

Discounts for Lack of Marketability for Equity Securities in VC-Backed Companies

A COMPARISON OF APPROACHES

Amanda Miller – amanda.miller@ey.com

Dwight Grant – dwight.grant@us.pwc.com

ASA Fair Value Summit

November 14, 2012

ASA Fair Value Summit



AMANDA MILLER, PH.D.

EXECUTIVE DIRECTOR – COMPLEX SECURITIES PRACTICE, VALUATION & BUSINESS MODELING
ERNST & YOUNG, LLP

AMANDA.MILLER@EY.COM

650-496-4577

Amanda Miller has over 15 years of experience in assisting clients with the valuation of illiquid investments, equity & fixed income derivatives, contingent assets and liabilities and other complex securities. Specific areas of focus include:

- *Privately-Held Company Securities*, including preferred stock, common stock, options, warrants, management incentive plans with performance and market conditions, and related analyses
- *Illiquid Credit Instruments*, including convertible notes & related derivatives, auction rate securities and structured products
- *Private Equity & Venture Capital*, including various complex investments, for financial reporting and tax
- *Contingent Considerations and other Probabilistic Models*, including earnouts / clawbacks, warranties and other guarantees, analysis of variable interest entities and Value at Risk modeling

Amanda earned her Ph.D. at Stanford University in Electrical Engineering in 1994, where her thesis developed a new statistical approach for Positron Emission Tomography (“PET”) imaging. She also holds dual M.S. degrees in Statistics and Electrical Engineering from Stanford, and dual B.S. degrees in Mathematics and Engineering & Applied Science from Caltech. She completed the Berkeley Finance Series programs in Derivatives and Bonds, ABS & Risk Management in 2007.

ASA Fair Value Summit



DWIGHT GRANT, PH.D.

MANAGING DIRECTOR – VALUE ANALYTICS PRACTICE, TRANSACTION SERVICES

PRICEWATERHOUSECOOPERS, LLP

DWIGHT.GRANT@US.PWC.COM

415-498-8116

Dwight has worked as a valuation professional for 6 years. Prior to that he taught Finance in universities in the United States and Canada and conducted research in finance and economics. He has published more than 35 articles in refereed journals including the *Journal of Political Economy*, *Journal of Finance*, *Journal of Derivatives* and *Management Science*. Dwight specializes in the valuation of complex financial assets and derivatives. He has served as an expert witness in more than 50 cases, many of which involved valuation.

Dwight is actively engaged in the valuation of preferred stock, common stock, options, warrants, convertible bonds, contingent consideration, management incentive plans and other complex derivatives. Prior to joining PwC, Dwight was managing director and leader of the Financial Engineering practice at Duff & Phelps, where he led the valuation of a wide range of complex securities including: Securities in private companies, complex management incentive awards, swaps and options on a large range of underlying assets, many complex structured products tied to the financial crisis and the TARP securities.

Dwight holds a PhD and an MBA in finance from the Wharton School at the University of Pennsylvania and a BA in economics from the University of Western Ontario.

ASA Fair Value Summit



BILJANA MARIJANOVIC

MANAGER – COMPLEX SECURITIES PRACTICE, VALUATION & BUSINESS MODELING
ERNST & YOUNG, LLP

BILJANA.MARIJANOVIC@EY.COM

415-894-8279

Biljana Marijanovic has over 5 years of experience in assisting clients with the valuation of equity securities and derivatives, debt securities (including hybrid securities), contingent assets and liabilities and other complex contracts. Specific areas of focus are:

- *Equity Derivatives:* including warrants, employee stock options, convertible notes and convertible preferred; valuation of embedded derivatives including conversion and early redemption features, make whole provisions, and change-in-control and other company specific contingencies of convertible debt, convertible preferred or other hybrid instruments; valuation of preferred and common stock in privately-held companies with complex capital structures.
- *Debt Instruments:* including valuation of corporate debt, intercompany debt, mezzanine and early stage debt, as well as debt modifications taking into account current trends in a company's cost of borrowing and performing synthetic credit rating analyses; illiquid credit instruments, including convertible notes and related derivatives.

Biljana earned her M.S. at University College, London (UK) in Mathematical Modeling. She also holds dual B.S. degrees in Applied Mathematics and Electrical Engineering from Southern Methodist University (Dallas, TX).

AGENDA

- Introduction
- Equity value and marketability considerations
 - Marketability of the investor interests
 - Marketability of the junior interests
- Discount for lack of marketability (DLOM) approaches
- Assessing DLOMs in put-based approaches
 - Volatility in a complex capital structure
 - Differential DLOM
- Examples
- Discussion

INTRODUCTION

- Marketability refers to the ability to quickly exchange an asset for its full value.
 - Common stocks traded on the NYSE are examples of securities that are highly marketable: any value sacrificed for execution speed is very small.
 - Houses are examples of assets that are often much less marketable than listed stocks: the value sacrificed for execution speed can be substantial.
- The securities in private companies are typically much less marketable than houses, and often very much less so.
 - If investors, acting as a group, can sell the company, then their securities may be as marketable as the company itself, which is typically not very marketable.
 - In some cases, there are over-the-counter markets in the securities of private companies. The degree of marketability there varies on a case-by-case basis.
 - In many instances, there is no market whatsoever or security transfers are restricted and, in those cases, marketability will be achieved only at a future date.
- Discounts for lack of marketability (DLOMs) are widely accepted as a way to distinguish between freely traded securities and illiquid securities.

DISCOUNTS FOR LACK OF MARKETABILITY

- American Society of Appraisers defines DLOM as:
 - “Theoretically, the marketability discount is that discount necessary to generate a sufficient increment in return to the (prospective) purchaser of a minority interest of an entity’s closely held shares to induce the purchaser to make this particular investment rather than an alternative investment identical in all respects save marketability.”
 - “Stated alternatively, if predictable and observable returns can be obtained from two investments—one in a marketable stock and the other in a non-marketable stock—other things being equal, a rational investor will pay somewhat less for the non-marketable shares than for the freely tradable shares.”

EQUITY VALUE AND MARKETABILITY CONSIDERATIONS

\$50
MILLION

VS.

\$30
MILLION

- Basis
 - Cash flows under current ownership, discounted at the investors' required rate of return
- Rationale
 - Consistent with the breakpoints (if using option pricing method, or OPM), consistent with what investors will pay (or have paid) for an interest in the business

MARKETABILITY OF THE INVESTOR INTERESTS

- Since we measured the equity value consistent with the investors' required rate of return, no DLOM is needed for shares that have all the rights that investors typically expect
- Examples of rights that investors typically expect include:
 - Information rights
 - Board seats
 - Drag along, tag along, right of first refusal
 - Veto power over changes to the articles
 - Veto power over transactions

MARKETABILITY OF THE JUNIOR INTERESTS

- To the extent that the shares being valued do not have all the rights that investors expect, we would expect them to be less marketable than the investor interests
- A market participant investing in these shares would require a higher rate of return than the model would otherwise indicate

DL0M APPROACHES

- There are at least three widely practiced approaches to adjusting for a lack of marketability ⁽¹⁾:
 - A qualitatively determined percentage adjustment to value based on facts, circumstances, empirical data and judgment - also referred to as the “Restricted Stock Study Adjustment Method.”
 - A qualitatively determined adjustment to the required rate of return of a security based on facts, circumstances, empirical data and judgment.
 - A quantitatively determined percentage adjustment to value based on a “protective put” model and judgment. The put models require an input related to the underlying security’s volatility.

(1) See Appendix A for DL0M literature.

RESTRICTED STOCK STUDY ADJUSTMENT METHOD

- Transactions in the restricted stock of publicly traded companies provide insights into the nature of the potential adjustment attributable to lack of marketability.
 - Median discount observed in these studies range from 13% to 45%
 - Factors that appear to be most significant:
 - the underlying volatility of the stock
 - the restriction period of the stock in the transaction
 - the size of the block being sold as a percent of shares outstanding
- The Practice Aid does not endorse estimating a DLOM based solely on reference to studies; rather, each situation should be evaluated based on its individual facts and circumstances.

RESTRICTED STOCK STUDY ADJUSTMENT METHOD (CONT)

- Pre-IPO studies estimate implied DLOM using the price a stock exhibited in private transactions prior to an IPO, when compared to the publicly traded price subsequent to the IPO.
 - Studies using this data have indicated an average downward adjustment of 21% to 66% (from 1980 to 2002)
- Potential issues:
 - As only successful IPOs are tracked in the study, this data may reflect a sample bias.
 - Further, because much of the underlying “transaction” data is based on stock option grants rather than actual sales of stock, the data may not accurately reflect arm’s-length prices.
- Reliance on Pre-IPO studies has diminished in current valuation practice.

ADJUSTMENTS TO REQUIRED RATE OF RETURN

- Another DLOM approach is to directly adjust the required rate of return for the security, using a qualitatively determined adjustment based on facts, circumstances, empirical data and judgment.
- Expression for value, where PV is the present value, $E[CF_t]$ is the expected cash flow at date t , and r is the required rate of return.

$$PV = \frac{E[CF_1]}{(1+r)^1} + \frac{E[CF_2]}{(1+r)^2} + \frac{E[CF_3]}{(1+r)^3} + \dots + \frac{E[CF_n]}{(1+r)^n}$$

- Expression for value, PV^* , where the value has been adjusted for a lack of marketability by increasing the required rate of return by d .

$$PV^* = \frac{E[CF_1]}{(1+r+d)^1} + \frac{E[CF_2]}{(1+r+d)^2} + \frac{E[CF_3]}{(1+r+d)^3} + \dots + \frac{E[CF_n]}{(1+r+d)^n}$$

QUANTITATIVE MODELS

- A third approach is quantify a percentage adjustment to value based on a variety of “put” models.
- Non-marketable security has the same value as a portfolio composed of the security and an at-the-money put on the security with a term equal to the non-marketable period.
 - The DLOM, in percent, is the ratio of the put’s value to the security’s value.
- Subsequent articles have proposed variations on this basic idea by proposing different put models and, in some cases, supporting them with empirical data. *(See Appendix A)*
- Major input in any put-based quantitative model is the volatility – the question is, which volatility?

ESTIMATING VOLATILITY FOR PUT-BASED DLOM MODELS

- The volatility in a put-based model is used as a measure of the risk of the security – the higher the risk, the higher the DLOM
- In practice, many valuation professionals assume that the volatility for common stock will be the same as the overall equity volatility for the enterprise
- In theory, it would be more reasonable to consider the volatility for each security specifically ⁽¹⁾
 - Generally, common stock will have a “high” volatility relative to the overall equity volatility due to its leverage in the capital structure
 - Latest round of financing will have a “low” volatility relative to the overall equity volatility

(1) For example, see Neil J. Beaton and Stiliian Ghaidarov, “Option Pricing Model”, Valuation Strategies, November/December 2009.

DIFFERENTIAL PUT DLOM

- If the volatility for each security within an enterprise is different, it is possible to estimate the volatility for each security
- The “Differential DLOM”
 - Possible to say that a DLOM is already incorporated into the value of the latest round of preferred stock (using its volatility)...
 - ...and then estimate incremental DLOM for the junior classes (using their volatilities)
- Differential DLOM:

$$1 - DLOM_{Cs} = (1 - DLOM_{Pf}) * (1 - DLOM_{Incremental})$$

resulting in:

$$DLOM_{Incremental} = 1 - \frac{1 - DLOM_{Cs}}{1 - DLOM_{Pf}}$$

ASA Fair Value Summit

EXAMPLE: CALCULATIONS, DIFFERENTIAL PUT DLOM

BEV	\$6,757,620	\$6,757,620		
	Breakpoints			
Liquidation preference (K)		\$5,000,000		
Call Option		\$3,515,240		
Call Option Spread	\$3,242,380	\$3,515,240		
	Ownership Claim			
Preferred A	100%	50%		
Common		50%		
	100%	100%		
	Value of Ownership Claim		Total	Total (1-Incrm. DLOM)
Preferred A	\$3,242,380	\$1,757,620	\$5,000,000	\$5,000,000
Common		\$1,757,620	\$1,757,620	\$1,079,405
Total			\$6,757,620	\$6,079,405
$N(d_1)$	1.000			
Delta spreads	0.195			
	Security Delta		Total	Volatility
Preferred A	0.195	0.402	0.598	40.4%
Common		0.402	0.402	77.3%
	S	σ	DLOM (Percent)	DLOM (Incremental)
Preferred A	\$5,000,000	40.4%	32.6%	0.0% (1)
Common	\$1,757,620	77.3%	58.6%	38.6% (2)

(1) Calculation: $1 - (1 - 0.586) / (1 - 0.586)$

(2) Calculation: $1 - (1 - 0.586) / (1 - 0.326)$

ASA Fair Value Summit

EXAMPLE: SOLVING TO A FULLY MARKETABLE VALUE CONSISTENT WITH A PUT-BASED DLOM FRAMEWORK

- In this example an appraiser has estimated the fully marketable value of the equity of a company, consistent with a put-based DLOM framework, to be \$10.03 million
- Two securities outstanding:
 - Participating preferred with a liquidation preference of \$7.423 million and a 50% participation
 - Common stock with 50% participation
- The equity volatility is 50%, the time to liquidity is 5 years, the risk-free rate of interest is 0.67%
- The next slide shows the allocation of value and application of the DLOMs
 - As in the first example, the value of the preferred is \$5.0 million and of the common is \$1.08 million.
 - These two sets of calculations are mathematically identical and the comparison extends to multiple issuances of preferred.

ASA Fair Value Summit

EXAMPLE: CALCULATIONS, FULLY-MARKETABLE VALUE

BEV	\$10,032,342	\$10,032,342		
	Breakpoints			
Liquidation preference (K)		\$7,422,985		
Call Option		\$5,218,714		
Call Option Spread	\$4,813,628	\$5,218,714		
	Ownership Claim			
Preferred A	100%	50%		
Common		50%		
	100%	100%		
	Value of Ownership Claim		Total	Total(1-DLOM)
Preferred A	\$4,813,628	\$2,609,357	\$7,422,985	\$5,000,000
Common		\$2,609,357	\$2,609,357	\$1,079,405
Total			\$10,032,342	\$6,079,405
$N(d_1)$	1.000			
Delta spreads	0.195			
	Security Delta		Total	Volatility
Preferred A	0.195	0.402	0.598	40.4% (1)
Common		0.402	0.402	77.3%
	S	σ	DLOM (Percent)	DLOM (Value)
Preferred A	\$7,422,985	40.4%	32.6%	\$2,422,985
Common	\$2,609,357	77.3%	58.6%	\$1,529,952

(1) Calculation: $40.4\% = (50\%)(0.598)(10.032/7.422)$

COMPARISON OF APPROACHES FOR BACKSOLVING

- **Case 1**
 - Solve for the equity value consistent with transaction without adjustment, then apply a DLOM for common stock (as suggested by the AICPA Guide).
- **Case 2**
 - Apply a premium to the Series A price and to the liquidation preference using a Protective Put DLOM (preferred volatility), to estimate the fully marketable equivalent of the transaction consistent with a put-based DLOM framework. Then apply a Protective Put DLOM to each security.
- **Case 3**
 - Apply a premium to the Series A price but **not** to the liquidation preference, then solve for the equity value consistent with this price. Then apply a Protective Put DLOM to each security.
- **Case 4**
 - Solve for the equity value consistent with transaction without adjustment, then apply a use Protective Put DLOM (with 50% volatility) to discount total equity value before allocating.

ASA Fair Value Summit

COMPARISON OF APPROACHES FOR BACKSOLVING

	Total Equity Value		A		Common		DLOM Volatility	DLOM
	As Solved	With DLOM	As Solved	With DLOM	As Solved	With DLOM		
Case 1	\$6,758	\$6,758	\$5,000	\$5,000	\$1,758	\$1,072	40.4% (pref); 77.3% (common)	39% (Differential) for common
Case 2	\$10,086	\$10,086	\$7,463	\$5,000	\$2,623	\$1,076	40.4% (pref); 77.3% (common)	33% for A, 59.0% for common
Case 3	\$11,085	\$11,085	\$7,463	\$5,000	\$3,623	\$1,485	40.4% (pref); 77.3% (Common)	33% for A, 59.0% for common
Case 4	\$6,758	\$4,055	\$3,297	\$3,297	\$757	\$757	50.0%	40% for total equity

Note: All calculations assume 50% overall equity volatility and 0.67% risk-free rate

ASA Fair Value Summit

EXAMPLE: EVOLUTION OF VALUE FOR A SUCCESSFUL START-UP

Purpose of this example is to explore the results from different DLOM methodologies as a company evolves:

○ Series A

- \$5m total at \$1.00/share
- 50% fully diluted shares out of 10m shares outstanding
- 5 years to liquidity event

○ Series B

- \$10m total at \$2.00/share
- 33% fully diluted shares out of 15m shares outstanding
- 3 years to liquidity event

○ Series C

- \$15m total at \$5.00/share
- 16.7% fully diluted shares out of 18m shares outstanding
- 2 years to liquidity event

○ Series D

- \$20m total at \$10.00/share
- 10% fully diluted shares out of 20m shares outstanding
- 1 year to liquidity event

ASA Fair Value Summit

EXAMPLE: COMPARISON, CONVERTIBLE PREFERRED

Value	Total Equity Value (aggregate)	Term	A	B	C	D	Common Stock
Scenario A	\$8,128	5.0	\$1.00	n/a	n/a	n/a	\$0.63
Scenario B	\$23,603	3.0	\$1.52	\$2.00	n/a	n/a	\$1.20
Scenario C	\$58,979	2.0	\$2.90	\$3.22	\$5.00	n/a	\$2.68
Scenario D	\$111,835	1.0	\$4.87	\$5.01	\$6.15	\$10.00	\$4.79

DLOM	Scenario A	Scenario B	Scenario C	Scenario D
Differential put (common stock volatility vs A)	29.0%	19.0%	9.0%	1.0%
Differential put (common stock volatility vs latest round)	29.0%	30.0%	30.0%	25.0%
Protective Put (common stock volatility)	52.0%	46.0%	38.0%	27.0%
Asian Put (common stock volatility)	35.0%	29.0%	23.0%	16.0%
Finnerty (common stock volatility)	28.0%	25.0%	21.0%	15.0%
Protective Put (OPM volatility)	40.0%	32.0%	27.0%	19.0%
Asian Put (OPM volatility)	25.0%	20.0%	16.0%	11.0%
Finnerty (OPM volatility)	23.0%	19.0%	16.0%	11.0%

Note: All calculations assume 50% overall equity volatility and 0.67% risk-free rate

ASA Fair Value Summit

COMPARISON, CONVERTIBLE PREFERRED

Common fair value per share

	Scenario A	Scenario B	Scenario C	Scenario D
Differential put (common stock volatility vs A)	\$0.44	\$0.97	\$2.44	\$4.74
Differential put (common stock volatility vs latest round)	\$0.44	\$0.84	\$1.87	\$3.59
Protective Put (common stock volatility)	\$0.30	\$0.65	\$1.66	\$3.50
Asian Put (common stock volatility)	\$0.41	\$0.85	\$2.06	\$4.02
Finnerty (common stock volatility)	\$0.45	\$0.90	\$2.12	\$4.07
Protective Put (OPM volatility)	\$0.38	\$0.81	\$1.95	\$3.88
Asian Put (OPM volatility)	\$0.47	\$0.96	\$2.25	\$4.26
Finnerty (OPM volatility)	\$0.48	\$0.97	\$2.25	\$4.26

Common fair value per share as % of latest round

	Scenario A	Scenario B	Scenario C	Scenario D
Differential put (common stock volatility vs A)	44.4%	48.5%	48.7%	47.4%
Differential put (common stock volatility vs latest round)	44.4%	41.9%	37.5%	35.9%
Protective Put (common stock volatility)	30.0%	32.3%	33.2%	35.0%
Asian Put (common stock volatility)	40.7%	42.5%	41.2%	40.2%
Finnerty (common stock volatility)	45.0%	44.9%	42.3%	40.7%
Protective Put (OPM volatility)	37.5%	40.7%	39.1%	38.8%
Asian Put (OPM volatility)	46.9%	47.9%	45.0%	42.6%
Finnerty (OPM volatility)	48.2%	48.5%	45.0%	42.6%

Note: All calculations assume 50% overall equity volatility and 0.67% risk-free rate

DISCUSSION – SO WHAT MAKES SENSE?

- What level of DLOM is reasonable?
- What should the fair value of the common stock be relative to the latest round?

ASA Fair Value Summit

QUESTIONS?

APPENDIX A – DLOM LITERATURE

- Protective Put:
 - Chaffe, DBH III. “Option Pricing as a Proxy for Discount for Lack of Marketability in Private Company Valuations” Business Valuation Review, 1993.
- Longstaff Method (upper bound):
 - Longstaff, Francis A. “How Much Can Marketability Affect Security Values? 67 1995 385-410, Journal of Finance.
- Finnerty Method:
 - Finnerty, John. “An Average-Strike Put Option Model of the Marketability Discount” Journal of Derivatives, Summer 2012.
- IRS Summary publication:
 - IRS. “Discount for Lack of Marketability” Job Aid for IRS Valuation Professionals September 25, 2009 Developed by Engineering/Valuation Program DLOM Team