



GREGORY A. BARBER

Traditional valuation methods are often difficult to apply to privately owned, development-stage companies.



Valuing Common Stock in
**DEVELOPMENT-STAGE
COMPANIES**



Valuing the common shares of private, development-stage companies has tested the resources and skills of valuation professionals for years. Traditional valuation methods are often difficult to apply. For example, when valuing early-stage companies, the income approach, at times, yields results that are very sensitive to small changes in assumptions. This sensitivity usually results because of the significant leverage in the capital structure of the company, the high discount rate, and the long period of anticipated negative cash flows. As an added difficulty, the market approach is almost impossible to use because of a lack of comparable publicly traded companies. Nevertheless, valuation profes-

sionals are routinely asked to value these securities, often to support the administration of a company's stock option plan before an anticipated initial public offering (IPO).

Both APB No. 25 (Accounting for Stock Issued to Employees) and FAS No. 123 (Accounting for Stock-Based Compensation) require companies to determine the "fair value" of the security used in their option plans. Usually the security involved is the common shares of the company. This value is easily ascertainable if the company is public, but in a private company, an independent valuation is usually required. The value of the common shares used to set the strike price for options grants has, for the past several years, received considerable scrutiny by the SEC, especially for options granted in the 12 months before an IPO. Options granted at strike prices below fair value require companies to reflect a compensation charge on their

income statements. In a period when positive earnings in technology companies are becoming more important, companies would be wise to procure independent valuation opinions at the time of stock option grants.

Absent any evidence to the contrary, the SEC has looked to the IPO price, convertible preferred stock offerings, and arm's-length transactions in the company's common shares as indications of the subject company's common stock value. From a valuation perspective, an arm's-length transaction in the company's common stock is a strong indicator of value, especially if the market for the shares is reasonably efficient, and may obviate the need for a valuation. Using the IPO price as an indicator of value, although conservative, suffers from material shortcomings. First, it fails to recognize the significant impact liquidity has on the value of the common shares. Second, it does not recognize the sig-

GREGORY A. BARBER, CFA is the managing director of Sierra Capital Advisors, LLC, a valuation consulting and advisory firm located in the San Francisco Bay Area. He has over 11 years of experience valuing companies for investment purposes, as well as for the SEC and IRS.



between the company and the venture capital (VC) investors as the offering price. In theory, if these additional features could be reasonably and objectively valued, their value could be subtracted from the preferred stock value to provide an indication of the value of the common stock.

Traditional Features of Preferred Stock in VC-Financed Companies

Although preferred stock offerings differ from round to round and from company to company, there are some features that seem to occur in most VC financings. The following list provides a brief description of the key features of a typical preferred stock series.

Convertible. Usually the preferred shares are convertible into common shares on a one-for-one basis, subject to anti-dilution protection. Conversion is usually at the option of the holder; however, an IPO of sufficient size often triggers an automatic conversion.

Voting and board seats. Traditionally the preferred shares carry one vote for each common share into which they are convertible. Each round of preferred stock financing usually comes with the right to appoint one or two board members to a five-to-ten member board.

Dividend preference. The preferred shares are given dividend preference over the common shares, if and when the board declares a dividend.

Liquidation preference. The preferred shares usually carry a “liquidation preference” equal to their offering price. The liquidation preference provides the preferred shareholders priority to the liquidation proceeds before common shareholders in a winding up of the company.

Marketability. The preferred shares usually have no restrictions on transfer prior to an IPO.

The common shares usually carry one vote per share, as do the preferred shares, and dividends are rarely declared in companies in need of cash to finance product and market development. Therefore, these two features do not distinguish the common shares from the preferred stock and are irrelevant to the analysis. Further, although the preferred stockholders’ right to convert to common shares is valuable, it does not distinguish the preferred shares from the common shares.

The features that most distinguish the preferred shares from the common stock, as shown below in Exhibit 1, are the right to appoint board members, the liquidation preference, and differences in marketability. If the value of these features is removed from the preferred stock, what remains is essentially common stock.

Right to Appoint Board Members

The right to select one or two board members for a board that does not usually exceed ten members is a significant right. The board seats allow the preferred shareholders to influence the operating and strategic direction of the portfolio company. The level of influence does not reach absolute control for a single preferred stock series. Acting together, however, several preferred stock series holders can control the company. It would seem logical then that the right to select board members (the “Control Features”) would be a valuable feature, but it would be worth something less than the control premiums seen in public entities, due to the limited extent of influence and the lack of synergies with existing operations. Broad measures

nificant events that may have occurred in the company’s evolution from the option grant date to the IPO, and their impact on value. Using the preferred stock offering price as an indicator of value has the benefit of occurring contemporaneously or close to the valuation date of the common shares. In that, it recognizes the relevant state of affairs at the company. However, the preferred shares have many valuable features the common shares do not. These features are often the subject of as much negotiation and debate

EXHIBIT 1
Preferred Stock vs. Common Stock Value

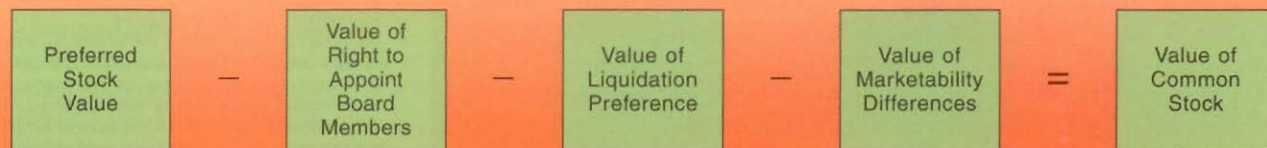


EXHIBIT 2
Time Sensitivity

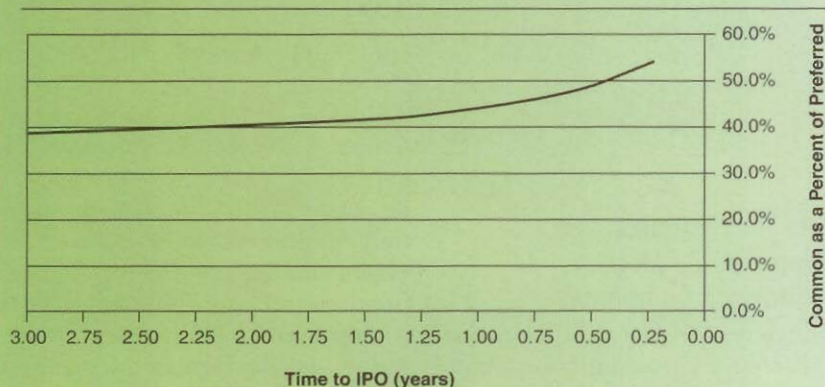
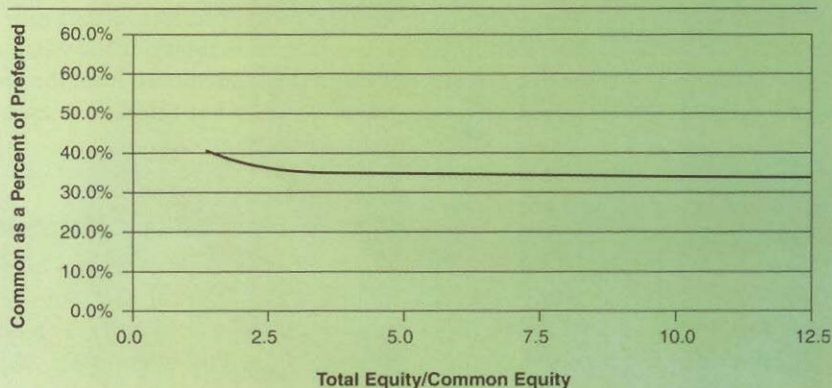


EXHIBIT 3
Equity Cushion Sensitivity



of minority discounts (the mirror image of the control premium) across time and industries approximate 30%.¹ The valuation expert needs to consider the facts and circumstances of the subject company in selecting an appropriate discount. For illustration purposes, a minority discount of 15% appears reasonable to remove the control features of the preferred stock.

The Liquidation Preference

The valuation of the liquidation preference is more problematic. It can be viewed as a limit on downside risk, similar to the protection a put option provides. Put options can be readily valued using many accepted models. However, these models value the option as if it were marketable, and clearly, the option embedded in the preferred shares is no more marketable than the preferred shares themselves. Another

shortcoming of simply valuing an embedded put option using only traditional models is that the downside protection is not absolute, i.e., there is no guarantee that the value of the company will remain above the liquidation preference.² This is a fundamental assumption of traditional option models. So clearly, the liquidation preference is not as valuable as a simple put option model would indicate.

The option marketability issue can be dealt with by using special or "exotic" option pricing models that consider limited marketability. One such model was developed by Mark Rubinstein in 1995.³ Rubinstein's model deals with limited marketability by reducing the option's term based on the holder's level of diversification and risk aversion. In the model, sale of the option is not possible, only the exercise into the underlying stock. This is similar to the circumstances in which a preferred

stockholder finds himself or herself, as the sale of the shares (and the embedded option) is usually very difficult. Reducing the option's term to capture the impact of marketability is also a method used in SFAS No. 123.

Example. To adjust the put option value for the probability that the value of the company will fall below the liquidation preference requires the application of simple statistical techniques. This is achieved through the use of the standard normal distribution, calculation of a z score, and translation into a probability. Assume the subject company has a total equity value of \$100, that the liquidation preference of the preferred stock is \$40, and that the annual standard deviation is \$75, the probability that the company's value will fall below the liquidation preference in the next year can be measured as follows:

$$z = \frac{X - \mu}{\sigma}$$

Where:

X is the value of the observation, or \$40;
 μ is the mean observation, or \$100;
 σ is the standard deviation of the distribution, or \$75.

Therefore:

$$z = \frac{\$40 - \$100}{\$75}$$

$$z = -.80$$

1 *Mergerstat Review 2000*, (Los Angeles, CA: Mergerstat, 2000).

2 Some practitioners view the liquidation preference as having value only if the orderly liquidation value of the company's hard assets is sufficient to meet the liquidation preference. This view fails to capture the value of the intangible assets that may have been created by the failing company. These assets can include software, customer relationships, brands, and Internet traffic.

3 Rubinstein, "On the Accounting Valuation of Employee Stock Options," *Journal of Derivatives* pp. 8-24 (Fall 1995). Another is: Carpenter, "The exercise and valuation of executive stock options," *Journal of Financial Economics* 48 (1998) p. 127-158.

4 Value can be received by the preferred shareholders even if the company value falls below the liquidation preference, as the preferred shareholders would still receive all the liquidation proceeds. However, for the sake of simplicity, the value of the put option was calculated based only on the probability that the company value remains above the liquidation preference.

This translates into a probability of 28.8% that the value of the company in one year will be between \$40 and \$100, and 78.8% that the value will exceed \$40. As the put option is worth its full value only if the company value stays above the liquidation preference, this probability would be multiplied by the put option value indicated from the option model. The result would equal the value of the put embedded in the preferred stock.⁴ Use of the standard normal distribution assumes that the values of development-stage companies are normally distributed. Given that the market for VC investments is reasonably efficient (that is, there is significant competition for investment opportunities), it does not appear to be an unreasonable assumption.⁵

Marketability Differences

The preferred stock price already reflects its limited marketability. VC investors understand that it may be difficult to sell their holdings in development-stage companies, even though there is usually no restriction on their doing so. The common shares that are the subject of the valuation exercise are usually completely restricted from sale, that is, they cannot be sold at all. Further, the common shares of the subject company are, by their nature, more volatile than the preferred stock. This is because the common shares have no liquidation preference. One of the fundamental findings in marketability studies is that increased volatility leads to increased marketability discounts.⁶ Again, the valuation professional will need to consider the facts of the particular case to determine the appropriate liquidity discount. For illustration purposes, a 15% marketability adjustment appears reasonable.

A Common Stock Valuation Model

The model is best understood in concert with an example. Assume the interest being valued is the common stock of a VC-financed, development-stage company (new world.com) that has recently issued 500,000 Preferred Series B at a price of \$7 per share and that they have a liquidation preference of \$7 per share and the right to select two of seven

board members. Assume, as above, that the other differences between the common and preferred shares are uneconomic and, therefore, irrelevant. In applying the model, begin by removing the liquidation preference. This is done by first valuing a put option using an option valuation model that considers the option's limited marketability.

The inputs to the put option model are selected as follows in Exhibit 3A:⁷

The variables above were input into Rubinstein's option pricing model and resulted in a put option value of \$5.23.

Adjusting this result for the probability that the company value will not remain above the liquidation preference:

Liquidation preference:	\$3.5 million
Estimated total equity:	\$5.0 million
Standard deviation:	\$12.5 million (250% x \$5 million)
Z score:	-0.12

EXHIBIT 3A Inputs to Put Option Model

Stock price:	\$7.00	The original purchase price.
Strike price:	\$7.00	The liquidation preference.
Term:	1.0 years	An estimate of the time new world.com has until its development efforts either fail or are successful, or the time until IPO, whichever is shorter.
Risk-free rate:	6.00%	A one-year-duration T-Bill.
Volatility:	250%	An estimate of the expected standard deviation of the company's equity value over the next year. Unseasoned, public technology companies routinely have standard deviations over 100%. A private company, with its additional technology, market, personnel, and other risks, would be expected to have a much higher standard deviation.





Applying the inputs to the z-score test indicates that there is a 54.8% chance the company's total equity value will exceed the liquidation preference, or \$3.5 million, in one year.

Applying the results of the analysis in succession:

Preferred A offering price	\$ 7.00
Less: Liquidation preference (\$5.23 x 54.8%)	\$ (2.87)
Equals: Common stock, control level equivalent	\$ 4.13
Less: Control features discount (\$4.13 x 15%)	\$ (0.62)
Equals: Common stock, marketable, minority level equivalent	\$ 3.51
Less: Marketability discount (\$3.51 x 15%)	\$ (0.53)
Equals: Common stock, nonmarketable, minority level equivalent	\$ 2.98

The above example suggests that the common shares of new world.com are worth approximately 42.6% of the Preferred B shares one year prior to the IPO.

Sensitivity Analysis

The model above was tested under various time, "equity cushion," and volatility assumptions to measure the model's sensitivity to key inputs and check the reasonableness of its results. The equity cushion is the amount of equity above the liquidation preference and is measured as Total Equity/Liquidation Preference. In the sensitivity tests all other variables were fixed and the three

⁵ An alternative to assuming the values of VC investments are normally distributed would be to assume that VC investment returns are normally distributed and use the log-normal distribution (also known as the geometric Brownian motion model) assumption used in the Black-Scholes option pricing model. However, the geometric Brownian motion model is, statistically speaking, leptokurtosis; the likelihood of returns near the mean and of large returns are, in reality, greater than the model predicts (Chriss, *Black-Scholes and Beyond Option Pricing Models* (Irwin, 1997) p. 115). In this analysis, returns relatively close to the mean are usually being estimated. Further, one study of VC returns suggests that, on average, about 60% of investments result in positive returns, while 40% result in losses (Kane, "Understanding the Venture Capital Market," *Investing in Venture Capital*, published by The Institute of Chartered Financial Analysts, December 1988). Given that the geometric Brownian motion model underpredicts small price moves and that evidence suggests

inputs above were varied. Finally, an analysis was conducted that adjusted multiple inputs to simulate how a company's common stock may change in value relative to the preferred stock throughout the company's development.

Time sensitivity. To test the model's sensitivity to a change in the term of the option, the period was varied from 3.0 years down to 0.25 years in Exhibit 2 on page 40. The fixed variables were volatility (250%), the risk-free rate (7%), and an equity cushion ratio of 1.25. The results of the analysis are somewhat surprising, suggesting that no material change in the common-to-preferred stock ratio would occur until approximately one and one-half years prior to an IPO (or expected product completion and market acceptance). The model also suggests that even within one year of an IPO, and given no changes in the company's risk profile (volatility is stable at 250%), a significant discount of 45% to 55% from the preferred stock price is warranted.

Equity cushion sensitivity. In Exhibit 3 on page 40, the model's sensitivity to the size of the equity cushion was analyzed by varying it from 1.25 up to 12.50. For this analysis the term was set to 2.0 years, volatility was fixed at 250%, and the risk-free rate was 7%. The striking feature of this analysis is that it appears that the size of the equity cushion does not materially affect the value of the common as a percentage of the preferred stock. Even at high levels of equity cushion, the common stock as a percentage of the

60% of VC investments result in gains, the normal distribution of values was concluded to be a better predictor.

⁶ Meyers, "Restricted Stock: An Approach to Valuation," Management Planning, Inc. (1990)

⁷ One method of estimating the volatility (or standard deviation) of development-stage companies may lie in the capital asset pricing model. Given an estimated discount rate, it is possible to calculate the beta required to achieve that rate. Given the company's beta, the standard deviation of the market, and an estimate of the company's correlation with the market, it is possible to calculate a company's implied volatility from the equation used to calculate beta. Care should be taken by the valuation professional to consider: (1) the liquidity premium built into VC discount rates, and (2) that the total return of small stocks (and probably development-stage companies) is not entirely explained by their beta (or volatility).

preferred stock did not fall below 33%. This is likely due to the high volatility expected in the total equity value of the company. In general though, the higher the equity cushion, the higher the value of the liquidation preference, and the lower the value of the common stock relative to the preferred shares.

Volatility sensitivity. In the volatility sensitivity analysis, detailed in Exhibit 4 at right, the term was set at 2.0 years, the risk-free rate was again fixed at 7%, and the equity cushion was set to 1.25. Volatility was varied over a wide range from 400% to 25%. The results again are instructive; discounts of 30% from the preferred stock value are warranted even in stable (25% volatility) companies, two years from an IPO (or expected product completion and market acceptance date). However, discounts of 60% from the preferred stock price appear to be the norm for an early-stage company.

Real-world simulation. In the last analysis shown in Exhibit 5 at right, newworld.com's entire corporate development was simulated from "seed" stage to three months prior to an IPO. The key model inputs are shown in the table below the graph. Essentially, the volatility and risk-free rate decrease through time while the equity cushion increases. The control features and marketability discounts also decrease through time to reflect the shorter expected period of benefit. As the graph shows, the change in the common share price relative to the preferred stock can be dramatic, beginning in the 30%-to-40% range and rising to the 70%-to-80% range three months before an IPO. The results are intuitively pleasing as they lend objective support to valuation levels thought reasonable by valuation professionals.

Conclusion

The examples above are simplified and an actual situation may be complicated by many other factors. For example, the liquidation preference could be for a dollar amount more or less than the preferred offering price, affecting the value of the liquidation preference and the common stock accordingly. The preferred shares of private companies

EXHIBIT 4
Volatility Sensitivity

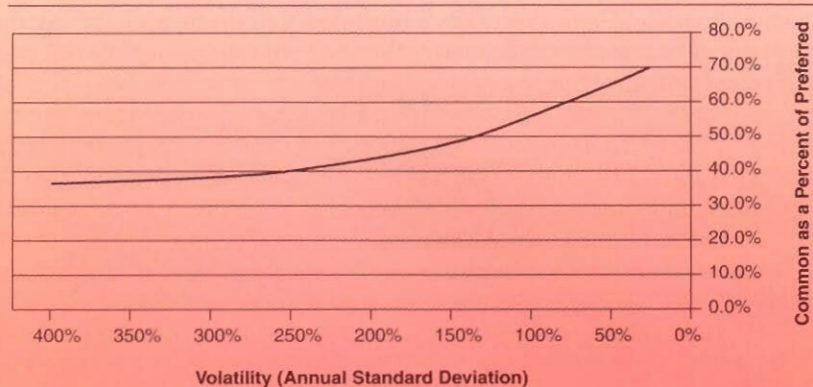
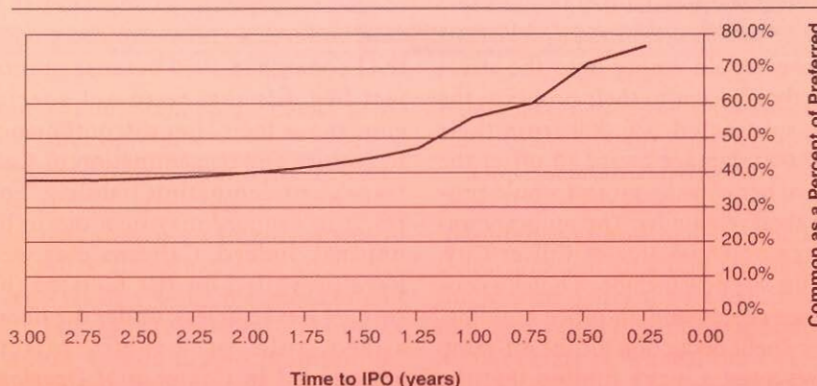


EXHIBIT 5
Simulated newworld.com



Time to IPO	3.00	2.75	2.50	2.25	2.00	1.75	1.50	1.25	1.00	0.75	0.50	0.25
Volatility (%)	300	282	264	245	227	209	191	173	155	136	118	100
Risk-Free Rate (%)	7.00	6.91	6.82	6.73	6.64	6.55	6.45	6.36	6.27	6.18	6.09	6.00
Equity Cushion	1.25	1.29	1.34	1.39	1.45	1.51	1.57	1.64	1.72	1.80	1.90	2.00
Control Discount	15%	15%	15%	15%	15%	15%	15%	15%	10%	10%	5%	5%
Marketability Discount	15%	15%	15%	15%	15%	15%	15%	15%	10%	10%	5%	5%

can also have other features that distinguish them from the common shares, such as the right to participate in later financings and the right to participate in the liquidation proceeds above the liquidation preference (a "participating preferred"). Each of these features would tend to further reduce the value of the common stock relative to the preferred stock.

The model though, provides a far more reliable method of valuing the

common stock of a VC-financed, pre-IPO company than traditional methods. The model is sensitive to key variables, such as each company's stage of product development and expected time to product completion. This gives the model the flexibility to be applied in most circumstances. Most importantly the model's inputs can be reasonably determined from observable data that can be verified and tested for reasonableness. ■