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The Base Rate Book – Sales Growth

Integrating the Past to Better Anticipate the Future

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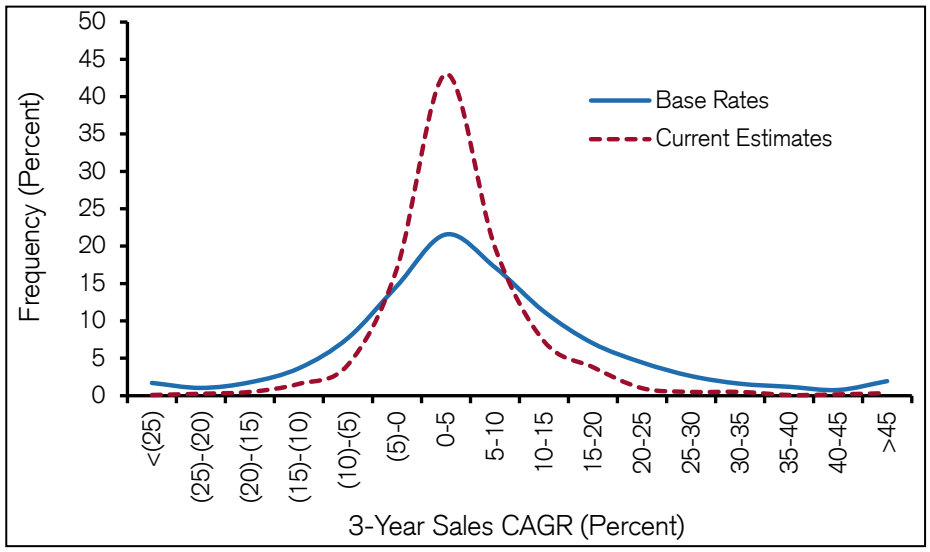


"'Pallid' statistical information is routinely discarded when it is incompatible with one's personal impressions of a case."

Daniel Kahneman[1]

- Successful active investing requires a forecast that is different than what the market is discounting.
- Forecasts about outcomes relevant to us commonly suffer from biases of optimism and overconfidence.
- Research reveals that consideration of the results for an appropriate reference class can enhance the quality of forecasts.
- Sales growth is the most important value driver for most companies.
- This report shows the base rate of sales growth rates for a large sample of companies over more than two decades. We sort the companies into deciles, allowing for easy identification of an appropriate reference class.
- We provide a method to integrate our views with the base rates to sharpen the quality of forecasts.
- We share some case studies, positive and negative, to demonstrate results for some outliers.

Introduction

On an earnings call in February 2015, Elon Musk, the chairman and chief executive officer (CEO) of Tesla Motors, set out a path for the company to reach a market capitalization of about $700 billion in 10 years.[2] That approached the size of Apple Inc., which had the largest market capitalization of any company in the world at the time.

Here is Musk's math. If you assume sales in 2015 of $6 billion (the current consensus is around $5.7 billion) and sales growth of 50 percent compounded annually, you get about $345 billion in 2025. If you then take a 10 percent net income margin and apply a price-earnings multiple of 20, you get very close to $700 billion.

The obvious question is: How likely is it that Tesla will achieve those figures? The natural way to answer the question is to roll up your sleeves and do an analysis from the bottom up. How many cars can they sell? How much will each cost? In which countries can they expand sales? What other businesses can they move into? How profitable will the business be? And so forth.

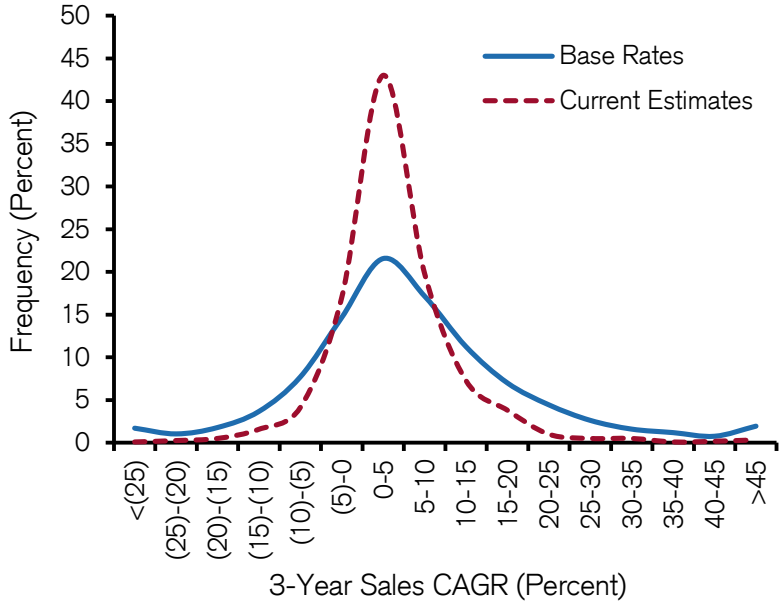
Researchers who study forecasts of this nature find that two biases, optimism and overconfidence, are common. Optimism about personal predictions has value for encouraging perseverance in the face of challenges, but distorts assessments of likely outcomes.[3] For example, notwithstanding that only about 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.[4] The bottom line on optimism: "People frequently believe that their preferred outcomes are more likely than is merited."[5]

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 two 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.[6] Most people, including financial analysts, place too much weight on their own information.[7]

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.[8]

Exhibit 1 shows how this bias manifests in forecasts. Both are distributions of sales growth rates annualized over three years for roughly 1,500 public companies in the U.S.[9] The distribution with the lower peak reflects the actual results over the past two decades, and the distribution with the higher peak is the set of growth rates that analysts are currently forecasting.

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



Source: FactSet.
Note: I/B/E/S consensus estimates as of May 4, 2015.

Consistent with the overconfidence bias, the range of expected outcomes is vastly narrower than what the results of the past suggest is reasonable. Forecasts are commonly too optimistic and too narrow. Behavioral biases and distortions introduced by incentives are the best explanations for the pattern of faulty forecasts.[10]

Given these insights, how might we assess the plausibility of Musk's assumptions? One way would be to delve into the specifics for Tesla and come up with conceivable scenarios. We might even employ an analogy: Tesla has a disruptive innovation and a dynamic leader as did Apple, the company Tesla hopes to match in market capitalization.

But knowing that we are prone to optimism and overconfidence suggests that we should introduce techniques to manage those biases. By far the most useful way to do that is to examine the experience of many companies over time, the base rate, and thoughtfully integrate that rate with our own view. This is not our typical approach. As Daniel Kahneman, the eminent psychologist, notes bluntly, "People who have information about an individual case rarely feel the need to know the statistics of the class to which the case belongs."[11]

We can certainly think about Tesla's individual prospects in assessing the likelihood that the company will achieve those figures. But Kahneman's approach would have us look at the sample of all the companies that had $6 billion of sales, adjusted for inflation, to determine how many grew 50 percent compounded annually for ten years. The answer for the past two decades: zero. In fact, if we lower the starting sales base to $700 million, there was not an instance of growth at that rate in a population of 6,700. While Musk allowed that these were assumptions only, he added, "I bet that they do occur."

Though decision scientists have known for a long time that the proper use of base rates improves the quality of forecasts, the technique remains remarkably underused.[12] We believe this reflects the human desire for a narrative. Causality is clear in stories about the specifics, which makes those scenarios vivid. Base rates, on the other hand, are largely antiseptic and hence less appealing to the mind.

Base Rates of Sales 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.[13] 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 growth is the most important driver of corporate value.[14] As a result, we analyze the distribution of sales growth rates for the constituents of the S&P 1500 Index over a 21-year period from 1994-2014. This sample represents roughly 90 percent of the capitalization of the U.S. equity market. We identify the members of the index at the beginning of each year and then calculate the compound annual growth rates (CAGR) of sales for the subsequent 1, 3, 5, 10, and 20 years for each firm. We adjust all of the sales figures to remove the effects of inflation, which translates all of the numbers to 2014 dollars. So no company is in our sample until it is included in the S&P 1500, but once it is in the index it stays in our sample even if it exits the index.

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 20-25 percent for three years. You start with row marked "20-25" and slide to the right to find the column "3-Yr." There, you'll see that 4.4 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 4.4 percent comes from: 1,060 instances out of the total of 23,914 (1,060/23,914 = 4.4 percent).

Exhibit 2: Base Rates of Sales Growth (CAGR) for the S&P 1500 (1994-2014)

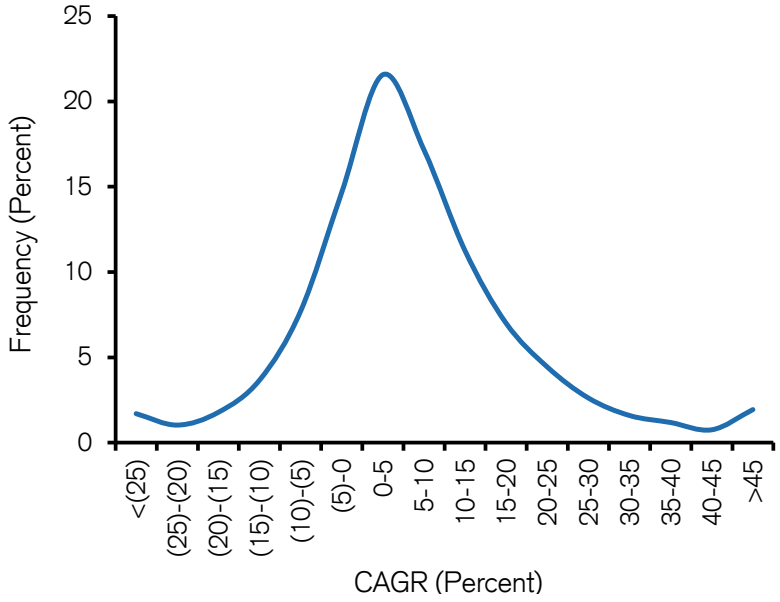
Full Universe	Base Rates				
CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr	20-Yr
<(25)	4.0%	1.7%	1.1%	0.5%	0.1%
(25)-(20)	1.6%	1.0%	0.7%	0.1%	0.1%
(20)-(15)	2.6%	1.8%	1.4%	0.7%	0.1%
(15)-(10)	3.9%	3.7%	2.9%	1.4%	0.4%
(10)-(5)	7.0%	7.7%	7.0%	5.4%	1.8%
(5)-0	12.7%	14.7%	16.5%	16.8%	11.5%
0-5	17.6%	21.6%	24.6%	30.8%	43.0%
5-10	15.4%	17.2%	18.7%	23.3%	25.9%
10-15	10.6%	11.2%	11.7%	11.7%	11.8%
15-20	6.9%	7.0%	6.9%	5.5%	3.9%
20-25	4.7%	4.4%	3.5%	2.0%	0.6%
25-30	3.2%	2.6%	2.1%	0.7%	0.6%
30-35	2.1%	1.6%	1.0%	0.4%	0.1%
35-40	1.6%	1.2%	0.6%	0.2%	0.2%
40-45	1.2%	0.8%	0.4%	0.2%	0.0%
>45	4.9%	1.9%	0.9%	0.3%	0.0%
Mean	8.8%	6.2%	5.3%	4.6%	4.9%
Median	5.2%	4.5%	4.2%	4.1%	4.2%
StDev	50.3%	16.4%	13.1%	9.6%	6.7%

Full Universe	Observations				
CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr	20-Yr
<(25)	1,153	406	205	56	1
(25)-(20)	471	246	126	14	1
(20)-(15)	748	425	261	75	1
(15)-(10)	1,147	875	564	149	4
(10)-(5)	2,050	1,842	1,355	574	21
(5)-0	3,695	3,508	3,184	1,796	131
0-5	5,138	5,157	4,748	3,285	488
5-10	4,489	4,104	3,606	2,485	294
10-15	3,094	2,689	2,260	1,251	134
15-20	2,004	1,672	1,332	589	44
20-25	1,358	1,060	677	211	7
25-30	929	625	397	80	7
30-35	610	380	192	45	1
35-40	469	282	116	26	2
40-45	349	180	84	18	0
>45	1,416	463	181	27	0
Total	29,120	23,914	19,288	10,681	1,136

Source: FactSet.
Note: CAGR = compound annual growth rate.

Exhibit 3 is the distribution for the three-year sales growth rate. This shows, in a graph, what the numbers say in exhibit 2. The mean, or average, growth rate was 6.2 percent per year and the median growth rate was 4.5 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, 16.4 percent, gives an indication of the width of the bell curve.

Exhibit 3: Three-Year CAGR of Sales for the S&P 1500 (1994-2014)



Source: FactSet.
Note: CAGR = compound annual growth rate.

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. The best way to do that 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 5 percentage points (except for the tails). The population includes companies that are now dead.[15]

There is a modest survivorship bias because each sample only includes the firms that survived for that specified time. For a company to be included in our 20-year sample, for instance, requires 20 years of survival. To give you some sense of this effect, the survivorship rates are 92 percent for 1 year, 84 percent for 3 years, 76 percent for 5 years, 59 percent for 10 years, and 38 percent for 20 years.

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 Tesla as an example. Elon Musk said he hopes to grow sales 50 percent per year for the next decade from a sales base of $6 billion. We first find the correct reference class. In this case, it's the decile that has a sales base between $6 and 13 billion. Next we examine the row of growth that is marked ">45," representing a sales growth rate of 45 percent or more. Going out to the column under "10-Yr," we see that no companies achieved this feat. Indeed, we have to go down to 35-40 percent growth to see any companies, and even there it is only one-fifth of 1 percent of the sample.

In total, exhibit 4 shows results for 55 reference classes (11 size ranges times 5 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. We will show how to incorporate these base rates into your forecasts for sales 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 for S&P 1500 (1994-2014)

$0-250 Mn	Base Rates				
CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr	20-Yr
<(25)	6.6%	4.1%	4.0%	2.7%	0.8%
(25)-(20)	2.2%	1.4%	0.7%	0.2%	0.0%
(20)-(15)	2.6%	1.8%	1.3%	1.9%	0.0%
(15)-(10)	3.8%	3.2%	2.2%	1.0%	0.0%
(10)-(5)	6.0%	6.4%	4.6%	2.0%	1.6%
(5)-0	8.8%	9.1%	10.5%	7.4%	4.0%
0-5	11.0%	12.9%	14.7%	18.1%	17.7%
5-10	10.4%	12.5%	15.5%	20.9%	26.6%
10-15	9.3%	11.2%	12.1%	15.8%	25.0%
15-20	7.4%	8.2%	11.3%	11.0%	14.5%
20-25	5.1%	7.4%	5.6%	7.7%	2.4%
25-30	4.6%	5.3%	4.8%	3.3%	4.8%
30-35	3.7%	3.3%	3.3%	2.2%	0.8%
35-40	2.9%	3.0%	2.3%	1.1%	1.6%
40-45	2.5%	2.0%	1.4%	1.5%	0.0%
>45	12.9%	8.2%	5.8%	3.1%	0.0%
Mean	24.1%	13.3%	10.9%	9.9%	9.9%
Median	9.1%	9.5%	8.8%	8.8%	9.8%
StDev	153.9%	30.6%	24.2%	18.1%	12.8%

$250-450 Mn	Base Rates				
CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr	20-Yr
<(25)	4.1%	1.6%	0.9%	0.2%	0.0%
(25)-(20)	1.6%	0.8%	0.6%	0.1%	0.0%
(20)-(15)	2.9%	1.9%	1.0%	0.2%	0.0%
(15)-(10)	3.3%	3.2%	3.0%	0.8%	0.0%
(10)-(5)	6.1%	5.6%	5.5%	4.0%	0.0%
(5)-0	10.8%	9.8%	11.0%	15.7%	4.6%
0-5	13.4%	17.1%	19.3%	22.1%	34.5%
5-10	12.6%	16.6%	19.3%	23.8%	29.9%
10-15	11.6%	14.6%	16.3%	16.4%	23.0%
15-20	8.4%	8.5%	9.2%	9.7%	6.9%
20-25	6.2%	7.2%	5.6%	4.4%	1.1%
25-30	4.5%	4.4%	3.6%	1.1%	0.0%
30-35	2.6%	2.3%	1.6%	0.2%	0.0%
35-40	2.8%	1.7%	1.1%	0.5%	0.0%
40-45	2.3%	1.6%	1.0%	0.5%	0.0%
>45	6.9%	3.2%	1.0%	0.1%	0.0%
Mean	11.2%	9.6%	8.1%	6.9%	7.5%
Median	8.3%	7.9%	7.1%	6.1%	6.7%
StDev	25.9%	17.4%	13.9%	9.5%	5.2%

$450-700 Mn	Base Rates				
CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr	20-Yr
<(25)	3.9%	1.4%	0.5%	0.2%	0.0%
(25)-(20)	1.6%	1.1%	0.2%	0.0%	0.0%
(20)-(15)	2.8%	2.1%	2.1%	0.2%	0.0%
(15)-(10)	4.5%	3.7%	3.4%	1.9%	0.0%
(10)-(5)	6.5%	7.8%	6.0%	6.7%	0.0%
(5)-0	10.3%	10.7%	12.8%	13.5%	7.3%
0-5	14.4%	17.3%	19.4%	25.6%	34.9%
5-10	15.0%	18.2%	20.0%	26.0%	29.4%
10-15	11.2%	13.1%	16.1%	16.0%	23.9%
15-20	7.7%	9.6%	9.0%	6.0%	3.7%
20-25	5.5%	6.5%	4.5%	2.0%	0.0%
25-30	4.5%	2.5%	3.1%	0.7%	0.9%
30-35	3.1%	1.7%	0.8%	0.6%	0.0%
35-40	1.9%	1.3%	0.8%	0.3%	0.0%
40-45	1.5%	0.9%	0.4%	0.1%	0.0%
>45	5.6%	2.1%	0.8%	0.1%	0.0%
Mean	10.0%	7.7%	6.9%	5.5%	6.7%
Median	6.9%	6.7%	6.3%	5.4%	6.9%
StDev	28.4%	16.0%	12.3%	8.9%	5.3%

$700-1,000 Mn	Base Rates				
CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr	20-Yr
<(25)	3.4%	1.3%	0.2%	0.3%	0.0%
(25)-(20)	1.6%	1.4%	1.0%	0.0%	0.0%
(20)-(15)	2.6%	1.2%	1.0%	1.1%	0.0%
(15)-(10)	4.2%	3.9%	2.6%	1.4%	1.8%
(10)-(5)	7.4%	8.5%	7.3%	3.2%	1.8%
(5)-0	12.8%	13.6%	15.4%	12.9%	6.3%
0-5	16.2%	20.7%	24.9%	31.0%	39.6%
5-10	15.4%	16.0%	17.4%	22.2%	34.2%
10-15	9.9%	12.1%	13.1%	15.5%	9.9%
15-20	8.3%	8.7%	8.3%	7.9%	5.4%
20-25	5.0%	4.6%	4.1%	2.4%	0.9%
25-30	3.5%	2.9%	2.1%	1.0%	0.0%
30-35	2.5%	2.1%	0.8%	0.8%	0.0%
35-40	1.8%	1.4%	0.6%	0.2%	0.0%
40-45	1.1%	0.3%	0.3%	0.0%	0.0%
>45	4.4%	1.3%	0.9%	0.0%	0.0%
Mean	9.0%	6.5%	5.9%	5.7%	5.1%
Median	5.6%	4.9%	4.5%	5.0%	5.0%
StDev	33.3%	15.2%	11.8%	9.4%	5.6%

$1,000-1,500 Mn	Base Rates				
CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr	20-Yr
<(25)	3.5%	1.1%	0.8%	0.7%	0.0%
(25)-(20)	1.7%	0.7%	0.4%	0.1%	0.0%
(20)-(15)	2.8%	2.0%	1.0%	0.5%	1.0%
(15)-(10)	4.1%	3.5%	2.5%	0.6%	0.0%
(10)-(5)	7.3%	8.4%	8.1%	3.0%	0.0%
(5)-0	12.3%	15.3%	17.3%	17.6%	7.9%
0-5	16.9%	20.8%	22.5%	29.2%	53.5%
42134	15.8%	15.9%	19.2%	28.6%	26.7%
42292	11.5%	13.0%	13.5%	12.0%	8.9%
15-20	6.9%	8.0%	7.5%	5.5%	2.0%
20-25	5.3%	4.2%	3.2%	1.1%	0.0%
25-30	3.4%	2.3%	1.6%	0.8%	0.0%
30-35	2.0%	1.5%	0.9%	0.2%	0.0%
35-40	1.3%	0.9%	0.4%	0.1%	0.0%
40-45	1.0%	0.7%	0.4%	0.0%	0.0%
>45	4.3%	1.5%	0.6%	0.0%	0.0%
Mean	7.8%	6.0%	5.0%	4.6%	4.3%
Median	5.4%	4.6%	4.4%	4.7%	4.1%
StDev	23.9%	15.1%	12.9%	9.5%	4.5%

$1,500-2,250 Mn	Base Rates				
CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr	20-Yr
<(25)	3.3%	1.2%	0.5%	0.2%	0.0%
(25)-(20)	1.9%	1.0%	0.6%	0.3%	0.0%
(20)-(15)	2.4%	1.9%	1.2%	0.3%	0.0%
(15)-(10)	4.1%	3.7%	2.8%	0.9%	0.9%
(10)-(5)	6.8%	7.3%	6.6%	7.7%	2.6%
(5)-0	12.8%	14.7%	17.3%	14.6%	11.1%
0-5	18.4%	22.7%	25.3%	35.0%	48.7%
5-10	15.6%	19.1%	21.6%	23.8%	19.7%
10-15	12.2%	12.2%	11.6%	10.3%	13.7%
15-20	6.9%	6.7%	6.3%	4.8%	2.6%
20-25	4.6%	3.4%	3.2%	1.2%	0.9%
25-30	2.8%	2.3%	1.4%	0.5%	0.0%
30-35	1.9%	1.0%	0.6%	0.3%	0.0%
35-40	1.7%	0.8%	0.3%	0.1%	0.0%
40-45	1.0%	0.5%	0.3%	0.1%	0.0%
>45	3.9%	1.5%	0.4%	0.0%	0.0%
Mean	7.5%	5.5%	4.8%	4.1%	4.3%
Median	5.2%	4.5%	4.2%	3.6%	3.1%
StDev	22.9%	13.4%	10.4%	7.2%	5.5%

$2,250-3,500 Mn	Base Rates				
CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr	20-Yr
<(25)	3.8%	1.6%	0.6%	0.7%	0.0%
(25)-(20)	1.5%	1.0%	0.4%	0.3%	1.0%
(20)-(15)	2.8%	2.0%	2.0%	0.4%	0.0%
(15)-(10)	3.8%	4.0%	3.4%	1.9%	1.0%
(10)-(5)	6.5%	7.6%	8.4%	6.6%	3.0%
(5)-0	12.8%	15.2%	16.7%	19.6%	14.0%
0-5	20.5%	24.8%	26.6%	31.6%	55.0%
5-10	16.2%	16.9%	17.9%	22.3%	17.0%
10-15	10.9%	11.1%	11.8%	8.9%	5.0%
15-20	7.0%	6.5%	5.9%	5.3%	3.0%
20-25	4.2%	3.4%	2.9%	1.6%	1.0%
25-30	2.8%	2.4%	1.5%	0.4%	0.0%
30-35	1.5%	1.3%	0.9%	0.1%	0.0%
35-40	1.4%	0.9%	0.4%	0.3%	0.0%
40-45	0.9%	0.4%	0.5%	0.0%	0.0%
>45	3.4%	0.9%	0.4%	0.0%	0.0%
Mean	6.3%	4.7%	4.1%	3.4%	3.1%
Median	4.5%	3.8%	3.4%	3.3%	2.9%
StDev	20.7%	13.1%	11.7%	9.4%	5.8%

$3,500-6,000 Mn	Base Rates				
CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr	20-Yr
<(25)	3.7%	1.4%	0.9%	0.3%	0.0%
(25)-(20)	1.3%	1.0%	0.8%	0.1%	0.0%
(20)-(15)	2.2%	1.5%	1.4%	0.7%	0.0%
(15)-(10)	4.3%	3.9%	3.1%	1.0%	0.0%
(10)-(5)	7.3%	7.6%	6.9%	6.4%	1.9%
(5)-0	13.7%	16.5%	17.9%	19.1%	17.0%
0-5	20.4%	24.4%	28.8%	36.2%	44.3%
5-10	17.3%	18.9%	18.7%	20.3%	33.0%
10-15	10.4%	9.8%	8.3%	11.8%	1.9%
15-20	6.3%	5.7%	6.1%	3.3%	1.9%
20-25	4.0%	3.2%	3.7%	0.4%	0.0%
25-30	2.2%	1.6%	1.7%	0.4%	0.0%
30-35	1.4%	1.7%	0.7%	0.0%	0.0%
35-40	1.1%	1.1%	0.3%	0.1%	0.0%
40-45	0.8%	0.8%	0.2%	0.0%	0.0%
>45	3.6%	1.0%	0.4%	0.0%	0.0%
Mean	6.1%	4.9%	4.1%	3.3%	3.6%
Median	4.3%	3.6%	3.4%	3.0%	3.8%
StDev	21.5%	13.3%	10.7%	6.8%	4.3%

$6,000-13,000 Mn	Base Rates				
CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr	20-Yr
<(25)	4.1%	1.6%	1.3%	0.2%	0.0%
(25)-(20)	1.7%	1.2%	0.7%	0.0%	0.0%
(20)-(15)	2.6%	1.7%	1.1%	1.0%	0.0%
(15)-(10)	3.7%	4.1%	3.2%	1.4%	0.0%
(10)-(5)	7.5%	9.1%	8.2%	6.0%	2.1%
(5)-0	14.0%	18.1%	21.6%	21.7%	13.4%
0-5	20.3%	24.3%	27.6%	36.8%	59.2%
5-10	17.2%	17.5%	18.6%	22.3%	19.7%
10-15	10.8%	9.1%	8.8%	6.6%	5.6%
15-20	5.5%	5.4%	4.5%	2.6%	0.0%
20-25	3.9%	3.3%	1.7%	0.9%	0.0%
25-30	2.3%	1.9%	1.7%	0.1%	0.0%
30-35	1.5%	0.8%	0.4%	0.3%	0.0%
35-40	1.0%	0.8%	0.3%	0.2%	0.0%
40-45	0.7%	0.2%	0.2%	0.0%	0.0%
>45	3.4%	0.8%	0.2%	0.0%	0.0%
Mean	5.5%	3.5%	3.0%	2.8%	3.1%
Median	4.1%	2.9%	2.7%	2.9%	2.6%
StDev	21.5%	12.7%	10.1%	7.3%	3.8%

>$13,000 Mn	Base Rates				
CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr	20-Yr
<(25)	3.8%	2.2%	1.4%	0.2%	0.0%
(25)-(20)	1.3%	0.9%	1.2%	0.2%	0.0%
(20)-(15)	2.2%	1.7%	1.5%	1.0%	0.0%
(15)-(10)	3.6%	3.3%	2.8%	2.6%	0.0%
(10)-(5)	8.6%	8.1%	7.5%	6.6%	4.6%
(5)-0	17.1%	20.5%	20.7%	21.3%	26.9%
0-5	22.3%	26.6%	31.5%	33.9%	36.9%
5-10	17.2%	18.8%	18.2%	22.3%	26.9%
10-15	8.7%	7.4%	7.9%	8.4%	4.6%
15-20	5.1%	3.9%	3.5%	2.6%	0.0%
20-25	3.3%	2.5%	2.1%	0.6%	0.0%
25-30	2.0%	1.4%	0.6%	0.2%	0.0%
30-35	1.1%	0.9%	0.7%	0.1%	0.0%
35-40	0.8%	0.6%	0.2%	0.0%	0.0%
40-45	0.6%	0.4%	0.1%	0.0%	0.0%
>45	2.4%	0.7%	0.2%	0.0%	0.0%
Mean	4.1%	2.8%	2.5%	2.6%	2.5%
Median	3.0%	2.3%	2.2%	2.7%	2.6%
StDev	18.6%	12.1%	9.8%	7.0%	4.7%

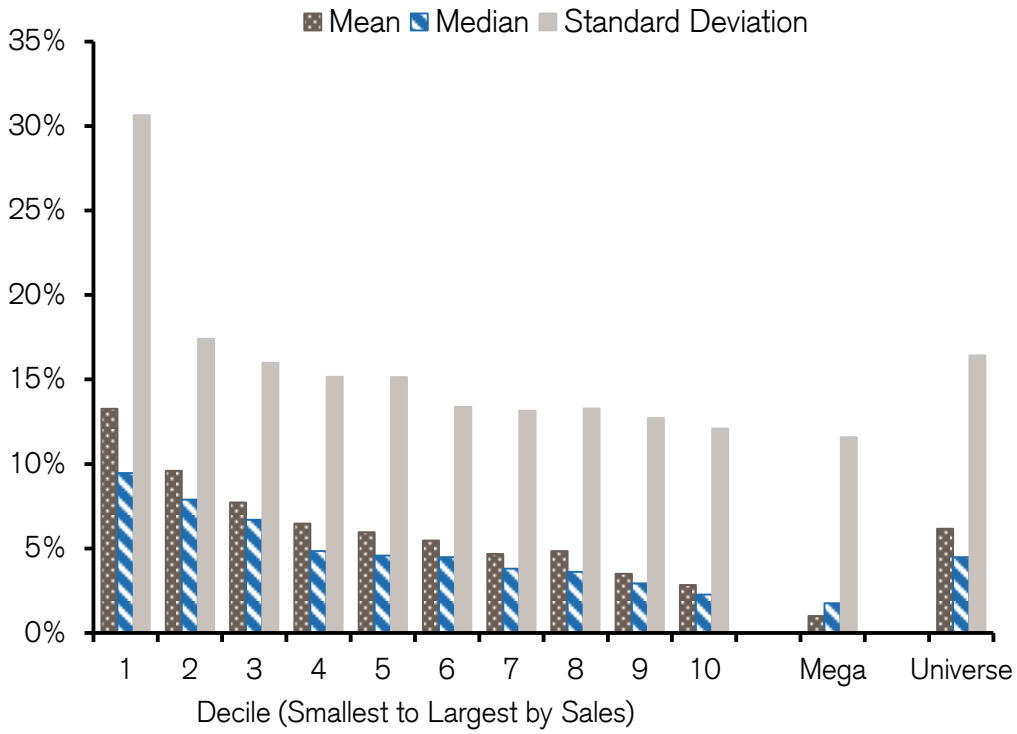
>$50,000 Mn	Base Rates				
CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr	20-Yr
<(25)	4.4%	3.1%	3.6%	0.5%	0.0%
(25)-(20)	1.1%	0.9%	0.9%	0.5%	0.0%
(20)-(15)	2.0%	1.6%	1.1%	0.9%	0.0%
(15)-(10)	4.1%	3.6%	2.3%	5.7%	0.0%
(10)-(5)	9.9%	9.5%	7.7%	4.7%	12.5%
(5)-0	16.5%	20.9%	22.0%	23.1%	25.0%
0-5	23.3%	28.2%	33.6%	34.9%	43.8%
5-10	18.0%	19.5%	17.9%	25.9%	18.8%
10-15	7.7%	6.6%	7.7%	3.3%	0.0%
15-20	4.5%	2.9%	1.8%	0.5%	0.0%
20-25	3.5%	1.6%	0.9%	0.0%	0.0%
25-30	1.7%	0.5%	0.5%	0.0%	0.0%
30-35	0.8%	0.2%	0.0%	0.0%	0.0%
35-40	0.6%	0.4%	0.0%	0.0%	0.0%
40-45	0.2%	0.2%	0.0%	0.0%	0.0%
>45	2.0%	0.2%	0.0%	0.0%	0.0%
Mean	2.4%	1.0%	1.0%	1.2%	1.2%
Median	2.6%	1.8%	1.7%	2.0%	0.6%
StDev	18.6%	11.6%	9.4%	6.5%	4.4%

Full Universe	Base Rates				
CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr	20-Yr
<(25)	4.0%	1.7%	1.1%	0.5%	0.1%
(25)-(20)	1.6%	1.0%	0.7%	0.1%	0.1%
(20)-(15)	2.6%	1.8%	1.4%	0.7%	0.1%
(15)-(10)	3.9%	3.7%	2.9%	1.4%	0.4%
(10)-(5)	7.0%	7.7%	7.0%	5.4%	1.8%
(5)-0	12.7%	14.7%	16.5%	16.8%	11.5%
0-5	17.6%	21.6%	24.6%	30.8%	43.0%
5-10	15.4%	17.2%	18.7%	23.3%	25.9%
10-15	10.6%	11.2%	11.7%	11.7%	11.8%
15-20	6.9%	7.0%	6.9%	5.5%	3.9%
20-25	4.7%	4.4%	3.5%	2.0%	0.6%
25-30	3.2%	2.6%	2.1%	0.7%	0.6%
30-35	2.1%	1.6%	1.0%	0.4%	0.1%
35-40	1.6%	1.2%	0.6%	0.2%	0.2%
40-45	1.2%	0.8%	0.4%	0.2%	0.0%
>45	4.9%	1.9%	0.9%	0.3%	0.0%
Mean	8.8%	6.2%	5.3%	4.6%	4.9%
Median	5.2%	4.5%	4.2%	4.1%	4.2%
StDev	50.3%	16.4%	13.1%	9.6%	6.7%

Source: FactSet.

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 mean and median growth rates decline as firm size increases, as does the standard deviation of the growth rates. This point has been well established empirically.[16] Exhibit 5 shows this pattern for annualized growth rates over three years. The lesson is to temper expectations about sales growth for large companies.

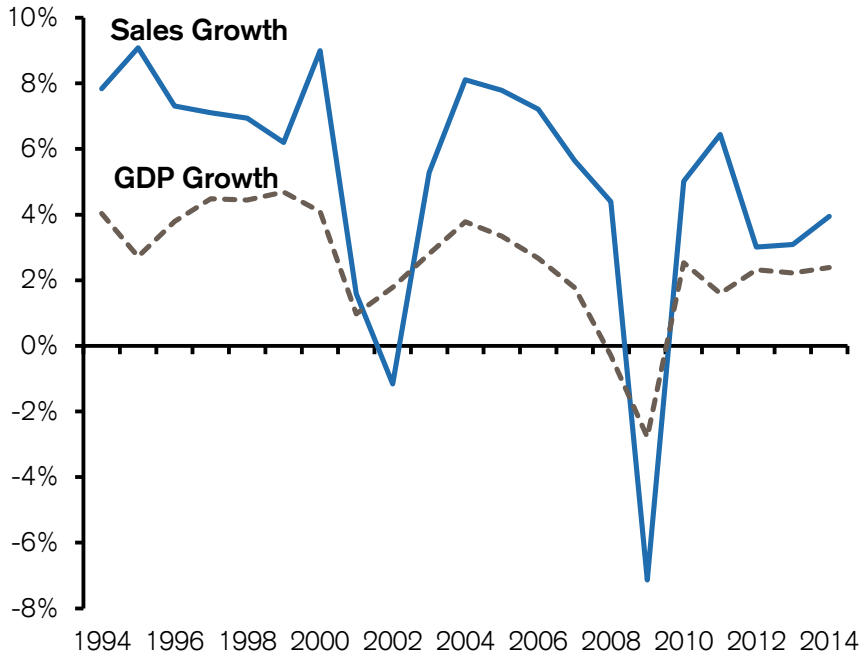
Exhibit 5: Growth Rates and Standard Deviations Decline with Size



Source: FactSet.
Note: Growth rates are annualized over three years; mega companies have sales in excess of $50 billion in the base year.

Next, sales growth follows gross domestic product (GDP) reasonably closely (see Exhibit 6). The correlation between GDP growth and the median sales growth in the same year is strong, with a coefficient of 0.80. Over the 21-year period, U.S. GDP grew at 2.5 percent per year, adjusted for inflation, with a standard deviation of 1.8 percent. Corporate sales growth was higher than that of the broader economy for a few reasons, including mergers and acquisitions, international growth, and currency swings.[17]

Exhibit 6: Median Sales Growth Rate Is Correlated with GDP Growth



Source: FactSet and Bureau of Economic Analysis.

Finally, notwithstanding our natural tendency to anticipate growth, 31 percent of the companies in the sample had negative sales growth rates for 3 years, after an adjustment for inflation, and 30 percent shrunk 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.[18]

Using Base Rates to Model Growth

We have established that there are two ways of making a forecast. You can do bottom-up research, which is the most natural method, or you can turn to a base rate. The research in decision making shows that the bottom-up approach is subject to biases and that incorporating the base rate generally improves the accuracy of the forecast. Yet we don't want to lean too much on either our own analysis or the base rate. We want to combine the two intelligently.

There is a technique to combine the two approaches, which we will apply to our sales growth data.[19] Correlation is the key to the method. Correlation measures the degree of linear relationship between variables in a pair of distributions. The value of a correlation can fall between -1.0 (the rise in one variable perfectly correlates with the fall of the other) and 1.0 (both variables move in tandem). A zero correlation indicates randomness. We will examine a single variable, sales growth, measured over time and all of the correlations are positive.

If the correlation between two distributions is high, then what happened before gives you a really good sense of what will follow. For example, the correlation for cash flow return on investment (CFROI®) for companies in the consumer staples sector is about 0.90 from one year to the next.[20] That means if you know Nestlé's CFROI from last year, you can forecast it this year with a great deal of accuracy. The bottom-up work is highly relevant.

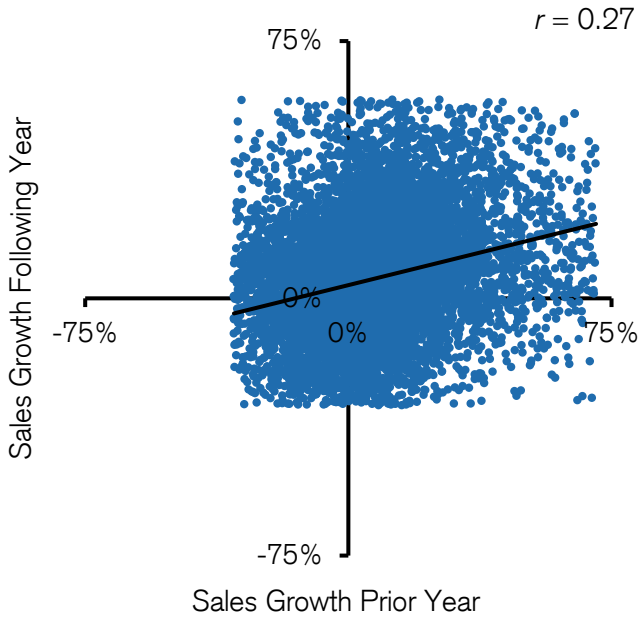
If the correlation is low, what happened before provides no inkling of what will happen next. Take the annual total shareholder returns for the S&P 500 as a case.[21] The correlation from year to year, from 1928 through 2014, is essentially zero. Telling you last year's return provides no help in forecasting the return for this year. Your best forecast is the average of the reference class.

The basic idea is that the correlation determines how you should weight the bottom-up analysis and the base rate. For Nestlé, a sensible forecast is nine parts last year's CFROI and one part last year's average sector CFROI, the base rate. For your S&P 500 forecast, you should place minimal weight on what happened last year and rely largely on the average return since 1928, the base rate.

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.[22] Sales growth is important and more predictable than profit growth.

Exhibit 7 shows that the correlation coefficient is 0.27 for the year-to-year sales growth rate. We start with the constituents of the S&P 1500 Index as of 1994, and use the figures from 1994 through 2014.[23] Specifically, we correlate the growth rates of 1994 with those of 1995, 1995 with 1996, et cetera. It turns out that the correlation doesn't change much if we consider only companies with sales in excess of $20 billion.

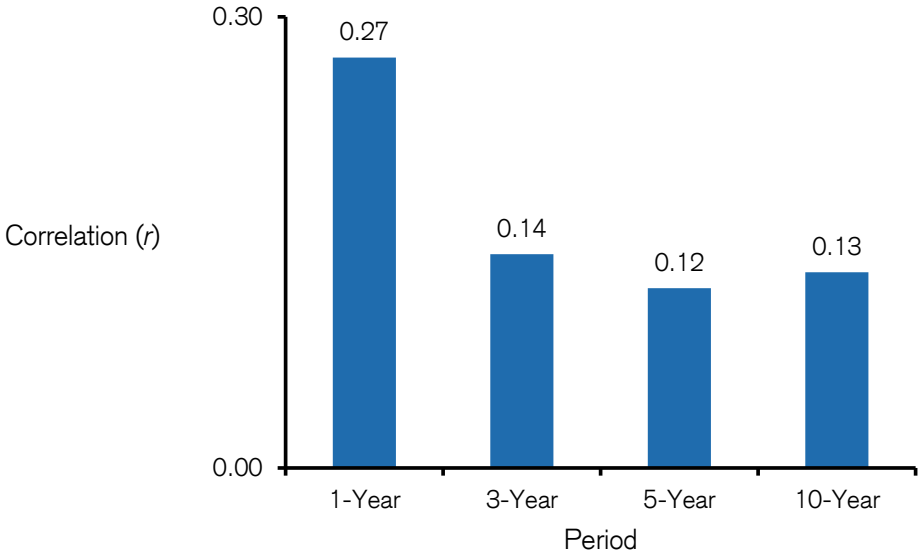
Exhibit 7: Correlation of One-Year Sales Growth Rates



Source: FactSet.

The correlations tend to decline as we consider longer time periods, which comes as no surprise. Exhibit 8 shows the correlations for 1-, 3-, 5-, and 10-year horizons for the full population of companies. The lesson is that 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 8: Correlation of Sales Growth Rates for 1-, 3-, 5- and 10-Year Horizons



Source: FactSet.

This approach to modelling regression toward the mean doesn't say that some companies won't grow rapidly and others won't 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.

Case Studies

We have already compared Elon Musk's scenario for Tesla's next decade to a base rate. We now turn to some case studies of successes and failures.

The first case is Apple, and the results are astounding. In fact, the company has had extraordinary results in two eras (see Exhibit 9). From 1981 through 1990, the company's sales grew at a CAGR of 36 percent. While impressive, this was off a relatively low starting sales base of $400 million. Still it was a rate of growth achieved by less than one-half of one percent of companies of a similar size.

Exhibit 9: Apple's Extraordinary Growth, Then (1981-1990) and Now (2003-2013)

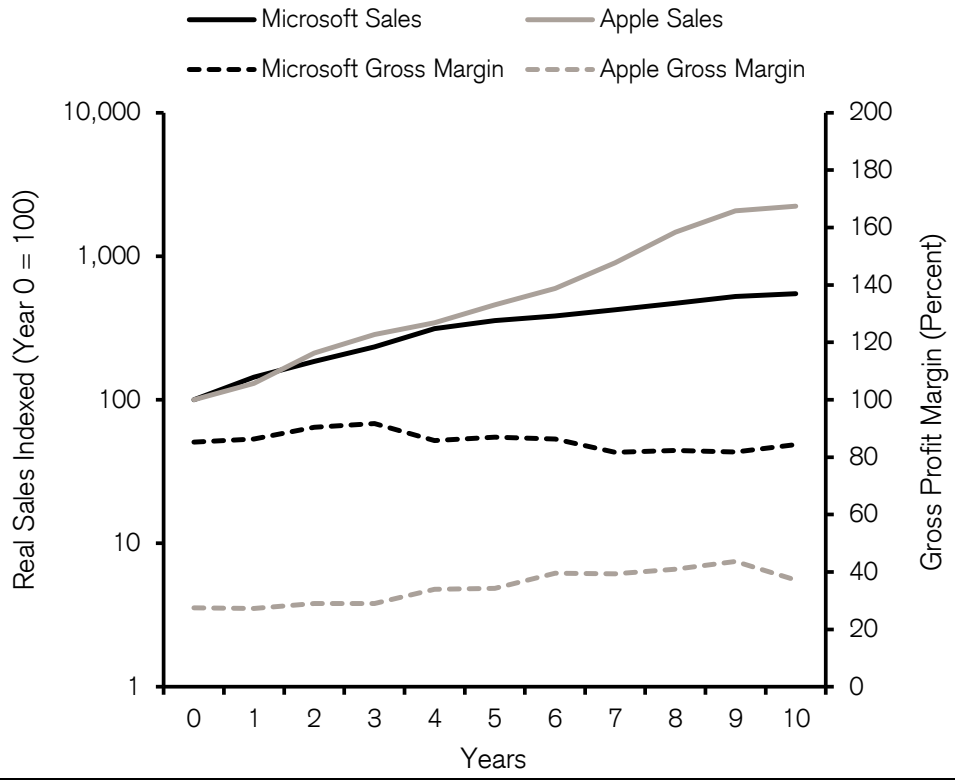
10-Year Period	Real CAGR	Yr (0) Sales	Base Rate	
1981-1990	36.4%	418	4 out of 833	0.48%
2003-2012	36.2%	7,463	2 out of 1251	0.16%
2004-2013	35.6%	8,396	2 out of 1251	0.16%

Source: FactSet.
Note: Figures in 2014 U.S. Dollars.

Apple's growth in the last dozen years has also been truly amazing. Out of the 1,251 companies in Apple's size cohort ($6-13 billion), there were only 2 instances of sales growth of 35-40 percent compounded annually over 10 years. Both were Apple. That this was without any major acquisitions makes the feat even more remarkable.

It is interesting to compare Apple in the early 2000s to Microsoft, another company that realized rapid growth. We matched the two companies based on sales, adjusted for inflation, which suggest fiscal 2003 as the base year for Apple and fiscal 1995 for Microsoft. We then examine the sales growth for the subsequent decade (see Exhibit 10). Note that the vertical axis is on a logarithmic scale, which means that the difference between the tick marks reflects the same percentage change (1 to 10 is the same as 10 to 100). Apple grew sales at a rate roughly double that of Microsoft.

Exhibit 10: Sales and Gross Margins for Apple (F2003-13) and Microsoft (F1995-2005)



Source: FactSet.
Note: Figures in 2014 U.S. Dollars.

Exhibit 10 also shows the annual gross margin for each company. Microsoft, primarily a software company, had an average gross margin of more than 85 percent while Apple, primarily a hardware company, averaged 35 percent.

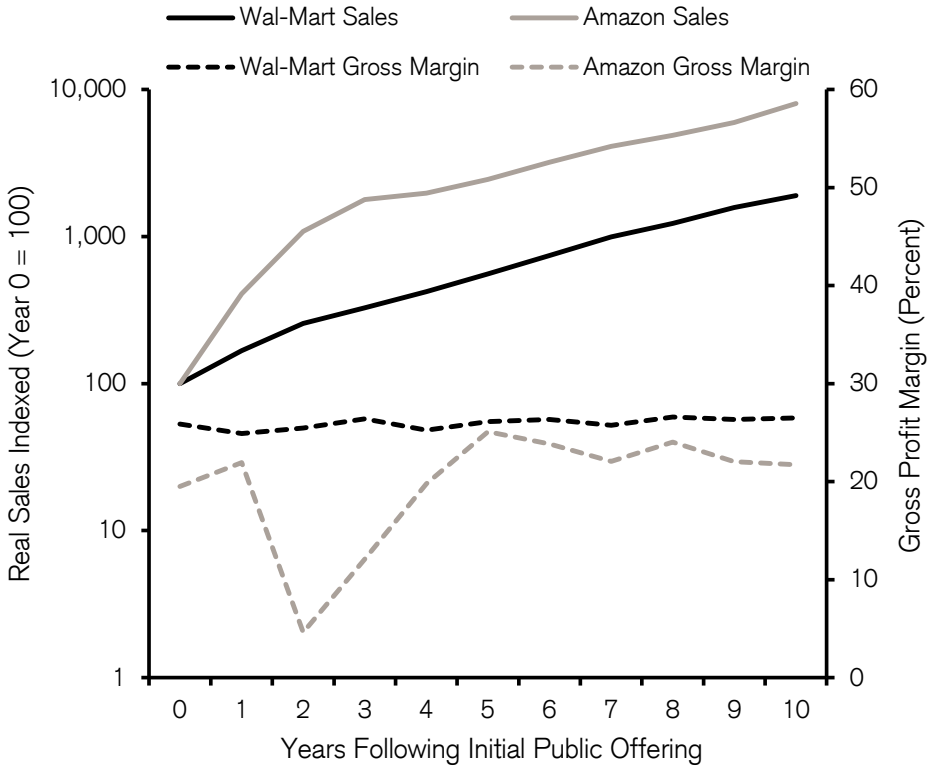
Will the level of sales of Apple, now at $200 billion, place a limit on the company's growth? Tim Cook, the company's CEO, doesn't think so. Here's what he said recently (emphasis added):[24]

> Y'know, we're fortunate to have a good year, but maybe the most important answer to that first would be that **we don't believe in such laws as laws of large numbers. This is sort of, uh, old dogma, I think, that was cooked up by somebody** and Steve [Jobs] did a lot of things for us for many years, but one of the things he ingrained in us [is] that putting limits on your thinking [is] never good. And so, we're actually not focused on numbers, we're focused on the things that produce the numbers, right?

Apple shows that base rates are not destiny. As Dan Lovallo and Daniel Kahneman write, "It's true that the outside view [the base rate], being based on historical precedent, may fail to predict extreme outcomes—those that lie outside all historical precedents. But for most projects, the outside view will produce superior results."[25]

Amazon.com is another company that has sustained remarkable top line growth. One interesting comparison is between Amazon and Wal-Mart Stores, Inc. The companies had a similar level of sales, adjusted for inflation, at the time of their respective initial public offerings (IPOs). Amazon's IPO was in 1997 and Wal-Mart's in 1970. Exhibit 11 shows the sales growth of both companies for the ten years following their IPOs. Both realized torrid sales growth: Amazon about 55 percent compounded annually and Wal-Mart about 34 percent.

Exhibit 11: Sales and Gross Margins for Wal-Mart and Amazon.com, Ten Years Post-IPO



Source: Company filings and FactSet.

Exhibit 11 also shows the gross margins for each company. Wal-Mart's gross margin was in the mid-20 percent range, while Amazon, save the heavy spending during the peak of the dot-com bubble, was in the low 20s. In 2014, Wal-Mart's gross margin was about 25 percent and Amazon's was in excess of 29 percent.

Warren Buffett, the chairman and CEO of Berkshire Hathaway, sounds a cautionary note about companies that predict rapid growth. Here's an excerpt from his letter to shareholders in 2000. While this was during the dot-com bubble, the passage bears quoting in full (emphasis added):[26]

> One further thought while I'm on my soapbox: 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.

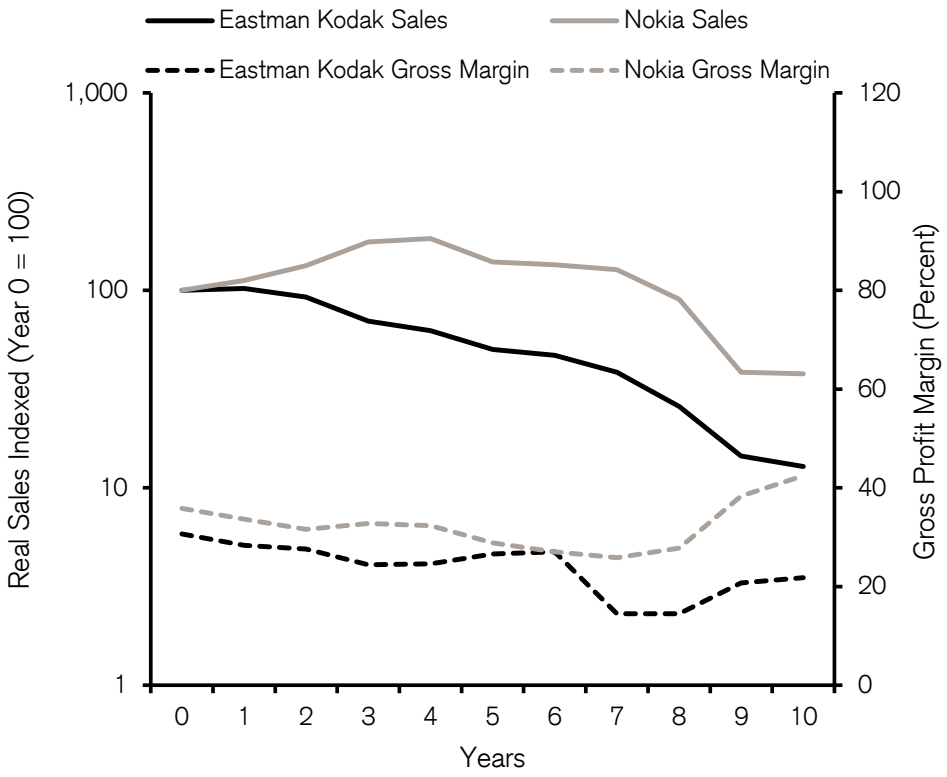
> It's fine for a CEO to have his own internal goals and, in our view, it's even appropriate for the CEO to publicly express some hopes about the future, if these expectations are accompanied by sensible caveats. But for a major corporation to predict that its per-share earnings will grow over the long 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.**
>
> 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.

Naturally, not all of the examples are success stories. The Eastman Kodak Company and Nokia Corporation are two companies that have struggled in recent years as the result of technological change. Kodak had a dominant, and highly profitable, franchise in photo film that came under severe pressure as digital photography took off. The company filed for bankruptcy in early 2012 and continued to restructure the business. In the decade ended 2014, Kodak's sales declined at a compounded annual rate of close to 19 percent. Part of this decline is attributable to divestitures.

Nokia, once a leader in the smartphone as well as the traditional mobile phone market, saw its lead at the top end toppled by Apple and Samsung and at the low end by Asian manufacturers. Sales for the 10 years ended 2014 shrank 9 percent compounded annually. Nokia's sales in 2008 were more than four times those of 2014, with divestitures again playing a role.

Exhibit 12 shows the sales and gross profit margin for Kodak and Nokia from 2004 through 2014. These cases show how once strong and proud companies can stumble, and ultimately shrink. While the distribution of sales growth rates is skewed to the right, it's important to recognize that plenty of businesses also shrink.

Exhibit 12: Sales and Gross Margins for Eastman Kodak and Nokia, 2004-14



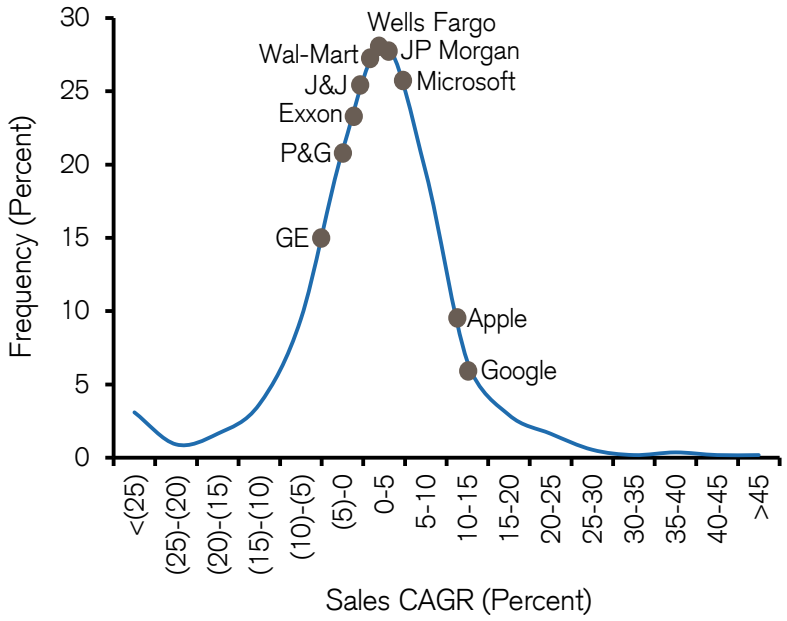
Source: FactSet.

Current Expectations

Exhibit 1 showed the current expectations for sales growth over three years for more than a thousand public companies in the U.S. The median expected growth rate is 2.7 percent, which is consistent with GDP growth of 2-3 percent.

Exhibit 13 shows 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 13: Three-Year Expected Sales Growth Rates for Ten Mega Companies



Source: FactSet.
Note: I/B/E/S consensus estimates as of May 4, 2015; Growth rates are annualized; J&J = Johnson & Johnson, GE = General Electric, Exxon = ExxonMobil, and P&G = Procter & Gamble.

Analysts expect negative sales growth for four of the ten, which corporate actions or commodity prices can largely explain. The standard deviation of growth rates for this small sample is 5.7 percent.

Summary

Active investing requires having a point of view that is different than that of the stock market. Implicit in such a variant perception is a forecast of outcomes that is at odds with what the market implies.

Research shows that optimism and overconfidence can creep into our forecasts, thus distorting them. This is especially true when the outcomes have personal relevance. Research also shows that incorporating a base rate can improve the quality of our forecasts. Notwithstanding the utility of this method, it remains substantially underutilized.

In this piece we provide the base rates for sales growth rates for a large sample of U.S. companies over a span of more than two decades. We start with sales growth because it is the most important value driver. We then provide a method to integrate our views, as well as results from the past, with base rates to sharpen the quality of our forecasts. We also share a few case studies to show what happened to some outliers.

Appendix: Observations for Each Base Rate by Decile for S&P 1500 (1994-2014)

$0-250 Mn	Observations				
Sales CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr	20-Yr
<(25)	158	78	61	22	1
(25)-(20)	52	26	10	2	0
(20)-(15)	63	35	20	15	0
(15)-(10)	92	62	33	8	0
(10)-(5)	145	124	70	16	2
(5)-0	213	176	158	60	5
0-5	266	249	221	146	22
5-10	251	240	234	169	33
10-15	225	215	183	128	31
15-20	178	157	170	89	18
20-25	123	143	84	62	3
25-30	110	102	72	27	6
30-35	90	63	49	18	1
35-40	71	57	34	9	2
40-45	61	39	21	12	0
>45	312	158	87	25	0
Total	2,410	1,924	1,507	808	124

$250-450 Mn	Observations				
Sales CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr	20-Yr
<(25)	108	34	15	2	0
(25)-(20)	42	17	9	1	0
(20)-(15)	77	41	17	2	0
(15)-(10)	87	67	49	7	0
(10)-(5)	162	118	89	33	0
(5)-0	285	208	179	131	4
0-5	354	362	315	184	30
5-10	333	352	314	198	26
10-15	306	309	266	137	20
15-20	223	180	150	81	6
20-25	165	153	92	37	1
25-30	118	93	58	9	0
30-35	69	49	26	2	0
35-40	74	36	18	4	0
40-45	62	34	16	4	0
>45	182	67	16	1	0
Total	2,647	2,120	1,629	833	87

$450-700 Mn	Observations				
Sales CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr	20-Yr
<(25)	111	31	8	2	0
(25)-(20)	46	26	4	0	0
(20)-(15)	79	47	37	2	0
(15)-(10)	128	84	60	19	0
(10)-(5)	185	178	107	66	0
(5)-0	294	243	227	133	8
0-5	411	395	344	251	38
5-10	427	414	353	255	32
10-15	319	299	285	157	26
15-20	219	218	160	59	4
20-25	156	147	79	20	0
25-30	129	58	55	7	1
30-35	89	39	14	6	0
35-40	54	30	14	3	0
40-45	43	21	7	1	0
>45	161	48	15	1	0
Total	2,851	2,278	1,769	982	109

$700-1,000 Mn	Observations				
Sales CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr	20-Yr
<(25)	98	31	4	3	0
(25)-(20)	46	32	18	0	0
(20)-(15)	74	27	19	11	0
(15)-(10)	120	92	48	14	2
(10)-(5)	211	199	135	32	2
(5)-0	368	317	285	128	7
0-5	464	484	460	308	44
5-10	442	373	322	221	38
10-15	284	283	242	154	11
15-20	237	202	153	79	6
20-25	144	108	75	24	1
25-30	101	68	38	10	0
30-35	72	48	15	8	0
35-40	51	32	12	2	0
40-45	32	8	6	0	0
>45	125	30	17	0	0
Total	2,869	2,334	1,849	994	111

$1,000-1,500 Mn	Observations				
Sales CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr	20-Yr
<(25)	108	29	17	8	0
(25)-(20)	53	19	9	1	0
(20)-(15)	85	50	20	6	1
(15)-(10)	125	89	53	7	0
(10)-(5)	223	215	169	35	0
(5)-0	377	391	362	204	8
0-5	520	531	472	339	54
42134	485	405	402	331	27
15-Oct	353	332	282	139	9
15-20	213	204	158	64	2
20-25	163	107	68	13	0
25-30	104	59	34	9	0
30-35	62	38	19	2	0
35-40	39	24	8	1	0
40-45	32	18	8	0	0
>45	132	37	13	0	0
Total	3,074	2,548	2,094	1,159	101

$1,500-2,250 Mn	Observations				
Sales CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr	20-Yr
<(25)	99	31	11	2	0
(25)-(20)	57	24	12	4	0
(20)-(15)	73	48	24	3	0
(15)-(10)	124	94	58	10	1
(10)-(5)	205	183	135	90	3
(5)-0	387	372	352	170	13
0-5	558	572	515	409	57
5-10	473	483	440	278	23
10-15	369	307	237	120	16
15-20	210	169	128	56	3
20-25	139	87	65	14	1
25-30	84	59	28	6	0
30-35	57	25	12	3	0
35-40	51	20	6	1	0
40-45	29	13	7	1	0
>45	119	37	8	0	0
Total	3,034	2,524	2,038	1,167	117

$2,250-3,500 Mn	Observations				
Sales CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr	20-Yr
<(25)	112	38	12	8	0
(25)-(20)	45	23	8	3	1
(20)-(15)	83	49	39	4	0
(15)-(10)	112	97	68	21	1
(10)-(5)	190	183	168	73	3
(5)-0	373	367	333	216	14
0-5	597	600	532	349	55
5-10	473	408	358	246	17
10-15	317	267	235	98	5
15-20	203	158	117	59	3
20-25	123	83	58	18	1
25-30	83	59	29	4	0
30-35	45	31	17	1	0
35-40	40	21	7	3	0
40-45	25	10	9	0	0
>45	98	22	7	0	0
Total	2,919	2,416	1,997	1,103	100

$3,500-6,000 Mn	Observations				
Sales CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr	20-Yr
<(25)	110	33	17	3	0
(25)-(20)	37	24	15	1	0
(20)-(15)	64	36	27	7	0
(15)-(10)	128	95	61	11	0
(10)-(5)	216	186	135	68	2
(5)-0	405	403	351	204	18
0-5	602	596	565	387	47
5-10	512	460	367	217	35
10-15	307	238	162	126	2
15-20	185	138	120	35	2
20-25	119	78	73	4	0
25-30	66	39	34	4	0
30-35	42	41	14	0	0
35-40	33	26	6	1	0
40-45	24	20	4	0	0
>45	106	25	8	0	0
Total	2,956	2,438	1,959	1,068	106

$6,000-13,000 Mn	Observations				
Sales CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr	20-Yr
<(25)	124	40	27	3	0
(25)-(20)	51	30	14	0	0
(20)-(15)	78	44	23	12	0
(15)-(10)	111	103	68	18	0
(10)-(5)	228	230	173	75	3
(5)-0	425	458	455	271	19
0-5	618	615	582	460	84
5-10	522	443	393	279	28
10-15	327	231	185	82	8
15-20	168	137	95	33	0
20-25	117	83	35	11	0
25-30	69	48	36	1	0
30-35	47	20	9	4	0
35-40	29	20	6	2	0
40-45	21	6	4	0	0
>45	103	20	5	0	0
Total	3,038	2,528	2,110	1,251	142

>$13,000 Mn	Observations				
Sales CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr	20-Yr
<(25)	125	61	33	3	0
(25)-(20)	42	25	27	2	0
(20)-(15)	72	48	35	13	0
(15)-(10)	120	92	66	34	0
(10)-(5)	285	226	174	86	6
(5)-0	568	573	482	279	35
0-5	739	744	733	443	48
5-10	571	526	423	291	35
10-15	287	208	183	110	6
15-20	168	109	81	34	0
20-25	109	71	48	8	0
25-30	65	40	13	3	0
30-35	37	26	17	1	0
35-40	27	16	5	0	0
40-45	20	11	2	0	0
>45	78	19	5	0	0
Total	3,313	2,795	2,327	1,307	130

>$50,000 Mn	Observations				
Sales CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr	20-Yr
<(25)	29	17	16	1	0
(25)-(20)	7	5	4	1	0
(20)-(15)	13	9	5	2	0
(15)-(10)	27	20	10	12	0
(10)-(5)	66	52	34	10	2
(5)-0	110	115	97	49	4
0-5	155	155	148	74	7
5-10	120	107	79	55	3
10-15	51	36	34	7	0
15-20	30	16	8	1	0
20-25	23	9	4	0	0
25-30	11	3	2	0	0
30-35	5	1	0	0	0
35-40	4	2	0	0	0
40-45	1	1	0	0	0
>45	13	1	0	0	0
Total	665	549	441	212	16

Full Universe	Observations				
CAGR (%)	1-Yr	3-Yr	5-Yr	10-Yr	20-Yr
<(25)	1,153	406	205	56	1
(25)-(20)	471	246	126	14	1
(20)-(15)	748	425	261	75	1
(15)-(10)	1,147	875	564	149	4
(10)-(5)	2,050	1,842	1,355	574	21
(5)-0	3,695	3,508	3,184	1,796	131
0-5	5,138	5,157	4,748	3,285	488
5-10	4,489	4,104	3,606	2,485	294
10-15	3,094	2,689	2,260	1,251	134
15-20	2,004	1,672	1,332	589	44
20-25	1,358	1,060	677	211	7
25-30	929	625	397	80	7
30-35	610	380	192	45	1
35-40	469	282	116	26	2
40-45	349	180	84	18	0
>45	1,416	463	181	27	0
Total	29,120	23,914	19,288	10,681	1,136

Source: FactSet.

Endnotes

[1] Daniel Kahneman, *Thinking, Fast and Slow* (New York: Farrar, Straus and Giroux, 2011), 249.
[2] Tesla Motors, Inc. Q4 2014 Earnings Call, February 11, 2015. See FactSet: callstreet Transcript, page 7.
[3] Kahneman, 257.
[4] See Small Business Association, Office of Advocacy, "Frequently Asked Questions," January 2011 (https://www.sba.gov/sites/default/files/sbfaq.pdf) and Arnold C. Cooper, Carolyn Y. Woo, and William C. Dunkelberg, "Entrepreneurs' Perceived Chances for Success," *Journal of Business Venturing,* Vol. 3, No. 2, Spring 1988, 97-108.
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[13] Alfred Rappaport and Michael J. Mauboussin, *Expectations Investing: Reading Stock Prices for Better Returns* (Boston, MA: Harvard Business School Press, 2001).
[14] Rappaport and Mauboussin, 46. Growth only creates value when a company earns in excess of the cost of capital. Growth at a negative spread destroys value.
[15] Most public companies "die" as the result of mergers and acquisitions. See Michael J. Mauboussin and Dan Callahan, "Why Corporate Longevity Matters: What Index Turnover Tells Us about Corporate Results," *Credit Suisse Global Financial Strategies*, April 16, 2014. Also, Madeleine I. G. Daepp, Marcus J. Hamilton, Geoffrey B. West, and Luís M. A. Bettencourt, "The mortality of companies," *The Royal Society Publishing*, Vol. 12, No. 106, April 1, 2015.
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[23] The calculations actually capture each company as long as it remains in existence, even if it leaves the S&P 1500 Index. We also trim the top and bottom five percent of the growth rates. Companies with growth rates in the top five percent are generally extremely small firms or firms that engaged in a significant merger and acquisition activity.
[24] See http://www.imore.com/tim-cook-goldman-sachs-conference.
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