Funding Biotech

HCMG 8770

Spring 2024

[Last Updated 02/07/2024]

Contact Information

Lecturer: Alex C. Sapir
Email: asapir@wharton.upenn.edu
Office Hours: **TBD**

Teaching Assistants:
TBD
Office Hours: **By appointment**

Lectures

Class Meeting:

Monday, 10:15-11:45am, Location: Huntsman Hall (Room TBD)

Course Description

The biotechnology (biotech) industry is one of the most capital-intensive segments of the health care industry. The actual cost to bring a drug from the research labs to patients is estimated to be in the hundreds of millions of dollars, and yet only 10% of all drugs that enter human testing are ever approved, often failing due poor safety or lackluster efficacy. Therefore, when you factor in the cost of these drug failures, the cost to get a drug approved can reach into the billions. And that's not even considering the cost to market the drug once approved. Despite these inherent risks and high costs of drug development and marketing, there were over $500 billion of equity capital invested into biotech companies over the past 10 years signaling a robust market where returns are disproportionate to risk.

This course will explore funding these risky biotech ventures from two perspectives: the biotech CEO (primary focus of the course) and the biotech investor (secondary focus of the course). Students will learn about the various ways biotech companies are capitalized (e.g., equity, convertible/structured debt, licensing partnerships, clinical trial financing, royalty monetization, etc.) and the tradeoffs a biotech CEO considers when deciding which options to pursue at various stages of the company's evolution. We will also explore first-hand how the biotech investor thinks about the firm's capital structure when deciding to make an equity investment as well as understand the quantitative (e.g., market & competitive assessments, total financing needs of the firm, NPV) and qualitative (e.g., physician's proclivity to prescribe, strength of management, etc.) diligence the biotech investor performs prior to making an investment. For the final project, students will analyze the capital requirements for a biotech company make recommendations based on the financing options available to the firm.

Through readings, lectures, case studies, guest speakers, and a final project, students will learn concepts and analytical frameworks and acquire the tools and skills necessary to make important financing decisions as a biotech CEO.

Course Learning Objectives

The course's three key learning objectives, from most to least important,:

1. The five primary ways biotech CEOs fund their companies (equity, convertible / structured debt, licensing partnerships, clinical trial financing, and royalty monetization) and the opportunities and risks associated with these various financing vehicles (including how the biotech CEO considers these tradeoffs when making decisions how to finance their company).
2. To apply the tools and skills learned in the course and make recommendations to a biotech CEO on how best to capitalize the firm.
3. How the biotech equity investor makes decisions regarding which companies to fund and which to not fund.

Course Format

- Lecture/presentation by instructor
- Industry guest speakers
- Case study discussions
- Student projects and presentations to biotech senior management

Course Prerequisites

- FNCE 6110 or waiver granted

Course Materials

Required textbook: "Healthcare Finance: Modern Financial Analysis for Accelerating Biomedical Innovation," Andrew W. Lo and Shomesh E. Chaudhuri, 2023, 1st edition.

Readings: The textbook, cases, and course readings are listed below and are required. The readings will be posted on the course website (cases are available through Study.Net, other readings through Course Materials @ Penn Libraries).

Course Website: The course website is located at https://canvas.upenn.edu . The syllabus, case questions, assignments, and readings will be posted on this website.

Grading

Midterm Exam	**30%**
Final Project	**40%**
Class Participation	**30%**

1. **Midterm Exam:** The midterm exam will be closed book / closed note and will take place during class on **October 7th**.

2. **Final Project:** Students will work in teams (no more than five students) on a final project. Students will be assigned to a biotech company and will have access to the CEO / CFO. Students will assess the capital needs of the firm up to and potentially beyond positive cash flow and make recommendations to the firm's senior management on a capital strategy that aligns the interests of patients and investors. The final deliverable will be a 1-hour presentation to senior management. Grading will be based on depth of analysis, clarity of capital need recommendations, quality of presentation and feedback from the firm's senior management. Key questions to be answered include:
   - What is the firm's overall strategy and how has the firm been financed to date?
   - What are the firm's capital needs from a development, manufacturing, and commercial perspective?
   - Given where the company is in its evolution as well as its plans for the future, what are the financing options available to the firm and what are the tradeoffs of those various options?
   - Based on your analysis, what recommendations would you make to senior management on how best to fund the company in order to maximize the interests of patients and investors?

3. **Class Participation:** Class participation makes up 30% of the final grade. The class participation grade will be assessed using a combination of on-time class attendance (including guest speakers) and actively participating during in-class and case study discussions. There are always unforeseen circumstances throughout the semester than may cause you to miss class (i.e., illness, death in the family, religious holiday, etc.). Therefore, missing up to **two** classes during the semester will not affect your participation grade.

Classroom Guidelines and Policies

Attendance

Your on-time attendance for each class session is expected, as is your active participation. Students should remain in attendance for the duration of class. Missing up to **two** classes during the semester will not affect your participation grade.

Name Tent Cards

Display your name tent at each lecture including classes with guest speakers.

Laptops

Following Wharton's electronics policy, all phones, laptops, and other electronic devices must be turned off during class. Violations of this policy will lead to a lower participation grade. You may, however, use tablets and a stylus to take electronic notes during class.

Academic Honesty

All students should familiarize themselves with the University's guidelines on citations, plagiarism and academic dishonesty, which are found at:
http://www.upenn.edu/academicintegrity/ai_codeofacademicintegrity.html
Any violations of this policy will result in significant consequences, including but not limited to, grade deductions and reporting to the University.

Course Schedule and Required Reading

August 26:

Readings:

- Healthcare Finance – Chapter 1 (Why Healthcare Finance) & Chapter 2 (From the Laboratory to the Patient)

September 2: no class (Labor Day)

September 9:

Readings:

- Healthcare Finance – Chapter 3 (Present Value Relations) & Chapter 4 (Evaluating Business Opportunities)

September 16:

Readings:

- New Financing Methods in the Biopharma Industry: A Case Study of Royalty Pharma, Inc.
- Healthcare Finance – Chapter 15 (A Case Study of Royalty Pharma)

September 23:

Readings:

- TBD

Guest Speaker:

- **Capital Options for Biotech Companies: A Banker's Perspective**
  - *Lyla BiBi (Wharton HCM '06), Managing Director, Head of the US Healthcare Equity Capital Markets (ECM), Goldman Sachs*

September 30:

Readings:

- TBD

Guest Speaker:

- **Financing Clinical Trials and Building Manufacturing Plants**
  - *Terry-Ann Burrell, CFO, Beam Therapeutics*

October 7: Mid-Term Exam (in class)

October 14: no class (MBA Opportunity Week)

October 21:

Readings:

- Case Study: Transforming Alkermes into a Global Biopharmaceutical Company [available at Study.Net]

October 28:

Readings:

- Case Study: Genzyme/GelTex Pharmaceuticals Joint Venture [available at Study.Net]

November 4:

Guest Speaker:

- **When Things Don't Go According to Plan: Experience at PhaseBio**
  - *Jonathan Mow, CEO at Veralox Therapeutics*

November 11:

Readings:

- Case Study: Dicerna [available at Study.Net]
- *Healthcare Finance* – Chapter 11 (Healthcare Analytics), pages 252-267

November 18:

Readings:

- *Healthcare Finance* – Chapter 12 (Biotech Venture Capital), pages 272-296

Guest Speaker:

- **Making Equity Investments in Biotech Companies: What to Look / Watch Out for**
  - *Adam M. Koppel (Wharton HCM '00), Healthcare Partner, Bain Capital*

November 25:

Readings:

- *Business Models to Cure Rare Disease: A Case Study of Solid Biosciences,* Journal of Investment Management, Vol. 14, No. 4, (2016), pp. 87–101.
- *Extraordinary Measures* (Movie, CBS Films, 2010)

Guest Speaker:

- **There's something more important than capital when building a biotech company**
  - *John F. Crowley, CEO, Biotechnology Innovation Organization (BIO)*

Guest Speaker Bios

Lyla BiBi is head of the US Healthcare Equity Capital Markets (ECM) Group within Investment Banking. Prior to covering healthcare in 2015, she focused on financial institutions within ECM for eight years, primarily the bank, asset manager and advisory sectors. She initially joined Goldman Sachs in 2006 as an associate and was named managing director in 2015. Lyla rejoined the firm as a managing director in 2021. Prior to joining the firm in 2006, Lyla was an associate analyst at Sanford C. Bernstein and Co. Inc, within the medical devices and healthcare services team. Before rejoining the firm, she worked at Blackstone for a year, where she was head of ECM.

Lyla earned a BA in Political Science, with a minor in Economics, from Colgate University in 2000 and an MBA from the Wharton School of the University of Pennsylvania in 2006.

Terry-Ann Burrell is Chief Financial Officer of Beam Therapeutics. Prior to Beam, Ms. Burrell spent 11 years with J.P. Morgan, most recently as a Managing Director in the healthcare investment banking group. There, she had broad coverage across the biotechnology and pharmaceutical industries, helping to execute over $10 billion in equity and equity linked financings and more than $50 billion in M&A transactions. She was instrumental in advising clients on transaction considerations, including strategic rationale, valuation and structuring, and engaged with more than

100 companies during her tenure. Prior to J.P. Morgan, Ms. Burrell worked in equity research at Citigroup, where she covered specialty pharmaceuticals and generics.

Ms. Burrell holds an MBA from New York University Leonard N. Stern School of Business and a B.A. from Harvard University

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Jonathan Mow is the CEO at Veralox Therapeutics, a clinical stage company developing first-in-class small molecule therapeutics that treat the underlying pathologies of immuno-inflammatory diseases HIT and T1D as well as several programs in the discovery phase. Jonathan is a life sciences executive with more than 25 years of experience in biotechnology management and is the chief executive officer of Veralox. Previously he served as the chief executive officer of PhaseBio Pharmaceuticals (NASDAQ) where he led the company from early stages through Phase 3 development, including the company's IPO in 2018. Prior to PhaseBio, Jonathan served as vice president, business development for Amylin Pharmaceuticals until its sale to Bristol-Myers Squibb in 2012; co-founder and vice president, commercial and business development of Corus Pharma, Inc. until its acquisition by Gilead Sciences in 2006; and head of business development for PathoGenesis Corporation, until it's acquisition by Chiron Corporation in 2000. Jonathan has also held positions in marketing, marketing research and sales at Bristol-Myers Squibb, Wyeth/Lederle International and Syntex Laboratories.

Jonathan holds a BS in Mechanical Engineering from UC Berkeley and an MBA from Carnegie Mellon University Tepper School of Business.

Adam M. Koppel rejoined Bain Capital in 2016 as a Partner of Bain Capital Life Sciences. He initially joined Bain Capital in 2003 as a member of the Public Equity team where he worked as a

leader within the healthcare sector until 2014. From 2014 to 2016, Dr. Koppel was EVP of Corporate Development and Chief Strategy Officer at Biogen. Prior to initially joining Bain Capital in 2003, Dr. Koppel was an Associate Principal at McKinsey & Co in New Jersey where he served a variety of healthcare companies.

Dr. Koppel received an MD and PhD in Neuroscience from the University of Pennsylvania School of Medicine. He also received an MBA from The Wharton School at the University of Pennsylvania, where he was a Palmer Scholar. He graduated *magna cum laude* from Harvard University with an AB and AM in History and Science.

John F. Crowley is the CEO of Biotechnology Innovation Organization (BIO). He previously served as Executive Chairman and Chief Executive Officer of Amicus from 2005 to 2022. John's involvement with biotechnology stems from the 1998 diagnosis of two of his children with Pompe disease—a severe and often fatal neuromuscular disorder. In his drive to find a cure for them, he left his position at Bristol-Myers Squibb and became an entrepreneur as the Co-founder, President and CEO of Novazyme Pharmaceuticals, a biotech start-up conducting research on a new experimental treatment for Pompe disease (which he credits as ultimately saving his children's lives). In 2001, Novazyme was acquired by Genzyme Corporation and John continued to play a lead role in the development of a drug for Pompe disease as Senior Vice President, Genzyme Therapeutics.

John and his family have been profiled numerous times on the front page of The Wall Street Journal and are the subjects of a book by Pulitzer prize-winning journalist Geeta Anand, "The Cure: How a Father Raised $100 Million-And Bucked the Medical Establishment-In a Quest to Save His Children." The major motion picture, Extraordinary Measures, starring Brendan Fraser and Harrison Ford, is inspired by the Crowley family journey. John is the author of a personal memoir: Chasing Miracles: The Crowley Family Journey of Strength, Hope, and Joy.

John served as a commissioned officer in the U.S. Navy Reserve from 2005-2016, assigned to the United States Special Operations Command, and is a veteran of the global war on terrorism, with service in Afghanistan. The Crowley family was the recipient of the 2011 Family Exemplar Award from the University of Notre Dame. He is also a member of the University Council on Science & Technology at Notre Dame. Currently, John serves as a member of the Board of Directors of Intellia Therapeutics, Inc. and Entrada Therapeutics, Inc. He is the former National Chairman of the Make-A-Wish Foundation of America and is a founding Board member of the Global Genes Project. John is a Henry Crown Fellow at the Aspen Institute. He was awarded a Doctor of Laws Degree (Honoris Causa) from the University of Notre Dame, where he delivered the commencement address to the Class of 2020.

John graduated with a B.S. in Foreign Service from Georgetown University, and earned a J.D. from the University of Notre Dame Law School and an M.B.A. from Harvard.