



# New Stock Option Rules for Early Stage Companies

Dr. Stanley Jay Feldman, Axiom Valuation Solutions and  
Associate Professor of Finance, Bentley College

Ken Appleby, Foley & Lardner

Jack Malley, First Jensen Group





# Agenda

- I. Overview of Fair Value Changes Relevant for Early Stage Companies
- II. Update on Final 409A Regulations
- III. Valuation of Early Stage Companies for 409A and 123R Expense Calculations
- IV. What is a CFO to Do?



# **III. Valuation of Early Stage Companies: Establishing the Fair Value of a Private Firm's Common Stock**

**Dr. Stanley Jay Feldman**



## The Basic Value Identity (ownership%, value %)

Fair Value of Enterprise

=

- Fair Value of Debt (0%,10%)
- Fair Value of Equity
  - Series A
  - Series B
  - Series C
  - Common ( 50%, 20%)
    - Warrants
    - Options



## Twin Objectives: Pre-IPO

- Objective 1: A low fair value of common resulting in a low strike price is desirable since it supports the alignment of managers and owners and minimizes the cost associated with expensing of options.
- Objective 2: Maximize the value of the enterprise for purposes of capital raising.



## Achieving The Twin Objectives

- Developing a fair value methodology where the bulk of the enterprise value shows up in the preferred stock
  
- The fair value of the common stock, while it retains far less value, nevertheless should properly reflect the probability of achieving the embedded growth opportunity that is the basis for its current capital structure.
  - Liquidation preference model does not meet the fair value standard in this setting



## Measuring Fair Value of Common

- Step1: Estimate firm's enterprise value
- Step2: Use a model, e.g. contingent claims, to allocate equity between preferred and common
- Step3: Make adjustments for lack of liquidity and marketability
- Step 4: Subtract value of previously issued warrants and options from value in step3 to arrive at the fair value of common, i.e., the strike price.



# Enterprise Valuation Method Depends on Stage of Enterprise Development

Stage	Description	Valuation Approach
1	Early Start up	Real Option; Asset
2	Middle stage start-up; nor revenue or expense history	Real Option, and possibly income method depending upon facts
3	Late-stage start-up: product development milestones reached	Income and/or Market Methods
4	Initial product revenue; evidence that firm is on growth	Income and/or Market Methods
5	Expected positive cash flow emerges	Income and/or Market Methods
6	Established a profitable history	Income and/or Market Methods



# Contingent Claims Model Approach

- Well accepted model in corporate finance
- AICPA practice guide reviews its use in 409A and 123R settings



## Contingent Claims Model Approach

- Step 2: Estimate the value of common
- Value of a call option on the enterprise value
  - exercise price = preferred shareholders initial investment and accumulated unpaid dividends through the redemption date
  - less the value of the preferred stock's convertibility option
  - = value of common before the value of previously issued warrants and options have been subtracted from the common equity pie.



## Stage 2 Biotech Firm Enterprise Model: Compound Call Option

Summary Report Table 1: Fair Value of H3Capital Structure						
Row			Total	Shares in Class	Per Share	Source
1	Total Fair Value of H3		\$28,348,134			Table 5-10; Row 1
2	Value of Debt		\$28,896			Table 5-10; Row 2
3	Value of Equity (R1 - R2)		\$28,319,239			Table 5-10; Row 3
4	Liquidity Discount *		20%			Table 5-10; Row 7
5	Value of Equity adjusted for Liquidity (R3 * (1 - R4))		\$22,655,391			Table 5-10; Row 9A
6	Value of Preferred adjusted for Liquidity (see Allocation Model in Table 5-10, Row 9B)	\$20,601,268				Table 5-10; Row 9B
7	Value of Common adjusted for Liquidity but before any Warrants and Employee Stock Options (R5 - R6)	\$2,054,123				Row 5 - Row 6
8	Value of Warrants to purchase Common Stock	\$27,123		72,002		Table 5-10; Row 10
9	Value of Employee Stock Options issued in 2002	\$54,717		139,230		Table 5-10; Row 12
10	Value of Employee Stock Options issued in 2003	\$1,897		5,000		Table 5-10; Row 14
11	Value of Employee Stock Options issued in 2004	\$83,762		233,600		Table 5-10; Row 16
12	Value of Employee Stock Options issued in 2005	\$81,841		240,568		Table 5-10; Row 18
13	Value of Employee Stock Options issued in 2006	\$128,664		394,800		Table 5-10; Row 20
14	Total Value of Warrants (Common) and Employee Stock Options (R8 + R9 + R10 + R11 + R12 + R13)	\$378,003				Row 8 + Sum of Row 9 to Row 13
15	Value of Common adjusted for Liquidity, Warrants and Employee Stock Options (R7 - R14)	\$1,676,119		4,546,462	\$0.37	Table 5-10; Row 21
16	Total Allocated Value (R6 + R14 + R15)		\$22,655,391			Row 6 + Row 14 + Row 15

\* See Feldman, Principles of Private Firm Valuation (Wiley, 2005) for discussion of the size of the liquidity discount



## Key Input for 409A and 123R: Volatility

- Volatility is the standard deviation of returns on the firm's common stock
- Although the value of a call option increases with volatility, this is not necessarily the case in the contingent claims world since the value of the preferred stock convertibility option increases with volatility



## Measuring Volatility for a Private Firm

- Method 1: Selecting a set of peer public firms, calculate the return standard deviation, delever, calculate the median, and relever using the target firm's capital structure
- Method 2: CAPM-based: Convert equity cost of capital into volatility
- Method 3: See Cochrane , "The risk and return on venture capital", *Journal of Financial Economics*, 2004



## Example: Volatility of Peer Public Firms

Name of Firm	Ticker	Unlevered Annual Standard Deviation of Returns	Comparable Target Indications
Anadys Pharmaceuticals Inc.	ANDS	95.34%	CMV
ViroPharma Inc.	VPHM	299.58%	HIV
VaxGen Inc.	VXGN.PK	165.55%	Smallpox
AVANT Immunotherapeutics	AVAN	74.35%	HIV
Hemipherx BioPharma	HEB	168.49%	HIV
Orchestra Therapeutics	OCHT.OB	53.80%	HIV
CytRx Corp.	CYTR	214.67%	CMV & HIV
Panacos Pharmaceuticals Inc.	PANC	186.56%	HIV
Achillion Pharmaceuticals, Inc.	ACHN	63.95%	HIV
Incyte Corp.	INCY	46.67%	HIV
Idenix Pharmaceuticals	IDIX	55.35%	HIV
Adventrx Pharmaceuticals Inc.	ANX	185.34%	HIV
Progenics Pharmaceuticals Inc.	PGNX	120.94%	HIV
Pharmexa A/S	PHARMX.CO	36.06%	HPV & HIV
Omrix Biopharmaceuticals Inc.	OMRI	216.07%	Smallpox
Vertex Pharmaceuticals Inc.	VRTX	60.64%	HIV
Gilead Sciences	GILD	36.25%	CMV & HIV
<b>Average</b>		<b>122.33%</b>	
<b>Median</b>		<b>95.34%</b>	



# CAPM-based Volatility Measure

## CAPM – Capital Asset Pricing Model

1	CAPM Estimated Beta	4.33
2	CAPM Estimated Beta Squared	18.74
3	S&P 500 Annual Return Standard Deviation	12.73%
4	S&P 500 Annual Return Standard Deviation Adjusted for Capital Structure	9.79%
5	S&P 500 Annual Return Variance	0.96%
6	H3 Return Variance Based on CAPM: $R5^*R2$	17.95%
7	H3 CAPM Annual Return Standard Deviation	42.37%
8	Average: Comparables	122.33%
9	<b>Final Average Unlevered Volatility</b>	<b>82.35%</b>

H3 D/E Ratio	0.05
<b>H3 Levered Volatility</b>	<b>84.62%</b>



## Summary

- Fair value is a market-based measure that is a de-facto standard for financial reporting purposes.
- Implementation of the fair value standard requires the use of a complex set of valuation models.
- 409A and 123R require both independence and transparency.
- The fair value of common should reflect the growth opportunity inherent in the expected performance of the firm. If not, the common stock value will be below fair value.



# New Stock Option Rules for Early Stage Companies

Dr. Stanley Jay Feldman, Axiom Valuation Solutions and  
Associate Professor of Finance, Bentley College  
[stan@axiomvaluation.com](mailto:stan@axiomvaluation.com)

Ken Appleby, Foley & Lardner  
[kappleby@foley.com](mailto:kappleby@foley.com)

Jack Malley, FirstJensenGroup  
[jmalley@firstjensengroup.com](mailto:jmalley@firstjensengroup.com)