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From: Johnathan Mun [jmun@crystalball.com]
Sent: Friday, May 14, 2004 11:57 AM
To: Director - FASB
Cc: Michael Tovey
Subject: Comment on File Reference No. 1102-100

Please see attached comments below on the FAS 123 Exposure Draft.

<<Comment on Exposure Draft.doc>>

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Memo

To: Financial Accounting Standards Board

From: Dr. Johnathan Mun

CC: Michael Tovey

Date: May 14, 2004

Re: Comment on FAS 123 Methodologies

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.

Bulow-Shoven Method

An alternative proposed by Stanford University professors Jeremy Bulow and John Shoven shortens the time frame involved in modeling a grant's value. Since most programs require employees who leave the company to exercise their options within 90 days, the Bulow-Shoven approach would assume that a new grant is made every quarter, requiring a company to subtract the value of extending its existing options another three months as an expense, along with the three-month cost of any newly granted options. The authors contend such an ongoing method would give a more-accurate picture of the cost of outstanding grants than any attempt to provide a once-and-for-all valuation. According to the CFO Magazine, "FASB says it will take these issues into account in its deliberations over the final rule, due out by the end of the year. 'We expect that over time, companies will move to the binomial method, because it provides a better measure of the option value,' says board member G. Michael Crooch. And he notes that the use of estimates is a necessary evil. "FASB must rely on management and auditors to properly apply our standards," he says.

Although simple to calculate, there are several issues that the Board needs to consider. <u>These issues make the Bulow-Shoven approach less attractive and less applicable in real-life ESO valuation</u>. A summary of the issues are listed below:

- A modified expected life of 90 days is used instead of the maturity length (e.g., 0.25 years is used instead of the full 10 years) will too significantly shorten the life and reduce the option value. For instance, a $100 stock price at grant date, $100 strike price, 10-year maturity, 5% risk-free rate, 0% dividend, and 50% volatility will yield a value of $67.32 using the Black-Scholes model (BSM) for 10 years but only $9.95 using 0.25 years as the maturity and setting risk-free rate to 0% according to the Bulow-Shoven method. The disparity between these two figures is way too significant. Future true-ups on the value cannot be determined currently as the stock price is not yet known.

- A BSM is used in the valuation for the 90-day period. In real-life, the ESO is an American option, not a European option where the BSM is applicable. The employee can execute at any time during this period, and this flexibility is not accounted for in the BSM.

- True-ups should be done after the fact, that is, valuation performed in advance, and when the stock price becomes known, firms can then perform a true-up to modify the actual expenses. This should not be done on-the-fly as suggested by the methodology.

- Firms will be unable to perform any strategic planning to forecast their ESO costs because this method requires actual stock prices to be known before a value can be assigned. This provides significant barriers to firms who require knowledge of their proposed ESO grants in advance for strategic and corporate planning requirements. This method is applicable only after the stock price becomes known, otherwise stock prices will have to be forecast for every 90-day period for the next 10 years or for the life of the option. Forecasting stock prices is infinitely more difficult and inaccurate than any input variable in the binomial lattice.

- The method does not follow the proposed FAS 123 requirements such as incorporating real-life measures. Specifically, the method ignores suboptimal exercise behavior, vesting, and forfeiture rates. In fact, per the first item on this Memo, the treatment of forfeiture rates should be treated within the lattice model, and not outside the model due to the interactions among variables. The Bulow-Shoven method completely ignores this.

- Blackout dates will now become significant because the proportion of blackouts to the 90-day period is high and needs to be accounted for but the methodology fails to do so.

- The FAS 123 proposals explicitly prohibit the use of expected life analysis, but this method uses something akin to an expected life of 90 days.

- The FAS 123 proposals require expensing be based on multiple mini-grants, not on a straight-line or modified amortization schedule as the method employs (e.g., the method shows an example recognizing 1/2 of the grants one year before vesting, and 1/8 in each of the next 4 quarters.

The comment that this author has on the applicability of the Bulow-Shoven method is that it is simple to apply but not in line with the spirit of FAS 123. The bullet points above are just a few insights into how the method is not applicable. It is therefore suggested that the Board take these items into consideration.

Treatment of Forfeiture Rates

One note of caution in applying the customized binomial lattice is the application of forfeiture rates. The treatment of forfeiture rates will also yield a difference in the option valuation results. Specifically, forfeiture rates can be applied inside a customized binomial lattice model (calculations are performed inside the lattice algorithm above) versus outside (adjusting the results after obtaining them from the binomial lattice). The valuation obtained will in most cases and under most conditions be different. At the time of writing, it is still unknown which direction the final FAS 123 requirements will lean towards. Figure 1 illustrates some of the non-trivial differences in valuation between using forfeitures inside versus outside of the binomial lattice for a typical ESO. Applying forfeiture rates internal to the lattice consistently provides a lower value than when applied outside the lattice.

If the forfeiture rate is applied inside the lattice, which in the author's opinion is the correct method, then when using the customized binomial lattice algorithm, simply input the forfeiture rate as is. In addition, the forfeiture rates can also be allowed to change over time in the customized binomial lattice algorithm. If the forfeiture rate is applied outside the lattice, simply set all forfeiture rates to zero in the binomial lattice and multiply the valuation results by *(1–Forfeiture)*.[1] To understand the theoretical implications of inside versus outside treatments of forfeiture rates, we first need to understand how forfeiture rates are used in the model.

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[1] This has the same effect of multiplying the number of grants by (1–Forfeiture) because total valuation is Price x Quantity x (1–Forfeiture), so it does not matter whether the forfeiture adjustment is made on the option price or the quantity of option grants, as long as it is only applied once.

Comparing ESO Valuation on Applying Forfeitures Inside versus Outside Lattices

Stock Price	$50	$50	$50	$50	$50	$50	$50	$50
Strike Price	$50	$50	$50	$50	$50	$50	$50	$50
Maturity	10	10	10	10	10	10	10	10
Risk-free Rate	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%
Dividend	0%	0%	0%	0%	0%	0%	0%	0%
Volatility	55%	55%	55%	55%	55%	55%	55%	55%
Lattice Steps	1000	1000	1000	1000	1000	1000	1000	1000
Vesting Period	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Suboptimal Behavior	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80
Forfeiture Rate	**0.00%**	**2.50%**	**5.00%**	**7.50%**	**10.00%**	**12.50%**	**15.00%**	**20.00%**
Naïve BSM	*$34.02*	*$34.02*	*$34.02*	*$34.02*	*$34.02*	*$34.02*	*$34.02*	*$34.02*
Customized Binomial (Inside Forfeiture)	*$22.60*	*$21.45*	*$20.40*	*$19.44*	*$18.56*	*$17.75*	*$16.99*	*$15.63*
Customized Binomial (Outside Forfeiture)	*$22.60*	*$22.04*	*$21.47*	*$20.91*	*$20.34*	*$19.78*	*$19.21*	*$18.08*
Difference	*$0.00*	*($0.58)*	*($1.07)*	*($1.46)*	*($1.78)*	*($2.03)*	*($2.22)*	*($2.45)*

Figure 1 – Comparing the application of forfeiture rates

When applied inside the lattice, the forfeiture rate is used to condition the customized binomial lattice to zero if the employee is terminated or leaves during the vesting period. Post-vesting, the forfeiture rate is used to condition the lattice to execute the option if it is in-the-money or allowed to expire worthless otherwise, regardless of the suboptimal exercise behavior multiple when the employee leaves. This is important because due to the nonlinear interactions among variables, by putting the forfeiture rates inside the lattice, these interactions will be played out in the model—for instance, forfeiture dominates when an employee leaves, but suboptimal behavior and vesting dominate the value when there are no forfeitures, and the employees' actions will depend on the rate of forfeiture and suboptimal behavior. This rate is applied inside the customized binomial lattice. That is, at certain nodes, the lattice value becomes worthless going forward as the option is terminated due to forfeiture. This is more applicable in real life where if an employee who holds a large ESO grant leaves, his or her ESOs become worthless going forward (in the vesting period or post-vesting if the ESO is at-the-money or in-the-money). In other words, each option grant has a different expected life (the point where forfeiture occurs is the point where the option value reverts to zero or is executed if in-the-money), and the backward induction calculation used will result in different values compared to applying forfeiture rates outside the lattice.

In contrast, when used outside the lattice, this means that all grants will never be forfeited in the valuation analysis. Forfeiture adjustments will only occur afterwards. In other words, all ESOs will mature and their values will be based on the total length of maturity. Then, these values are adjusted for forfeitures. This is less likely to happen in real life because what this implies is that all employees who are terminated or leaves voluntarily will only leave at the end of the maturity period. If this were the case, then at maturity, the vesting period would have been over anyway, and by definition, employees will be able to exercise their ESOs if they are in-the-money. Thus, adjusting the forfeitures this way makes little sense. In addition, by setting the forfeiture rates outside of the lattice, any and all interactions among forfeiture, vesting, and suboptimal behavior (see the examples on nonlinearity and interactions among variables provided in this article) will be lost. Finally, by setting the forfeiture rates outside the lattice means that the employee's employment status plays no role in determining whether an ESO will be executed. This also makes no sense. If an employee forfeits his or her ESO after they are vested, he or she has a limited time to execute the options or lose them. Also, by leaving the forfeiture rate outside, it assumes that employees will execute an ESO when the stock price exceeds the suboptimal exercise threshold regardless of their employment status, which again violates the contractual requirements in the ESO, especially when the employee has already forfeited the option.
With that said, no matter how forfeitures are applied, the higher the forfeiture rate, the lower the option value becomes. However, as seen in Figure 1, valuing the option using forfeiture rates based on applying them internally in a lattice reduces the option value more than applying it external to the lattice.

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 2 below shows the customized binomial lattice valuation results of a typical ESO.[2]

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 2 – Customized binomial lattice valuation results

[2] 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.

Figure 3 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.[3]

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 3 – Non-marketability and non-transferability discount

Please do not hesitate to continue our conversations going forward.

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[3] 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.