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Marmer Penner Newsletter

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Valuing Restricted Stock – Part II

In the November 1999 Marmer Penner Newsletter, we discussed empirical evidence from public markets which suggested that restricted stock holdings are typically discounted by 40% on average from their gross value. In this newsletter we discuss an approach which can assist in quantifying a discount for a particular holding.

Approach for the Quantification of Restricted Stock Discounts: *The Mercer Approach*

An approach to the quantification of restricted stock discounts described by Christopher Mercer equates the quantum of the restricted stock discount to the cost of hedging the restricted stock during the restriction period and is directly related to the volatility of the stock at the day the restricted stock holding is required to be valued. The rationale for this approach is based on the premise that the risk related to holding restricted stock (and therefore the discount that should be afforded to a notional investor who is acquiring a block of restricted stock) is directly related to the risk that the stock price may decline during the restriction period – after all, if there was a guarantee issued with restricted stock that the price of the stock will not decline during the restriction period, holding restricted stock would be risk-free, except for the time value of money foregone during the restriction period. Therefore, the restricted stock discount should equal the cost of providing the price guarantee during the restriction period. This is best illustrated by the example described below in Figure 1, that calculates the discount for a hypothetical single share of stock in CIBC:

Figure 1

Assume an investor is provided with an opportunity to purchase a single share in CIBC, whose stock closed recently on the TSE at about $30, but was not allowed to trade the stock for four months following the purchase. There is risk that in the four months following the purchase, the stock price could drop below $30, and because of the restriction, the investor would be prevented from minimizing their loss, even if the stock price continued to drop. How much should an investor be willing to pay for this opportunity? The investor could purchase the share at its gross price of $30, and at the same time, insure against the risk associated with a price decline by purchasing a single put option on the TSE at an exercise price of $30 that expires in four months. A put option in CIBC provides the investor with the right, but not the obligation, to sell the CIBC stock at the specified $30, called the exercise or “strike” price on or before the expiration date. This way, even if the stock price dropped, the investors could exercise the option to sell the share at $30 and protect themselves completely from a drop in the stock price. A single CIBC put option with these terms (i.e. exercise price of $30 and an expiry date in four months) recently traded at $1.95. Therefore, the maximum that the investor should be willing to pay for the opportunity described by this example is the $30 stock price less the $1.95 cost of the put option, or $28.05. Expressed as a restricted stock discount,

$$\text{Restricted stock discount} = 1 - \frac{\text{Gross Value} - \text{Cost of Insurance to Guarantee Gross Value}}{\text{Gross Value}}$$

$$= 1 - \frac{\$30 - \$1.95}{\$30}$$

$$= 1 - \frac{\$28.05}{\$30}$$

$$= 1 - 0.935$$

$$= 6.5\%$$

Under the circumstances described in Figure 1, the opportunity provided to the investor had a 6.5% restricted stock discount associated with it. The discount can be expressed in the following general form:

Figure 2

$$\text{Discount} = 1 - \frac{\text{Gross value} - \text{Cost of Insurance to Guarantee Gross Value}}{\text{Gross Value}}$$

In the real world, investors acquire "insurance" against declines in stock prices by purchasing put options in the stock they hold. Buying and selling of put options is commonplace on virtually all North American public markets.

Valuing a Block of Restricted Stock Using the *Mercer Approach*

The above example can be extended for almost any holding of restricted stock. This is illustrated by the example illustrated in Figure 3.

Figure 3

Assume that an executive holds 20,000 shares of restricted stock in the company they are employed with. The shareholding is only a small percentage of the total outstanding stock in the company, and the average daily trading volume of the stock is large enough to absorb the block entirely when it ultimately gets sold by the executive following the lifting of the restriction period. The executive becomes separated from their spouse and it becomes necessary to value all of their assets under family law in the province in which they reside. On the date of separation from their spouse, the 20,000 shares of stock have not vested; the stock ownership agreement with the company indicates that the restrictions on the holding gets lifted over a four year period such that in each of the next four years, 25% of the shares may be sold. Assume further that the stock closed at $120 on the date that the executive became separated from their spouse, and that the stock does not pay dividends, and that the volatility of the stock, from published market data, is 40%.

In the example illustrated in Figure 3, which is more typical of real life restricted share problems, the value of a series of put options that hedges the entire holding is calculated with a range of expiry dates between one and four years. Unlike the example from Figure 2 however, published market prices are typically not available for the series of put options required to hedge the entire shareholding. It is therefore necessary to calculate all possible put option prices for different combinations of exercise prices and expiry dates. This ability is accomplished by making use of two fundamental equations from corporate finance.

Put-Call Parity and the *Black-Scholes* Formula

In order to calculate the value of any put option, one must first understand that the value of a put option is related mathematically to the value of a call option having the same terms by the equation from corporate finance known as *put-call parity.* The put-call parity equation simply states the mathematical relationship between a put option and a call option having the same terms, as follows:

Figure 4

Call option value – Put option value = Stock Price – Present value of Strike Price

Moving the terms around using simple algebra, one can solve for the value of the put option:

Put option value = Call option value – Stock Price + Present value of Strike Price

From the put-call parity equation, the stock price and the present value of the strike price are easily obtained. The call option value is determined by using the *Black-Scholes* equation derived by Professors Fisher Black and Myron Scholes in 1972, which is shown in Figure 5. This equation calculates the value of a call option for a non-dividend paying stock.

If the stock under consideration pays dividends, adjustments are required to account for the dividend paying nature of the stock.

Figure 5

C	=	$SN(d_1) - Xe^{-rt}N(d_2)$, where
d_1	=	$\dfrac{\ln(S/X) + (r + \sigma^2/2)\,T}{\sigma\sqrt{T}}$
d_2	=	$d_1 - \sigma\sqrt{T}$, and where
C	=	current option value
S	=	current stock price
X	=	exercise price
r	=	risk-free interest rate
T	=	time to maturity of option in years
σ	=	standard deviation of the annualised continuously compounded rate of return of the stock
ln	=	natural logarithm function
e	=	the base of the natural logarithm function, or 2.71828
N(d)	=	the probability that a random draw from a standard normal distribution will be less than d

The *Black-Scholes* formula provides the last of the three unknowns contained in the formula for the value of the put option given in Figure 4. By substituting these terms into the equation given in Figure 4, a valuator can then proceed to determine the restricted stock discount for the executive's restricted stock holding, as follows:

Figure 6

Number of Shares (A)	Restriction Period (years)	Risk-free Interest Rate	Exercise Price of Put Required to Hedge Single Share	Value of Call per *Black-Scholes*	Value of Put per *Put-call Parity* (B)	Total Cost of Hedging Strategy (A) x (B)
5,000	1	6.00%	$127.20	$19.11	$19.11	95,549
5,000	2	6.25%	$135.00	$27.06	$26.65	133,233
5,000	3	6.50%	$143.40	$33.26	$31.97	159,848
5,000	4	6.75%	$152.40	$38.59	$35.95	179,735
20,000				Total cost of hedging strategy (		568,365
			Total value of portfolio, but for restricted nature (D)			2,400,000
				Restricted stock discount (C) ÷ (D)		24%

Conclusion

When calculating the restricted stock discount for a particular shareholding, it is important to have all the facts, as underlying circumstances can render the approach discussed in this paper inappropriate. A careful review of the circumstances surrounding the restricted stock holding as well as knowledge of the other shareholders are necessary. In certain circumstances, a restricted stock discount is not appropriate to take at all. However, where a restricted stock discount is appropriate, the approach discussed in this paper provides a method to establish a supportable range. It is not appropriate to apply an arbitrary 25% to 40% discount except in the most general of circumstances. Particularly in litigation, a supportable approach to the quantification of restricted stock discounts like the one discussed in this paper, is necessary.