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Discount Rates for Biotech Companies

A valuation relies on two major assumptions, the cash flows and the discount rate. A cash flow is defined as a stream of money, either to receive or to pay, at a certain moment in time, with some likelihood. The sum of all cash flows considered in a valuation is the cash flow set. It must be the goal of each valuator to feel as comfortable as possible with the cash flow set; he therefore tries to justify each parameter and elaborates the cash flow set with comparable products or epidemiological data for sales estimations, or with historical data for success rates.

The second assumption is the discount rate. Via the discount rate a cash flow set is translated into value. The discount rate must be determined with the utmost care, because usually the value of a project or a company is very sensitive to this parameter. It is generally accepted that more risk comes along with a higher discount rate. But when it comes to determining what risk corresponds to what premium in the discount rate practitioners and academics struggle and there is still no broadly accepted method to elaborate the premiums. They therefore invoke models to determine the discount rate (or the cost of capital[1]). The commonly used model is the capital asset pricing model (CAPM). It basically states that there are two sorts of risks, diversifiable and not-diversifiable ones. The diversifiable risks do not need to be rewarded with a premium, because an investor can eliminate them by holding a large portfolio to diversify. The main risk factor of a biotech company, the clinical success of its projects, is typically such a diversifiable risk. According to CAPM the success rates should not have an influence on the discount rate. Considering that the underlying market of all pharma and biotech companies is pretty much the same - the healthcare market - we should therefore assume that the discount rates of pharma and biotech companies are very similar to each other. In the reality, however, we observe a different relationship between success rates and discount rate. Usually the discount rate decreases the more mature a company is. While a start-up or a company that is still in discovery stage faces a high cost of capital of over 20%, a clinical stage company can already use a lower discount rate. When a company has a project on market the cost of capital usually is already close to a large pharmaceutical company discount rate, i.e. between 8% and 10%. So the discount rate seems to depend mainly on the stage of a company. The most important property of the stage of a company is doubtlessly its probability to ultimately take one project to the market and enter profitability. We therefore can observe a direct relationship between success rate and risk premium.

While CAPM is a generally accepted method to determine the cost of capital, it is also generally accepted that it has serious flaws. It is for instance hard to understand that Chelsea Therapeutics, a clinical stage company, should have a cost of equity that is close to the risk free rate with a beta of 0.12 (source: Nasdaq, January 14, 2008). First, the correlation of the company value with the market, the so-called beta, is notoriously sensitive to the calculation

[1] Since most valuations serve the purpose of calculating the value of equity we focus our discussion on the cost of equity.

period, making it a rather unreliable parameter. Second, it is accepted that company specific risks, although diversifiable, influence the discount rate. People therefore add a variety of premiums to the base rate returned by the CAPM. These premiums depend on management experience, liquidity, or other hard-to-capture concepts. The premiums then become subjective and difficult to justify.

As a remedy the Market-Derived Capital Asset Pricing Model (MCPM) has been conceived. Albeit being an interesting alternative MCPM overstates the influence of the company specific risks in the case of biotech companies when compared to the market reality.

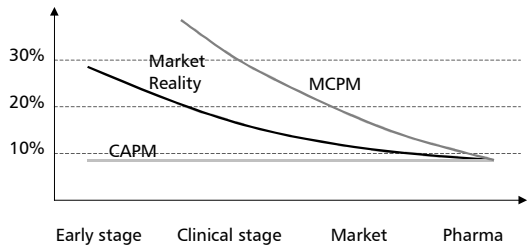

Figure 1. Modelled and observed discount rates

The lack of a consistent model makes a consistent comparison of valuations impossible. But investors and entrepreneurs alike must be able to compare different companies with each other and their value development over time. Without a consistent approach these comparisons become obsolete.

In the marketplace we can observe a consistent decrease of the discount rate with advancement of the stage of the company. There might be some differences between some companies because ultimately the stage of a company is not the only parameter that determines the discount rate. The therapeutic area and competitive environment have an influence on the risk profile. Often investors acknowledge the risk reducing nature of license contracts with a lower discount rate. This can also be interpreted as the value added by the approval of the company's technology by a respected industry partner.

Table 1. Industry discount rates.

Company	Discount Rate	Comment, Source
Genentech	20%-28%	1990, Webpage.
Genentech	16%-19%	1999, Webpage.
Lilly	18.75%	Rate to discount acquired IP R&D. Annual Report 2004.
Arpida	18%	One anti-infective in phase III. UBS Analyst Report.
Jerini	15%	One anti-allergic in review. CS Aalyst Report.
Actelion	15%	Integrated drug development company with one major marketed product. Annual Report 2004.
Schering	14.25%	Region USA. Annual Report 2005.
Schering	13.5%	Region Europe. Annual Report 2005.
CAT	12.5%	Projects owned by CAT. Cash offer by AZ for CAT.
MedImmune	11.3%	Fully integerated drug development company. Annual Report 2004.
Berna Biotech	9.9%	Vaccine company, CAPM + small company spread. Merger Memorandum Crucell Berna-Biotech by PWC.
AstraZeneca	8%	Projects partnered with AZ. Cash offer by AZ for CAT.
AstraZeneca	Risk free rate	Risk neutral valuation. Annual Report 2004.
Merck KGaA	7%-7.6%	Chemical company with pharma business. Annual Report 2005.

Avance has elaborated an own discount model that takes account of company specific risks using expected utility theory. Below we display discount rates for some predefined pipelines. We

nicely see that advancement of projects and license contracts reduce the discount rate. Of course, not modelled factors like management and special regulatory risk could require further finetuning of the discount rate.

Table 2. Discount rates from Avance's model.

Project 1	Project 2	Project 3	Project 4	Discount
NDA ($ 500)	Ph. 3 ($ 500)	Ph. 2 ($ 500)	Ph. 1 ($ 500)	12.0%
NDA ($ 300)	Ph. 3 ($ 300)	Ph. 2 ($ 300)	Ph. 1 ($ 300)	12.0%
Ph. 3 ($ 500)	Ph. 3 ($ 500)	Ph. 1 ($ 500)	Ph. 1 ($ 500)	13.4%
Ph. 3 ($ 300)	Ph 3 ($ 300)	Ph. 1 ($ 300)	Ph. 1 ($ 300)	13.8%
Ph. 3 ($ 500)	Ph. 2 ($ 500)	Ph. 1 ($ 500)	Ph. 1 ($ 500)	15.1%
Ph. 3 ($ 500, lic)	Ph. 2 ($ 500, lic)	Ph. 1 ($ 500, lic)	Ph. 1 ($ 500, lic)	14.2%
Ph. 3 ($ 300)	Ph. 2 ($ 300)	Ph. 1 ($ 300)	Ph. 1 ($ 300)	16.7%
Ph. 3 ($ 500)	Ph. 1 ($ 500)	Prec. ($ 500)	Prec. ($ 500)	17.3%
Ph. 3 ($ 500, lic)	Ph. 1 ($ 500, lic)	Prec. ($ 500, lic)	Prec. ($ 500, lic)	15.3%
Ph. 3 ($ 300)	Ph. 1 ($ 300)	Prec. ($ 300)	Prec. ($ 300)	18.5%
Ph. 2 ($ 500)	Ph. 1 ($ 500)	Prec. ($ 500)	Prec. ($ 500)	19.3%
Ph. 2 ($ 500)	Prec. ($ 500)	Prec. ($ 500)	Prec. ($ 500)	19.5%