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Multi-indication deals

Drugs can have more than one indication. This is most often the case for cancer drugs, e.g. Avastin or chemotherapeutics in general. When out-licensing such compounds in development, the licensor (biotech) is likely to point at the potential of the drug in several indications, increasing the overall value of the drug. The licensee (pharma) also recognise the additional value of "add-on" indications. New indications are a standard way to extend the life of a drug. Nevertheless, it is rarely clear from the beginning which indications will be developed and commercialised. Pharma is therefore careful to attribute already from the beginning a higher value to the drug because of potential additional indications. But it agrees to do so once it initiates the development of a new indication.

The license contract often include milestones that are indication specific, e.g. a milestone of US$ 10 Mio for the start of a phase III trial for a first indication, and another milestone of US$ 5 Mio for each start of a phase III trial in any other indication. Biotech companies welcome this structuring because it allows them publishing an eye-catching headline on the deal value. Adding up all milestones of all possible indications yields a nice sum of potential biodollars that might attract the attention of investors. But in most cases the payment of all milestones remains a highly improbable event. The headline of a multi-indication license deal therefore provides only little information about the realistic size of the deal.

In order to understand how good a deal is, a company has to perform a valuation of the term sheet. This valuation of multi-indication deals usually is done by indication. As soon as the project splits up into several indications we can value each indication separately, each cash flow particular to one specific indication depending on the success rates of the core project and then the sub-project (the indication, c.f. figure 1).

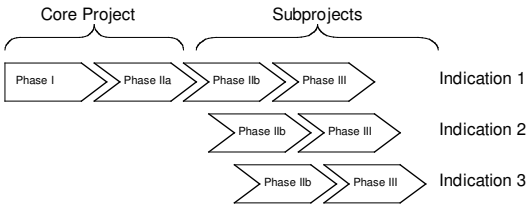

Figure 1: Multi-indication Project

This valuation approach works fine as long as the license contract only contains plain milestone and royalty payments. But assume that we have three indications, each with potential annual sales of US$ 400 Mio. Furthermore we have a tiered royalty structure with 10% royalties up to US$ 500 Mio, 12% royalties for sales between US$ 500 Mio and US$ 1,000 Mio, and 14% for sales exceeding US$ 1,000 Mio. If we calculate each indication separately we also calculate the royalties per indication. This would mean 10% of US$ 400 Mio for each indication. One indication alone never reaches the second royalty tier, not to mention the third. Nevertheless it is well possible that all indications make it to the market, totalling annual sales of US$ 1,200 Mio. This would correspond to

10% of US$ 500 Mio, 12% of the next US$ 500 Mio, and 14% of the remaining US$ 200 Mio, totalling US$ 138 Mio. Comparing these US$ 138 Mio to the royalties calculated per indication (3*US$ 40 Mio) we notice a 15% difference. The valuation per indication falls short in accounting 15% of the royalty streams.

If the license contract includes commercial milestones, then the problem is even more complex. Imagine a commercial milestone of US$ 250 Mio after having reached annual sales of US$ 1,000 for the first time (e.g. like in the contract between Regeneron and Sanofi-Aventis, press release of November 28, 2007). When calculating the value of each indication separately, then this milestone is never going to happen; each indication reaches at most US$ 400 Mio sales, not US$ 1,000 Mio. But in reality, it is very well possible that the milestone happens when all three indications are commercialised.

Of course one might argue that the sales of the first indication represent US$ 0 Mio to US$ 400 Mio, the sales of the second indication sales from US$ 400 Mio to US$ 800 Mio, and the sales from the third one US$ 800 Mio to US$ 1,200 Mio. This way we could consider not only the commercial milestone but also the tiered royalty structure. But this simplified method has a serious flaw: It implicitly assumes that if the third indication comes to the market the first and second do so as well. And if the second comes to the market, then at least the first one does so as well (figure 1). This is not necessarily true. It is well possible that the compound works in one indication but not in another. But the success of the compound in one indication does not necessarily have to follow the order of development, e.g. it is thinkable that only the second and third indication will make it. Figure 3 exhibits the situation where every combination of successful indications is possible. In case the commercial milestone is triggered after cumulative sales of US$ 1,000 Mio, it still depends on how many indications are commercialised. The US$ 1,000 Mio are much faster reached with three indications than with just one; the milestone therefore gets differently discounted.

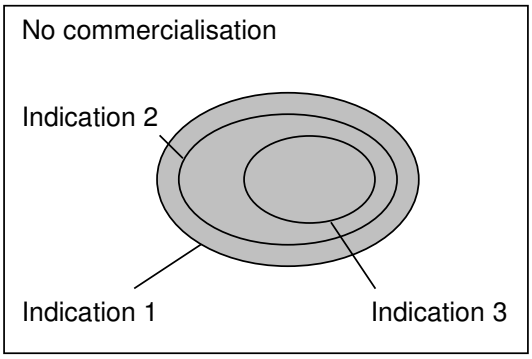

Figure 2: Joint success rates of indications, complete dependency.

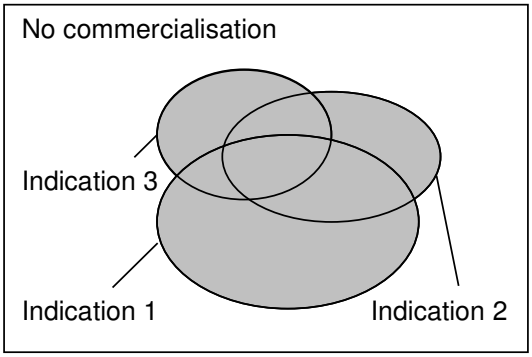

Figure 3: Joint success rates of independent indications.

In order to value the license contract correctly (if it contains a tiered royalty structure or commercial milestones) we must not only define the success rates for each indication, but also the probability that the indications are simultaneously on the market. Once we have done so, the valuation becomes relatively simple. Imagine the following license contract (we focus only on the critical terms like tiered royalties and commercial milestones):

Table 1: License Contract

Terms	US$ Mio
Royalty rate up to US$ 500 Mio	10%
Royalty rate up to US$ 1,000 Mio	12%
Royalty rate above US$ 1,000 Mio	14%
Milestone after US$ 1,000 Mio cumulative sales	100
Milestone after US$ 1,000 Mio annual sales	250

We assume that the indications reach the market with 20%, 15%, and 10% success rates, respectively. The sales potential of each indication is US$ 400 Mio and the sales curve is as displayed in figure 4. The first indication would come to market in 4, the second in 5, and the third in 6 years from now. Patent protection still lasts 17 years from now for all three indications. We use a discount rate of 12%.

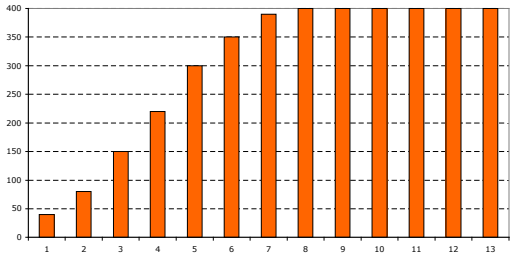

Figure 4: Sales curve per indication

Assuming that the indications behave like in figure 2, i.e. they depend on each other, we get a value of US$ 65.1 Mio. If on the other hand we assume that the indications are completely independent of each other as shown in figure 3, then the value drops to US$ 59.7 Mio. The difference in value of almost 9% comes from the fact that the dependent scenario assumes that in 10% all three indications are simultaneously on the market, while the independent scenario also assumes this to happen in 0.3% (=20%*15%*10%). It is mainly in this scenario where the milestone for annual sales and the third royalty tier kicks in.

Table 2: Values and probabilities

Indication 1	Indication 2	Indication 3	Value	Probabilities Independent Scenario	Probabilities Dependent Scenario
1	0	0	155.3	15.3%	5%
0	1	0	132.8	10.8%	0%
0	0	1	112.7	6.8%	0%
1	1	0	339.4	2.7%	5%
1	0	1	317.0	1.7%	0%
0	1	1	290.5	1.2%	0%
1	1	1	458.4	0.3%	10%

The necessity to perform the valuation by scenario (which indications are on the market) is particularly clear in the presence of milestones that are only triggered when two indications co-exist. Such terms are relatively rare, but they are included in some contracts.

Very interestingly, only the value of the license contract is impacted by different joint probability assumptions (dependent vs. independent). The overall value of the project remains unaffected! As long as we maintain the indication success rates of 20%, 15%, and 10% the

value of the project is not going to change. Only the license contract includes terms that amplify the effect of higher sales. If we attribute lower probabilities to these scenarios, the value of the license contract becomes lower.

What does that mean for a biotech company trying to license a multi-indication project? Assuming independent success rates between the indications their part of the license contract does not look as good as it should. Biotech can therefore go back to the negotiation table claiming that they do not get the share they have agreed on with pharma. In our case, biotech could for instance ask to trigger the two sales milestones already at US$ 750 Mio sales (once cumulatively, once annually. This way, the contract is worth US$ 65.1 Mio again, but this time under the assumption of independent success rates. Independent success rates can therefore be used as a very subtle negotiation argument in order to get higher terms.