

Memo

To: Financial Accounting Standards Board
From: Dr. Johnathan Mun
CC: Michael Tovey
Date: June 1, 2004
Re: Comment on FAS 123 Methodologies III – Marketability Discounts

This memo is written in response to the request for comment on the March 31, 2004 Proposal for FAS 123 Revisions. In general, this author and practitioner agrees with the overall proposal with the following suggestions and comments. This memo is a follow-up to the author's previous comments, and are based on an excerpt of the author's book, "Valuing Employee Stock Options Under 2004 FAS 123" (Wiley, September 2004). The calculations performed throughout this memo uses the author's own proprietary software algorithms on applying customized binomial lattices and thousands of lattice steps are used. All errors are my own.

Marketability Discounts

The 2004 proposed FAS 123 revision does not explicitly discuss the issue of non-marketability. That is, ESOs are neither directly transferable to someone else nor are they tradable in the market. Under such circumstances, it can be argued based on sound financial and economic theory that a non-tradable and non-marketable discount can be appropriately applied to the ESO. The author's suggestion is to allow the incorporation of marketability discounts be taken by firms issuing ESOs. However, this is not a simple task as will be discussed.

A simple and direct application of a discount should not be based on an arbitrarily chosen percentage *haircut* on the resulting binomial lattice result. Instead, a more rigorous analysis can be performed using a *put option*. A call option is the contractual right but not the obligation, to *purchase* the underlying stock at some predetermined contractual strike price within a specified time, while a put option is a contractual right but not the obligation, to *sell* the underlying stock at some predetermined contractual price within a specified time. Therefore, if the holder of the ESO cannot sell or transfer the rights of the option to someone else, then the holder of the option has given up his or her rights to a put option (that is, the employee has written or sold the firm a put option). Calculating the put option and discounting this value from the call option provides a theoretically correct and justifiable non-marketability and non-transferability discount to the existing option.

However, care should be taken in analyzing this haircut or discounting feature. The same inputs that go into the customized binomial lattice to calculate a call option should also be used to calculate a customized binomial lattice for a put option. That is, the put option must also be under the same risks (volatility that can change over time), economic environment (risk-free rate structure that can change over time), corporate financial policy (a static or changing dividend yield over the life of the option), contractual obligations (vesting, maturity, strike price, and blackout dates), investor irrationality (suboptimal behavior), firm performance (stock price at grant date), and so forth.

Albeit non-marketability discounts or haircuts are not explicitly allowed by FAS 123, the valuation analysis is performed below anyway, for the sake of completeness. It is up to each firm's

management to decide if haircuts should and can be applied. Figure 1 below shows the customized binomial lattice valuation results of a typical ESO.¹

Customized Binomial Lattice (Option Valuation)	Behavior (1.20)	Behavior (1.40)	Behavior (1.60)	Behavior (1.80)	Behavior (2.00)	Behavior (2.20)	Behavior (2.40)	Behavior (2.60)	Behavior (2.80)	Behavior (3.00)
Forfeiture (0.00%)	\$24.57	\$30.53	\$36.16	\$39.90	\$43.15	\$45.87	\$48.09	\$49.33	\$50.40	\$51.31
Forfeiture (5.00%)	\$22.69	\$27.65	\$32.19	\$35.15	\$37.67	\$39.74	\$41.42	\$42.34	\$43.13	\$43.80
Forfeiture (10.00%)	\$21.04	\$25.22	\$28.93	\$31.29	\$33.27	\$34.88	\$36.16	\$36.86	\$37.45	\$37.94
Forfeiture (15.00%)	\$19.58	\$23.13	\$26.20	\$28.11	\$29.69	\$30.94	\$31.93	\$32.46	\$32.91	\$33.29
Forfeiture (20.00%)	\$18.28	\$21.32	\$23.88	\$25.44	\$26.71	\$27.70	\$28.48	\$28.89	\$29.23	\$29.52
Forfeiture (25.00%)	\$17.10	\$19.73	\$21.89	\$23.17	\$24.20	\$25.00	\$25.61	\$25.93	\$26.19	\$26.41
Forfeiture (30.00%)	\$16.02	\$18.31	\$20.14	\$21.21	\$22.06	\$22.70	\$23.19	\$23.44	\$23.65	\$23.82
Forfeiture (35.00%)	\$15.04	\$17.04	\$18.61	\$19.51	\$20.20	\$20.73	\$21.12	\$21.32	\$21.49	\$21.62
Forfeiture (40.00%)	\$14.13	\$15.89	\$17.24	\$18.00	\$18.58	\$19.01	\$19.33	\$19.49	\$19.63	\$19.73

Figure 1 – Customized binomial lattice valuation results

Figure 2 shows the results from a non-marketability analysis performed using a down-and-in upper barrier modified put option with the same exotic inputs (vesting, blackouts, forfeitures, suboptimal behavior, and so forth) calculated using the customized binomial lattice model. The discounts range from 22% to 53%. These calculated discounts look somewhat significant but is actually in line with market expectations.²

¹ Assumptions used: stock and strike price of \$100, 10-year maturity, 1-year vesting, 35% volatility, 0% dividends, 5% risk-free rate, suboptimal behavior range of 1.2 to 3.0, forfeiture range of 0% to 40%, and 1,000 step customized lattice.

² Cedric Jolidon finds that the mean values of marketability discounts to be between 20%-35% in his article, "The Application of the Marketability Discount in the Valuation of Swiss Companies," (Swiss Private Equity Corporate Finance Association). A typical marketability range of 10%-40% were found in several discount court cases. In the CPA Journal (Feb 2001), M. Greene and D. Schnapp found that a typical range was somewhere between 30%-35%. Another article in the *Business Valuation Review* finds that 35% is the typical value (Jay Abrams, "Discount for Lack of Marketability"). In the *Fair Value* newsletter, Michael Paschall finds that 30%-50% is the typical marketability discount used in the market.

Haircut (Customized Binomial Lattice Modified Put)	Behavior (1.20)	Behavior (1.40)	Behavior (1.60)	Behavior (1.80)	Behavior (2.00)	Behavior (2.20)	Behavior (2.40)	Behavior (2.60)	Behavior (2.80)	Behavior (3.00)
Forfeiture (0.00%)	\$11.33	\$11.33	\$11.33	\$11.33	\$11.33	\$11.33	\$11.33	\$11.33	\$11.33	\$11.33
Forfeiture (5.00%)	\$10.76	\$10.76	\$10.76	\$10.76	\$10.76	\$10.76	\$10.76	\$10.76	\$10.76	\$10.76
Forfeiture (10.00%)	\$10.23	\$10.23	\$10.23	\$10.23	\$10.23	\$10.23	\$10.23	\$10.23	\$10.23	\$10.23
Forfeiture (15.00%)	\$9.72	\$9.72	\$9.72	\$9.72	\$9.72	\$9.72	\$9.72	\$9.72	\$9.72	\$9.72
Forfeiture (20.00%)	\$9.23	\$9.23	\$9.23	\$9.23	\$9.23	\$9.23	\$9.23	\$9.23	\$9.23	\$9.23
Forfeiture (25.00%)	\$8.77	\$8.77	\$8.77	\$8.77	\$8.77	\$8.77	\$8.77	\$8.77	\$8.77	\$8.77
Forfeiture (30.00%)	\$8.34	\$8.34	\$8.34	\$8.34	\$8.34	\$8.34	\$8.34	\$8.34	\$8.34	\$8.34
Forfeiture (35.00%)	\$7.92	\$7.92	\$7.92	\$7.92	\$7.92	\$7.92	\$7.92	\$7.92	\$7.92	\$7.92
Forfeiture (40.00%)	\$7.52	\$7.52	\$7.52	\$7.52	\$7.52	\$7.52	\$7.52	\$7.52	\$7.52	\$7.52

Non-marketability and Non-transferability Discount (%)	Behavior (1.20)	Behavior (1.40)	Behavior (1.60)	Behavior (1.80)	Behavior (2.00)	Behavior (2.20)	Behavior (2.40)	Behavior (2.60)	Behavior (2.80)	Behavior (3.00)
Forfeiture (0.00%)	46.09%	37.09%	31.32%	28.39%	26.25%	24.69%	23.55%	22.96%	22.47%	22.07%
Forfeiture (5.00%)	47.43%	38.92%	33.43%	30.62%	28.57%	27.08%	25.98%	25.42%	24.95%	24.57%
Forfeiture (10.00%)	48.60%	40.55%	35.35%	32.68%	30.73%	29.32%	28.28%	27.75%	27.31%	26.95%
Forfeiture (15.00%)	49.62%	42.01%	37.08%	34.57%	32.73%	31.40%	30.43%	29.93%	29.53%	29.19%
Forfeiture (20.00%)	50.52%	43.31%	38.66%	36.29%	34.57%	33.33%	32.42%	31.96%	31.59%	31.28%
Forfeiture (25.00%)	51.32%	44.48%	40.09%	37.86%	36.25%	35.10%	34.26%	33.84%	33.49%	33.22%
Forfeiture (30.00%)	52.03%	45.53%	41.38%	39.29%	37.79%	36.72%	35.95%	35.56%	35.25%	35.00%
Forfeiture (35.00%)	52.67%	46.48%	42.56%	40.60%	39.20%	38.21%	37.50%	37.15%	36.86%	36.63%
Forfeiture (40.00%)	53.24%	47.34%	43.64%	41.80%	40.49%	39.57%	38.92%	38.60%	38.34%	38.14%

Figure 2 – Non-marketability and non-transferability discount

Therefore, it is the recommendation of this practitioner that the lack of transferability and marketability discounts be discussed more clearly, blackout dates be allowed in the fair-market valuation of the ESOs, and additional detailed guidance be provided in the final release.

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