RESEARCH

Growth Forecasting

How to perform a multi-year Forecast based on historical data.

This paper explains how to forecast annual bookings based on growth rate. A forecast based on growth rate requires at least four years of historical data.

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Summary Points

- Historically, organizations use *capacity-based* forecasting, in which the average capacity of a salesperson is multiplied by the number of salespeople.
- In capacity-based forecasting, growth is therefore perceived as an outcome of a group's capacity, and often by a single department such as sales or marketing.
- It is recommended to use a *growth-rate-based* forecast for a multi-year forecast due to the inaccuracy of a capacity-based forecast.
- 4ıo A growth-rate-based forecast reflects how the *entire system* performed over time.
- Such a forecast, incorporating the system rather than the individual salespeople, is more accurate because it reflects how every part of the organization contributed in previous years.
- A *system-based forecast* includes the hiring and onboarding process of the HR department.

ACME has been growing its *non-recurring* booking numbers steadily since 2015. In Q3 2021, the new CRO of ACME submits a budget request for ten additional sales reps to be ramped and available per Jan 1.

In this case, the assumption is being made that:

I) In 2021, bookings were $25M across 12 ramped reps or approximately $2M per rep.

II) Therefore, in 2022, growing the team to $40M/$2M/rep = 20 reps. Eight extra reps are needed. There is an anticipation of a 10% turn-over, so ten sales positions are opened.

III) Thus, to hit $60M in 2023, we are going to need $60M/2M/rep = 30 reps

As a Revenue Architect, it is your responsibility to validate if this is realistic.

Year	Booking
A2015	$585,655
A2016	$827,776
A2017	$1,703,379
A2018	$3,922,670
A2019	$10,301,665
A2020	$15,287,736
A2021	$24,762,591

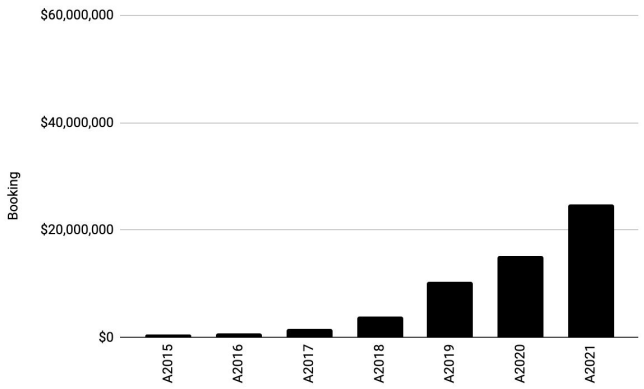


Figure 1: *Historic booking performance of ACME LLC (a non-recurring services business).*

The source data worksheet for this research can be found here.

Growth Rate Based Forecasting

The next step is a practical guide on using the growth rate. It helps us predict if $40M in 2022 and $60M in 2023 is feasible. The principle behind the use of growth rate is that historical growth predicts future growth. That is unless something of significance has taken place.

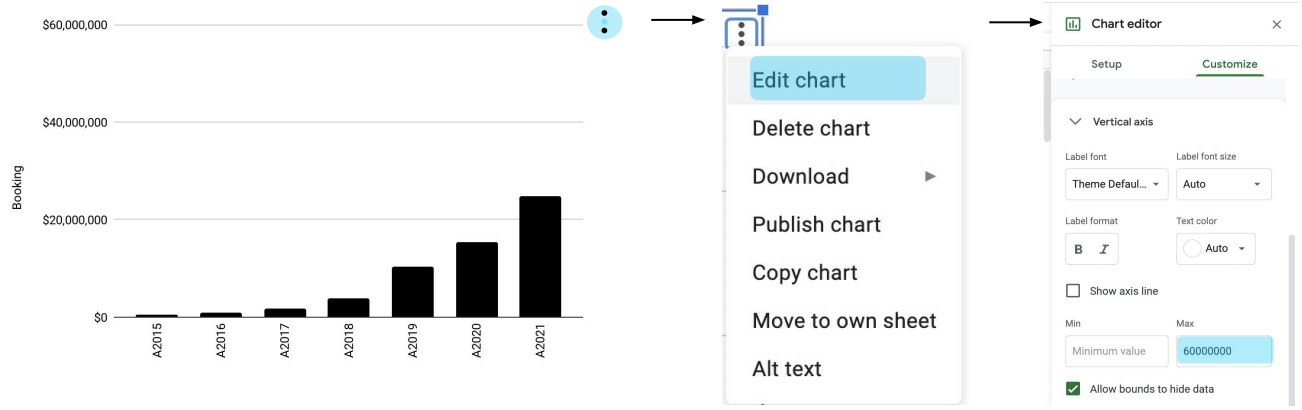


Figure 2: *Customizing of the vertical axis*

Next, we need to add the years, but NOT the forecasted data. See Figure 3. Setting the vertical axis max value to 60,000,000, the appearance remains the same.

Step 1. Get the visual right.

You will be making customizations to the chart in the editor a lot. Here are the steps required to get into the chart editor and how you will alter the scale to $60,000,000.

Not doing this will make the chart editor automatically adjust to: Removing the open data and changing the scale of the vertical axis to slightly above the current max value of $24,762,591.

Year	Booking
A2015	$585,655
A2016	$827,776
A2017	$1,703,379
A2018	$3,922,670
A2019	$10,301,665
A2020	$15,287,736
F2021	$24,762,591
F2022	
F2023	

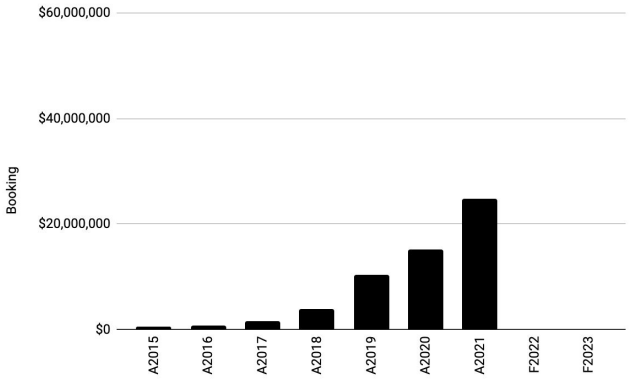


Figure 3: *Creating a visible gap in the chart.*

Step 2. Display the values on a logarithmic scale.

Out of the box, the chart will display on a linear scale. Due to the near doubling year over year, a Logarithmic Scale provides meaningful insights. Compare the plotted data on a Linear vs. Logarithmic scale in Figure 4.

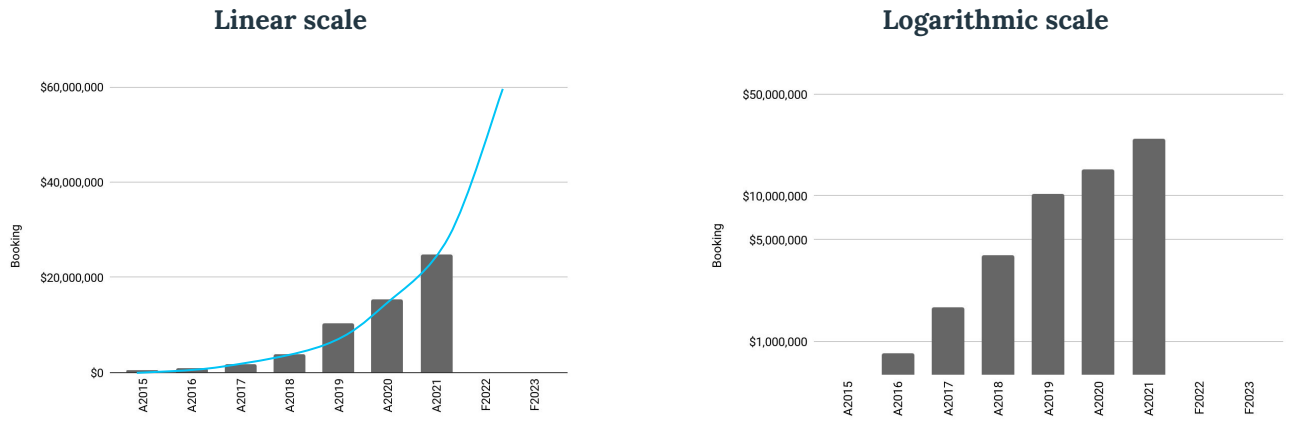
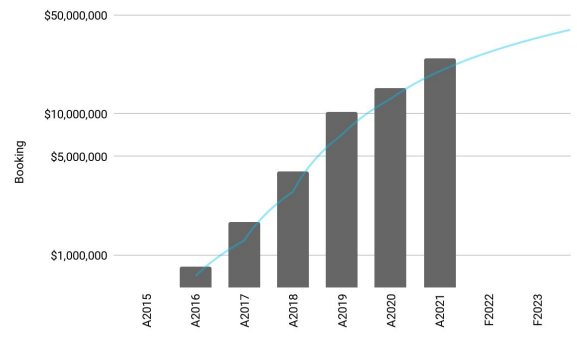


Figure 4: *The logarithmic scale will reveal the growth trend.*

Our eyes deceive us using a linear scale, thinking that growth is accelerating. Follow the blue line on a linear scale. It looks as if the business is accelerating, and $60M is achievable as early as 2022! In contrast, the blue line depicted on a Logarithmic scale shows growth is declining.

Step 3. Add a trendline, also known as a regression line.

Forecasting based on growth rate relies on a trendline, also known as a regression line. So let's start by adding a trendline.



Open the Chart editor..

- Click in the chart on the blue bars

You now are in the series

- Check the ***Trendline*** box
- Use ***Moving Average*** as a type

It will now add a trendline on the selected data series.

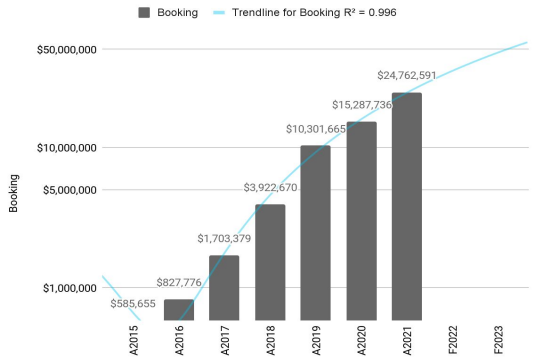
Figure 5: *Let a trendline of growth rate depict the growth.*

There are six options for a trendline: Linear, Exponential, Polynomial, Logarithmic, Power Series, and Moving Average. Which one to pick? The one that most accurately reflects the behavior. How do you know which one is the most accurate? Read on.

Step 4. Pick an accurate trendline based on the R^2 value.

R^2 is a statistical measure of how close the trendline matches the data. An R^2 of 1 means a perfect fit. The R^2 value is something that can be found in the chart.

Toggle between the various Trendline types and see how the R^2 value changes. Pick the one closest to 1.



Open the Chart editor..

- Legend > set Top in Position
- Trendline Type > Linear
- Check the box Show R^2

The changes in the R^2 value are shown in the legend. Note that "Moving Average" as a type of trendline does not have an R^2 value.

Figure 6: *Make sure to use the correct trendline.*

Regression Type	R^2 value
Linear	0.862
Exponential	0.979
Polynomial	0.996
Logarithmic	0.734
Power Series	0.961
Moving Average	N/A

In this case, a Polynomial trendline gets us the closest to 1 with a value of 0.996. It is advised to not use a trendline with an R^2 with a value < 0.950

Table 1. *R^2 value as a function of regression type based on this specific data set.*

Step 5. Determine what the trendline is telling you.

Let's take a step back. We have historic data from 2015 through 2021, and we need to forecast the Booking for 2022 and 2023 with reasonable accuracy.

Well, the plotted polynomial trendline in Figure 6 presented that.

Figure 7 compares the forecast of $40M in 2022 and $60M in 2023 with the trendline.

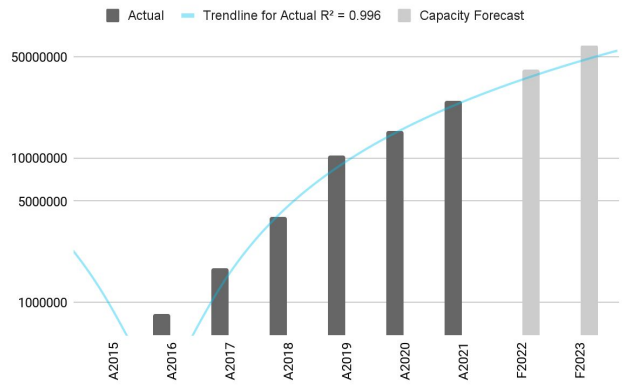


Figure 7: *Growth rate based forecast vs. Capacity Forecast.*

Remember that we are on a logarithmic scale, so the gap between the forecasted value is based on capacity (bar) and the forecasted value is based on growth rate (line). Although it appears small, it is significant.

Next, we are going to calculate what the actual value is.

Step 6. Calculate the future growth based on the growth rate.

We need the mathematical formula for the trendline to calculate the growth rate. The arguments of the growth formula can be found in google sheets as follows; First, make sure you have a legend; it doesn't matter where it is positioned. Next, double-click the trend-line to get into the chart editor. Under Trendline, there is a dropdown box called *Label*. Pick *Use Equation*.

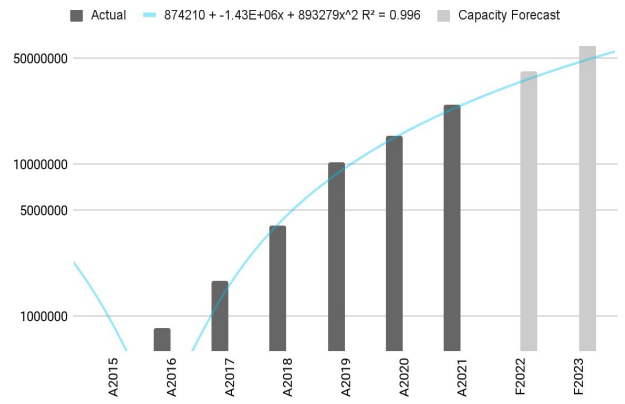


Figure 8: *The chart trendline provides the arguments of a quadratic growth curve.*

A formula now appears in the legend, giving us the arguments of a quadratic equation:

Growth Rate:	Booking [period n] = ax2+bx+c
a [x^2]	$ 893,279
b [x]	- $ 1,430,000
c	$ 874,210

In this formula, [x] is the number of periods [n].

Period	Fiscal Year	Actual
0	A2015	$585,655
1	A2016	$827,776
2	A2017	$1,703,379
3	A2018	$3,922,670
4	A2019	$10,301,665
5	A2020	$15,287,736
6	A2021	$24,762,591
7	F2022	
8	F2023	

Table 2. *R^2 value as a function of regression type based on this specific data set.*

Entering the arguments a, b, c, and period [n] in a formula gives us the ability to forecast 2022 and 2023.

Booking [period x] = ax2+bx+c

Booking [period x] = $893,279x2-$1,430,000x+$874,210

Booking [period 7] = $893,27972-$1,430,0007+$874,210

Booking [period 7] = $34,634,881

Using the same equation, we can calculate the estimated Booking for 2023 (period 8)

Booking [period 8] = $893,27982-$1,430,0008+$874,210

Booking [period 8] = $46,604,066

Period	2	3	4	5	6	7	8	9
Year	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
a [x2]	$893,279	$893,279	$893,279	$893,279	$893,279	$893,279	$893,279	$893,279
b [x]	-$1,430,000	-$1,430,000	-$1,430,000	-$1,430,000	-$1,430,000	-$1,430,000	-$1,430,000	-$1,430,000
c	$874,210	$874,210	$874,210	$874,210	$874,210	$874,210	$874,210	$874,210
Forecast	$1,587,326	$4,623,721	$9,446,674	$16,056,185	$24,452,254	**$34,634,881**	**$46,604,066**	**$60,359,809**

Table 3. *Historic comparison and a 3-year forecast based on the Quadratic formula*

In this case, as a Revenue Architect, the Growth-rate based approach forecasts $34.6M in 2022, $46M in 2023, and $60M in 2024. That means the $60M is achievable but in 2024. Not in 2023. That reflects the performance of the entire system.

Key Findings

Historically, we have based our Booking forecasts on capacity — human capacity, or the number of sales reps that we have. In this method, the total amount of Booking is calculated based on the total number of sellers performing at an average of 80% against quota.

A capacity-based forecast is fundamentally based on a people approach.

In a people approach, people get fired if a forecast is missed, or if a company experiences expedited growth, they tend to hire more people immediately. In a people approach, growth depends on the people's performance. The quality of hiring, onboarding, training, and enablement are all very important.

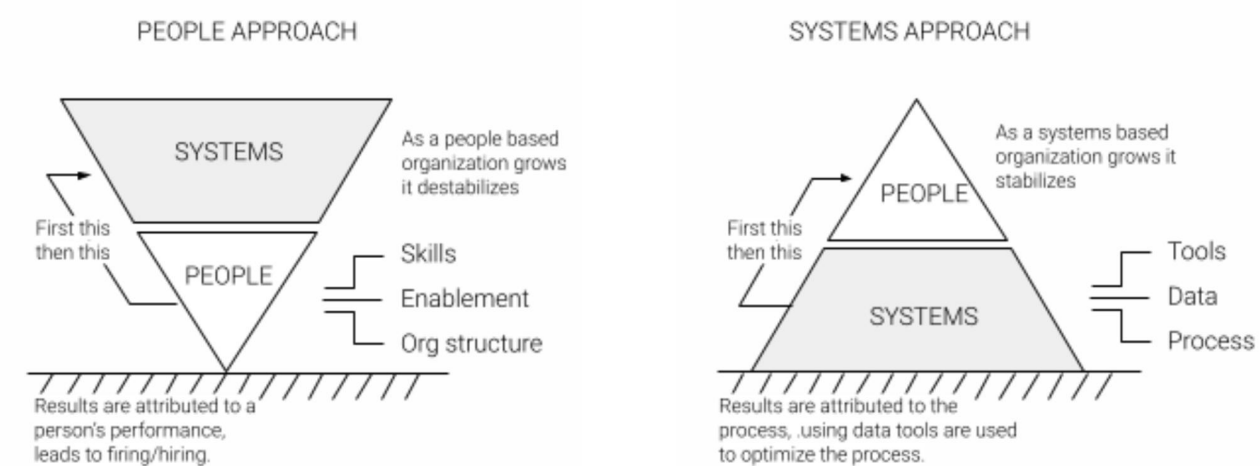


Figure 9: *A Systems Approach leads us to a growth rate-based forecast.*

In contrast, a growth rate-based forecast sees the historical performance as a result of processes, tools that automate processes, and data that guide the processes. Professor James T. Reason [Ref. 4.] wrote a distinguished paper on human fallibility titled “Human Error, Models and Management.” In this, Reason states:

> *“The basic premise in the system approach is that humans are fallible and errors are to be expected, even in the best organizations. Errors are seen as consequences rather than causes, having their origins not so much in the perversity of human nature as in “upstream” systemic factors. These include recurrent error traps in the workplace and the organizational processes that give rise to them.”*

The System as a whole (bowtie) consists of subsystems (functions). And each sub-system consists of a process, which is a series of actions. Each action can be automated or improved via tools. Performance of each part of the process is measured in data indicating effectiveness and efficiency. The goal is to achieve growth that is both scalable and sustainable. Scalable in that when you do 2x as much, you should get ~2x as much, and sustainable in that if you want more of it, the resources are available at the same/similar cost.

James Clear adapted a quote from Greek poet Archilochus that says it best:

> *“We do not rise to the level of our goals. We fall to the level of our systems.”*

Suggested Action

We recommend creating an annual booking forecast, for three years, based on the historical growth rate.

Footnotes

Footnote 1. PLG and CLG behave differently

An exception to this growth model is Product-Led Growth (PLG) and Consumption-Led growth. In both cases, the growth is in response to a customer action:

- *In PLG*, the customer acts as the product's marketing and sales. This scales with the growth. The more users sign-up, the more sales reps you have.
- *In consumption-led growth*, existing customers buy more as they succeed and consume more. Consumption can be anything like bandwidth, storage, computing power, skins, templates, etc.

Footnote 2. Growth-rate naturally declines

A business grows from $1M by $4M to $5M (5x). It uses four reps. Each rep is fully ramped. Each rep contributes $1M/year on average in this example. From $5M, it's unlikely that the organization will grow at the same growth rate of 5x. To do this, they would have to grow to $25M. It is doubtful that the same team that did $4M in growth can do $20M the following year. In a linear capacity-based growth model, the organization needs 20 ramped sales reps doing each $1M per year. Instead, this successful company adds six reps and grows to $15M (3x). And in the subsequent year, the company added another five reps and grew from $15M to $30M (2x). This demonstrates how growth declines, from 5x to 3x to 2x in a healthy growing business.

Footnote 3. Growth is the outcome of an entire system

Growth is not the outcome of a single sub-system of your organization, e.g., the Sales department or even the combination of marketing and sales. In modern, rapidly growing revenue operations, growth is the outcome of the entire system's performance: hiring sales reps, which rely on the systems and tools in place to recruit and the systems and tools in place to ramp those reps. But also to provide the leads for the sales reps, not just by increasing the marketing spend but by putting the systems, processes, and tools in place. The weakest link in the system will determine the growth rate factor.

References

Ref. 1. Blueprints for a SaaS Sales Organization by Jacco J. van der Kooij and Fernando Pizarro

Ref. 2. Calling Bullshit: The Art of Skepticism in a Data-Driven World by Carl Bergstrom and Jevin West

Ref. 3. Hiring Star Sales People Isn't the Best Way To Grow via Harvard Business Review by Frank V. Cespedes and Jacco van der Kooij.

Ref. 4. Human error: models and management by James Reason, University of Manchester

Ref. 5. Storytelling with Data: A Data Visualization Guide for Business Professionals by Cole Nussbaumer

Ref. 6. The Great Mental Models Volume 3: Systems and Mathematics by Rhiannon Beaubien and Rosie Leizrowice

Ref. 7. The SaaS Sales Method: Sales as a Science, by Jacco J. van der Kooij and Fernando Pizarro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