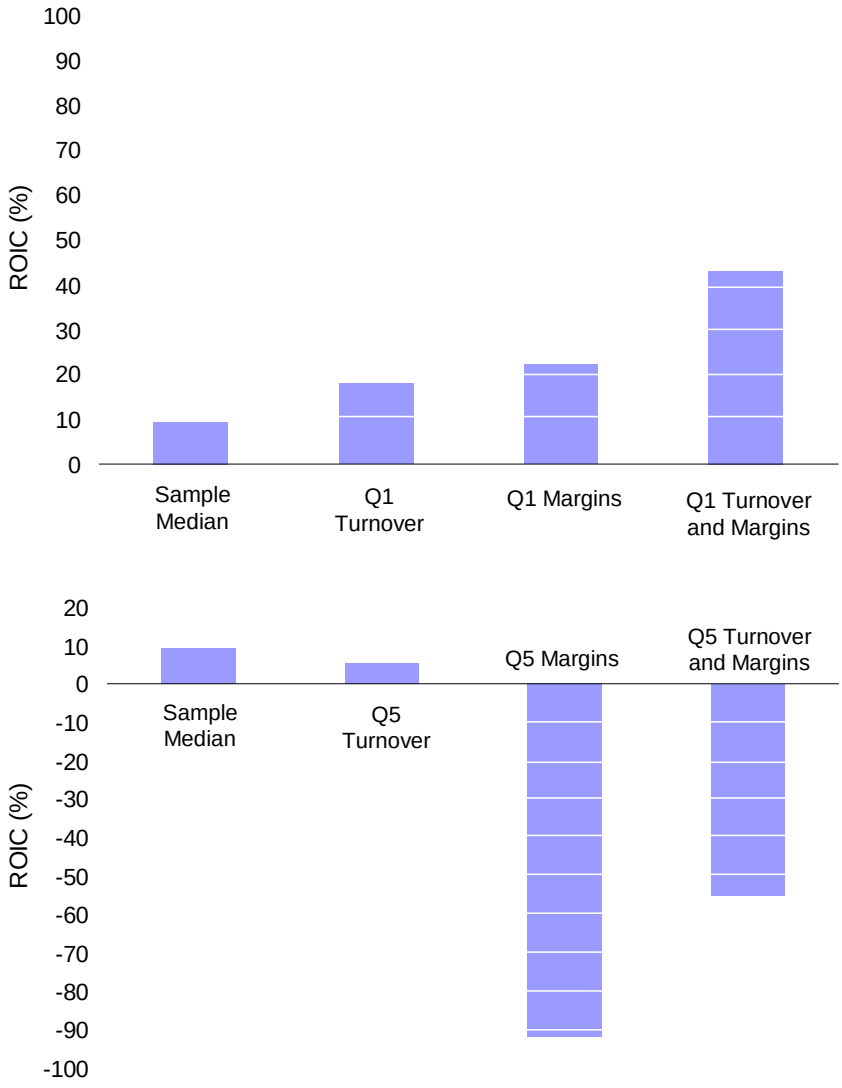


Source: LMCM analysis.

A look at the roughly 30 companies that remained in the fifth quintile is also revealing. Symmetrical with the high-performing companies, they posted NOPAT margins and invested capital turnover below the full sample's median. This group was persistently unprofitable, posting negative NOPAT margins for the measured period. Invested capital turns, while poor, were roughly 60 percent of the median. The results for both the best and worst companies also reflect the reality that the distribution of NOPAT margins is much wider than that for invested capital turnover.

Exhibit 10 summarizes the performance composition for the best and worst companies, starting with the median ROIC for the full sample (bar on the far left), then substituting invested capital turns (second from the left), then substituting NOPAT margins (third from left), and finally showing the returns for the whole subgroup (far right).

Exhibit 10: Decomposition of Persistently Best and Worst Companies



Source: LMCM analysis.

Our search for factors that may help us anticipate persistently superior performance leaves us little to work with. We do know persistence exists, and that companies that sustain high returns over time *start* with high returns. Operating in a good industry with above-average growth prospects and some consumer advantage also appears correlated with persistence. Strategy experts Anita McGahan and Michael Porter sum it up: [22]

> It is impossible to infer the cause of persistence in performance from the fact that persistence occurs. Persistence may be due to fixed resources, consistent industry structure, financial anomalies, price controls, or many other factors that endure . . . In sum, reliable inferences about the cause of persistence cannot be generated from an analysis that only documents whether or not persistence occurred.

Implications for Modeling

The objective of our brief tour through the world of ROIC patterns is to provide guidance for investors building company models. More specifically, these empirical findings can help modelers avoid common errors. Here are the main implications for modeling:

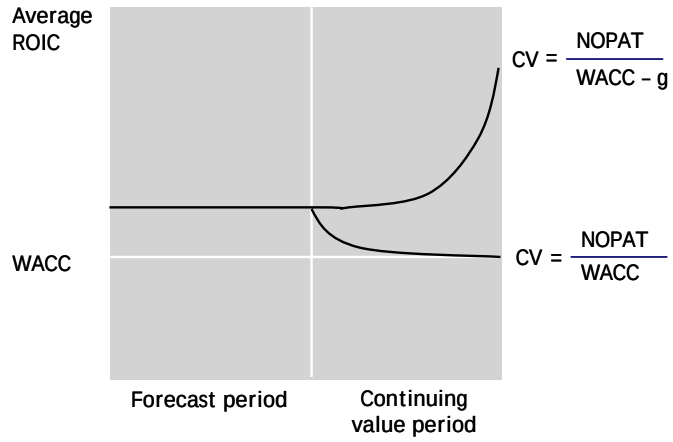
- *Understand the results from the reference class*. People who model and plan are often too optimistic about the future because they limit their inputs to the specific task at hand and the relevant information they have gathered for that task. The research of ROIC patterns, which has spanned decades, provides a large and robust reference class that can inform the inputs for any individual company. We know a small subset of companies generate persistently attractive ROICs—levels that cannot be attributed solely to chance—but we are not clear about the underlying causal factors. Our sense is most models assume financial performance that is unduly favorable given the forces of chance and competition.

- *Understand the model's hidden assumptions.* The errors here tend to come in two distinct areas. First, analysts frequently project growth, driven by sales and operating profit margins, independent of the investment needs necessary to support that growth. As a result, both incremental and aggregate ROICs are too high. A simple way to check for this error is to add an ROIC line to the model. An appreciation of the degree of serial correlations in ROICs provides perspective on how much ROICs are likely to improve or deteriorate.

  The second error is with the continuing, or terminal, value in a discounted cash flow (DCF) model. The continuing value component of a DCF captures the firm's value for the time beyond the explicit forecast period. Common estimates for continuing value include multiples (often of earnings before interest, taxes, depreciation, and amortization—EBITDA) and growth in perpetuity. In both cases, unpacking the underlying assumptions shows impossibly high future ROICs. [23]

  Take, for example, a simple growth-in-perpetuity continuing value that equals NOPAT divided by the cost of capital less growth. This assumption assumes that NOPAT can grow without additional capital, leading to an upward drift of ROIC (see Exhibit 11). This assumption is clearly inconsistent with the vast empirical evidence that returns mean revert.

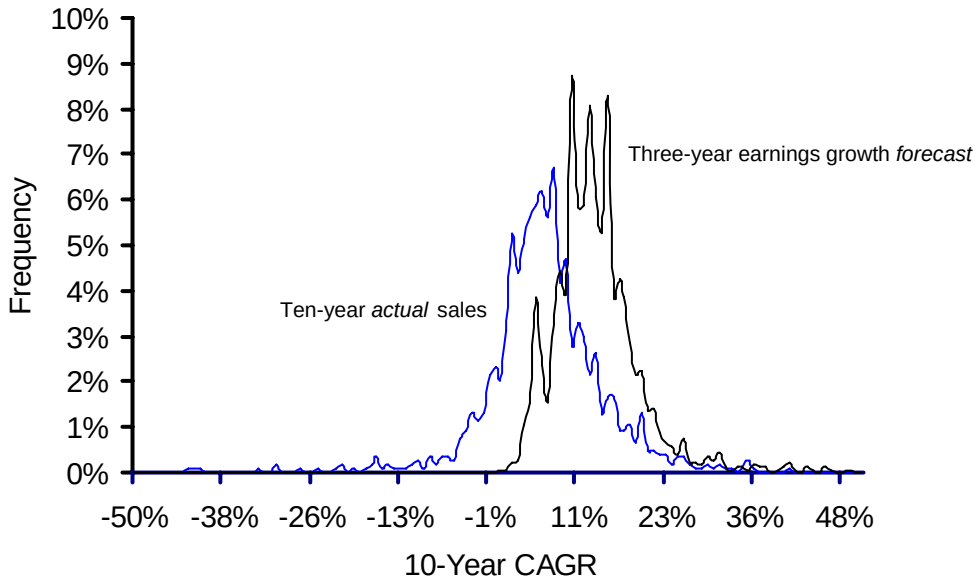
Exhibit 11: Exposing the Hidden Assumptions Behind the Growth-in-Perpetuity



Source: Tim Koller, Marc Goedhardt, and David Wessels, *Valuation: Measuring and Managing the Value of Companies*, Fourth Edition (New York: John Wiley & Sons, 2005), 286. Used with permission.

- *Understand the difficulty in sustaining high growth and returns.* Both companies and investors tend to be too optimistic about future growth rates. As the record shows, few companies sustain rapid growth rates, and predicting which companies will succeed in doing so is very challenging. Exhibit 12 illustrates this point. The distribution on the left is the actual 10-year sales growth rate for a large sample of companies with base year revenues of $500 million, which has a mean of about six percent. The distribution on the right is the three-year earnings forecast, which has a 13 percent mean and no negative growth rates. While earnings growth does tend to exceed sales growth by a modest amount over time, these expected growth rates are vastly higher than what is likely to appear. Further, as we saw earlier, there is greater persistence in sales growth rates than in earnings growth rates.

Exhibit 12: Great Growth Expectations

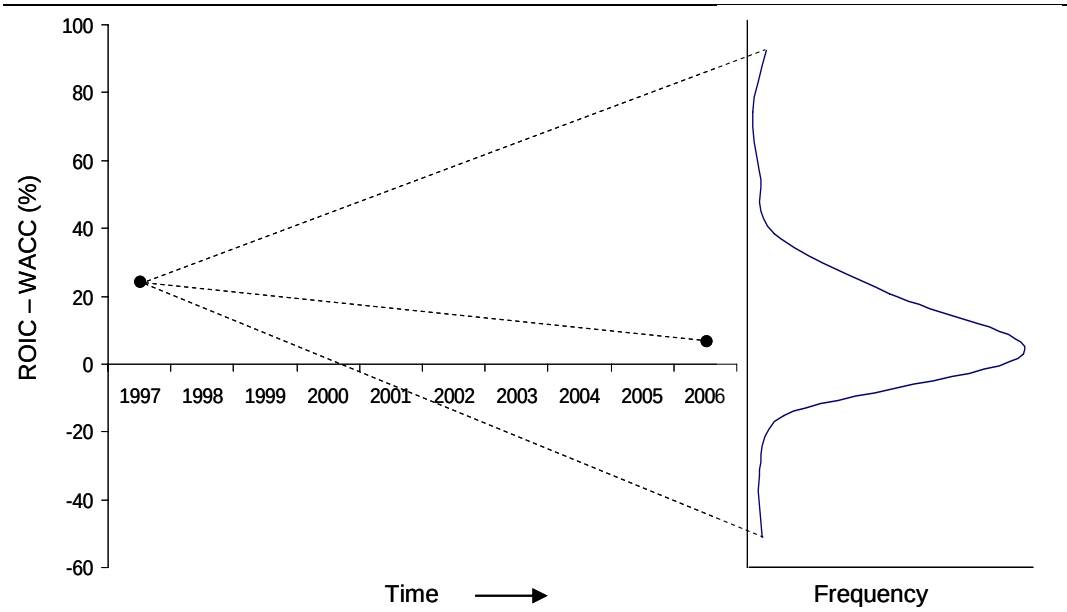


Source: Michael J. Mauboussin, *More Than You Know: Finding Financial Wisdom in Unconventional Places, Updated and Expanded* (New York: Columbia Business School Publishing, 2008), 179.

- *Understand the need to think probabilistically*. One powerful benefit to the outside view is guidance on how to think about probabilities. The data in Exhibit 5 offer an excellent starting point by showing where companies in each of the ROIC quintiles end up. At the extremes, for instance, we can see it is rare for really bad companies to become really good, or for great companies to plunge to the depths, over a decade.

  Here's a way to visualize the probabilities using Exhibit 5. Assume you randomly draw a company from the highest ROIC quintile in 1997, where the median ROIC less cost of capital spread is in excess of 20 percent. Where will that company end up in a decade? Exhibit 13 shows the picture: while a handful of companies earn higher economic profit spreads in the future, the center of the distribution shifts closer to zero spreads, with a small group slipping to negative.

Exhibit 13: Great to Good



Source: LMCM analysis.

- *Understand the chances of a turnaround*. Investors often perceive companies generating subpar ROICs as attractive because of the prospects for unpriced improvements. The challenge to this strategy comes on two fronts. First, research shows low-performing companies get higher premiums than average-performing companies, suggesting the market anticipates change for the better. [24] Second, companies don't often sustain recoveries.

  Defining a sustained recovery as three years of above-cost-of-capital returns following two years of below-cost returns, Credit Suisse research found that only about 30 percent of the sample population was able to engineer a recovery. Roughly one-quarter of the companies produced a non-sustained recovery, and the balance—just under half of the population—either saw no turnaround or disappeared. Exhibit 14 shows these results for nearly 1,200 companies in the technology and retail sectors.

Exhibit 14: I've Fallen and I Can't Get Up

	Technology [a] (%)	Retail [b] (%)
No turnaround	45	48
Nonsustained turnaround	26	23
Sustained turnaround	29	29

[a] Sample of 712 companies from 1960 to 1996.
[b] Sample of 445 companies from 1950 to 2001.

Source: HOLT and Michael J. Mauboussin, *More Than You Know: Finding Financial Wisdom in Unconventional Places, Updated and Expanded* (New York: Columbia Business School Publishing, 2008), 169.

- *Understand expectations*. This discussion has focused exclusively on firm performance—fundamentals—and has purposefully avoided shareholder returns. For active investors, of course, the objective is to find mispriced securities or situations where the expectations implied by the stock price don't accurately reflect the fundamental outlook. [25] A company with great fundamental performance may earn a market rate of return if the stock price already reflects the fundamentals. You don't get paid for picking winners; you get paid for unearthing mispricings. Failure to distinguish between fundamentals and expectations is common in the investment business.

  One purpose of this report is to underscore the importance of embracing an inside-outside view in model building. Modelers uninformed about broader ROIC patterns are at a marked disadvantage to those who recognize and reflect these empirical findings in their thinking. As Daniel Kahneman stresses, the outside view feels unnatural because it requires letting go of what you (think you) know.

  Another purpose is to highlight what we don't know. Randomness plays a large role in the aggregate figures, whether or not we recognize it. And while we see some companies generate persistently superior ROICs—that is, a greater number than chance alone allows—we don't know precisely why their returns are so good. Most of the proposed causal explanations fall prey to the halo effect.

* * *

Special thanks to Brian Lund for his valuable input throughout this project. He was crucial in all aspects of data analysis and provided valuable comments and feedback on the report.

Appendix A: Explanation of the Methodology

Our data came from Capital IQ. We started with the Russell 3000 (as of October 1, 2007) and narrowed the sample by eliminating financials and companies where we didn't have data for the full 1997 through 2006 sample period. That left us with 1,115 non-financial companies.

Return on invested capital (ROIC) is defined as NOPAT margin x invested capital turnover, where:

$$\text{NOPAT Margin} = \frac{\text{EBITA (1 – effective tax rate)}}{\text{Sales}}$$

$$\text{Invested Capital Turnover*} = \frac{\text{Sales}}{\text{(Total assets) – (current liabilities) + (short-term debt) – (long-term investments) - (excess cash) **}}$$

* We calculate invested capital by taking an average of the end of period and beginning of period balance sheets.

** We consider any cash above three percent of sales to be excess cash.

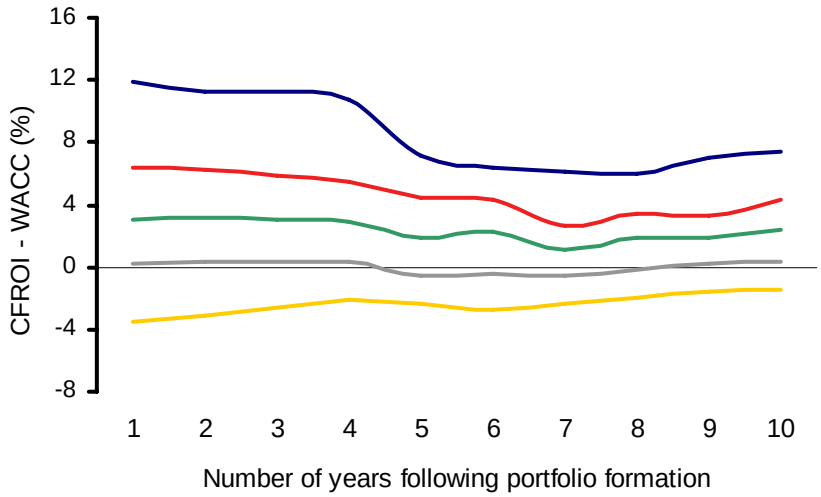
In the rare instances where a company had a negative NOPAT margin and negative invested capital turnover, the product of these two figures results in a positive ROIC calculation. In such cases, we left excess cash in the invested capital calculation, making invested capital positive and making ROIC negative.

Appendix B: Independent Analysis by Credit Suisse HOLT

To independently verify our results, we asked our friends at Credit Suisse HOLT to do similar analysis using their return measure, cash flow return on investment (CFROI®). CFROI is a real (i.e., inflation-adjusted), after-tax measure of economic returns. The sample, at just under 1,000 companies, is modestly smaller than ours.

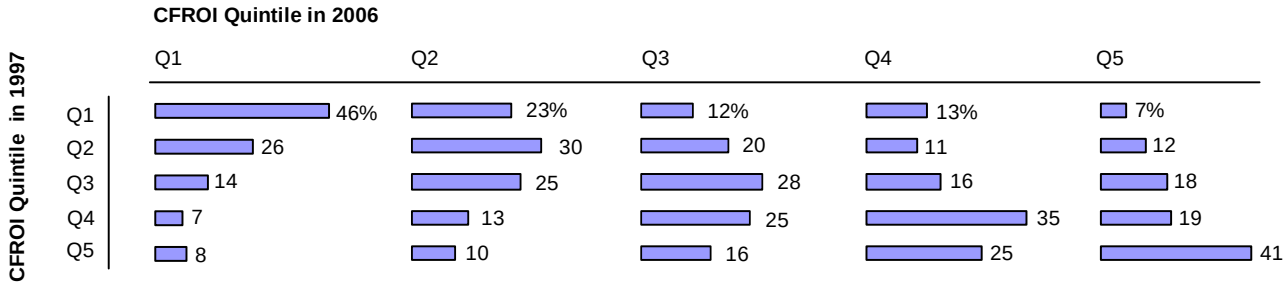
Exhibit 15 shows a pattern very similar to that of Exhibit 2. Likewise, Exhibit 16 offers results on persistence close to those in Exhibit 5.

Exhibit 15: Median CFROI Reversion



Source: HOLT and LMCM analysis.

Exhibit 16: CFROI Persistence



Source: HOLT and LMCM analysis.

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

Endnotes

[1] James Montier, *Behavioral Investing: A Practitioner's Guide to Applying Behavioral Finance* (West Sussex, England: John Wiley & Sons, 2007), 105-110.
[2] Daniel Kahneman and Dan Lovallo, "Timid Choices and Bold Forecasts: A Cognitive Perspective on Risk Taking," *Management Science*, Vol. 39, 1, January 1993, 17-31. Also, Roger Buehler, Dale Griffin, and Michael Ross, "Inside the Planning Fallacy: The Causes and Consequences of Optimistic Time Predictions," in Thomas Gilovich, Dale Griffin, and Daniel Kahneman, *Heuristics and Biases: The Psychology of Intuitive Judgment* (Cambridge, UK: Cambridge University Press, 2002), 250-270. Finally, Dan Lovallo and Daniel Kahneman, "Delusions of Success: How Optimism Undermines Executives' Decisions," *Harvard Business Review*, July 2003, 56-63. Also http://www.edge.org/3rd_culture/kahneman07/kahneman07_index.html.
[3] Alfred Rappaport and Michael J. Mauboussin, *Expectations Investing: Reading Stock Prices for Better Returns* (Boston, MA: Harvard Business School Press, 2001), 15-16.
[4] Ichak Adizes, *Corporate Lifecycles: How and Why Corporations Grow and Die and What to Do About It* (Englewood Cliffs, NJ: Prentice Hall, 1988).
[5] Robert R. Wiggins and Timothy W. Ruefli, "Sustained Competitive Advantage: Temporal Dynamics and the Incidence and Persistence of Superior Economic Performance," *Organizational Science*, Vol. 13, 1, January-February 2002, 82-105; L.G. Thomas and Richard D'Aveni, "The Rise of Hypercompetition from 1950 to 2002: Evidence of Increasing Industry Destabilization and Temporary Competitive Advantage," *Working Paper*, October 11, 2004.
[6] Horace Secrist, *The Triumph of Mediocrity in Business* (Evanston, IL: Bureau of Business Research, Northwestern University, 1933); Dennis C. Mueller, *Profits in the Long Run* (Cambridge: Cambridge University Press, 1986); Pankaj Ghemawat, *Commitment: The Dynamic of Strategy* (New York: Free Press, 1991); Bartley J. Madden, *CFROI Valuation* (Oxford, UK: Butterworth-Heinemann, 1999); Krishna G. Palepu, Paul M. Healy, and Victor L. Bernard, *Business Analysis & Valuation* (Cincinnati, OH: South-Western College Publishing, 2000); Tim Koller, Marc Goedhart, and David Wessels, *Valuation: Measuring and Managing the Value of Companies*, 4th ed. (New York: John Wiley & Sons, 2005). In some cases, some companies may enjoy increasing returns. See W. Brian Arthur, "Increasing Returns and the New World of Business," *Harvard Business Review*, July-August 1996, 101-109; and Carl Shapiro and Hal Varian, *Information Rules: A Strategic Guide to the Network Economy* (Boston, MA: Harvard Business School Press, 1998).
[7] Stephen M. Stigler, "Regression Towards the Mean, Historically Considered," *Statistical Methods in Medical Research*, Vol. 6, 1997, 103-114.
[8] Francis Galton, *Natural Inheritance* (London: MacMillan, 1889). You can find the book at http://galton.org/.
[9] Jim Albert, "Comments on 'Underestimating the Fog,'" *By the Numbers*, February 2005. The same phenomenon appears to apply to models explaining company performance; error terms tend to decline with sample size. See, for example, Anita M. McGahan and Michael E. Porter, "How Much Does Industry Matter, Really?" *Strategic Management Journal*, Vol. 18, 1997, 15-30.
[10] Besides a clear survivorship bias, there is a concern about an age effect: a player's skills tend to improve as he gets into his late 20s and diminishes after that. We don't think there are strong age influences here. The average age for each quintile in the initial year is 27, 29, 28, 27, and 27 for quintiles one through five, respectively.
[11] Sustaining high returns does not maximize shareholder value if a company forgoes value-creating opportunities solely to maintain the high returns. See Bin Jiang and Timothy Koller, "How to Choose Between Growth and ROIC," *McKinsey Quarterly*, September 2007.
[12] We based this analysis on Koller, Goedhart, and Wessels, 150. Also see similar analysis by HOLT in Appendix B.
[13] Mueller; Geoffrey F. Waring, "Industry Differences in the Persistence of Firm-Specific Returns," *American Economic Review*, Vol. 86, 5, December 1996, 1253-1265; Anita M. McGahan and Michael E. Porter, "The Emergence and Sustainability of Abnormal Profits," *Strategic Organization*, Vol. 1, 1, February 2003, 79-108; Wiggins and Ruefli. For work on turnarounds, see Jeffrey L. Furman and Anita M. McGahan, "Turnarounds," *Managerial and Decision Economics*, Vol. 23, 2002, 283-300. There is also evidence for persistent superior performance among mutual fund managers. See Robert Kosowski, Allan Timmerman, Russ Wermers, and Hal White, "Can Mutual Fund 'Stars' Really Pick Stocks? New Evidence from a Bootstrap Analysis," *Journal of Finance*, Vol. 61, 6, December 2006, 2551-2595.

[14] For a thoughtful dissenting view, see Jerker Denrell, "Random Walks and Sustained Competitive Advantage," *Management Science*, Vol. 50, 7, July 2004, 922-934. Denrell argues long leads in random walks show up as sustained differences in interfirm profitability.
[15] You can calculate the sample size by multiplying the percentages in Exhibit 5 by 223. Since the total sample is 1,115 companies, each quintile contains 223 companies. So, for instance, the upper-left corner of Exhibit 5 would include roughly 91 (0.41 x 223) companies. The growth rate in Exhibit 6 relates to those companies. Note some of Exhibit 6's growth rates represent a very small sample. For example, the growth rate of companies that started in Q4 and ended in Q1 is eight percent, but the sample size is only approximately 18 companies (0.08 x 223). Evenly distributed, each cell would contain approximately 45 companies (1,115 sample size divided by 25 cells). It turns out the upper-left and bottom-right corners are overrepresented, with roughly 1.5 times the companies that an equal distribution would imply, and the bottom-left and upper-right corners are underrepresented, with about 0.6 times the companies an equal distribution would imply.
[16] Louis K.C. Chan, Jason Karceski, and Josef Lakonishok, "The Level and Persistence of Growth Rates," *Journal of Finance*, Vol. 58, 2, April 2003, 643-684.
[17] Jerker Denrell, "Selection Bias and the Perils of Benchmarking," *Harvard Business Review*, April 2005.
[18] Phil Rosenzweig, *The Halo Effect . . . and the Eight Other Business Delusions That Deceive Managers* (New York: Free Press, 2007).
[19] Anita M. McGahan and Michael E. Porter, "The Emergence and Sustainability of Abnormal Profits," *Strategic Organization*, Vol. 1, 1, February 2003, 79-108; Anita M. McGahan and Michael E. Porter, "The Persistence of Shocks to Profitability," *The Review of Economics and Statistics*, Vol. 81, 1, February 1999, 143-153.
[20] Pankaj Ghemawat, *Strategy and the Business Landscape*, 2nd ed. (Upper Saddle River, NJ: Pearson Prentice Hall, 2006), 95-123.
[21] Michael E. Porter, *Competitive Advantage: Creating and Sustaining Superior* Performance (New York: The Free Press, 1985); Bruce Greenwald and Judd Kahn, *Competition Demystified: A Radically Simplified Approach to Business Strategy* (New York: Portfolio, 2005).
[22] Anita M. McGahan and Michael E. Porter, "Comment on 'Industry, Corporate and Business-Segment Effects and Business Performance: A Non-Parametric Approach' by Wiggins and Ruefli," *Strategic Management Journal*, Vol. 24, September 2003, 861-879.
[23] Michael J. Mauboussin, "Common Errors in DCF Models," *Mauboussin on Strategy*, March 16, 2006.
[24] Furman and McGahan.
[25] Rappaport and Mauboussin.

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