

**Analysis Group, Inc. Comments on the FASB Exposure Draft Pertaining to
Equity-Based Compensation, Issued March 31, 2004**

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With one exception, our comments focus on valuation-related issues. We agree with FASB's stated objective of estimating fair value based on valuation techniques that (1) reflect the characteristics of the instrument being valued; (2) are based on accepted financial and economic principles and are generally accepted by valuation experts; and (3) can reflect changes in inputs during the instrument's contractual term.

We also agree with FASB's attempt to ensure consistency and comparability by giving precise guidelines as to how inputs are to be calculated and precluding firms from switching back and forth between models. In addition, the ED specifies minimum disclosure requirements concerning the methods used to estimate both fair value and the model's inputs.

We share FASB's preference for lattice-based models, because they have the ability to explicitly reflect the characteristics of the instrument being valued and can allow model inputs to vary over time. Similarly, we share FASB's view that it would be inappropriate to mandate the use of any particular model at this time.

Below we offer both general and specific comments. Our specific comments focus on statements in the ED that appear to be ambiguous, contradictory or inconsistent with generally accepted financial or economic principles.

I. General Comments

A. Need for Flexibility

Because improvements in methods used to estimate fair value are expected to continue to evolve, we recommend that the final rule FASB include language similar to that in Paragraph 154 of Statement 123: "The Board's intent in this Statement is for the guidance in both the standards section and the guidance in the illustrations in Appendix B to be sufficiently broad that employers may adopt future refinements in models that improve their application to employee stock options without requiring the Board to amend this Statement." Such a statement will insure that companies are encouraged to adopt improvements both in the models used to value equity-based instruments and the methods used to estimate inputs.

For example, the ED discusses two types of models that can be used to estimate fair value: lattice and closed form models. However, since lattice models are usually taken to mean tree-based models such as the binomial and trinomial models, the ED may be interpreted as precluding the use of other types of models, such as a simulation model. There are instances (e.g., the valuation of very complex performance vested instruments involving both path dependency and multiple state variables) where simulation methods may be the only viable solution method. The ability to use more flexibly models is expected to be crucial if, as is generally expected, firms emphasize the use of non-traditional performance vested and indexed options and other equity-based instruments.

However, deviation from the FASB guidelines should be allowed only if, as stated on page 42 of the ED, the new methods are consistent with "...established principles of financial economic theory and generally accepted by experts in that field." This philosophy is similar to the one advocated by the International Accounting Standards Board (IASB), where their final rule provides a framework that is tied to the principle that entities should consider factors that willing market participants would consider in selecting the option pricing model to apply.¹

B. Mechanism for Providing Clarification

As will be discussed in more detail under our specific comments, certain statements in the ED appear to be either ambiguous or inconsistent. We recommend that in the final rule that FASB attempt to clarify these statements.

II. Specific Comments

A. Treatment of Equity versus Liability Awards

In the ED equity awards are treated differently from liability awards. The principal difference is that fair value for liability awards is remeasured at the end of each reporting period based on the market value of the underlying stock. For equity grants the fair value is not remeasured.

Comment: We recommend that the same method be used for both types of instruments. Otherwise, there is a risk that the instruments chosen by a particular firm will be based on the accounting treatment rather than on how well the instrument fits with the firm's business objectives. The remeasurement feature is expected to promote more accurate estimates on an ex-post basis and to lead to greater reporting variability.

¹ Page 30 of the IASB's final rule, dated February 2004.

B. Calculation and Use of the Expected Term of Employee Stock Options

According to the ED, all option pricing models used to estimate fair value must take Expected Option Term (EOT) into account. When computing EOT, companies are to reflect the instrument's contractual term as well as *employees' expected exercise and post-vesting employment termination behavior* ("exercise" and "termination behavior"). For closed form models, the duration input is similar to that required in Statement 123, except that EOT rather than "expected option life" is to be substituted for the option's contractual term. However, for lattice-based models that have been modified to take into account an option's contractual term and employees' exercise and termination behavior, EOT is to be an *output* from the model, not an input to the model.

Comment: We recommend that FASB clarify how EOT is to be used in a lattice model. Since companies using lattice-based models (that have been modified to take into account exercise and termination behavior) are both to estimate EOT and output this measure, one interpretation would be that lattice-based models are to be tied to or "calibrated" to EOT. That is, companies are to adjust the lattice-based model so that the value it outputs for EOT equals the actual observed value of EOT. The notion of calibrating the model to historical data is an important concept. Unlike exchange traded options (ETOs), employee stock options (ESOs) do not have prices to which they can be calibrated. Hence, accuracy is greatly improved by ensuring that option valuation models correctly predict actual observed measures of exercise and termination behavior, such as EOT.

Another interpretation is that companies are relatively unconstrained with respect to the data and methods to be used to account for expected exercise and departure behavior. The only constraint, under this view, would appear to be that companies are to use data and methods that are consistent with "... established principles of financial economic theory and generally accepted by experts in that field...and reflect[] any and all substantive characteristics of the instrument." This suggests that firms using lattice models are to modify the traditional binomial model to reflect both the characteristics of the instrument being valued and employees' expected exercise and termination behavior. They will also need to determine appropriate measures of employees' expected exercise and termination behavior. These measures would include EOT, which by definition accounts for both employees' expected exercise and termination behavior, as well as other measures. As was the case with the first interpretation, presumably the model would include a mechanism that would enable it to be tied or calibrated to observed measure(s) of exercise and termination behavior.

A final interpretation is that EOT is to be used instead of the option's contractual life as the duration input for lattice-based models in addition to closed form models.

C. Appropriate Duration to Use for Lattice Models

As noted above, for lattice models there is ambiguity concerning the proper duration input to use. Several places in the ED (e.g., first full paragraph on page 46 or Appendix B, describing the

calculation of the risk free rate for lattice-based models) state or imply that the lattice model can be based on an instrument's contractual term. However, Footnote 9 of Appendix B states: "To reflect the effect of employee's inability to sell their vested options, this Statement requires that the fair value of an employee share option be based on its expected term rather than its contractual term."² This footnote is also inconsistent with Paragraph 20 of Appendix B, which states: "However, if an entity uses a lattice model that has been modified to take into account an option's *contractual term* and employees' expected exercise and post-vesting employment termination behavior, the expected term is estimated based on the resulting output of the lattice" (emphasis added). For a lattice model, use of the option's expected term to account for nontransferability is contrary to how lattice models are used by valuation experts. The above quote and guidance are given by the Option Valuation Group (OVG) convened by FASB.³

D. Inconsistent Durations for Key Model Inputs

There is an inconsistency in the ED with respect to the terms to be used for lattice models for key model inputs, such as the risk-free rate, volatility and dividend yield. The ED states that whereas volatility is to be over a period that is commensurate with the contractual term of the options, the risk-free rate is to be for the expected term of the option. Also, the illustrations (e.g., Illustration 4) indicate that that the three inputs, discussed above, are to be based on the instrument's contractual life (denoted as "CT" in the Illustration).

Comment: For a lattice model, the appropriate term for the inputs is clearly the instrument's contractual life.⁴ To see this, assume that the risk-free rate exhibits a term structure and that the term structure covers just the instrument's expected term. Since exercise can occur at any time after the option vests up to and including the instrument's contractual life, values for the risk-free rate, one of the inputs required to compute the option's continuation value, would not be available from the option's expected term to its contractual life. We recommend that the ED indicate that the duration for all of the inputs should be the instrument's contractual life.

E. ED Recommendation that Both Types of Models Be Used to Determine EOT

In a Footnote on page 48 of the ED, FASB gives additional direction concerning an acceptable method for using a lattice model to estimate EOT for financial reporting purposes. The method involves using a lattice model's estimate of fair value as an input to a closed form model. The closed form model is then solved for the value of the duration (EOT) that will cause the value produced by the closed form model to equal the value produced by the lattice model.

Comment: As noted in the ED, a lattice model can be modified to output EOT. Experts in the field may thus consider it unnecessary to use both types of models in the determination of fair value, as combining two will result in values that differ from those derived by an appropriately modified binomial lattice model.

² A similar statement is made in Issue 4(d) on page iii.

³ See No. 20, pages 5 and 6 of Minutes of the FASB Option Valuation Group Meeting, July 8, 2003, which states: "... the inability to transfer an ESO is to be captured through the...early exercise behavior considered in an option-pricing model."

⁴ See Cox, J., and M. Rubinstein, Options Markets, Prentice Hall, 1985, pages 254-255.

F. Expected Option Term May Not Be the Best Calibration Measure to Use

The ED requires the use of EOT as its principal calibration measure. However, we believe there are potential problems with using EOT.

Comment: The problem with the use of EOT as a measure of employee exercise and termination behavior is that it is greatly influenced by censoring and by changes in other factors, such as growth rate of the underlying stock price, length of the vesting period, the instrument's contractual life and stock price volatility. Censoring occurs when values are estimated based on incomplete information. Censoring occurs when estimating EOT because only the first few years of data are observed for more recent grants. As a result, the data do not reflect exercise behavior that will occur later in the life of the grant, causing EOT estimates to be biased downward. EOT is also influenced by changes in the growth rate of the underlying stock, stock price volatility, length of the vesting period and the instrument's contractual life. Consequently, separate estimates must be developed to reflect expected changes in these factors. For example, separate estimates of EOT would be required for each tranche of a program that is subject to a graded vesting schedule, since as noted on page 48 of the ED, EOT is expected to vary with the vesting period.

G. Exercise Multiple May Be a Superior Calibration Measure to EOT

Instead of using EOT, we recommend that FASB consider the use of other measures, such as the exercise multiple. The exercise multiple is the expected or average ratio of the stock price at exercise to the strike price.

Comment: The advantage of using the exercise multiple as a measure of exercise behavior is that it is generally not affected by censoring or by the other factors discussed above. For example, it is not affected by changes in the length of the vesting period.

As is the case with EOT, a lattice model can be modified to output the exercise multiple as well as many other measures of exercise and post-vesting termination behavior. As discussed above, a lattice model can be calibrated to the exercise multiple (or to any other measure) by adjusting parameters controlling the employee's early exercise behavior so that it outputs an exercise multiple equal to the average multiple at which employees are actually observed to exercise their options.

H. The Use of an Exercise Multiple to Model Early Exercise

The ED recommends that for the purpose of outputting EOT and estimating fair value that the lattice model be modified to reflect that exercise occurs whenever the stock price exceeds some predetermined multiple of the strike price.

Comment: While it is necessary to use some type of mechanism to reflect the effect of lack of transferability and other factors affecting early exercise, there are important issues to consider with regard to the proposed mechanism. First, exercise multiples fail to explicitly reflect factors

that are known to lead to early exercise for non-traded instruments, such as risk aversion and lack of diversification. Both of these factors, which come into play because of lack of transferability, are cited both in the financial literature and in the International Accounting Standards Board final rule.⁵ Second, the method recommended in the ED implicitly assumes that the optimal exercise boundary is constant. The optimal exercise boundary, even for models that reflect risk aversion and lack of diversification, is not constant, but instead continually declines as one approaches the expiration date. Consequently, the use of EOT could lead to errors in the estimation of fair value. Third, this method essentially imposes a barrier at the level of the stock price where exercise is assumed to occur. This complicates the solution process, because it is well known that failure to place a node of the lattice at the level of the barrier will cause measurement errors. This is the reason that American barrier options are usually valued by using a trinomial lattice model, because of its ability to ensure the correct placement of the lattice.

I. FASB Believes Lattice-Based Models May Not Be Suitable for Some Firms

While the ED does not require any particular model, it does state a strong preference for lattice-based models: “[Board members] believe that a *lattice model is preferable* because it offers the greater flexibility needed to reflect the unique characteristics of employee stock options and similar instruments” (emphasis added). Lattice-based models can also reflect the term structure of risk-free rates and volatilities and expected changes in dividend yields over the option’s contractual term. While the ED states a preference for lattice-based models, it does not require firms to use them. According to the ED, FASB did not require firms to use such models because some firms may lack the required historical data on employee exercise and post-vesting termination patterns.

Comment: A lattice model can be constructed that uses readily available data to meet ED requirements.⁶ The model can be calibrated to such readily available measures of exercise and termination patterns as EOT (which by design incorporates this behavior), the ratio of expected stock price at exercise to the strike price (the “exercise multiple”), or the expected time-to-exercise. The term “calibrated” means that parameters in the model (e.g., parameters controlling early exercise behavior) are adjusted so that the model outputs the correct value of the desired calibration measure. For example, if by examining its historical data a company determined that an EOT of 6.2 years could be expected for a particular ESO grant, the input parameters of the lattice model would be adjusted until the model’s outputted EOT equaled 6.2. Moreover, when a firm lacks the data required to compute EOT or other appropriate calibration measures, it is often possible, as noted in the ED, to use data from similar companies as a proxy.

J. Guidance Concerning the Calculation of Model Inputs

The ED gives fairly precise guidance concerning how model inputs are to be calculated: (1) it specifies factors that should be considered when estimating specific inputs, such as volatility; (2)

⁵ International Accounting Standards Board, International Financial Reporting Standard: IFRS 2 Share-Based Payment, March 2004, Paragraph b16, page 32. In addition to lack of transferability, our model is also able to reflect the affect of risk aversion and lack of diversification on early exercise behavior.

⁶ Analysis Group has developed a binomial lattice model that has these capabilities. The results of the model have been used in both 10Q and 10K filings that were audited by one of the Big Four accounting firms.

it requires firms to consider factors that might cause the future to be different from the past and how inputs, such as the risk-free rate and volatility, are expected to change during the contractual term of the instrument (so-called “term structure” effects); (3) when estimating volatility, it requires firms to consider the possibility of mean reversion (i.e., the tendency for volatility to return to some long term level); and (4) that dividend payments and dividend yield may exhibit a trend.

Comment: The requirement to consider mean reversion when estimating volatility suggests that firms are to consider the use of sophisticated statistical models, which consider mean reversion, such as a GARCH-type models. For the most part, allowing the inputs to a lattice model to vary with time will not present any difficulties. The one exception is volatility. Unless care is exercised, allowing volatility to vary with time will cause technical difficulties with the construction of the binomial lattice (i.e., prevent the lattice from recombining). When this occurs, the number of nodes increases exponentially making it impossible to value all but options with a small number of time steps.

K. Requirement to Calculate Expected Values for Inputs

The ED states that there is likely to be a range of estimates for expected volatility, dividends and option life and that if no value within the range is any more likely than any other value, then an average of the range (its “expected value”) should be used for each of these inputs.

Comment: Based on the wording of this statement and on the illustrations in Appendix B of the ED, it appears that even if the time paths of the inputs can be accurately estimated, a firm should instead use the average of the year-by-year changes in the inputs in the model. This method is inconsistent with methods used by experts in the field and with the goals of the ED. Consistent with the goals of the ED, experts in the field use lattice models that have been modified to reflect the actual term structure and to allow the inputs to vary year-by-year rather than lump the year-to-year changes into a single number.⁷

L. Calculation of Expected Values for Lattice Models

When using a lattice-based model, the ED requires that expected values for volatility, dividends and option life are to be determined for a particular node (or multiple nodes during a particular time period) and not over multiple time periods unless such an application is supported by the instrument being valued.⁸ This statement and the one above suggest that these inputs to a lattice model should *not* be allowed to vary across time, but instead should be based on the values that would be appropriate for either a single node (of the lattice) or for a range of nodes, which presumably would then be averaged, for a particular time period.

Comment: Given the length of the contractual term of most equity-based instruments, these three inputs may not remain constant over time. Hence, practitioners may argue that these inputs be allowed to change across time for both lattice and closed form models. Both types of models

⁷ See Clewlow, L. and C. Strickland, *Implementing Derivatives Models*, Wiley, 1998, pages 37–40.

⁸ It is not clear why this requirement does not also apply to the risk-free rate. Presumably the risk-free rate, volatility and dividend yield could all vary with time.

have been modified to allow the inputs to vary with time (and with the level of the stock price). While, as stated above, it may be reasonable to assume that these inputs may vary with time, this variance may not be dependent upon the level of the stock price. For example, sophisticated models currently used to estimate future values of volatility (e.g., GARCH models) generally do not depend upon the level of the stock price but rather, as recommended in the ED, on a mean reverting process that converges to an equilibrium level of volatility.⁹

M. Methodology for Valuing Instruments with Performance Features

In Illustration 5 of Appendix B, FASB computes the value of a performance-based option by multiplying the fair value of a typical option (from Illustration 4) by the most likely number of options to vest as a result of the performance condition (in this case, growth in the company's market share).

Comment: This method may lead to valuation errors because it fails to reflect the correlation between the performance measure and the stock price.¹⁰ Since the performance measure would be positively correlated with the level of the stock price, high levels of performance would be associated with high stock prices at the measurement date. A high price at the measurement date would lead to a higher fair value than for a typical option. Hence, the method proposed in the ED will tend to understate valuations associated with high levels of performance (because it uses average value per option rather than a high value per option) and overstate valuations associated with low levels of performance. The problem is that the value per option and the number of options expected to vest are determined simultaneously. As a consequence, practitioners may argue that the correlation between the performance condition and the stock price be reflected by using a lattice-based model that, in addition to stock price, includes the performance condition as another stochastic state variable.¹¹ Such a model would use inputs that are similar to those used to value instruments with indexed strike prices (see Illustration 7 in Appendix B of the ED).

In addition, the ED recommends that fair value be based on the modal or "most likely number" of options that will vest. Another possible approach, discussed by FASB's Option Valuation Group, determines cost using the contingent valuation method, which requires that instruments be based on the expected present value of the cash flows from the instrument. When determining the fair value of a performance based instrument, this method computes an expected value rather than a modal value.¹²

⁹ Hu., J. Options, Futures and Other Derivative Instruments, Fifth Ed., Prentice Hall, Upper Saddle River New Jersey, 2002, page 376-377.

¹⁰ The magnitude of the error will depend upon the correlation between the stock price and the performance measure. It will be greatest for plans that include market conditions (e.g., options that vest only if the stock price exceeds a given value).

¹¹ Analysis Group has developed such a model.

¹² Under the contingent valuation method, the present value is to be based on the risk-free rate and the expected value is to be based on a risk-neutral distribution. See for example, Hull, J.C., Options, Futures and Other Derivatives, Fifth Ed., Prentice Hall, 2003.

N. Method Used to Value Reload Options

In the ED, reload options would be valued by treating each new generation of options as if it were a separate award. Methods exist for estimating the value of reload options. In fact, in the Option Valuation Group Minutes some of the members state that reload options can be easily valued by a binomial lattice model.

Comment: The method proposed in the ED is *not* expected to be the most accurate method for estimating the fair value of a reload option. The value of a reload option is not simply the sum of the values of the individual reloads, treated as if they were stand-alone awards. The ability to make subsequent exercises will cause employees to exercise reload options earlier and the value of each reload to be progressively less than would be the case for traditional employee stock options (ESOs).

O. Clarification of the Illustrations in Appendix B

As in Statement 123, the ED uses the term “forfeitures” throughout most of the document. However, the term “terminations” is substituted for forfeitures in the text of Appendix B.

Comment: While it may be possible to use the two words interchangeably during the vesting period (since the forfeiture and termination rates will be the same during this period), this is not the case post-vesting. After vesting, the two rates will differ because terminations result in forfeitures only if the instrument is out-of-the-money. If the instrument is in-the-money, the instrument will be exercised upon termination.

Also, the illustrations for graded vesting (Paragraph B70) require further explanation. The results show value increasing with increases in the vesting period. This result can be correct but is counter intuitive from the perspective of exchange-traded options. For exchange-traded options increases in the length of the vesting period will cause value to decline (because it reduces the number of exercise opportunities). This situation can occur with options because the vesting restrictions prevent risk averse employees from exercising options earlier than would be optimal from the standpoint of value maximization.

P. Optimal Exercise

Footnote 27 of Appendix B of the ED asserts that option pricing theory (presumably for exchange-traded options) generally holds that the optimal (or profit-maximizing) time to exercise an exchange-traded option is at the end of the option’s term, and that exercise prior to the end of an option’s term is “suboptimal.” However, for exchange-traded options on stocks that pay dividends, optimal exercise may occur earlier because option holders do not capture dividends. The greater the dividend yield, the earlier it makes sense to exercise. In fact, it is because an American option can be exercised early (when the value from exercise exceeds the value of continuing to hold the option) that its value exceeds that of a European option, which can only be exercised at the instrument’s expiration date (see Statement 123, page 93). Additionally, because

of lack of transferability and risk aversion, employees will exercise employee stock options earlier than would an unconstrained investor holding ETOs.

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