

An instinct for growth



Finance Valuation for Start-up's in Life Science

March 2019

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Presentation topics

- 1. The basics of valuation
- 2. Risk-adjusted DCF method used in valuation of life science companies in clinical stage
 - Development phase costs, length
 - Sales
 - Profits, royalty rates
 - Probabilities of success
 - Discount rates (WACC)
- 3. Additional topics (in brief):
 - Market approach for the valuation of early stage / pre-clinical stage companies
 - DLOMs





Valuations: What does it mean and why does it matter?

"We're willing to put \$8M in at a \$32M pre-money valuation"

"We need to have 20% of the company if we are going to invest \$8M"

Pre-money valuation	= \$32M (80%)
Investment	= \$8M (20%)
Post-money valuation	= \$40M (100%)



Valuation methodologies

Valuation methodologies can be broadly classified into one of three approaches:





Income approach - DCF model

"Prediction is very difficult, especially if it's about the future."

Niels Bohr (1885 - 1962), Danish physicist of Jewish descent, made foundational contributions to understanding atomic structure and quantum theory, for which he received the Nobel Prize in Physics in 1922.

- Income approach:
 - DCF
 - Risk-adjusted DCF







Traditional vs. Biotech cash flows (cont.)







Estimating costs

Major steps in the drug development

Preclinical	First early trial to determine if drug engages its expected target	Testing in animals
Phase I	Initial safety evaluations, determine safe dosage range, identify common side effects, study toxicity profile of the drug	20-80 healthy volunteers
Phase II	Begin to explore efficacy while maintaining safety	100-300 targeted volunteers
Phase III	Final confirmation of safety and efficacy	1000-3000 targeted volunteers
Approval	→ Filing a new drug application after successful clinical trials	Depends on trial endpoints



Estimating costs

Drug development costs and duration of drug development





Discount

rate

Probability

Sales

Costs

Profits



Estimating sales

Top-down calculation:		Value parameter	Value
	World population		7.7 bn
	Population of interest	Advanced economies	1.07 bn
	Prevalence	15/100,000	160,500
	Symptomatic rate	100%	160,500
	Avg. no. of attacks (annual)	7.3	1,171,650
	Diagnosis rate	60%	702,990
	Access to healthcare	90%	632,691
	Treatment rate	60%	379,614
	Number of doses per attack	2	759,229
	Price per dose	US\$ 8,000	US\$ 6,072 mn
	Market share	4%	US\$ 244 mn





Estimating sales

Disease category median peak sales:

Category	Sales
Anti-infectives	US\$ 265 mn
Blood	US\$ 302 mn
Bones & Joints	US\$ 127 mn
Cancer	US\$ 344 mn
CNS	US\$ 422 mn
CVS	US\$ 145 mn
GIT	US\$ 299 mn
Inflammatory	US\$ 349 mn
Metabolic	US\$ 371 mn
Ophthalmologics	US\$ 157 mn
Pain	US\$ 274 mn
Respiratory	US\$ 213 mn
Skin	US\$ 69 mn
Urology	US\$ 685 mn
Women	US\$ 386 mn

- 1. Only sales of successful drugs are published
- 2. Drugs that do not seem profitable are abandoned during development
- 3. Average sales are distorted by few blockbuster drugs
- Sales of small population drugs are not always published



Estimating profits

Big pharma

Manufacturing

- Manufacturing capability
- Marketing and selling knowhow
- Commercial capability



Costs Sales Profits Probability Discount rate

Small pharma

Royalty revenues

- The licensor participates in the net revenues of the outlicensed product with a certain percentage
- Usually ranges between 5%-25% and most likely to be on the range of 12%-20%.
- Fixed or tied to the amount of sales revenues





Probability of Success







Likelihood of Approval from Phase I to NDA, by disease:







Probability of Success - Rare Diseases







Likelihood of Approval from Phase I to NDA, by disease:





Likelihood of Approval - NME vs. Biologic vs. Non-NME:



Costs



Profits

Sales

Probability

Discount

rate



Estimating discount rate (WACC)





Estimating discount rate (WACC)

Discount rate comparables: $R_e = R_f + \beta (R_m - R_f) + ARP$

Company	Discount rate	Subject of valuation
Lilly	18.75%	IPR&D
Arpida	18%	Phase III drug
Private (neuro)	21%	Share capital
Private (psychiatry)	20%	Share capital
Private (diabetes/metabolic)	23%	Share capital
Private (immune)	20%	Share capital
Private (stem cells)	20%-25%	Share capital
Private (oncology)	20%	IPR&D



Illustrative example – income approach



Major assumptions:

- 1. Pre-Phase II drug. Field of metabolic diseases.
- 2. Costs: \$5m PII; \$15m PIII; \$3m NDA
- 3. Sales: Peak revenues \$240m (annual growth 5%)
- 4. Profits: Royalties 15%
- 5. Probabilities for success: metabolic disease (45.2% P2 to P3; 71.4% P3 to NDA; 93.8% NDA to approval)
- 6. Discount rate: 20%

Stage	Year	Cash flow \$ <i>m</i>	Proba- bility	Weighted cashflow \$m	Present value \$ <i>m</i>	Total Value \$ <i>m</i>
Dhees	1	-2.5	100%	-2.5	-2.3	
Phase I	2	-2.5	100%	-2.5	-1.9	
	3	-5.0	45%	-2.3	-1.4	
Phase II	4	-5.0	45%	-2.3	-1.2	
	5	-5.0	45%	-2.3	-1.0	
NDA	6	-3.0	32%	-1.0	-0.4	
	7	50.7	30%	15.3	4.7	
	8	53.2	30%	16.1	4.1	
	9	55.8	30%	16.9	3.6	
	10	58.6	30%	17.8	3.1	30.0
	11	61.6	30%	18.6	2.7	
	12	64.7	30%	19.6	2.4	
Sales	13	67.9	30%	20.5	2.1	
	14	71.3	30%	21.6	1.8	
	15	74.8	30%	22.7	1.6	
	16	78.6	30%	23.8	1.4	
	17	82.5	30%	25.0	1.2	



Additional topics



Market approach for the valuation of early stage / pre-clinical stage companies

Stage: Preclinical - spinal cord injuries

Our Company

Market Capital: ???

Stage	Year	Cash flow \$ <i>m</i>	Proba- bility	Weighted cashflow \$ <i>m</i>	Present value \$ <i>m</i>	Total Value \$m
Phase I	1	-1.0	100%	-1.0	-0.9	
THASET	2	-1.0	100%	-1.0	-0.8	14.0
Comparable	3	39.8	59%	23.5	14.9	

Major assumptions:

- 1. Pre-clinical stage. Market approach.
- 2. Costs: \$2m Pl;
- 3. Probabilities for success: neurology disease (59.1% P1 to P2)
- 4. Discount rate: 20%
- **5. DLOM:** 25%

Asterias Biotherapeutics, Inc.

Public (Nasdaq)

Stage: Phase II clinical trial for spinal cord injuries

Market Capital: \$53 million (\$39.8m after DLOM of 25%)



DLOMs

Study name	DLOM	Type of study	Year pulished
Valuation Advisors	40%-60%	Pre-IPO	1998 - 2018
Finnerty	20%-50%	Option Pricing	2002
Emory	40%-50%	Pre-IPO	1980-2000
Longstaff	20%-65%	Option Pricing	1995

- Valuation analysts are often asked to value nonmarketable ownership interests in closely held (private) companies.
- Depending on the valuation approaches, analysts often have to
- apply a valuation adjustment to the initial (i.e., marketable) value indications in order to reach the final (i.e., nonmarketable) value conclusion.





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Thanks for listening

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