February 18, 2005

The Technical Challenges to Accurately Valuing Employee Stock Options[1]

Overview

The Securities and Exchange Commission has stated that it is considering issuing guidance regarding the implementation of FASB's revised Statement 123, which requires firms to use fair value accounting to expense employee stock options. This Panel urges the SEC to give due consideration to the serious technical obstacles and valuation inconsistencies created by Statement 123 (r) and delay implementation until these problems have been resolved.

In the Panel's view, the public interest requires that shareholders and potential shareholders have the best possible information regarding the impact of the issuance of employee stock options on the value of the firm and its outstanding shares. In light of the issues that our Panel has studied in its review of Statement 123 (r), we believe that the proposed approach will likely diminish the quality of information available to shareholders.

Moreover, the decision to move the imprecise valuation of employee stock options out of the footnotes of the financial statements and into the balance sheet and income statement implies that employee stock options will be a net cost to the firm and that this cost can be measured precisely and reliably. As this report makes clear, this Panel disagrees with this premise, especially regarding the calculation methods suggested by Statement 123 (r).

Background

FASB Statement 123 (r) strongly points to Black-Scholes and binomial (or lattice) type models as the methods to calculate the value of an employee stock option that will satisfy FASB's requirements. Yet, existing finance and economic literature suggest that the Black-Scholes method has serious deficiencies with regard to the value of the options being issued. FASB implicitly recognizes this by suggesting the use of binomial or lattice models. While these models allow a richer form of analysis, they do so only by creating a wide range of discretion regarding assumptions to be used in the calculation. Black-Scholes, by contrast, is limiting because it makes a well-defined set of assumptions that happen not to be applicable to the particular options under consideration. But, the discretion of binomial or lattice type models opens firms up to potential liability if the set of assumptions used in valuing the options turn out, *ex post*, not to be born out by the actual unfolding of events, thus allowing the assumptions to be challenged as unrealistic and amounting to earnings manipulation or fraud.[2] The firm and its shareholders are thus placed in an almost impossible situation of either having to use a model which is known

[1] The International Employee Stock Options Coalition provided funding support for the panel to independently evaluate this issue.

[2] Hassett, K. and Wallison, P., 2004, "A Troubling Requirement," *Regulation*, Vol. 27, No. 1, Spring 2004.

to be wrong, or select one which could hypothetically be more appropriate, but might also expose the firm to legal liability.

The Black-Scholes model of stock options represented a revolution in the way the value of freely-traded options was perceived. The path-breaking insight of these models was that an option's value could be calculated by observing the cost of a portfolio that represented the mirror-image of the option. Typically this involved some combination of a position in the underlying security and in a risk free bond. The creation and valuation of such a mirror-image portfolio required that the relevant instruments were traded in deep and liquid markets and therefore that the valuation and trading of the option could be done independently of the valuation and trading of the underlying security. Moreover, to make the model tractable and thus usable by financial market participants, certain simplifying assumptions were made about the likely future behavior of the price of the underlying security.

These assumptions gave Black-Scholes a wide applicability in the field of publicly traded options. Market participants were able to trade these freely in highly liquid markets and generally held options for a relatively short period of time. This minimized the limitations of Black-Scholes. Of course, the private market participants themselves bore the risk in using any simplifying assumptions in their trading strategies. This is clearly not the case when the company itself, with the imprimatur of both FASB and the SEC, uses the same model to calculate a value that is provided to the public at large.[3]

Current applications of binomial and lattice models, being theoretically based on Black-Scholes, suffer from most of these same problems. In addition, these models allow the user discretion with a number of parameter values. The range of option value estimates that can be derived from plausible parameter values is enormous, thus casting doubt on the quality of earnings reports that will be based on these models. A review of the literature indicates that these shortcomings to the FASB approach fall into five broad classes: (1) assumption of option independence from the underlying security value; (2) risk neutrality; (3) parameter uncertainty; (4) mathematical assumptions regarding the distribution of returns and changes in their volatility over time; and (5) tax laws and other rules.

1) Independence

The Black-Scholes model was created to value publicly traded options that were created in a secondary market independent of the underlying firm and its security. In essence, these options were "side bets" on the value of the underlying security. The exercise of the options would have no effect on the underlying security's value. Exercise of the options would simply mean the transfer of ownership of some of the existing security from one owner to another.

[3]Fisher Black himself was quite frank about some of the shortcomings of Black-Scholes, even regarding its application to publicly-traded options. See Black, Fisher, "The Hole in Black-Scholes," *Risk Magazine*, 1988 and "How to Use the Holes in Black-Scholes," *Journal of Applied Corporate Finance*, Winter 1989.

This is not the case for the employee stock options for which the Black-Scholes model is now being considered. The exercise of these options does not mean simply the transfer of ownership of the underlying security, but the dilutive addition of new and additional units of the underlying security to the market by the firm. This violates the assumptions that underpin the Black-Scholes model making it inappropriate for the calculation of the value of the options.

Consider this problem of independence at its most basic level. The company issues some options on a given day. FASB's recommended framework would value the option based in part on the price of the security that day. But, the market would be unaware on that day that the options were being issued. The issuance was therefore not in the price. One could assume that the issuance of the options would have no effect on the price. In that case, the issuance of the option was not material information for the market. If that were so, then the whole exercise of valuing the option for shareholders would be a frivolous exercise. Alternatively, one could assume that the information was material, in which case the Black-Scholes and lattice models would require using a market price known to be incorrect when valuing the option.

This is not just a theoretical problem. According to most of the theoretical and empirical literature on employee stock options, stock prices should, and do, rise when the decision to grant the options becomes known.[4] In other words, although the decision to offer new shares to employees at potentially below-market prices in the future entails a gross dilution cost to shareholders, the literature shows that the employee incentive effects, and other potential beneficial effects of granting the options, on average creates value for preexisting shareholders in excess of the gross dilution cost. Because stock prices are demonstrably affected by the decision to grant options, it is inappropriate to assume for purposes of valuing the options the reverse, as the methods suggested by FASB all do.

This problem is particularly applicable to employee stock options and is not the case for other types of options for which Black-Scholes was created. A crucial point here is that FASB is focusing on gross costs without taking into account the amount that preexisting stockholders gain from the granting of employee stock options. Even if one wanted to focus only on the gross (rather than net) cost of granting the options, the application of existing option pricing models would not be an appropriate way to calculate that gross cost.

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[4] See, for example, Aboody, D., 1996, "Market Valuation of Employee Stock Options." *Journal of Accounting and Economics.* 22:1, pp357-91, and Aboody, D., Barth, M. and Krasznik, R., "SFAS 123 Stock-Based Compensation Expense and Equity Market Values, working paper, July 2001. The latter paper finds that the positive effect of options on future earnings offsets the negative effects associated with their costs in valuation regressions. Studies of the stock price reaction include, Bell, T. Landsman, W., Miller, B., and Yek, S., 2002, "The Valuation Implications of Employee Stock-Option Accounting for Computer Software Firms," *Accounting Review*, 77, 4, 971-96, and Core, J., and Larcker, D., 2002, "Performance Consequences of Mandatory Increases in Executive Stock Ownership," Journal of Financial Economics, 64, 3, 317-340.

This criticism also applies to the more general case of binomial or lattice type option valuation models. They presume the independence of the price of the underlying security from the issuance of the option. Thus, none of the alternatives offered in FASB 123 (r) solve this problem.

2) Risk Neutrality

A second key assumption of Black-Scholes type models, including as a practical matter binomial and lattice models, is the ability to create a synthetic mirror-image of the option in a low cost and risk-neutral manner. It is assumed the value of the option can be calculated using the ability to arbitrage between the option and these alternative securities that, in combination, replicate the option. As a practical matter, this presupposes the existence of liquid and deep markets for those other instruments. It also presupposes that the economics of the option can be replicated using other instruments and that there are no restrictions against hedging the underlying exposure. By definition, arbitrage is based on risk neutrality, or stated differently, that all of the risks involved in one security also exist in the alternative set of securities, and that no new set of risks is introduced. If these conditions do not exist, then the arbitrage process used by Black-Scholes cannot be used to replicate the option in a risk neutral manner. This was key to the path-breaking assumption by Black and Scholes that the price of the option could be determined independently from assumptions of the future price movement of the underlying security. Without this the Black-Scholes model will not work.

The options for which the FASB is now considering using the Black-Scholes model for calculation purposes are not tradable or hedgable by employees and therefore do not possess this principle of risk neutrality. The violations of this principle are numerous. First, there is no market for the options themselves, and this is true *by construction* (the incentive benefits of granting employee stock options depend on the option being attached to the employee). [5]

Second, the risks associated with payoffs from holding the options generally cannot be replicated using instruments for which deep and liquid markets now exist. For example, the value of the options depends on exercise behavior of the employees, and the uncertainty about their behavior cannot be hedged in the marketplace. The decision to exercise (after being permitted to do so by the vesting of the options) depends on unobservable characteristics of employees (e.g., their degrees of risk aversion, their retirement preferences, their desires to relocate to another firm), which are not known, much less priced in the market. [6]

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[5] These constraints are crucial in hamstringing researchers when developing practical models of executive stock options. While there is a vast literature exploring the empirical performance of Black-Scholes, and while that literature finds countless deviations from the model's setup, it is nonetheless true that the literature may be a poor guide to the actual empirical nature of executive options. Since their prices are not visible, analogous research to that on publicly traded options cannot be done, and regularities concerning prices and volatilities etc. cannot be identified.

[6] Even advocates of expensing concede this point. For example, Bodie, Z., Kaplan, R., and Merton, R., 2003, "For the Last Time: Stock Options Are an Expense," *Harvard Business Review*, March, write that "some adjustment should be made for forfeiture and early exercise," and that the "actual magnitude of these

Third, the principle of arbitrage that underpins Black-Scholes modeling of option value presupposes that the agents buying the options are free to create and trade the synthetic set of securities that replicate the option. But, employees who receive stock options typically are not. Insider trading rules and the restrictions on the options would limit the ability to freely trade the securities in question. They cannot sell the option or write calls on it. The employees cannot short the underlying security. They cannot trade the underlying security on many days due to the release of other material information by the firm. Thus, the employees receiving the options cannot arbitrage in the way that Black and Scholes assume they could.[7]

It is important to emphasize that we are not merely pointing out the well-known fact that the violation of risk neutrality implies that the value of illiquid and unhedgable employee stock options to employees is extremely difficult to determine (because it depends on the employee's preferences). Rather, we are pointing out that the failure of risk neutrality makes the gross dilution cost to preexisting shareholders of the firm extremely difficult to determine. It is this gross dilution cost that FASB is implicitly trying to estimate and impute as a compensation expense to the firm. Absent risk neutrality, the exercise behavior of employees will be idiosyncratic and unpredictable, and the exercise behavior of employees (the decision of when to exercise the option) is a key factor in the gross dilution cost and therefore the implicit compensation value of granting the option.

FASB in its ruling admits that "the inability to sell or hedge an employee share option effectively reduces the option's value." However, FASB argues that by requiring the fair value of an option to be based on its expected term, rather than contractual term, the problem is remedied. The literature does not support this conclusion.[8] Unless one can know the preferences of employees, one cannot gauge their exercise behavior, and therefore, one cannot place a reliable value on the gross dilution cost of granting options to them.

3) Parameter Uncertainty

Some proponents of the FASB approach might counter that this risk-neutrality problem can be modeled by the proposed alternative means of estimating the exercise

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adjustments needs to based on specific company data such as stock price appreciation and distribution of option grants among employees." (p. 7).

[7] This likely explains why the literature finds that there is a significant gap between the value of granted options to employees and the cost to the firm. See Hall, B. and Murphy, K., 2000, "Optimal Exercise Prices for Executive Stock Options," *American Economic Review*, May, 90:2, pp 209-14. Also, Hall, B., and Murphy, K., 2002, "Stock Options for Undiversified Executives," *Journal of Accounting and Economics*, 33:1, pp 3-42. Individuals put a lower value on their options since they expose them to significant and undiversifiable risk.

[8] A recent paper that expands the models to account for some of these factors is Pander, G., 2003, "Valuation of Stock Option Grants Under Multiple Severance Risks," *The Journal of Derivatives*, Winter, 25-37. While this paper incorporates the constraints into an internally consistent framework, it is still far from complete since it does not incorporate modifications to address issues we discuss below.

behavior of employees using binomial and lattice models. It is true that the motivation for binomial and lattice models is that they afford researchers the opportunity to layer over the Black-Scholes framework additional model features, which in principle, could allow idiosyncratic employee behavior to be modeled. Such models could permit researchers to impute estimates of the cost of illiquidity and other constraints, and trace their effects on employees' exercise behavior. There is, however, significant disagreement in the literature concerning appropriate methods in this setting. For example, these estimates often use specific parametric assumptions concerning utility functions to determine the effects of vesting and blackout dates on employees' exercise behavior. The functional form chosen and the utility function parameters chosen both significantly affect results. However, the empirical literature often provides little or no guidance concerning these key parameters. [9]

In addition, it is crucial that valuation analysts be able to specify a "reasonable" range of a wide variety of parameters. An accurate assessment of this range requires knowledge of the entire joint distribution of the relevant parameters. This presents a difficult challenge to the analyst because the parameters in question are highly unlikely to be independently distributed. For example, risk-loving individuals might tend to purchase riskier stocks, or work for riskier firms, or do both. This makes the assumption of independent distribution intuitively implausible and illustrates how all of the parameters could take on extreme values. The joint distribution then can only be calculated if the analyst estimates the parameters of the relevant model simultaneously. But such estimation is extremely difficult generally and particularly difficult given the limited data available. Such an analysis would provide highly uncertain valuations.

4) Mathematical Assumptions Regarding the Distribution of Returns and Changes in Their Volatility over Time

As noted above, the theoretical insights by Black and Scholes on the valuation of options required some simplifying assumptions in order to make the formulae mathematically tractable and therefore usable and testable in the real world. A key assumption is that the returns on the underlying stock on which the options are written are generated by a continuous time random walk (known as geometric Brownian motion). This simplifying assumption is needed mathematically if one intends to create an explicit closed form expression for the value of a given option at the time it is granted, even abstracting from the aforementioned measurement problems.

The empirical finance literature, however, has uncovered a number of empirical regularities that are at odds with the basic Black-Scholes setup. In addition, binomial and

[9] Indeed, one could go further and state that the literature has found that attempts to estimate all relevant parameters at the same time lead to paradoxical results. For example, the "equity premium puzzle," discussed in Mehra, R., and Prescott, E. 1985, "The Equity Premium: A Puzzle," *Journal of Monetary Economics*, 15, 145-61, finds that the shareholder risk aversion consistent with observed historical stock returns is implausibly large. This observation set off a wave of research that has yet to fully resolve the issue, with much of that research relying on psychological rather than purely economic models. Yet the same preference parameters for employees will govern their option strategies. If these are not understood in the aggregate, how can the FASB assert that they are knowable at the firm level?

lattice calculations performed to date rely on return assumptions that are similarly at odds with the literature. There are a number of problems that result.

First, Black-Scholes assumes a constant volatility of returns at all dates and all prices. Empirical evidence suggests that share prices often experience periods of high volatility followed by periods of low volatility. A number of econometric models of increasing levels of generality have been proposed that allow econometricians to identify the data generating process that is consistent with observed time-varying volatility. However, there are myriad different such models, and estimates often are sensitive to arbitrary specification factors such as lag lengths and sample periods.[10]

This literature is still in flux, and more importantly, virtually nothing has been written about how to estimate the volatility of individual stocks at different points in time (rather than overall market indices). There is simply no usable empirical framework for reliably estimating stock market volatility changes of individual stocks. Unlike broad indices, individual firms go through a life cycle which intuitively suggests an evolving volatility. Given the importance of shifts in volatility over time for any option valuation, the absence of an empirical framework for volatility estimation is a significant problem.[11]

Second, systematic differences across firms can be important for predicting long-term volatility using past data. But existing models do not even consider how firms at different stages of their life cycle might differ with respect to trends and predictability of stock volatility. Black-Scholes assumes that the historic volatility of an underlying security will persist into the future. This assumption particularly penalizes young firms by assuming that their (high) post-IPO volatility will persist into the indefinite future. By and large, incentive stock options are disproportionately used by newer, faster growing companies. It is intuitively likely that the volatility of the performance of the securities of this type of firm will decrease as the firm matures. Thus, even if one were able to estimate an econometric model with great precision using past data movements, such a model may not be informative about future movements.

Third, econometricians have found that share prices exhibit mean reversion at low frequencies.[12] This observation implies that long-term options values based on the

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[10] Engle, R., 1982, "Autoregressive Conditional Heteroskedasticity with Estimates of the Variance of UK Inflation," *Econometrica*, 50, 987-1008 is the classic ARCH model reference. Bollerslev, T. 1986, "Generalized Autoregressive Condtional Heteroskedasticity," *Journal of Econometrics*, 31, 307-327, developed a widely applied version of the model. Hentschel, L., 1995, "All in the Family: Nesting Symmetric and Asymmetric GARCH Models," *Journal of Financial Economics*, 39, 71-104 finds that the U.S. data on stock returns reveal significant GARCH behavior. Indeed, in 2004 the CBOE started trading a futures contract (with the ticker VX) on the volatility of the S&P 500 index. This contract would not exist if volatility were stable. Also, implied volatilities in existing options prices often vary significantly across contracts for the same firm.

[11] Bekaert, G., Calomiris, C., and Chernov, M., 2004, "Option Pricing and the Data Generating Process," working paper, provide one of the first empirical attempts to incorporate these factors into a firm-level option valuation model. They find that the pricing errors of the Black-Scholes model at long horizons are "severe."

[12] Poterba, J. and Summers, L. , 1988, "Mean Reversion in Stock Returns: Evidence and Implications," *Journal of Financial Economics*, 22, 27-60, find strong mean reversion over longer horizons, a result that

random walk assumption might significantly overstate the value of options, since the possible range of future prices consistent with a mean reverting process is much smaller than the possible range consistent with a random walk. Moreover, long-term mean reversion and time-varying volatility are not the only nonlinear properties apparent in share price data. The frontier of the empirical finance literature is moving toward nonlinear models of ever greater generality, and finding significant gains for these advances.[13] Given the lack of consensus in this literature, however, it is safe to say that there is no single empirical approach to the identification of the underlying data generating process that is widely accepted. There are countless approaches, each with its own plusses and minuses.

This Panel believes that there is nothing wrong with the use of simplifying assumptions to provide mathematical tractability where it is required. Private market participants can and do use such calculations. They make implicit cost-benefit calculations that trade off the potential inaccuracy of the assumption with the need to get an estimate of the value of an option. They bear the cost of any inaccuracy.[14] But, providing information to the market about the potential impact of stock options being granted to employees does not require the computation of a precise figure *ex ante*. The impact of such options on dilution of share price depends crucially on the actual future course of the price of the underlying security. Providing an illustrative array of such calculations provides far better information to the market than does a precise calculation of a single value for an option. This is particularly true when the option value can only be derived by using a set of simplifying assumptions that may or may not reflect the

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has been expanded and replicated since. However, Kim, M., Nelson, C., and Starz, R., 1988, "Mean Reversion in Stock Prices? A Reappraisal of the Empirical Evidence," Technical Report 2795, NBER, show that this reversion is highly sensitive to time horizon chosen. This sensitivity of findings is the natural result of having a low number of observations for 10 or 20 year returns. This problem will be especially severe at the firm level. Another key factor will be the extent to which longer-run price behavior deviates from a random walk. To fully assess questions concerning long-run behavior, researchers require data for many years. For a 10-year old firm, there really is only one observation concerning the 10-year frequency, yet the presence or lack thereof of mean reversion at that frequency may be a determinant of option value.

[13] An excellent but somewhat dated review of the many non random-walk-like properties found in financial data is provided in Campbell, J., Lo, A., and Mackinley, A., "The Econometrics of Financial Markets," Princeton University Press, 1997. In their Chapter 2 they provide an example that evaluates a number of the models presented in that section with stock return data. In Panel A (page 69) they demonstrate that, "the random walk null hypothesis RW3 is rejected at all the usual significance levels for the entire time period and all subperiods for the equal-weighted index." Their Chapter 12 discusses the nonlinear properties of the data.

[14] Indeed, market participants have a well-developed short-hand for the various sensitivities of the Black-Scholes values with respect to specific parameters—the so-called "Greeks." These include "delta" (the sensitivity to price), "Gamma" (the sensitivity to price squared), "Theta" (the sensitivity with respect to time), "Rho" (the sensitivity with respect to the interest rate), and "Vega" (the sensitivity with respect to the volatility). Active market participants keep track of these variables precisely because Black-Scholes is only an approximation, and there is so much uncertainty about parameters, even for publicly traded options that otherwise more closely match the basic assumptions of the models. Presumably, it is valuable information for traders to know how incorrect their option value might be depending on how incorrect their parameter estimates turn out to be. The same should be true for a stock investor, and it would be regrettable if such an investor ignored these sensitivities that are almost always relied upon by option traders simply because FASB rules endorsed a specific number.

likely set of returns and volatility of the company in question. Given the imprecision, the most appropriate place for the information to be provided is in a footnote to the financial report, in keeping with long-standing accounting practice, until better models can be developed and tested.

The problem of the data generating process is the area where the gap between existing practice and empirical consensus is perhaps the largest.[15] Among the many candidate models there are some that empirical finance specialists believe on balance might be reasonable characterizations of the data and there are other approaches that have been resoundingly rejected such as geometric Brownian motion. Yet, FASB rules in support of models that rely upon data generating processes that have been rejected by the literature.

Even if one were to move beyond the Brownian motion assumption to more general and nonlinear data generating processes, one would have to pick among many candidates. The literature to date has not provided researchers with a universally accepted method for making this choice, but there are clear indications that the model choice will vary significantly across firms. This produces a variety of problems. First, the information provided to shareholders will be of diminished value because it is not comparable across firms. Thus, the reported earnings of two identical firms might vary significantly. Second, even the most reasonable choice of empirical model *ex ante* might not prove to have been the most appropriate *ex post*. This opens the firm to possible liability over a highly technical matter about which the finance profession disagrees. This is unlikely to be in the shareholders' interest.

The FASB seems to have acquired faith that in-sample calculations of option value will provide a precise guide to out-of-sample realized dilution costs and therefore implied compensation values. We are unaware of any studies that have found that such faith is justified at the firm level. Absent such studies, moving toward expensing using formulae with serious known flaws is a shot in the dark.

5) Tax Laws and Other Institutional Factors

The Black-Scholes model of option valuation made a number of simplifying assumptions about the institutional framework in which options are traded that facilitated the use of the analysis. Key among these simplifying assumptions is the tax treatment of options. The Black-Scholes model neglects the impact of taxes. In the case of exchange traded options this makes some intuitive sense. Both the buyer and the seller of options face similar tax consequences, and the tax consequences facing option traders are similar to the tax consequences of selling the synthetic portfolio that replicates the option. This is not necessarily the case for employee stock options. Tax consequences are yet another influence on employee exercise behavior which must be taken into account, and estimating the effects of those tax consequences would, as before, depend on the

[15] Again, recall the Campbell et al. (ibid) review that resoundingly rejected the random walk model. Yet the random walk model is the basic input for the binomial and Black-Scholes models.

interactions among individual employees' preferences and their individual tax circumstances.

Since the question of how tax treatment affects the exercise of options has not been examined in detail in the existing literature it is hard to know how important it may be. But, intuitively these effects could be sizeable. This is particularly true when one considers the details of the tax treatment with respect to options. Qualified stock options receive a different tax treatment from non-qualified ones. Qualified options are not taxed when the employee exercises them, but the employee pays capital gains tax when the stock is eventually sold. For qualified options, the firm cannot deduct the gain as a compensation expense. Non-qualified options produce an immediate tax liability of the spread between the market and exercise prices, and a deduction of the same amount for the employer. Moreover, some companies grant a significant number of options to international employees in various geographic regions that have different tax laws on stock options. Theoretically, the fact that very different sets of tax consequences can exist without the tax consequence being incorporated into the model of option valuation shows the limitation of these models.

In addition, the effects of tax policy on the underlying value of firms, and hence on the value of employee stock options, are themselves unpredictable (since tax policy changes), and this may add significant uncertainty to the valuation of options, and the effects of such uncertainty may vary systematically across firms. There are important and widely accepted interactions between tax parameters and those required by Black-Scholes and binomial models. The importance of these differences is clear from recent experience.

Under the "old view" of dividend taxation, dividend tax changes do not affect the value of the firm, whereas under the "new view" of dividend taxation, dividend taxes are capitalized into the value of the firm. The most recent empirical literature suggests that there is significant heterogeneity in U.S. equity markets with approximately half of firms experiencing large share price movements coincident to changes in dividend tax policy.[16]

Accordingly, during periods when the probability of tax law change is volatile, one might expect that share prices for some identifiable firms will be much more volatile than for others. During the 2004 election, for example, preliminary evidence suggests that many "new view" firms saw their share values swing wildly in response to Senator Kerry's prospects given his support for repeal of the favorable tax treatment of dividends.[17] A naïve application of the Black-Scholes or binomial model would impute an excessively high value for options at this moment, since the resolution of the election eliminates the probability that a President Kerry might repeal the dividend tax reductions.

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[16] This result is present in Auerbach, A. and Hassett, K., 2002, "On the Marginal Source of Investment Funds," *Journal of Public Economics* Vol. 81/1, pgs. 205-232. The paper explores the sensitivity of dividend payouts to cash flow and investment, and relates their findings to the predictions of these two models.

[17] Auerbach, A., and Hassett, K., 2005, "The Corporate Response to the 2003 Act: Did the Old View or the New View Win Out," working paper.

For about half of firms, volatility information drawn from the election period will be misleading concerning future volatility.

Conclusion

The above discussion makes clear that the assumptions that underlie Black-Scholes type models are not appropriate to valuing employee stock options. In principle, one can conceive of an approach to employee option valuation that would eventually take account of many or all of the above problems, and that might lead to estimates that could be considered reasonable. The lattice type framework could in concept be amended to incorporate a quite general data generating process and tax factors, for example. However, such a model is likely to be years away, even when applied to options for aggregate stock indices, and certainly has not been demonstrated to be useful out-of-sample at the present time. Moreover, even if such a model existed, it is unlikely that researchers would have access to the data needed to estimate the joint distribution of the relevant parameters necessary to put reasonable bounds on value estimates.

These technical problems do not prevent mandating increased disclosure of information about employee stock options. In fact, some of the policies supported by individual members of this panel include requiring:

- Information on the planned option pool and how it will be distributed.
- Information on early exercise behavior.
- Information on how many employees choose to sell upon exercise.
- Scenarios for estimates of the dilution and cash flow effects at different assumed share prices in the future.
- A forecast of the number of shares that will likely be created by grants of employee stock options and the costs of those future share offerings (spread on exercise), which could be incorporated into a forecasted EPS that could be updated over time.

Unfortunately, if the FASB rule is adopted as is, firms may find themselves in the position to report estimates based on Black-Scholes or binomial models that are known to be inaccurate, or to attempt to provide a more accurate read on their option values by moving toward a more modern and general framework through the hiring of expensive consultants with proprietary mathematical models and untested experience in the field. Absent specific guidance, however, firms will find themselves making an enormous array of decisions. Each of these decisions will entail a disputable judgment, not a reliable estimate. A recent article suggests that this may set off a blizzard of new lawsuits.[18] This Panel believes that would do a grave disservice to shareholders.

We urge the Securities and Exchange Commission to fully consider the magnitude of the issues surrounding the implementation of FASB 123 (r). The public is

[18] Hassett, K. and Wallison, P., 2004, "A Troubling Requirement" *Regulation,* Vol. 27, No. 1, Spring 2004, pp.52-58.

not served by requiring the reporting of highly imprecise calculations under the guise of precision.

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Biographies of Panel Members

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