AN ALERT FROM THE BDO FINANCIAL SERVICES PRACTICE

ASSET MANAGEMENT INSIGHTS

DEMYSTIFYING VALUATION METHODOLOGIES:
PART 1 – THE OPTION PRICING MODEL (OPM)

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INTRODUCTION

On August 1, 2019, the AICPA released the much-anticipated Accounting & Valuation Guide, "*Valuation of Portfolio Company Investments of Venture Capital and Private Equity Funds and Other Investment Companies*"—also known as the "AICPA Guide" or the "Guide". Understanding the nuances of appropriate valuation methodologies is challenging and as such the intent of the following, the first of a mini-series, is to address various valuation methodologies highlighted in the AICPA Guide which are generally deployed for valuing Level III investments.

The purpose of our series is purely educational in nature and we would refer end-users to the AICPA Guide and their own unique facts and circumstances in considering the appropriate valuation methodology for the specific circumstances at hand. We will begin each series by discussing the valuation methodology, the mechanics of how the technique is intended to work, the benefits inherent in the technique and the pitfalls of each.

The first valuation methodology we will cover in our series is the Option Pricing Model (OPM). In considering the use of the OPM for the allocation of a company's aggregate equity value to the underlying equity securities, it's important to reflect upon the commonly used equity allocation methods; OPM, a current value method (CVM) (i.e., a waterfall), a scenario based method such as the probability-weighted expected return method (PWERM) and a hybrid method (i.e., a combination of a scenario based method along with an OPM). For a detailed explanation of these equity allocation methods, please refer to Chapter 8 of the AICPA Guide.

THE OPM & OPM BACKSOLVE

In its purest form, the OPM is a Black-Scholes-based mathematical model that uses various inputs to calculate option strike prices (both put and call options) as of a future date. In the context of a private company's capital structure, the OPM strives to calculate the fair value of common stock based on the total equity value of a company. Total equity value used in the OPM model is often the company's most recent "post money" capital raise / equity financing round. A series of future call options representing various share classes, rights and preferences are assigned a tranche of future value based on the current equity value and based on volatility, estimated time to exit and various features of the company's equity securities, such as liquidation preferences, and anticipated dividend payouts.

BDO'S ASSET MANAGEMENT PRACTICE

BDO's Asset Management practice provides assurance, tax and advisory services to asset management entities, comprising hedge, private equity and venture capital funds as well as regulated funds. The practice services over 600 advisors nationwide with funds ranging from start-up funds to those with billions under management.

An iteration of the OPM, the "OPM backsolve", or reverse OPM, is most commonly utilized by CFOs in the fund world. On its surface, it attempts to answer the following question: What would an enterprise's equity value need to be for a marginal or new outside investor to invest on a per share basis, considering the company's current equity stack, which includes all of the existing share classes with their respective seniority, rights and preferences?

BENEFITS

- The OPM is ideal for situations in which companies have complex capital structures (i.e., more than 1 class of equity securities) and the end-user is attempting to allocate value amongst share classes in the stack.
- In situations where fundraising has not occurred for years and the last round of financing may be stale, the OPM at least attempts to identify a fair value based on comparable companies' metrics. While not perfect, it can take volatility and any share rights or preferences and solve for a fair value even though the last round of financing may be dated. It can provide a basic level of clarity to a new investor who is hesitant to invest at that aged round of financing.
- In pre-revenue situations, often the case in life sciences and technology companies, the OPM can arrive at a value where the market may be skeptical to assign any equity value.

PITFALLS

Inputs:

- In constructing the breakpoints in the OPM, the fund's management team, its General Partner and even fund formation attorneys often do not respect the option value and seniority of the preferred shares. This can have unintended consequences. For example, in the case of the OPM backsolve, when solving for the total equity value (total enterprise value in the absence of debt), if the preferred classes and their liquidation preferences are not accurately accounted for, the output could be meaningfully understated. In fact, the vast majority of fund CFOs dilute the preferred share class' value by dividing the value allocated to the preferred class by total shares outstanding arriving at a common share equivalent (CSE), or often referred to as an "as-if converted" to common stock value.
- Time to exit is a subjective gauge of the target company's IPO or strategic sale. Similarly, volatility is often subjective and contingent on a subset of similar private companies, which are often not appropriate and either underestimate or overestimate the private company's volatility.

Counter-intuitive/Circular Reference:

- When volatility in the public markets increase this usually equates to a declining stock market. Unfortunately, the OPM deciphers the increased volatility as an indication that "out of the money" options or warrants would come into play since there may be a greater perceived opportunity of an anomaly or large equity movement. In fact, just the opposite would often occur; enterprise value would coalesce around the liquidation preferences and thus bolstering the value of the preferred equity.

Pending IPO or Strategic Exit:

- In instances where a private equity is about to experience a strategic sale or initial public offering, we have found that value indications offered by the OPM are, in practice, quite meaningless. For example, in the situation of an IPO, all the preferred shares convert to a single common share class. Also, the market's perception of value will best approximate the investment's value in lieu of a mathematical model attempting to approximate such a value (i.e. the OPM).

OPM MECHANICS & INPUTS

Simply put, the OPM model relies on key inputs and the most recent post-money equity value to assign value to each preferred share class, common share class and common share equivalents. An iteration of the basic OPM, the OPM backsolve, takes the calculation a step further and attempts to quantify the correct equity value through a number of iterations using the most recent preferred equity raise as an anchor. However, for purposes of this series, we will discuss the basic OPM.

The following represent the key inputs that are used in the OPM calculation. A few of the key inputs into the model must be carefully considered and verified to the best of the end-user's ability.

- Time to exit – This is the assumed time until the underlying company has a strategic exit or an IPO.
- Volatility – Volatility measures how the underlying company would correlate to the overall market based on a similar set of companies in the same or similar industry verticals and, ideally, with similar growth metrics and investment characteristics. The selected volatility needs to be reflective of the estimated volatility over the time to exit (i.e., the investment horizon or holding period).
- Risk-free rate – Often, the risk-free rate is the U.S. Government Treasury Security yield. Consistent with the time to exit and volatility, the risk-free rate assumption needs to be reflective of the investment horizon. Often, it is necessary to interpolate the risk-free rate (generally calculated on a linear basis) assumption so that the interest rate matches the time to exit.
- Dividend assumptions – This is generally nil for venture capital backed companies but does come into play for private equity investments, particularly later stage Limited Liability Companies that make distributions to cover income taxes.

The inputs should be realistically assessed. As with any model, the "garbage-in, garbage-out" metaphor applies.

BASIC MECHANICS

As stated, the end goal of the OPM is to assign equity value to each share class based on the key inputs discussed above. So, what are the mechanics of this exercise? First, using a liquidation scenario for each share class in the company's equity structure or "stack" is assigned a "breakpoint" to demonstrate where these share classes would have value based on different liquidation or exit scenarios of the underlying company. This is performed for the most recent preferred security all the way up to the point all of the share classes are "in the money" (i.e., the intrinsic value is greater than zero) and ultimately until the last bucket is tipped – where preferred shares convert to common. Next, employing the Black-Scholes option pricing model, an implied underlying option value (using key inputs) is derived for each share class to capture the time value of the securities for the passage of time over the selected time to exit (i.e., holding period).

Exhibit A illustrates the application of the OPM with a subject company's capital structure that includes three classes of preferred stock (i.e., Series A through C) and common stock. The use of an OPM in this example is believed to be appropriate and yields credible value indications for the subject company's equity securities. The example utilizes the following key inputs:

- Total equity value – $1,154,451 (i.e., the value of all classes of equity to be allocated amongst the classes of equity securities)
- Time to exit – 5 years to a potential liquidity event
- Volatility – 50% which represents the selected annual equity volatility
- Risk-free rate – 2.5% which matches the time to exit / selected term of 5 years
- Dividend assumption – Zero (0) dividends expected over the selected term / time to exit

Based on the key inputs above, the example yields the following per share values for the subject company's equity securities:

- Series A Preferred – $1.27 per share
- Series B Preferred – $1.42 per share
- Series C Preferred – $2.00 per share
- Common Stock – $ 1.10

Capitalization Table

As of December 31, 2018

Exhibit A

(In Thousands)

Capitalization Table			
Security	**Number of Shares**	**Number of Fully Diluted Shares**	**Percent Ownership – Fully Diluted**
Series C	200	200	23.53%
Series B	100	100	11.76%
Series A	50	50	5.88%
Common	500	500	58.82%
Total	**850**	**850**	**100.0%**

Option Pricing Method – Breakpoint Analysis

As of December 31, 2018

Exhibit B

(In Thousands)

Black-Scholes Model	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7
	Series C LP	Series B LP	Series A LP	Common Participates	Series A Converts	Series B Converts	Series C Converts
Equity Value	1,154	1,154	1,154	1,154	1,154	1,154	1,154
Exercise Price	0	400	550	613	1,238	1,375	1,700
Expected Term	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Equity Volatility	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Risk-Free Rate	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%
Dividend Yield	–	–	–	–	–	–	–
Call Option Value	1,154	849	765	734	508	473	403
Incremental Call Option Value	**305**	**84**	**31**	**226**	**35**	**69**	**403**

Breakpoint Analysis		Breakpoint 1	Breakpoint 2	Breakpoint 3	Breakpoint 4	Breakpoint 5	Breakpoint 6
Security	**Total Fully Diluted Shares**	**–**	**–**	**–**	**1**	**2**	**2**
Series C	200	400					400
Series B	100		150			150	50
Series A	50			63	63	13	25
Common	500				625	125	250
Total	**850**	**400**	**150**	**63**	**688**	**288**	**725**
Less: Liquidation Preference					63	150	400
Less: Exercise Proceeds							
Cumulative Breakpoint		**400**	**550**	**613**	**1,238**	**1,375**	**1,700**

Option Pricing Method – Allocation and Value Summary

Exhibit C

As of December 31, 2018

(In Thousands)

Allocation of Value		Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7
Security	Total Fully Diluted Shares	Series C LP	Series B LP	Series A LP	Common Participates	Series A Converts	Series B Converts	Series C Converts
Series C	200	100.00%						23.53%
Series B	100		100.00%				15.38%	11.76%
Series A	50			100.00%		9.09%	7.69%	5.88%
Common	500				100.00%	90.91%	76.92%	58.82%
Total	**850**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**
Fully Diluted Shares Participating		**NA**	**NA**	**NA**	**500**	**550**	**650**	**850**

Indicated Value Summary	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7		
Security	Series C LP	Series B LP	Series A LP	Common Participates	Series A Converts	Series B Converts	Series C Converts	Aggregate Value	Aggregate Per Share Value (Actuals)
Series C	305	–	–	–	–	–	95	$400	$2.00
Series B	–	84	–	–	–	11	47	142	$1.42
Series A	–	–	31	–	3	5	24	63	$1.27
Common	–	–	–	226	32	53	237	549	$1.10
Total								**$1,154**	

These values represent a call option strike price or what the tipping point (in terms of liquidation value) would need to be for this share class to begin accruing value. The next step is a calculation of each preferred share class's **incremental** option value based on the initial option value. This begins with the preferred share's incremental option value based on the option value less the total equity value estimate. For subsequent share classes, the previous option value is deducted from the current option value to arrive at the incremental option value for each share class. Finally, the values of all incremental option values are applied to each share class until reaching the final share class scenario of when all the buckets are filled and preferred equity would convert to common equity. The summation of the initial preferred value per share is then calculated.

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