

Market Share

“Valuation is more Art than Science”

Forecast-based valuation can typically be subdivided in two phases:

1. Assess the assumptions.
2. Derive the value from the assumptions.

Step 1 is making the forecast and is usually the part that is related somewhat to art. JP Morgan once said that forecasts are inherently uncertain, especially the ones about the future. In a valuation model we try to confirm and harden each assumption with data, a good model, historical evidence, or a publication. We do so, e.g., with success rates. But at some point we will have to make a call. How good is the project or the technology? Will it stand up against competitors? Nobody will tell us, there is no data about this available. Sometimes we have insight in other valuations, especially if a company is public and covered by analysts. But where do they know from? We can still hide behind some scenarios, but ultimately the value is one number that corresponds more or less to one scenario. We have to express an opinion. Millions, even billions, or personal fates might depend on the decision taken based on that opinion. Therefore we want to make sure that this opinion is well-founded.

Table 1: Art vs. Science

Step	Seen As	Needs
Make Assumptions	Art	Opinion
Derive value	Science	Mathematics

Market Share

Most often the opinion gets expressed in the market share of a product. Will the product take 100% of the market, 50%, or maybe only 2%? We have already written on how to calculate market shares in a competitive scenario:

http://www.avance.ch/avance_on_predicting_sales.html

A scoring system can give an idea of the market strengths of various products. But such models rarely stand some stress testing. Especially in medicine some properties are killer criteria. In oncology safety is not that much of an issue, but in high blood pressure, where standard therapies are well established, even stupendous efficacy will have troubles compensating a worse safety profile. But these scoring systems can help forming an opinion.

It is interesting to mention that market share is usually expressed in terms of sales. Market share in terms of patients treated is different as the price of therapies vary. However, often the penetration, i.e. how many patients are treated with the drug in question, is approximated by the market share figure. This is a commonly made mistake.

Zipf Law

Another interesting source of input is the Zipf law. The Zipf law states, how the market shares of n players are distributed. Obviously there is always one player with the largest share. How does the second largest

market share behave relatively to that? Zipf's law reads:

$$f(k, s, N) = \frac{1/k^s}{\sum_{n=1}^N 1/n^s}$$

where k is the rank order (1 for the largest market share, 2 for the second largest, etc), s is a fitting parameter and N is the number of players.

If $s=1$ this means that the second largest share is half of the size of the largest, the third equals a third of the largest, and so on.

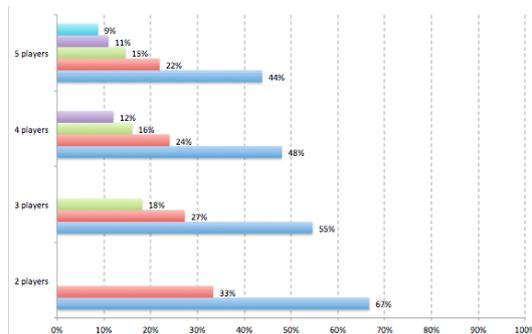


Figure 1: Market shares depending on number of participants

Zipf's law applies for instance to the frequency of words in a language (even though $s < 1$ in that case). Or the size of cities in a country.

Berndt et al. examined the market shares in the US ulcer market¹. They

¹ Berndt, E., L.T. Bui, D.H. Reiley, G.L. Urban. 1994. The Roles of Marketing Product Quality, and Price Competition in the Growth and Composition of the U.S. Anti-Ulcer Drug Industry. Working Paper #19-94 (May), Sloan School, MIT.

found that entrant $n+1$ can expect about 40% lower sales than entrant n .

Rierner et al. then analysed that the sales data fits well a Zipf distribution², even though that means that the above stated 40% rule might only work on average. The second loses 50% to the first entrant, the third 33% to the second, the fourth 25% to the third.

These numbers give an indication of our product's sales. If product A has sales forecasts of USD 2 bn and then a second product B reaches the market, this of course also impact the original forecast for product A. On the other hand, the rise of product B might already be included in the forecast of product A. When relying on other forecasts it is therefore important to understand how these were assessed.

Relative Market Share

Sometimes it is useful to know how much the market leader is ahead of the rest, and another competitor lags behind the leader. The relative market share for the leader is therefore calculated as $RMS_1 = MS_1 / MS_2$, it is always greater than 1 and denotes how much the leader advances the rest of the crowd. For other participants the relative market share is calculated as $RMS_n = MS_n / MS_1$ and is always less than 1.

Zipf's Law with $s=1$ always gives the leader a relative market share of 2, the others are $RMS_n = 1/n$. With $s=0.5$ we get $RMS_1 = 2^{0.5}$ and $RMS_n = 1/n^{0.5}$.

² Rierner, H., Mallik, S., Sudharshan, D. 2002. Market Shares follow the Zipf Distribution. Working Paper.

These numbers (i.e. with $s=0.5$) look in most markets more realistic.

Case Study³

Back in 2008 there were several products in development for hereditary angioedema (HAE). Jerini, Lev pharmaceuticals, Dyax, Pharming, Santarus, and even others were working hard on becoming the first one to get to the market. HAE has a limited patient population of 50,000 around the world, thereof about 6,000-8,000 in the USA.

In 2013 the following sales numbers were achieved:

Table 2: HAE market

Product	Company	Launched	Sales
Kalbitor	Dyax	2010	\$40mn
Firazyr	Jerini/Shire	2008	\$235mn
Ruconest	Pharming	2010	n/a
Cinryze	Lev/ViroPharma/ Shire	2009	\$400mn
Berinert	CSL	Before 2008	n/a

These numbers give a falsified picture as it is essential which approval have been obtained. Firazyr, e.g., only received approval in the US in 2011. Dyax and Pharming both expect to reach about USD 100 mn peak sales.

Assuming that Cinryze has more or less achieved peak sales and applying

³ This case study is purely based on publicly available sales figures and analyst statements. No research with regards to the products is reflected by this case study.

Zipf's law at $s=1$ we get the following peak sales:

Table 3: Sales distribution according to Zipf's law.

Product	Peak Sales	Market Share	Relative Market Share
Cinryze	\$400mn	48%	200%
Firazyr	\$200mn	24%	50%
Kalbitor	\$133mn	16%	33%
Ruconest	\$100mn	12%	25%

Firazyr has already passed the indicated peak sales, but Shire expects both its products, Cinryze and Firazyr to grow in revenues. But maybe Kalbitor and Ruconest grow to the expense of Firazyr?

Zipf's law is a simple quantitative model that disregards any market specifics. It simply puts the market shares of products in perspective. It is left to the analyst to say that these proportions are maintained once peak sales are achieved. Of course it complicates matters when the products don't reach the market at the same time.

HAE is a well defined indication. Others are much more complicated, take breast cancer for instance. This can be subdivided based on the genotype of the tumour and some products, e.g. Herceptin, have a clear application in one subgroup but not in others. Zipf's law doesn't care about the reasons why one product has a lower market share than the other, it simply states how the market shares behave depending on the number of products.

Rule of Three

When it comes to strategy the rule of three⁴ is an interesting and – as a welcome change – confirmed theory, originally put forward by Henderson of BCG. The theory says that any market is dominated by three players, whereas the third player is often more innovative than the first, but performs worse because of its weaker market share. As long as you don't belong to the first two it might be wiser to aim at niche markets, that allow better financial performance.

Conclusion

In some way Zipf's law is very similar to the Titius-Bode law in astronomy, which was thought to predict the sequence of the planetary distances in our solar system. It was thought to be reconfirmed by the discovery of Ceres (even though only an asteroid) and Uranus. But the distance of Neptune to the sun did not follow the Titius-Bode law and today it has no scientific significance anymore. Zipf's law is certainly more art than science, even though it has a scientific look.

4

<http://www.iveybusinessjournal.com/topics/strategy/competitive-markets-and-the-rule-of-three#.VE4O3ovF8aQ>