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A GUIDE TO DEALMAKING

What is the value of a deal?

The pharmaceutical and biotechnology industries see over 3,000 deals signed every year, many of which involve the complex and often unfamiliar process of valuing potential products that are not yet on the market. In this feature, valuation specialists Venture Valuation explain how the value of a product is calculated and how this relates to the overall deal value.

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What does it mean if a biotech company signs a $500 million deal for its preclinical product with a big pharmaceutical company? At one extreme, this could mean an up-front payment of $500 million—the maximum value such a deal can have—while at the other, it could be a milestone payment of $500 million to be paid in full when the product reaches the market, which would mean a much smaller present value for the biotech company. So, even though both deals would be labeled as $500 million deals, their actual value is completely different. Typically, most deals fall somewhere between these two extremes. Here, we provide an overview of how a product is valued and how this can help one judge the value of a deal.

In short, the value of a product is the present value of future streams of cash (cash flows). These cash flows are negative during development owing to development costs. After market entry, the costs associated with sales, marketing and manufacturing of the product represent negative cash flows, whereas revenues represent positive cash flows. To calculate the present value, we need to apply a discount rate, taking into account the time value of money and the general risk (such as lack of funding, management risk and licensing risk). As a result, payments to be received further in the future have a lower present value. The approach of discounting future cash flows to estimate their net present value is the classic discounted cash flow valuation.

For a biotechnology product, there is also a high risk that it will fail at one of the development stages (preclinical, phase 1, phase 2, phase 3 or registration). In aggregate, knowledge of the risk of failure at each stage allows the modeling of the cumulative probability that a product will reach the market, which is used to determine the risk-adjusted net present value (rNPV) of the product.

The deal terms do not influence the value of the product, as it is a payment between the licensee (negative cash flow) and licensor (positive cash flow). The deal terms simply distribute the value of the product between the two parties.

Valuing a product

There is not a 'right way' to value a product; however, the rNPV is the gold standard in the industry. As explained above, this valuation approach is based on the classical discounted cash flow valuation, with some special adjustments for the biopharma sector. The goal is to estimate the future cash flows, adjust them for the risk of development and then calculate their present value.

The rNPV calculation can be split into four elements:

- Cash flows associated with the development phase
- Cash flows associated with the market phase
- Risk adjustment
- Discounting to present value

With these four elements it becomes possible to build a cash flow model looking, for example, 15 years into the future, until the expected expiry of the key patent. To value a licensing deal, we use the same approach.

Development phase

The development phase looks at the costs and timelines associated with bringing the product to its different target markets. These include the costs and timelines of preclinical studies and clinical trials, including the costs of manufacturing material for clinical trials—basically, any direct costs associated with the development of the product before it gets to the market, and the timelines associated with that development.

Market phase

For the market phase, there are both outflows (negative cash flows) and inflows (positive cash flows) to be considered. The outflows include the costs associated with manufacturing and marketing the product. The inflows come from the sales of the product and depend on the pool of patients who receive the drug and the price at which the drug is sold. The elements used to estimate the sales include the prevalence or the incidence of the disease (i.e., how many people actually have the disease), the pricing of the drug in the different markets, the competition and—again based on the development timelines—the time when the product can be sold in the different markets. On the basis of this information, a revenue projection can be generated.

It is possible to fine-tune and apply different prices and different market shares for each market. Whichever level of sophistication is used, in the end the assumptions and expectations will drive the valuation. Valuation is not a precise science; it is rather an art.

Risk adjustment

In contrast to a classical discounted cash flow valuation, where the discount rate represents all the risk, the risk in an rNPV is split into two parts: (1) product-specific attrition risk (leading to risk adjustment) and (2) the general business risk (leading to discounting).

Reference data for the determination of the attrition risk are calculated from historical information on the success rate in each development phase for products of a similar category (e.g., specific indication, type of molecule, type of disease). A good source for this information is a study done by BIO in 2014, published in *Nature Biotechnology*[1].

The likelihood of the cash flows associated with the development and market phases can thus be estimated on the basis of past success rates. The risk adjustment of cash flows takes into account that the likelihood of success in each phase is conditional on the success of the previous phase, and the cumulative probability of success in a

Table 1: An example calculation of the value of a phase 2 biotech product

rNPV Calculation	Drug development stages														
	P2	P3	P3	P3	NDA/ MAA	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10
Cash flow projections															
Development costs (million $)	–9	–18	–18	–18	–2	–	–	–	–	–	–	–	–	–	–
Revenues (million $)	–	–	–	–	–	10	50	100	300	800	1,000	1,200	1,100	900	800
Costs (million $)	–	–	–	–	–	–6.5	–32.5	–65	–195	–520	–650	–780	–715	–585	–520
CF (million $)	–9	–18	–18	–18	–2	3.5	17.5	35	105	280	350	420	385	315	280
Risk adjustment															
Risk adjustment (%)	100	39	39	39	27	23	23	23	23	23	23	23	23	23	23
Risk-adjusted CF (million $)	–9.0	–7.0	–7.0	–7.0	–0.5	0.8	4.0	8.0	23.9	63.9	79.8	95.8	87.8	71.8	63.9
Discount (million $)	0.9	0.7	0.6	0.6	0.5	0.4	0.4	0.3	0.3	0.2	0.2	0.2	0.1	0.1	0.1
rNPV (million $)	–7.8	–5.2	–4.5	–3.9	–0.3	0.3	1.4	2.4	6.3	14.5	15.6	16.1	12.8	9.0	6.9
Product value (million $)	63.7														
Deal terms and value															
Up-front (million $)	5	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Milestones (million $)	–	–	–	5	10	20	–	30	30	–	–	–	–	–	–
Royalties (5%)	–	–	–	–	–	0.5	2.5	5	15	40	50	60	55	45	40
rNPV (million $)	5	0	0	1.1	1.3	1.9	0.2	2.4	2.7	2.1	2.2	2.3	1.8	1.3	1.0
Deal value (million $)	25.3														

In our example, royalties = 5%, discount rate = 16%, COGS, admin, S&M = 65%. At P2, success rate = 39%, probability that CFs will occur = 100%. At P3, success rate = 68%, probability that CFs will occur = 39%. At NDA, success rate = 86%, probability that CFs will occur = 27%. At market stage, probability that CFs will occur = 23%. P, phase; NDA, new drug application; MMA, marketing authorization application; CF, cash flow; COGS, cost of goods sold; S&M, sales and marketing; M[X], market years.

given phase is calculated by multiplying the probability of previous phases. Generally, the likelihood for the cost of the current phase (e.g., phase 1) is 100%, as the company needs to spend that money to know whether the product will pass the phase successfully.

Discounting to present value

Finally, the general business risk is taken into account to calculate the present value of the future expected risk-adjusted cash flows. The general risk is represented together with the cost of capital in a discount rate that generally lies between 10% and 26%, depending on the company involved. It is substantially lower for big pharma companies than for a small biotech company. As a result, the value of a project will be greater for a big pharma company when adjusted by its internal discount rate. In contrast, private investors financing a biotech company or project will use a higher discount rate, as their own cost of capital and the biotech's associated business risk are much higher.

In conclusion, value is in the eye of the beholder. Valuation can help to provide a basis for negotiations, but price is not equal to value; rather, it is the outcome of the negotiations, in which other factors such as the availability of multiple bidders and having enough time to raise funds play a role.

The value of a deal

A straightforward approach to understanding the value of a deal is to estimate the rNPV of the product and then calculate the present value of the deal. The cash flows are assigned as costs for the licensee and as revenues to the licensor. Such a model allows one to understand the value of different payments individually, and how the value of the product is split between the licensee and the licensor. The development of a biotechnology product is feasible only if a reasonable deal can be anticipated in which both parties, licensor and licensee, capture a significant portion of the value.

The question that remains now is, what is a reasonable split? Theoretically, 50%/50% would be fair to both parties, at least when the deal is valued with the discount rate of the licensee, which is arguably significantly higher than that of the licensor. In practice, however, we see more value going to licensees, as they usually have greater bargaining power: a biotechnology company is often under pressure to get a deal done as a means of financing the company. Thus, for younger companies with earlier-stage products, a deal value split of 1/3 licensor and 2/3 licensee is commonly seen.

As mentioned earlier, another consideration when estimating the assignment of the value of the product is what discount rate to apply. A pharma company would have a lower cost of capital, as well as a lower discount rate, as it can finance itself with debt. A biotechnology company, however, most often does not have this option. A pharma company could therefore offer a better price when calculating the value with a lower cost of capital. However, the question is whether the pharma company is willing to share its benefit of having easier access to capital with the biotechnology company[2]. Nonetheless, this difference helps companies to reach a deal that is favorable to both parties.

Table 1 shows the calculation of the rNPV of a phase 2 product and the value of a deal. In this example, the rNPV of the product is $63.7 million, based on a 16% discount rate and a cumulative probability of reaching the market of 23%. The present value of the deal with 5% royalties and milestone payments of up to $100 million is $25.3 million. The resulting deal split is thus 40%/60%.

Conclusion

For any biopharma product and deal, valuation is a key issue. Despite its complexities, a valuation can be done, arguably, at any stage of development. However, valuation is based on assumptions, and so it is essential to understand those assumptions and carefully choose them on the basis of the available information at the time of the valuation. Important value drivers of a product are the risk on one side and the market potential on the other. Having an understanding of the product value provides a basis for deal negotiations and puts an expected deal into perspective in terms of value to the licensee and licensor.

1. Hay, M. *et al. Nat. Biotechnol.* **32**, 40–51 (2014).
2. O'Connell, K.E., Frei, P. & Dev, K.K. *Nat. Biotechnol.* **32**, 617–619 (2014).

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