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The Problem of Success Rates

Use of success rates
Drug development is characterised by high attrition. Only one to two out of ten drug candidates make it through the clinical trials to the market. The success rates help quantifying this risk and implement it into the valuation. Typically, all cash flows are adjusted by the probability of their occurrence.

How success rates are assessed
Published success rates represent the chance of a drug development project to be continued in the next phase. Attrition rates are the opposite of success rates (1-success rate). We refer to references 1 and 2 for phase and disease category specific success rates.

The problem
There are three main categories that cause abandonment:
1. Lack of efficacy
2. Lack of safety
3. Lack of profitability

Economically motivated abandonment adds value. A company abandons projects that have negative net present value (NPV), increasing its value from a negative number to zero. This value increase is typically captured by real option valuation. If using the success rates as published, standard methods

like discounted cash flows (DCF) undervalue the projects in two ways: First, economic abandonment has a negative impact if included in the success rates. Second, the value adding affect of avoiding imminent losses in case of negative NPV is not captured.
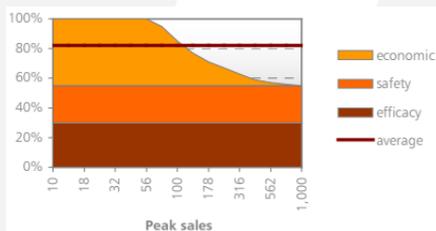
There are two ways to bypass the problem that the success rates are not adapted to the valuation purposes.

Clean success rates
The first option is to clean the success rates from economic abandonment reasons. In a second step you should then use a bottom-up approach to determine the drug's sales potential. Assume that the drug comes to the market as it is known, with possible, not yet known, effects that could lower the sales potential. If you clean the success rates we propose using real options as valuation method.

Conditioned sales estimates
If using published success rates the sales estimate must be free of doubt that the product is abandoned because of economic reasons. This possibility is already included in the success rates. The sales are therefore conditioned that the project will not be abandoned because of economic reasons. This automatically implies higher sales. Typically, one can use comparable sales rates of already commercialised drugs, because these represent the sample of projects that have not been abandoned because of economic reasons. Use DCF with conditioned sales estimates.

For a detailed analysis please consult (3).

1. Dimasi, J.A., *Risks in new drug development: approval success rates for investigational drugs.* Clin Pharmacol Ther, 2001. **69**(5): p. 297-307.
2. Kola, I. and J. Landis, *Can the pharmaceutical industry reduce attrition rates?* Nat Rev Drug Discov, 2004. **3**(8): p. 711-5.
3. Villiger, R. and B. Bogdan, *Valuing Pharma R&D: The Catch-22 of DCF.* Journal of Applied Corporate Finance, 2005. **17**(2, Spring): p. 113-116.