

VALUING private equity warrants ON INITIAL ISSUANCE

A METHODOLOGY SHOULD TAKE INTO ACCOUNT THE PRIVATE EQUITY NATURE OF THE TRANSACTION, AS WELL AS LIKELY EXPIRY EVENTS, SUCH AS MERGER, SALE, GOING PUBLIC, TO ACHIEVE AN APPROPRIATE VALUATION OF PRIVATE EQUITY WARRANTS.

Venture leasing company clients need a formula for deriving routine date-of-issuance valuations of private equity warrants ("warrants") issued to venture lessors by their lessees or borrowers ("lessees" or "issuers"). This article derives such a formula.

Venture lessor/lessees are generally emerging-growth, high technology companies backed by angel or venture capital investors. Angel investors and venture capitalists typically invest in a company by buying successive rounds of its preferred stock, which is convertible into common stock. Preferred stock is bought instead of common stock to prevent management "sweat equity" shareholders profiting from premature corporate dissolution. Each major sale of preferred stock to investors is a "round," and companies hope for successive rounds at increasing prices per share until the company's shares become publicly traded after an initial public offering (IPO) or a merger or sale of assets into another company (liquidity event). Until the liquidity event, the shares of stock in the company are "private equity," subject to significant legal and contractual restrictions on resale. The market for resellers of private equity is limited and deeply discounted.

Venture Leasing

Since early-stage companies generally lack track records or even revenues, venture lessors provide them a financial product known as a venture lease. The lessee is financed under a three to four-year-term equipment lease or a loan secured by equipment, and the lessee issues the lessor a warrant, or long-term option, to buy its preferred stock at an exercise price usually equal to that given investors in their most recent venture capital round. Venture leasing warrants are long-term at-the-money call options on private equity. The typical venture leasing warrant is exercisable for five to ten years, and sometimes subject to

early termination or forced exercise on certain corporate events.

Venture leasing private equity warrants. Venture leasing warrants permit the purchase of a quantity of stock that, when multiplied by the exercise price, is related to the aggregate lease or loan commitment. This relationship is known as "warrant coverage." For example, 5% warrant coverage for a \$100,000 equipment lease line would lead to a warrant with an exercise quantity times exercise price equal to \$5,000.

Conversion/net exercise feature. Most venture leasing warrants have a provision permitting the warrant to be exchanged for a number of shares equal in value to the difference between the aggregate warrant exercise price and the aggregate "fair market" value. This conversion feature not only enhances liquidity for the holder by avoiding the requirement that money be put up to purchase the warrant, but also allows a tacking of the holding period for Rule 144 purposes by counting the warrant holding period towards the required private equity holding period. This feature is not unique to these warrants and generally applies to stock option plans common in Silicon Valley.

Expiration provisions. Warrants are exercisable for a period of years, but sometimes have special early termination or forced exercise provisions that can significantly reduce a warrant's life-span and profit potential. Typical early termination provisions are on (1) IPO, or (2) merger, sale, or IPO.

Other features. Venture leasing warrants represent minor ownership interests, and hence no value attaches to them in terms of power over the issuer to cause it to perform an action, such as a redemption. In fact, most venture leasing warrants specifically provide that they do not give their holder any rights as a stockholder until there has been an exercise or conversion.

Sometimes warrants grant anti-dilution rights. Although strong anti-dilution rights could enhance value by maintaining relative ownership under specified circumstances, such provisions are usually present when there is special investor insecurity about management or co-investors, and

therefore their value as rights would tend to be counterbalanced by the risks from which they are designed to protect their holder. Generally, the warrant holder is a party to the same investor rights agreement as the angel investors or venture capitalists, although the registration rights usually cover the shares after exercise, not the warrants themselves.

Intrinsic vs. time values. An option to pay \$4 for an asset worth \$5 has an "intrinsic value" of \$1. Assuming there are no transaction costs, the option can immediately yield \$1 for its holder. However, options usually trade for an amount in excess of their intrinsic value. For example, a GM \$65 call trades for \$3 ³/₈, even though the stock is worth \$67 ⁵/₈. The remainder of \$0.75 (the intrinsic value of \$2 ⁵/₈ subtracted from the option price of \$3 ³/₈) is the "time value" or "theta" of the option. It is the value that the market assigns to the present value of the chance that the price of the asset, and with it the intrinsic value of the option, might further increase. Exhibit 1, on p. 16, charts a hypothetical XYZ 50 call, showing that as the stock increases in value, the relative time value declines. Additionally, theta "decays" with the passage of time, until, on their day of expiration, options trade for their intrinsic value.

Valuing theta. Options are valued based on market factors, which can be modeled by mathematical formulas, such as the Black-Scholes formula.¹ Such models are based on assumptions that may not apply to private equity warrants. Intellectual factors, such as judgment and appraisal, can be legitimately used to value these warrants as well.

Need for Methodology to Value Warrant Theta

Since venture leasing warrants are usually issued at a price per share that is the same as that given investors in the most recent venture round, the warrants have no intrinsic value when issued. Since the warrants are intended to be transferred at or shortly after issuance, they have only time value, or theta. Therefore, the goal is to develop a rigorous,

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Private equity volatility, with fewer pricing points, is harder to find than public market volatility.

intellectually honest, and consistent methodology to assess the time value of warrants at the time of issuance.

Modelling Time Value for a Venture Lease Warrant

Valuing theta on private equity is substantially different from valuing theta on public equity. Models that value public equity have certain fundamental assumptions that do not apply to private equity. Common models used include those used by public option traders, such as Black-Scholes, an arbitrary value not significantly related to characteristics of the warrant, and present value of expected investment gains. However, to the extent these models actually model time value, they are generally based on options traded in public markets to purchase securities that are also traded in public markets. Because venture leasing

warrants are restricted securities that are options for the purchase of securities that are themselves restricted, these models cannot be applied as-is to venture leasing warrants. From a practical and cost standpoint, a consistent theoretical model that can be applied across a portfolio is preferable to a series of one-off appraisals.

Problems with public equity option models. Popular models for valuing publicly traded options on public equity, such as the Black-Scholes model of valuing options often used by public companies in their financial statements, make many assumptions, including the following, some of which are articulated more clearly in the literature than others. Private equity warrants fail these assumptions—a failure that justifies a substantial discount on the value that would be ascribed to them by the models.

Continuous price discovery. Although one can almost always instantaneously learn from minute to minute the price per share of well-capitalized public companies, price discovery in private markets is substantially discontinuous, expensive, and opaque. Private equity valuations of any particular company occur months, rather than fractions of a second, apart, and are usually undertaken only at substantial cost and on the happening of a specific event affecting the company or an investor.

Additionally, it is possible for “discovered” prices for private equity to be wrong. For example, prices per share set at the start of a strategic marketing or manufacturing relationship consider much more than an objective price of the stock. It is not unusual for a company to sell for a price per share *less than* that set for the prior strategic

EXHIBIT 1
Hypothetical XYZ 50 Call Option

with six months to expiration; example from L. McMillan, *Options as a Strategic Investment*

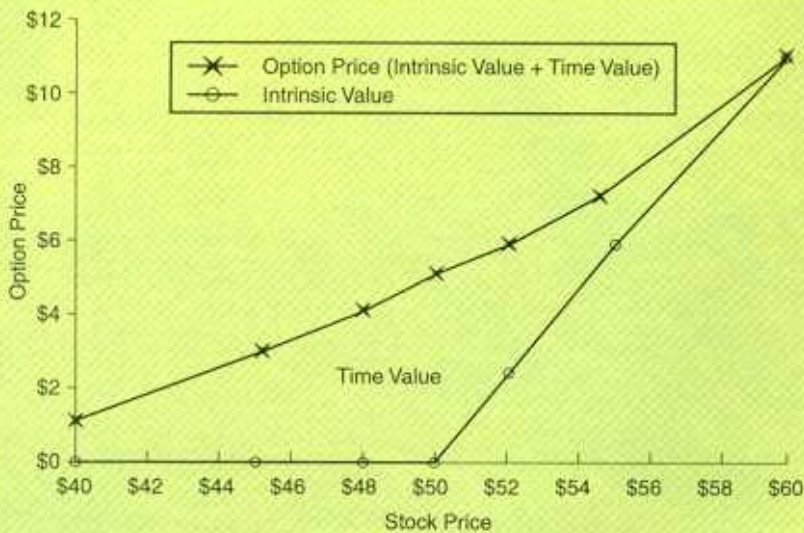
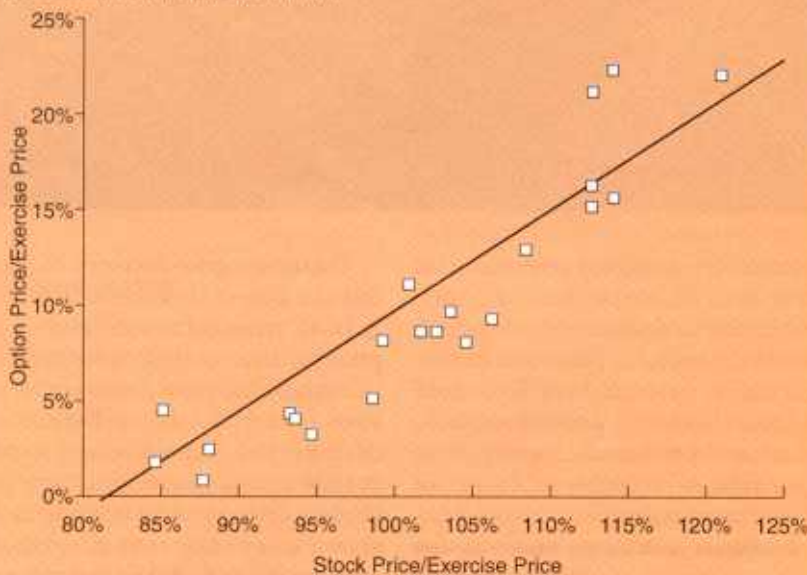


EXHIBIT 2
Publicly Traded Options on Internet Companies

Nov Dec Jan 1997/8 Calls as of 11/4/97



relationship (especially if the strategic relationship collapsed). Major corporate strategic partners often agree to a valuation that includes the very value of their own strategic contribution. Price discovery of microcapitalization issues even in public markets is in many ways mysterious and at variance with overall market behavior.

Volatility known and constant. The principal decision variable in option

valuation formulas is the volatility of the underlying instrument. Volatility is itself volatile, and prices do not follow a stationary stochastic process even in public markets. Modern option valuation models adjust for volatility of volatility, but even so, private equity volatility, having far fewer pricing points, is far more difficult to determine than is public market volatility. Prices for the underlying stock are

changed at rounds that are months apart. Volatility can be implied from the price of an option, and since much of the market attributes zero or nominal value to private equity warrants, that would imply a marketplace implied volatility for private equity warrants that is very low.

Option and financial derivative pricing models usually assume a normative probability distribution, which is debatable even for normal securities, and likely even more so for private equity. Even public equity markets show a much higher degree of system-shocker outliers and "fat tails" (leptokurtosis) than is assumed in models. Additionally, there is often asymmetry of distribution around the means (skewness) from bull and bear markets. "Shock" events with substantial effect on value and skewness are probably far more prevalent with private equity.

Additionally, volatility in private markets is far more a function of prevailing economic factors, rather than what is typically thought of as market volatility. Silicon Valley lessees are on the leading edge of world industry and inventiveness, and hence competitiveness. Product life cycles can be measured in months, and missteps are fatal. Public companies usually have more than one product; private venture companies can often be formed around a single product, and a failure to meet the product window or a proof of concept often occurs with very substantially concentrated effects. Whimsical Patent Office rulings and clinical trial results can instantly and dramatically gut the value of a private company's main asset far more so than would ordinarily be the case for a publicly traded company. As opposed to major companies in established industries, small companies lose life-sustaining products, customers, or investment partners every day.

No transaction costs. Unlike \$13 discount commissions for public option trades, private equity warrant sale costs are substantial. For example, legal opinion letters, legal review of registration statements, and preparation of selling shareholder documentation for underwriters or the Securities and Exchange Commission are often required and

expensive. Even the transaction costs of setting the initial warrant strike price are quite substantial.

Sell short and use the proceeds? Option theory posits that owning a call and selling a put on a stock is equivalent to owning the outright security, and that the security underlying the option can be sold short. This just simply is not the case with private equity, which generally cannot be sold short. One cannot create a riskless hedged position in private equity.

Identical tax rates. Conventional option pricing models assume that all market participants have the same tax rates, and that all transactions are taxed at the same rates. These assumptions are not valid in the venture leasing warrant context. Market participants have substantially different tax rates, and it is not unusual for an issuer to still be using up net operating loss carryforwards after its IPO.

No takeovers end the option's life early. The Black-Scholes model is for a European call option, which is exercisable at expiration, rather than an American call option, which is exercisable at any time up until expiration. While an American call option can theoretically be more valuable than a European call option on account of its exercise characteristics, and warrants, which are exercisable at any time up until expiration are theoretically American options, a private equity warrant really behaves like a European call option with an indeterminate expiration date prior to the stated expiration date. This is because exercise of the warrant is usually precipitated by an external event, such as an IPO, merger, or sale of assets. Additionally, the effect of a takeover in the public equity context, where takeovers are almost always at a premium, is very different from that for private equity, where takeovers are as likely a result of investors trying to salvage their investment at any price.

No legal restrictions on transactions. There are substantial restrictions, and resulting legal and due diligence expenses, on the sale of venture leasing warrants. There are legal restrictions requiring potential purchasers to be accredited investors, and there may

be contractual requirements preventing sale to a competitor.

Market regulation. Public companies must file annual and quarterly reports, and timely notices and descriptions of significant events. Private companies are often behind the curve in preparing and presenting financial information, and often "professional" chief financial officers, as opposed to controllers, are not brought in until the company is close to an IPO.

Econometric assumptions. The Kasouf model of warrant valuation is an econometric model making assumptions about past relationships from which regression coefficients are determined. These often do not hold true for early-stage companies.

Exercise of option not dilutive. The exercise of venture leasing warrants, although often for a small percentage of the stock, tends to be dilutive of the overall capitalization of the company. Net exercising in exchange for a portion of the warrant results in new shares being issued for which no cash is contributed. This dilutes the overall value of the company. There are some high profile examples, such as the IPEC stock crash in 1995, of what can transpire upon public "discovery" of investor dilutive stock issuance rights. The assumptions behind the Noreen-Wolfson model, which considers dilution upon exercise, are similar to those behind Black-Scholes, with the same difficulties; however, in a sampling of 32 warrants taken in August 1986 by Shannon Pratt and Philip Smith, results of the Noreen-Wolfson model consistently overestimated market prices of the warrants by an average of almost 30%.

Fixed income considerations. Private equity warrants are options on preferred stock that, although convertible, are technically a fixed-income security. Fixed-income option methodologies are extremely dependent on continuous price discovery and arbitrage-free market models, and these, as discussed above, are entirely absent from private equity. To complicate matters further, the fixed income is often not declared unless future liquidity is substantially impaired; venture capitalists have been known to require div-

Patent Office rulings and clinical trial results can gut the value of a private company's main asset far more than ordinarily occurs with publicly traded companies.

idend payments from under-performing companies.

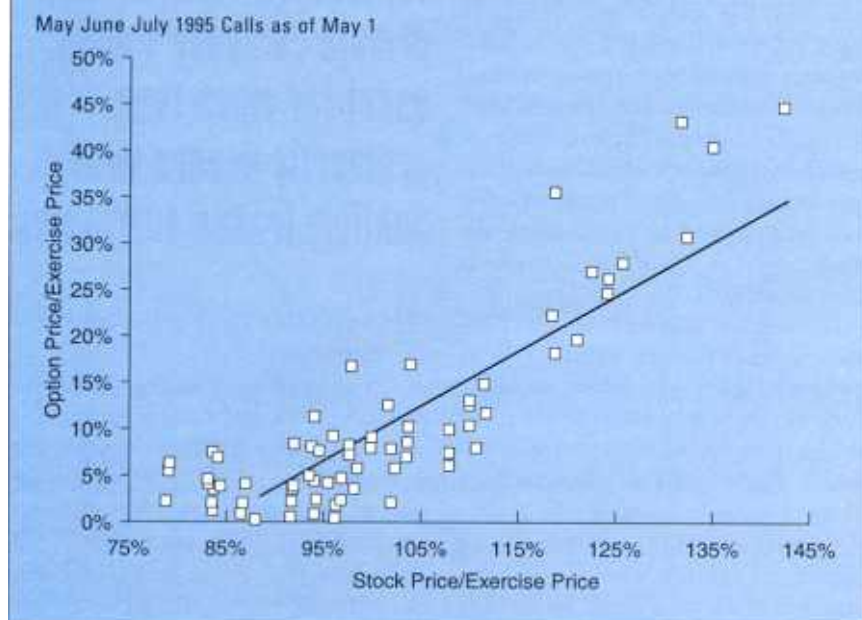
Compound optionality. Since the preferred stock is convertible into common stock on certain conditions, the preferred stock is itself largely an option. Valuing a warrant for preferred stock could include valuing a *call on a call* whose exercise the company largely controls by controlling events that permit or require the conversion of the preferred into common. Multiple contingencies tend to further diminish the value of an asset.

Transactions in the underlying security. Additionally, on a merger or sale of assets, it is sometimes advantageous to exercise a warrant fully, rather than convert it. Conversion of a warrant allows for a tacking of the Rule 144 holding period, but an exercise generally does not. Exercising is advantageous if there is an earn-out, because the more shares held, the greater the earn-out participation. However, if the merger consideration represents securities of an issuer, there will be a reset holding period. Sometimes a reset holding period results even if there is apparently no third party at the table, but a recapitalization through a new entity. However, during the reset holding period, the holder has paid in cash, is illiquid, and remains at substantial risk.

Other warrant valuation models. Other warrant models appropriately considered and rejected here are: (1) nominal value, (2) arbitrary "unit" value, (3) present value of expected investment gains, and (4) appraisal value.

Nominal value. Other valuation methods encountered show that many other participants in the private equity warrant marketplace have not considered it necessary to take the

EXHIBIT 3
Publicly Traded Options on Biotech Companies



scientific approach that is appropriate. For example, one major Silicon Valley law firm advised clients that \$0.001 per share is an appropriate valuation for a warrant, which by its nature appears to be arbitrary. Another major San Francisco law firm has advised clients that \$100 per warrant, without regard to the size of the warrant or amount of equity purchasable thereunder, is appropriate.

Arbitrary "unit" value. Another major Silicon Valley law firm has suggested that warrants be valued as an "investment unit" with the instrument, such as a lease, convertible note, or preferred stock, with which it is issued. However, this unit valuation is flawed. A lease and a warrant are qualitatively different: The lease is chattel paper that can be immediately and freely sold, unlike the warrant. The lease or note and the warrant have different terms to maturity and could be resold or converted at different times and have different life-spans. An investor is left to puzzle out how the investment unit basis should be allocated between the lease and the warrant, and risks penalties if tax rates change over time, or if he or she takes all the basis to the earlier-sold part of the "unit."

Present value of expected investment gains. Calculating the "intrinsic" value of the warrant on the basis of expect-

ed investment gains available by holding the warrant has problems for a newly issued warrant. A holder of the warrant is acquiring it with an expected return in exchange for the risk. Investments generally provide higher returns in exchange for higher risks, and it is not certain that investments with a distribution of typically high rates of return at a cost of higher risk are "more valuable" than risk-free government bonds. The entire field of investment management is devoted to choosing the investment at the initial conditions with intrinsically greater value than any other available investment. That more than one category of investment is available is indicative that there is no agreement on the subject. Given the very uncertain nature of venture capital-backed companies and their technologies, the rate of return is speculative until after a public market has developed for the underlying equity.

Appraisal value. Valuing warrants by appraising each company on a case-by-case basis is prohibitively expensive, and could rarely in fact be meaningful. Major venture capital firms, in negotiation with the companies themselves, all devoting very substantial energy, debate, and resources into establishing a price per share for the company, will have just set the price

per share. It is extraordinarily unlikely that a private appraiser or re-valuation of the company's intrinsic value by a leasing company could possibly improve upon or displace that reached by professionals in the crucible of negotiating a venture capital round with professional venture capital investors. This is the very essence of fair market value determination—a willing seller and a capable buyer, both well informed.

Recommended Methodology

Exhibits 2 and 3, on pages 16 and 18, show data on publicly traded options on Internet and biotech companies with exercise dates for three months following the price analyses. The vertical coordinates specify the ratio of option price to exercise price, while the horizontal coordinates specify the ratio of stock price to exercise price. The regression line is indicated in each chart. Both charts indicate that "at-the-money" options on biotech stocks in mid-1995 and on internet stocks in late 1997 traded at slightly over 9% premiums over intrinsic value (vertical axis). Offsetting the discount for the private nature of private equity warrants against the shorter term of the charted options is not, however, a sufficient discount.

The factors discussed above—illiquidity, opaque price discovery, immeasurable volatility, high transaction costs, inapplicability of option valuation model fundamental assumptions, forced premature termination vulnerability, substantial legal restrictions on transfer, financial and operating information opacity, and dilution on exercise—all substantially discount the value of private options on private equity against that of public options on public equity. This author believes a further discount of over two-thirds,

¹ Black and Scholes, "The Pricing of Options and Corporate Liabilities," 83 J. Pol. Econ. 637-54 (1973); Black, "How we Came Up With the Option Formula," J. Portfolio Mgmt. 4 (Winter 1989). For further discussion of option pricing, see Black, "How to Use the Holes in Black-Scholes," 1 J. Applied Corp. Fin. 36-41 (Winter 1989); Fabozzi, ed., *The Handbook of Fixed Income Options: Strategies, Pricing and Applications* (Irwin, 1996); McMillan, *Options as a Strategic Investment* (2d. ed., New York Institute of Finance, 1980)

Warrants, exercisable at any time up until expiration, are a species of American option.



and therefore to a maximum of 3%, is appropriate. The author also believes there are circumstances when an even greater discount is appropriate, which relate to the effect of forced termination on potential value.

Termination on IPO. A warrant that terminates on an IPO requires the holder to accept the IPO price per share. The underwriter of a typical IPO sets the IPO price low enough to cre-

ate an immediate after-market increase. Netscape, for example, went from an IPO price of \$28 to its first after-market trading price of \$75. The holder of a warrant requiring termination on an IPO does not get to speculate on this increase in value. Additionally, simply because a warrant expires on an IPO does not mean it can be sold at the IPO. Investment banks usually require existing shareholders to sign "lock-up"

agreements not to sell their stock for 180 days from the IPO, and existing shareholders do not often participate in IPOs. Instead, the warrant would be converted at the IPO price, and the warrant holder would instead hold stock. Stockbrokers calendar the lock-up dates and sell the stock short, hoping to panic inexperienced insiders into selling and further reducing the stock price at the end of the lock-up period. It is often the case that a stock sells for less than the IPO price six months later, even though it had increased following the IPO.

Transaction costs on an IPO sale are higher than those post-IPO: legal opinions, review of underwriter agreements, and sometimes negotiations are required on a sale in conjunction with an IPO. Additionally, there is residual liability to the seller pursuant to the indemnity provisions of the underwriting agreement. Most full-service brokerage houses will themselves handle the Rule 144 paperwork for post-IPO sales, and much less legal review is required for the seller's representation letter and legal opinion. Moreover, the underwriting discount of 6% to 9% on the IPO is much greater than the approximately 1% or less charged on brokers' transactions.

Termination on merger or sale. A warrant that expires on a merger or sale of assets is likely to expire worth even less than at IPO, as corporate buyers of companies are often more sophisticated and able to achieve better pricing than is the public at an IPO. Additionally, factors that caused the sale or merger may depress the value. Expiration on a merger or sale of assets creates the threat that the warrant could expire on an event that usually brings the lowest value per share, may occur when the company is at its most troubled, and removes the right to participate in the upside for the rest of the life of the merged or sold company.

A Proposed Methodology

Existing models used for valuing private equity do not work for the reasons set out above. Numbers assigned by fixed "mills per share" methodologies come from the ether, rather than from the application (*Continued on page 48*)

Private Equity Warrants

(Continued from page 19) of any methodology. An appropriate methodology consistently applied over time could assist in an area currently lacking a clear methodology, and assist in providing a safe haven for private equity warrant holders.

Therefore, the author proposes the following methodology to value warrants at or about the time of issuance, assuming they have been issued at a price per share equal to the most recent venture capital round. First, determine the size of the warrant, by multiplying the exercise price by the exercise quantity. Then determine the expiration conditions: if it (a) expires on or after ten years, whether or not there has been a merger, sale of assets, or IPO,

multiply the result by 3%; (b) survives a merger or sale of assets but not an IPO, or if it expires after five years or less, use 2%; and (c) does not survive a merger or sale of assets, use 1%. The following tabulates this methodology:

Stated expiry:	10 yrs.	5 yrs.
Survives merger, sale, and IPO	3%	2%
Survives merger or sale, not IPO	2%	2%
Expires on merger, sale, or IPO	1%	1%
Survives IPO, not merger or sale	1%	1%

So, for example, a warrant to purchase 10,000 shares of AcmeDotCom at \$5 per share would be worth the following, based on its expiration or forced termination provisions:

Ten years	\$1,500
Five years	\$1,000
IPO	\$1,000
IPO, merger, or sale of assets	\$500

A consistent methodology can more appropriately provide a valuation of private equity warrants than traditional public equity valuation models or by assuming, as some practitioners have done with clients, that there is virtually no value to the warrants (\$0.001), or, just as ill-advised, an arbitrary value (\$100). The valuation should take into account the private venture capital nature of the transaction as well as special expiry events such as merger, a sale, or going public. Only by taking these factors into consideration can an appropriate valuation be achieved. ●