Multivariate Analysis in ri:val

The company Bio-Tec is just in negotiations with BigPharma about a potential partnership for their project 0216. Figure 1 displays the term sheet in its current version.
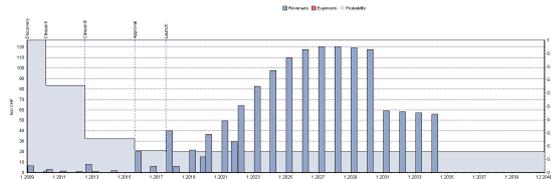

Figure 1: Current term sheet

The sales potential depends on many unforecastable factors like competition, drug profile, and marketing success. The companies have loosely agreed that the peak sales are about half a billion CHF (CHF 520 Mio precisely). Nevertheless, Bio-Tec thinks that there is a chance for the drug to become a blockbuster, and would also like to include this scenario in the valuation. Furthermore it might also be possible that the phase III trials cost CHF 150 Mio instead of the budgeted CHF 100 Mio. And finally, there might be an issue with respect to the timelines.

The business developer of Bio-Tec therefore runs a multivariate analysis of the project 0216 in ri:val. He wants to run a valuation allowing the following parameters to take various values:

Peak sales: Maintain the CHF 520 Mio average estimate, but allow in 10% of the cases peak sales greater than CHF 1 Bio. The business developer therefore chooses a lognormal distribution with mean CHF 520 Mio, and the 10% (or 90%) quantile set at CHF 1 Bio.
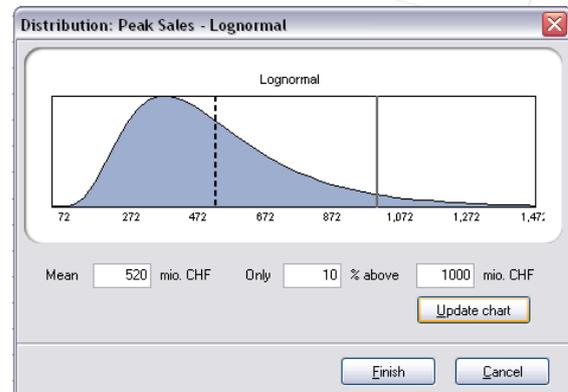

Figure 2: Peak sales are lognormally distributed

Clinical costs: The two companies estimate that in two thirds of the cases CHF 100 Mio should be enough for the phase III trials, but depending on the finally by the FDA approved study design the costs might also amount to CHF 150 Mio. The business developer therefore chooses the clinical phase III costs to be discretely distributed, with 66% at CHF 100 Mio and 34% at CHF 150 Mio.

Duration: Currently the development is scheduled to take 103 months. IN order to be conservative the business developer chooses a triangular distribution for the duration from 100 months, peaking at the predicted 103, and lasting up to 120 months, i.e. allowing for an almost 1.5 year delay.

ri:val now runs a number of valuations, typically 1,000, where in each valuation these three parameters take a random value according to their distribution (lognormal, discrete, and triangular in this case). While the average value is around CHF 32 Mio for Bio-Tec it should be with 80% probability within CHF 24 Mio and CHF 41 Mio. Interestingly, it is also possible, albeit unlikely, that the value is CHF 90 Mio.
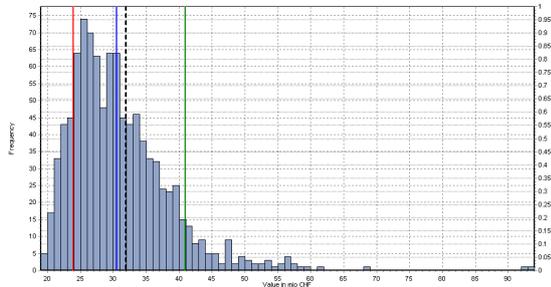
Figure 3: Value Distribution for Bio-Tec

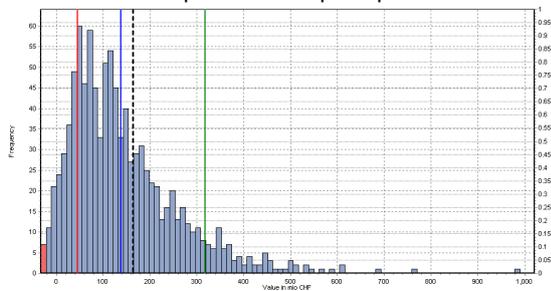The business developer is of course also interested in pharma's perspective.

Figure 4: Value Distribution for Pharma

For pharma the value can even turn slightly negative, but in 80% of the cases it is between CHF 45 Mio and CHF 319 Mio, on average CHF 163 Mio.

In the 10% worst case the value share is therefore 24/(24+45)=35%, for the average numbers it is 32/(32+163)= 16%, and for the 90% quantile it is 41/(41+319)=11%. Clearly, pharma profits much more from better than expected development. This is to some extent natural, as biotech already secures part of the value via upfront and milestone payments. Nevertheless, Bio-Tec's business developer might want to think about deal terms that allow him losing a bit less of the upside potential as, e.g., tiered royalties or commercial milestones.