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INVESTMENT MANAGEMENT

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The Impact of Intangibles on Base Rates

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Introduction

The cover of the *Economist* newspaper on March 25, 2017 showed a city landscape beneath a menacing spacecraft marked by the Amazon logo. The headline was, “Amazon’s empire.” An article in the issue had a title that asked, “Are investors too optimistic about Amazon?”[1] The stock would go on to appreciate 37.8 percent annually in the next four years versus a total shareholder return of 15.8 percent for the S&P 500 Index. That growth translated into an increase in market capitalization of more than $1 trillion.

The body of the article cites an analyst who forecasted that Amazon would grow its sales at a 16 percent compound annual rate through 2025. Of note, Amazon’s total sales were $136 billion in 2016, suggesting the company’s sales at the end of the period would be $517 billion.

The same paragraph mentions work that we did in 2016 revealing that no company with $100 billion or more in base year sales had ever grown at that mid-teens rate for that long.[2] Our data were from 1950-2015 and reflected sales figures unadjusted for acquisitions and divestitures but adjusted for inflation. The analysis was not specific to any particular business, but the clear implication was that it was improbable that a company that big could grow that fast.

Amazon will be at a $515 billion-plus sales run rate by the second quarter of 2022 and will have a 6-year sales growth rate ended 2022 of 27.6 percent, if the consensus estimates are accurate. That growth rate is more than 11 percentage points above the analyst’s seemingly “too optimistic” view. If achieved, Amazon’s results will recast the base rate data.

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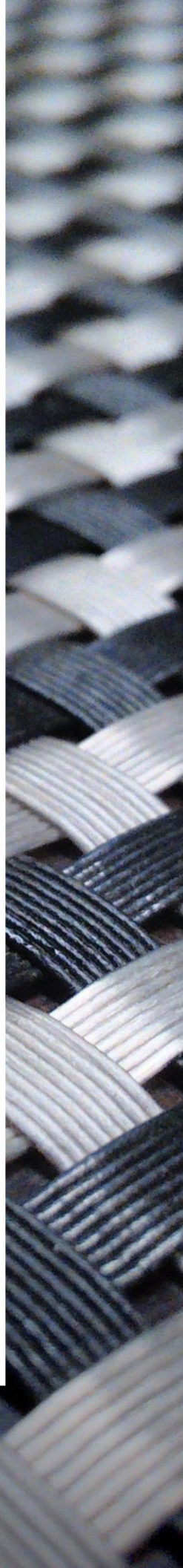

Two Ways to Make a Forecast

There are broadly two ways to make a forecast, which is really a judgment about the future.[3] The first method is to think causally, which is called taking the inside view. You gather lots of information about what is of interest, combine it with your own input and experience, and project into the future. Analyst models are a good example of this approach. The analyst studies a company's businesses and projects sales and operating profit margins based on a combination of macroeconomic factors, industry trends, and the company's competitive position.

Causal thinking is a form of storytelling that comes naturally. It is a compelling way to anticipate the future and a convincing way to explain the past. Our minds are great at creating facile narratives to explain what happens in the world around us.

The second method is to think statistically, commonly referred to as the outside view. Rather than weaving a story based on causal links, the statistical approach examines what happened to an appropriate reference class of cases in the past. The results of the reference class are called base rates. Now the analyst builds her model not by seeking causal links but rather by asking, "how did other companies perform that were in a similar position to the one I am studying?" Instead of relying on your own experience, you tap the experience of others.

This type of thinking is unnatural because it features statistics rather than stories. Further, base rates may not be readily available. But research shows that a thoughtful combination of the inside and outside views leads to more accurate forecasts.[4]

One of the keys to using base rates effectively is finding an appropriate reference class. In many instances, the distribution of outcomes is straightforward. In these cases, the outcomes don't fall too far from the average, and outliers are rare. Measures of corporate results, such as sales growth rates, generally fit into this camp. Base rates are very effective for assessing outcomes that follow, or resemble, a bell-shaped distribution.

In other instances, the distribution of outcomes has a variance that is large, the concept of an average is meaningless, and outliers skew the results.[5] For example, most books, songs, and movies have very modest sales while only a handful are blockbusters. Base rates are more difficult to apply, but knowledge of the distribution itself is very useful. In our experience, underutilization of base rates is a bigger problem than overutilization of them.

One important point to bear in mind is that outcomes of a proper reference class can change over time.[6] That Amazon's sales growth is on pace to be greater than anything we have seen in the past 70 years proves the point. That means that base rates can be very instructive but are not the final word. Indeed, there is reason to believe that some measures of corporate performance are shifting because the nature of business has changed.

Growth Rates in a World of Intangible Assets

The basic way that companies grow is by earning a return on investments. Return is measured by profits, which are the product of sales and margins. Investments can be tangible or intangible assets. Tangible assets are things you can touch and feel, such as factories, trucks, and machines. Intangible assets lack a physical existence and include software, the secret recipe for Coca-Cola, and the formulation of a life-saving drug.

One important distinction between corporate tangible and intangible assets is access. Only one company can use a tangible asset at a time, whereas many can use an intangible asset at the same time.[7] In reality, the

distinction is less stark as assets fall on a continuum. But the main point is that the marginal cost of sharing an intangible asset can be very low.

Intangible assets have two characteristics that are important for considering corporate growth rates.[8] The first is that they can enjoy strong economies of scale because they are commonly cheap to reproduce and share. Economies of scale are a measure of cost per unit as a function of output. Think of software as an example. The original code may be very expensive to produce but the cost per unit sold drops rapidly because it is inexpensive to share. That is the good news.

The second is obsolescence and the related concept of sunkenness. The value of intangible assets can drop precipitously when a new and better version comes along and makes the old version obsolete. And because the old version has very limited value, the investment cost is sunk. Let's continue with our example of software. Once a company introduces a new operating system for a computer or mobile phone, the old one is of little relevance or value. That is the bad news.

These characteristics highlight the contrast between tangible and intangible assets that are relevant for growth rates. Intangible assets are more scalable than tangible assets. That means successful companies that rely on intangible assets can grow faster than companies built on tangible assets. As the overall mix of investments shifts from tangible to intangible, we should expect to see faster growth rates for the winners than we have seen in the base rate data.

On the other hand, obsolescence means that companies that rely on intangible assets can decline more rapidly than those built on tangible assets. Intangible assets are rarely standard, unlike tangible assets, which means they have limited salvage value. A company with obsolete software cannot get much for it while a company with a failed store can recoup some value by selling inventory and furnishings. This means that we should also expect to see slower growth rates, or a greater rate of decline, for the losers than the base rate data reflect.

These observations about growth rates are important because overall investment spending has shifted in recent decades from being predominately tangible to intangible. We estimate that intangible investments for companies in the Russell 3000, which captures the vast majority of the investable U.S. equity market, was around $1.8 trillion in 2020. This is more than double the $800 billion those companies spent on capital expenditures.

This discussion suggests two hypotheses that we can test. The first is that intangible-based businesses can grow faster than what the base rate data show. In essence, the right tail of the distribution of growth rates is extending outward from the average. Amazon's results provide anecdotal evidence for this.

The second is that we should observe greater variance in the distribution of growth rates for intangible-based businesses. That means that the left tail of the distribution of growth rates is also spreading further from the average. BlackBerry's 26.7 percent average annual revenue decline in the past decade through February 2021 is a case in point.

This provides investors with good and bad news. The good news is there will be some businesses that grow in excess of what history would suggest, creating opportunity. The bad news is some businesses will lose their positions of prominence and decline more rapidly than their predecessors did. Base rates remain extremely informative, but we must have the mental flexibility to acknowledge how the population of companies has changed over time.

Base Rates Based on Intangible Asset Intensity

To test these ideas, we first need to sort the companies based on their intangible asset intensity. In a recent paper, three finance professors built a model to infer the value of intangible assets by examining market prices and merger and acquisition (M&A) deals.[9] High market prices relative to stated book values suggest a failure to recognize some intangible assets. When one company acquires another, the acquirer's accountants have to record the difference between the purchase price and tangible assets as goodwill or intangible assets. Using popular measures of knowledge and organizational capital as a benchmark, they found that the M&A data did a better job of estimating the value of intangible assets than did the market price technique.

The professors applied the M&A method to a large sample of companies from 1978-2017 to figure out where intangible asset intensity was highest. They found that the order of ranking from highest to lowest by industry was healthcare, technology, consumer, and manufacturing. They also placed about one-third of the companies into an "other" category because they didn't fit neatly into one of the industries.

We calculated the median sales growth rate for companies in each of those categories using the constituents of the Russell 3000 from 1984-2020. We also examined the standard deviation, a measure of the dispersion, of the distributions. Exhibit 1 shows the results for the full sample.

Exhibit 1: Base Rates for Sales Growth by Industry, 1984-2020

	Median CAGR				Mean CAGR				Standard Deviation			
Industry	**1-yr**	**3-yr**	**5-yr**	**10-yr**	**1-yr**	**3-yr**	**5-yr**	**10-yr**	**1-yr**	**3-yr**	**5-yr**	**10-yr**
Healthcare	11.5%	10.8%	10.4%	9.3%	52.6%	16.8%	12.6%	9.3%	406.3%	45.9%	30.6%	22.5%
Technology	9.7%	8.4%	7.9%	7.2%	15.4%	10.6%	9.0%	7.3%	49.0%	21.9%	16.5%	13.0%
All	7.4%	6.9%	6.5%	6.2%	16.6%	9.5%	8.0%	6.7%	177.3%	23.2%	16.4%	12.0%
Consumer	6.9%	6.4%	6.0%	5.9%	13.5%	8.9%	7.7%	6.6%	164.7%	18.8%	13.9%	9.5%
Manufacturing	5.4%	5.1%	5.0%	5.5%	9.3%	6.8%	6.1%	6.0%	50.4%	17.5%	13.1%	9.4%
Other	7.6%	7.3%	6.9%	6.3%	16.2%	9.6%	8.1%	6.6%	194.5%	22.5%	15.8%	12.2%

Source: FactSet.
Note: Constituents of the Russell 3000 Index as of year-end; growth rates are based on nominal sales; CAGR=compound annual growth rate.

The sales growth rates, measured either as the median or average, consistently go from highest for companies that are most intangible-asset intentive to lowest for those that are least intensive. While the short-term numbers are noisy, the relationship holds true over 1-, 3-, 5-, and 10-year periods. Consider the median compound annual sales growth rates over five-year periods. Growth was 10.4 percent for healthcare, 7.9 percent for technology, 6.0 percent for consumer, and 5.0 percent for manufacturing. The median across all companies was 6.5 percent. This supports the first hypothesis.

The standard deviation of the growth rates follows the same pattern. Where intangible asset intensity is high, the standard deviation is also high. Assuming these distributions are normally distributed, an imperfect but illustrative assumption, about two-thirds of healthcare companies had 5-year sales growth rates between -18.0 and 43.2 percent. The comparable figures for manufacturing companies were -7.0 and 19.2 percent. This is consistent with the second thesis.

To capture the potential impact of size, we broke the universe into seven bins based on starting year sales. A couple of patterns emerge. The first is that the average and median sales growth rates and standard deviations tend to decline as companies get bigger. This replicates a finding that has been established empirically.[10] The

second is that the basic relationship between high intangible asset intensity and high growth rates tends to hold across all size bins. (See the appendix for more detail.)

The global pandemic in 2020 was a substantial challenge for global health and economic growth. One silver lining was the ability of digital companies, built largely on intangible assets, to thrive in the chaos. We examined the sales growth rates of the companies in the Russell 1000, the largest one thousand companies in the U.S., to see which companies fared well. Healthcare and technology, the industries with the highest intangible asset intensity, represented over 60 percent of the top 20, 50, and 100 growers despite being only 29 percent of the universe (see exhibit 2).

Exhibit 2: Intangible Asset-Intense Industries Among the Fastest Growers in 2020

Industry	Top 20	Top 50	Top 100	Full Index
Healthcare	8	12	22	81
Technology	5	19	42	203
Consumer	4	8	15	189
Manufacturing	1	2	3	192
Other	2	9	18	327
Total	20	50	100	992
Healthcare + Technology, Number	13	31	64	284
Healthcare + Technology, Percent of Total	65%	62%	64%	29%

Source: FactSet.
Note: Includes companies with sales data for calendar years 2019 and 2020.

Conclusion

Accurate forecasts combine causal and statistical thinking in proper measure. Statistical thinking relies on identifying an appropriate reference class of past outcomes. An overreliance on base rates can lead to faulty forecasts if the statistical properties of a reference class change over time. That said, we believe that forecasters don't use base rates as frequently as they should.

Companies grow by generating a return on investment. The nature of investment has changed markedly in recent decades, from one dominated by tangible assets to one mostly in the form of intangible assets. Intangible assets have some characteristics that distinguish them from tangible assets, including greater potential economies of scale and higher risk of obsolescence. The good news is that intangible-intensive companies can grow faster than their tangible counterparts. The bad news is they can also become irrelevant and shrink fast.

As a consequence, we should see two effects in the data: higher growth and more dispersion in the outcomes. Our analysis of the results from companies in the Russell 3000 from 1984-2020 reveals both of these. The base rate of sales growth is getting stretched from the average in both the positive and negative direction.

There are two main lessons for investors. First, it is important to be mindful of the potential shift in the base rate as the result of the rise of intangibles. Second, skillful investors may be able to identify the companies that will grow faster than expected, hence providing the potential for attractive returns.

Appendix A

When sorting the companies into bins, we translate the starting year sales into 2020 dollars. When calculating the growth rates, we keep all figures in nominal terms. We exclude companies with base year sales of less than $1 million in 2020 dollars.

Exhibit 3: Base Rates for Sales Growth by Size and Industry, 1984-2020

Full Universe	Median CAGR				Mean CAGR				Standard Deviation			
Industry	**1-yr**	**3-yr**	**5-yr**	**10-yr**	**1-yr**	**3-yr**	**5-yr**	**10-yr**	**1-yr**	**3-yr**	**5-yr**	**10-yr**
Healthcare	11.5%	10.8%	10.4%	9.3%	52.6%	16.8%	12.6%	9.3%	406.3%	45.9%	30.6%	22.5%
Technology	9.7%	8.4%	7.9%	7.2%	15.4%	10.6%	9.0%	7.3%	49.0%	21.9%	16.5%	13.0%
All	7.4%	6.9%	6.5%	6.2%	16.6%	9.5%	8.0%	6.7%	177.3%	23.2%	16.4%	12.0%
Consumer	6.9%	6.4%	6.0%	5.9%	13.5%	8.9%	7.7%	6.6%	164.7%	18.8%	13.9%	9.5%
Manufacturing	5.4%	5.1%	5.0%	5.5%	9.3%	6.8%	6.1%	6.0%	50.4%	17.5%	13.1%	9.4%
Other	7.6%	7.3%	6.9%	6.3%	16.2%	9.6%	8.1%	6.6%	194.5%	22.5%	15.8%	12.2%

	Count			
Industry	**1-yr**	**3-yr**	**5-yr**	**10-yr**
Healthcare	6,493	5,278	4,282	2,511
Technology	14,491	12,009	9,874	6,012
All	90,725	76,369	64,252	41,145
Consumer	19,568	16,798	14,318	9,329
Manufacturing	19,659	17,333	15,139	10,544
Other	30,514	24,951	20,639	12,749

Sales: $0-1 Billion	Median CAGR				Mean CAGR				Standard Deviation			
Industry	**1-yr**	**3-yr**	**5-yr**	**10-yr**	**1-yr**	**3-yr**	**5-yr**	**10-yr**	**1-yr**	**3-yr**	**5-yr**	**10-yr**
Healthcare	14.7%	13.4%	12.6%	11.9%	66.5%	19.6%	14.2%	10.1%	465.4%	52.4%	35.1%	26.5%
Technology	11.6%	10.2%	9.4%	8.4%	18.4%	12.3%	10.5%	8.5%	56.5%	24.0%	17.5%	13.6%
All	9.7%	9.0%	8.4%	7.8%	24.3%	12.5%	10.3%	8.3%	237.7%	28.6%	19.8%	14.4%
Consumer	9.5%	8.4%	7.8%	7.4%	22.2%	12.5%	10.2%	8.2%	256.3%	25.2%	18.1%	12.1%
Manufacturing	7.3%	7.2%	6.9%	7.2%	13.9%	9.9%	8.5%	8.0%	66.5%	21.5%	15.8%	11.1%
Other	9.2%	8.9%	8.4%	7.6%	21.8%	12.0%	10.0%	8.0%	248.9%	26.2%	17.8%	13.4%

	Count			
Industry	**1-yr**	**3-yr**	**5-yr**	**10-yr**
Healthcare	4,930	3,945	3,151	1,748
Technology	10,157	8,346	6,795	4,062
All	49,819	41,290	34,214	21,125
Consumer	7,992	6,811	5,744	3,603
Manufacturing	8,274	7,262	6,268	4,259
Other	18,466	14,926	12,256	7,453

Sales: $1-5 Billion	Median CAGR				Mean CAGR				Standard Deviation			
Industry	**1-yr**	**3-yr**	**5-yr**	**10-yr**	**1-yr**	**3-yr**	**5-yr**	**10-yr**	**1-yr**	**3-yr**	**5-yr**	**10-yr**
Healthcare	8.3%	8.3%	8.1%	7.7%	9.7%	9.2%	9.3%	8.6%	18.7%	12.2%	9.8%	7.0%
Technology	7.2%	6.2%	6.0%	5.7%	8.8%	6.8%	6.0%	5.3%	22.9%	15.9%	14.1%	12.0%
All	6.1%	5.7%	5.6%	5.6%	8.2%	6.7%	6.2%	5.8%	30.1%	14.2%	11.4%	9.1%
Consumer	6.3%	6.1%	5.9%	5.9%	8.4%	7.2%	6.8%	6.3%	21.7%	13.1%	10.4%	7.8%
Manufacturing	4.7%	4.5%	4.6%	5.1%	6.9%	5.4%	5.2%	5.5%	39.0%	13.8%	10.7%	8.1%
Other	6.5%	6.4%	6.1%	5.6%	8.6%	7.0%	6.3%	5.4%	30.8%	14.8%	11.9%	10.1%

	Count			
Industry	**1-yr**	**3-yr**	**5-yr**	**10-yr**
Healthcare	915	765	637	409
Technology	3,103	2,606	2,177	1,348
All	26,234	22,253	18,888	12,403
Consumer	6,940	5,938	5,053	3,343
Manufacturing	7,166	6,289	5,506	3,885
Other	8,110	6,655	5,515	3,418

Sales: $5-10 Billion	Median CAGR				Mean CAGR				Standard Deviation			
Industry	**1-yr**	**3-yr**	**5-yr**	**10-yr**	**1-yr**	**3-yr**	**5-yr**	**10-yr**	**1-yr**	**3-yr**	**5-yr**	**10-yr**
Healthcare	7.9%	8.6%	8.2%	8.3%	8.6%	9.0%	8.7%	8.2%	12.1%	9.5%	7.9%	5.0%
Technology	5.3%	4.9%	3.9%	2.5%	7.4%	6.5%	5.4%	4.4%	22.1%	15.4%	13.1%	10.4%
All	4.9%	4.5%	4.5%	4.5%	6.0%	5.1%	4.7%	4.4%	20.9%	13.3%	10.8%	8.5%
Consumer	5.5%	5.4%	5.1%	5.2%	6.8%	5.8%	5.4%	5.2%	19.5%	10.9%	8.6%	6.1%
Manufacturing	3.7%	3.6%	3.9%	4.5%	5.1%	4.2%	4.2%	4.5%	22.1%	13.2%	9.7%	6.2%
Other	4.9%	4.5%	4.4%	3.7%	5.6%	4.4%	3.9%	3.1%	21.2%	15.2%	13.4%	12.0%

	Count			
Industry	**1-yr**	**3-yr**	**5-yr**	**10-yr**
Healthcare	194	166	138	79
Technology	519	441	367	232
All	6,453	5,573	4,764	3,155
Consumer	1,936	1,673	1,432	950
Manufacturing	1,933	1,710	1,494	1,045
Other	1,871	1,583	1,333	849

Sales: $10-25 Billion	Median CAGR				Mean CAGR				Standard Deviation			
Industry	**1-yr**	**3-yr**	**5-yr**	**10-yr**	**1-yr**	**3-yr**	**5-yr**	**10-yr**	**1-yr**	**3-yr**	**5-yr**	**10-yr**
Healthcare	7.3%	7.2%	6.9%	6.3%	7.9%	7.5%	7.1%	6.5%	14.7%	9.0%	7.0%	6.1%
Technology	5.7%	5.2%	4.9%	4.4%	6.4%	5.4%	5.0%	4.7%	17.3%	11.4%	9.6%	7.2%
All	4.8%	4.0%	3.8%	3.6%	5.4%	4.3%	3.9%	4.0%	20.0%	11.5%	9.1%	6.5%
Consumer	5.1%	4.6%	4.4%	4.5%	5.9%	5.2%	4.9%	5.0%	16.9%	10.6%	8.7%	6.6%
Manufacturing	3.2%	2.5%	2.4%	2.7%	4.0%	2.8%	2.4%	2.5%	21.0%	11.5%	8.8%	6.1%
Other	4.9%	4.0%	3.8%	3.2%	5.7%	4.2%	3.6%	3.8%	23.5%	12.6%	9.7%	6.5%

	Count			
Industry	**1-yr**	**3-yr**	**5-yr**	**10-yr**
Healthcare	284	252	223	175
Technology	431	370	320	228
All	5,226	4,597	4,031	2,834
Consumer	1,582	1,383	1,208	819
Manufacturing	1,577	1,434	1,296	960
Other	1,352	1,158	984	652

Sales: $25-50 Billion	Median CAGR				Mean CAGR				Standard Deviation			
Industry	**1-yr**	**3-yr**	**5-yr**	**10-yr**	**1-yr**	**3-yr**	**5-yr**	**10-yr**	**1-yr**	**3-yr**	**5-yr**	**10-yr**
Healthcare	5.5%	5.2%	4.4%	5.3%	7.6%	6.2%	5.4%	4.7%	15.8%	9.7%	7.9%	4.6%
Technology	5.2%	4.0%	3.2%	4.9%	6.4%	5.1%	4.3%	4.1%	14.7%	12.7%	11.4%	8.5%
All	4.6%	3.7%	3.4%	3.7%	5.2%	4.2%	3.6%	3.7%	17.6%	12.2%	9.6%	6.6%
Consumer	4.7%	4.0%	3.7%	4.3%	5.2%	4.4%	4.1%	4.1%	15.7%	10.1%	8.2%	6.3%
Manufacturing	3.7%	2.4%	2.2%	2.2%	4.0%	1.7%	1.0%	1.9%	21.9%	14.7%	11.2%	7.1%
Other	4.6%	4.1%	3.5%	3.5%	5.4%	5.4%	4.6%	4.5%	17.0%	12.2%	8.9%	6.0%

	Count			
Industry	**1-yr**	**3-yr**	**5-yr**	**10-yr**
Healthcare	93	80	71	60
Technology	145	130	118	86
All	1,714	1,524	1,359	976
Consumer	614	544	486	360
Manufacturing	414	369	332	224
Other	448	401	352	246

Sales: $50-100 Billion	Median CAGR				Mean CAGR				Standard Deviation			
Industry	**1-yr**	**3-yr**	**5-yr**	**10-yr**	**1-yr**	**3-yr**	**5-yr**	**10-yr**	**1-yr**	**3-yr**	**5-yr**	**10-yr**
Healthcare	3.5%	1.7%	2.0%	1.6%	2.6%	1.0%	1.3%	2.2%	17.1%	10.4%	7.4%	4.4%
Technology	5.5%	5.5%	6.1%	8.8%	6.6%	5.9%	5.9%	6.9%	16.3%	12.3%	10.4%	7.3%
All	4.3%	3.5%	3.3%	3.9%	5.1%	3.1%	2.9%	2.9%	21.7%	12.3%	9.7%	7.0%
Consumer	4.7%	4.2%	4.4%	4.0%	5.2%	4.0%	3.7%	3.0%	14.8%	9.9%	8.3%	6.0%
Manufacturing	3.3%	2.2%	1.5%	2.8%	1.7%	-0.1%	0.0%	0.8%	28.9%	15.1%	12.0%	9.6%
Other	5.0%	3.3%	3.7%	5.2%	8.4%	4.6%	4.1%	4.3%	25.8%	12.8%	9.1%	5.2%

	Count			
Industry	**1-yr**	**3-yr**	**5-yr**	**10-yr**
Healthcare	61	56	50	33
Technology	77	63	48	22
All	797	712	629	416
Consumer	298	274	250	169
Manufacturing	177	163	145	99
Other	184	156	136	93

Sales: >$100 Billion	Median CAGR				Mean CAGR				Standard Deviation			
Industry	**1-yr**	**3-yr**	**5-yr**	**10-yr**	**1-yr**	**3-yr**	**5-yr**	**10-yr**	**1-yr**	**3-yr**	**5-yr**	**10-yr**
Healthcare	5.5%	5.7%	6.1%	7.9%	7.4%	7.3%	7.4%	7.8%	7.5%	4.1%	2.9%	0.4%
Technology	5.1%	3.0%	1.8%	2.0%	3.7%	2.1%	0.9%	0.3%	11.1%	7.9%	6.3%	3.6%
All	4.1%	3.4%	2.9%	2.2%	3.2%	2.6%	2.1%	1.5%	13.8%	9.0%	7.4%	5.9%
Consumer	4.5%	4.0%	3.6%	3.4%	4.9%	4.4%	4.0%	3.5%	9.1%	6.6%	5.4%	4.8%
Manufacturing	0.4%	0.6%	0.8%	1.0%	-0.2%	-0.1%	0.1%	0.4%	20.7%	12.2%	9.9%	7.6%
Other	4.4%	0.4%	0.7%	-1.3%	2.4%	1.4%	0.9%	-1.2%	13.1%	8.7%	7.0%	4.4%

	Count			
Industry	**1-yr**	**3-yr**	**5-yr**	**10-yr**
Healthcare	16	14	12	7
Technology	59	53	49	34
All	482	420	367	236
Consumer	206	175	145	85
Manufacturing	118	106	98	72
Other	83	72	63	38

Source: FactSet.

Note: Constituents of the Russell 3000 Index as of year-end; growth rates are based on nominal sales.

Appendix B

We sort companies into five groups using a slightly modified version of the five-industry classification of Eugene Fama and Kenneth French. Fama and French assign companies based on their Standard Industrial Classification (SIC) codes. We follow the minor modifications of Michael Ewens, who reassigns hospitals from healthcare to consumer, as well as radio and TV providers from technology to consumer.[11] The table below shows the main sub-industries included in the five primary industries.

Industry Name	Sub-Industries
Consumer	Consumer durables, nondurables, wholesale, retail, hospitals, some services
Manufacturing	Manufacturing, energy, utilities
Technology	Electronics, computer hardware and software, telecommunications
Healthcare	Healthcare, medical equipment, pharmaceuticals
Other	Everything else, including mines, construction, building materials, transportation, hotels, business services, entertainment, finance

Please see Important Disclosures on pages 12-13

Endnotes

[1] "Are investors too optimistic about Amazon?" *Economist*, March 25, 2017.
[2] Michael J. Mauboussin, Dan Callahan, and Darius Majd, "The Base Rate Book: Integrating the Past to Better Anticipate the Future," *Credit Suisse Global Financial Strategies,* September 26, 2016.
[3] Daniel Kahneman, Olivier Sibony, and Cass R. Sunstein, *Noise: A Flaw in Human Judgment* (New York: Little, Brown Spark, 2021), 156-158.
[4] Mauboussin, Callahan, and Majd, "The Base Rate Book," 7-9.
[5] This can also be understood as mild, slow, and wild randomness. See Benoit B. Mandelbrot, *Fractals and Scaling in Finance: Discontinuity, Concentration, and Risk* (New York: Springer, 1997), 117-125.
[6] This means that the process that generates the distribution is not stationary. In a stationary series, the statistical properties such as the mean and standard deviation do not change over time. The distributions we are discussing are not stationary but stable enough to be beneficial.
[7] The technical term for this is a rivalrous good.
[8] For a more thorough review of the characteristics of intangible assets, see Jonathan Haskel and Stian Westlake, *Capitalism Without Capital: The Rise of the Intangible Economy* (Princeton, NJ: Princeton University Press, 2017), 56-88.
[9] Michael Ewens, Ryan H. Peters, and Sean Wang, "Measuring Intangible Capital with Market Prices," *Working Paper*, October 2020.
[10] Michael H. R. Stanley, Luís A. N. Amaral, Sergey V. Buldyrev, Shlomo Havlin, Heiko Leschhorn, Philipp Maass, Michael A. Salinger, and H. Eugene Stanley, "Scaling Behaviour in the Growth of Companies," *Nature*, Vol. 379, February 29, 1996, 804-806. Also, Rich Perline, Robert Axtell, and Daniel Teitelbaum, "Volatility and Asymmetry of Small Firm Growth Rates Over Increasing Time Frames," *Small Business Research Summary,* No. 285, December 2006.
[11] Michael Ewens. See https://github.com/michaelewens/Intangible-capital-stocks.

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