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Bayes and Base Rates 2.0

How History Can Guide Our Assessment of the Future

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Introduction

Our report, "Bayes and Base Rates," published in February 2026, sparked a lot of interest.[1] The premise of the report is that to anticipate what is going to happen, it is useful to start with base rates as a prior probability distribution and to update your view based on new information. A base rate captures the distribution of outcomes for a suitable reference class. Observing additional information allows you to revise that distribution as appropriate.

We applied base rates to the projected sales growth rates of a couple of companies, including OpenAI, a leader in artificial intelligence research. In particular, we focused on forecasts published in the press that suggested the company would have sales of $145 billion in 2029, up from $3.7 billion in 2024.[2] That is a compound annual growth rate (CAGR) of 108 percent.

Shortly after the report was written, the company increased its sales projection for 2029 to $184 billion.[3] That is a CAGR of 118 percent from 2024.

We asked how plausible these forecasts are in the context of history. To answer, we looked at the 5-year sales growth rates for all U.S. public companies from 1950 to 2024, which included about 18,900 firm-period observations. No company had ever grown that fast.

The closest was America Online (AOL) with a 103 percent CAGR from 1997 to 2001. AOL achieved that gain because it was the surviving entity following a merger of equals with Time Warner in early 2001. Time Warner's sales were more than five times those of AOL at the time of the merger agreement. We have more on the fastest-growing companies below.

OpenAI is reported to have had sales of $13.1 billion in 2025. The company forecasts $284 billion in 2030, a 5-year CAGR of 85 percent.[4] Here again, no company has ever grown that fast from beginning sales of that amount.

We heard three recurring questions. The first was whether it is better to present the growth rates based on figures that are nominal (i.e., as reported) or adjusted for inflation (i.e., real). Next was whether narrowing the sample to reflect a specific sector or industry would offer insight. The final question was whether base rates apply at all, given that generative artificial intelligence is a general purpose technology that is growing rapidly. In other words, is the past really prologue?

Two points are worth emphasizing before answering those questions. The first is that base rates are dynamic distributions. That means they change as the world changes. There is nothing in past results that says OpenAI's projected rates of growth are unachievable. Still, there is value in knowing that this would be a novel accomplishment were it to occur.

Second, growth in sales and creating value are separate concepts. Sales growth is essential for achieving economies of scale, especially for businesses with a high percentage of costs that are fixed. But it is also possible to grow rapidly and fail to earn a satisfactory return on investment. You must consider growth in the context of value creation.

Answering the Questions

Nominal versus real. We chose to reflect our data in nominal terms for the recent report because most investors and executives think about sales in those terms. (We always adjust the beginning sales to reflect inflation.) In the past, we have written about base rates for sales growth and presented the data in real terms.[5]

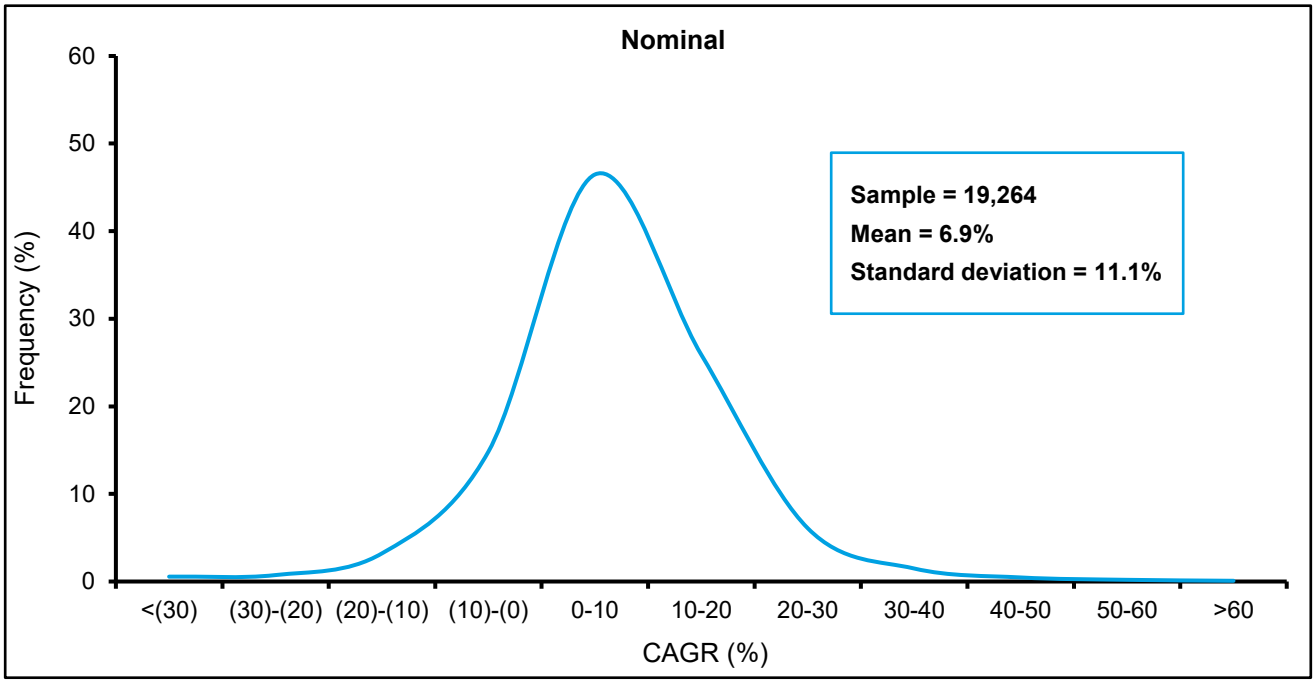
Removing the effect of inflation lowers the past growth rates and, presuming forecasts reflect inflation, reduces comparability. Exhibit 1 shows the distribution of 5-year sales growth rates for U.S. public companies with beginning sales of $2-5 billion from 1950 to 2025. The growth rates are nominal on the top and real on the bottom. The sample is just shy of 19,300 firm-period observations.

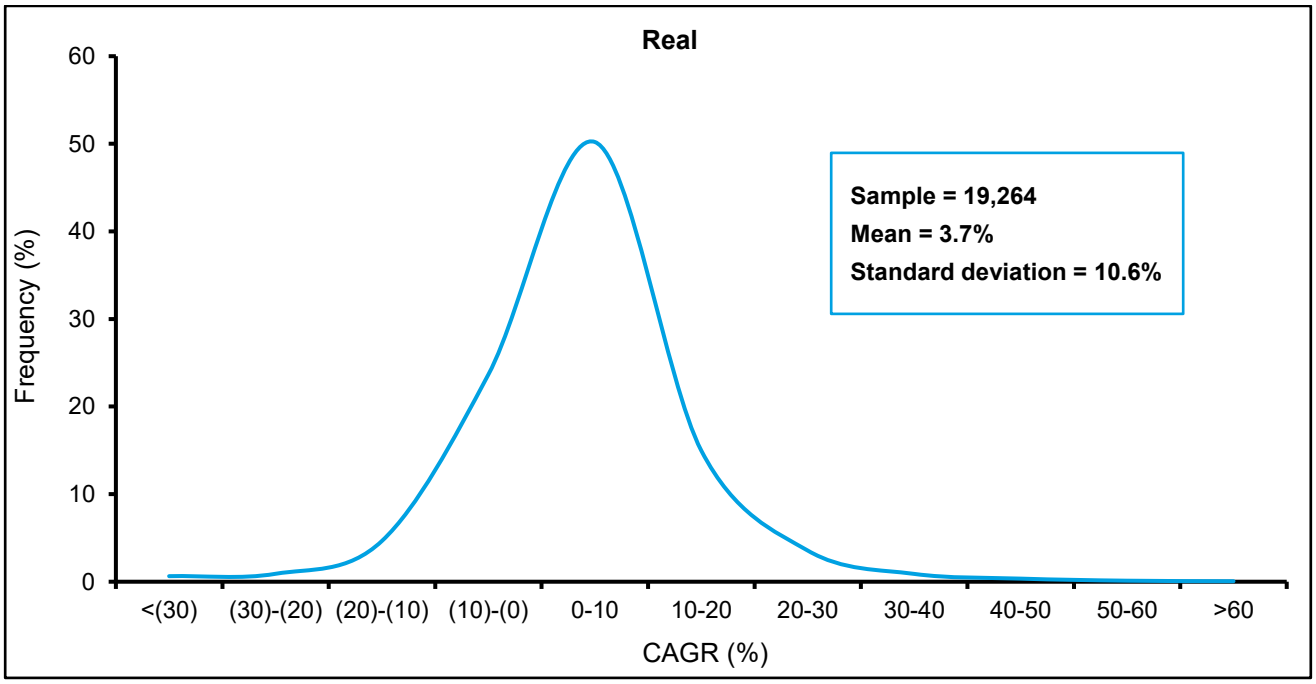
The mean nominal CAGR is 6.9 percent, and the standard deviation is 11.1 percent. Assuming an approximation based on a normal distribution, this implies about a 9.1 standard deviation outcome for OpenAI based on the original estimate, and a 10.0 standard deviation result considering the updated forecast.

Outcomes of this magnitude are essentially impossible. While the projected growth rates do reflect high expectations, these statistics do not apply literally because sales growth rates do not fit a perfect normal distribution.

The mean real CAGR is 3.7 percent, and the standard deviation is 10.6 percent. Deflating the sales growth rates to reflect inflation produces similar extreme outcomes.

Exhibit 1: Base Rates of Nominal and Real 5-Year Sales Growth for Firms With $2-5 Billion in Sales, 1950-2025





Source: Counterpoint Global; Compustat; FactSet.
Note: CAGR=compound annual growth rate; U.S. companies with beginning year sales of $2-5 billion in 2025 U.S. dollars.

Refining the sample to reflect the sector or industry. Before we get into the numbers, it is important to remember that this question seems to stem from the conjunction fallacy. With this cognitive bias, people perceive incorrectly that a narrow but specific scenario is more likely than a broader one.[6]

In this case, the perception is that the results would look better if the sample were distilled to information technology, or even further to software. But of course all of the numbers for all of the companies are in the larger sample. No subset of the full sample will reveal a company that grew faster than what the full sample shows.

Here are the figures. If we reduce the sample to the information technology sector (using the same beginning sales and time period), the average nominal 5-year CAGR of sales is 6.1 percent, and the standard deviation of growth is 13.3 percent. The average growth is lower than that of the full sample, but the standard deviation is higher. This implies that the original forecast of $145 billion of sales in 2029 is a 7.7 standard deviation event. The sample size of 1,610 is less than one-tenth of the full sample.

If we further narrow the sample to the software and services industry group, the number of firm-period observations shrinks to 580, the average sales growth rate drops to 5.1 percent, and the standard deviation rises to 14.7 percent.

Finally, if we narrow the industry to software, the sample drops to 350 and the CAGR of sales is 5.4 percent with a standard deviation of 14.7 percent.

In the latter two cases, the projected outcomes are events with a standard deviation of about seven. To put this in context, positive growth that is equal to a 7 standard deviation outcome is expected to occur roughly 1 in every 780 billion trials, assuming a normal distribution.

Application of base rates given a changing world. The main challenge in the proper use of base rates is finding an appropriate reference class.[7] The issue is whether the advent of generative artificial intelligence will render past growth rates meaningless.

There are at least three reasons to question the applicability of past sales growth rates. The first is that the rate of adoption is unprecedented. ChatGPT, OpenAI's best-known product, reached 100 million monthly active users in just 2 months, much faster than it took other well-known products, including TikTok, Instagram, and Facebook. ChatGPT's diffusion has been historic.

Second, OpenAI is growing rapidly. Sales in 2025 were reported to be $13.1 billion, a growth rate of about 255 percent versus 2024. Other companies have grown at that rate or faster in the past, but in most cases it was the result of an acquisition or a cyclical rebound.

And it is not just OpenAI. Anthropic, a competing artificial intelligence company, reportedly hit an annual run rate of $30 billion in revenue in early 2026, more than triple its run rate at the end of 2025.[8]

Third, sales growth is consistently higher for companies with more intangible asset intensity than for those with less.[9] The standard deviation of the growth rates follows the same pattern, with higher intangible intensity associated with greater variability. As the economy shifts toward increased investment in intangible capital, base rates need to be recast.

One counterpoint is that there has been a lot of innovation and disruption in the past 75 years, including the launch of other general purpose technologies (GPTs), including the integrated circuit (1958) and the commercial

internet (1991). GPTs are defined by pervasiveness, continuous improvement, and the ability to enable innovation. Generative artificial intelligence is the latest GPT.

Another is that OpenAI and other firms that maintain frontier generative artificial intelligence models rely on tangible infrastructure to support their growth. Large-scale projects are prone to delays and cost overruns.[10]

Exhibit 2 shows how real 5-year sales CAGRs have changed over the decades for companies with initial sales of $2-5 billion. We measure all initial sales in constant dollars to ensure comparability. As a reminder, the average real CAGR for the full sample is 3.7 percent, and the standard deviation is 10.6 percent.

Exhibit 2: Base Rates of 5-Year Real Sales CAGRs for Firms With $2-5 Billion in Sales by Decade, 1950s-2010s

	1950s	1960s	1970s	1980s	1990s	2000s	2010s
Sales growth (mean)	4.5%	7.5%	5.1%	2.1%	4.9%	3.2%	2.4%
Sales growth (median)	4.1%	6.3%	5.1%	2.4%	3.9%	3.0%	2.3%
Standard deviation	5.4%	7.2%	8.5%	11.1%	12.6%	11.2%	10.2%
Real GDP growth	4.2%	4.5%	3.2%	3.1%	3.2%	1.9%	2.4%

Source: Counterpoint Global; Compustat; FactSet.
Note: Sample assigned to decades based on the first year of growth period (e.g., growth from 2008-2012 is in the 2000s).

Average and median growth rates in the 1950s, 1960s, and 1970s were higher than that for the full period, albeit with lower standard deviations. The 1990s also had growth above the average, which was accompanied by an above-average standard deviation.

Growth in the 21st century has been below the average with a standard deviation similar to the average. The growth rate by decade correlates well with GDP growth. In particular, GDP growth was well above the average of the complete period in the 1950s and 1960s and well below it in the 2000s and 2010s.

Sticking with the cohort of companies with initial sales of $2-5 billion, we also looked at those that achieved 5-year nominal CAGRs in sales that put them in the top 25 of all instances from 1950 to 2025. A couple of observations stand out. First, the majority of the companies on the list grew mostly through mergers and acquisitions (M&A). AOL's merger with Time Warner is a good example.

About one-half of the occurrences were in the 1990s. While only about one-third of the sample is from the 21st century, those companies had an above-average rate of organic growth, including Alphabet, Block, and Tesla. The remainder were in the 1960s and 1970s, and M&A was again the main driver.

Conclusion

Forecasters commonly think the problem they are working on is unique. But substantial research shows it is useful to start with base rates as a prior probability distribution.[11] We applied this approach to companies in the artificial intelligence industry that have projections for sales growth rates that are higher than any level achieved by a public company of comparable size since 1950.

We heard questions about whether the data should be presented with or without inflation, if narrowing the sample to reflect a sector, industry group, or industry would reveal more insight, and whether past figures are relevant at all given that artificial intelligence is the latest general purpose technology.

Base rates are dynamic distributions that morph over time. For instance, companies with large beginning sales have grown faster in recent years than history would suggest.[12] That said, OpenAI's forecasts imply growth rates well beyond what any public company in the U.S. of that size has achieved in the past 75 years.[13]

We show base rates using nominal and real (i.e., adjusted for inflation) growth, and neither alters the conclusion that reaching the expected levels of sales will be hard.

The inclination to narrow the sample to a particular sector or industry appears to reflect a bias called the conjunction fallacy. The full sample includes all firm-period observations, so no subset will show a company with faster growth than what you will find in the complete population.

There are reasons to believe OpenAI may defy the odds that base rates suggest. These include rapid adoption of the product, high (but not unprecedented) one-year sales growth, and the fact that intangible-intensive businesses have proven they can grow fast.

On the other hand, there have been numerous disruptive innovations since 1950, and generative artificial intelligence is the latest in a series. Further, most of the companies atop the leaderboard of sales growth have gotten there through M&A rather than organically.

Endnotes

[1] Michael J. Mauboussin and Dan Callahan, "Bayes and Base Rates: How History Can Guide Our Assessment of the Future," *Consilient Observer: Counterpoint Global Insights*, February 10, 2026.
[2] James Fahey, "OpenAI's Explosive Growth: A Revenue Breakdown and Industry Comparison," *Medium*, June 7, 2025 and Sri Muppidi, "OpenAI Says Its Business Will Burn $115 Billion Through 2029," *The Information*, September 5, 2025.
[3] Sri Muppidi and Stephanie Palazzolo, "OpenAI Boosts Revenue Forecasts, Predicts $111 Billion More Cash Burn Through 2030," *The Information*, February 20, 2026.
[4] Ashley Capoot and Kate Rooney, "OpenAI Resets Spending Expectations, Tells Investors Compute Target is Around $600 Billion by 2030," *CNBC*, February 20, 2026.
[5] Michael J. Mauboussin, Dan Callahan, and Darius Majd, "The Base Rate Book–Sales Growth: Integrating the Past to Better Anticipate the Future," *Credit Suisse Global Financial Strategies*, February 23, 2016.
[6] Amos Tversky and Daniel Kahneman, "Extensional Versus Intuitive Reasoning: The Conjunction Fallacy in Probability Judgment," *Psychological Review*, Vol. 90, No. 4, October 1983, 293-315. The famous example here is called the "Linda problem." The setup is:
"Linda is 31 years old, single, outspoken and very bright. She majored in philosophy. As a student, she was deeply concerned with issues of discrimination and social justice, and also participated in anti-nuclear demonstrations."
The question is which is more probable?
Linda is a bank teller.
Linda is a bank teller and is active in the feminist movement.
A majority of people select the second option. This is wrong because the probability of being part of the large set (bank teller) is always equal to or greater than the subset of the large set (bank teller and feminist). In other words, the probability of a conjunction (A and B) can never exceed the probability of one of its components (A alone).
[7] Etienne Theising, Dominik Wied, and Daniel Ziggel, "Reference Class Selection in Similarity-Based Forecasting of Corporate Sales Growth," *Journal of Forecasting*, Vol. 42, No. 5, August 2023, 1069-1085 and Dan Lovallo and Daniel Kahneman, "Delusions of Success: How Optimism Undermines Executives' Decisions," *Harvard Business Review*, Vol. 81, No. 7, July 2003, 56-63.
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[9] Michael J. Mauboussin and Dan Callahan, "The Impact of Intangibles on Base Rates," *Consilient Observer: Counterpoint Global Insights*, June 23, 2021.
[10] Bent Flyvbjerg and Dan Gardner, *How Big Things Get Done: The Surprising Factors That Determine the Fate of Every Project, From Home Renovations to Space Exploration and Everything in Between* (New York: Currency, 2023).
[11] Daniel Kahneman and Dan Lovallo, "Timid Choices and Bold Forecasts: A Cognitive Perspective on Risk Taking," *Management Science*, Vol. 39, No. 1, January 1993, 17-31.
[12] Mauboussin and Callahan, "The Impact of Intangibles on Base Rates."
[13] There has been a media report that the company is coming up shy of its internal forecasts. See Berber Jin, "OpenAI Misses Key Revenue, User Targets in High-Stakes Sprint Toward IPO," *Wall Street Journal*, April 28, 2026 and Berber Jin and Corrie Driebusch, "OpenAI Wants to Go Public. First Sarah Friar Needs to Get It to Grow Up," *Wall Street Journal*, May 1, 2026.

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