VALUATION OF STOCK OPTIONS

The right to buy or sell a given security at a specified time in the future is an option. Options are "derivatives', i.e. they derive their value from the security that is to be traded in accordance with the option. Determining the value of publicly traded stock options is not a problem as the market sets the price. The value of a non-publicly traded option, however, depends on a number of factors: the price of the underlying security at the time of valuation, the time to exercise the option, the volatility of the underlying security, the risk free interest rate, the dividend rate, and the strike price. In addition to these financial variables, subjective variables also play a role. For example, in the case of employee stock options, the employee and the employer have different reasons for valuation, and, therefore, differing needs result in a different valuation for each party.

This appendix discusses the reasons for the valuation of non-publicly traded options, explores and compares the two predominant valuation models, and attempts to identify the appropriate valuation methods for a variety of situations. We do not attempt to explain option-pricing theory in depth nor do we attempt mathematical proofs of the models. We focus on the practical aspects of option valuation, directing the reader to the location of computer calculators and sources of the data needed to enter into those calculators.

Why Value?

The need for valuation arises in a variety of circumstances. In the valuation of a business, for example, options owned by that business must be valued like any other investment asset. If options are gifted or inherited, federal and state tax law requires valuation, and state law frequently requires valuation in divorce cases. Valuation of options is, of course, necessary in the purchase or sale of the options.

The popularity of employee stock options as a form of compensation gives rise to a number of valuation situations. Currently, FASB Statement 123 requires those companies electing to expense employee stock options to use the fair value of options to determine net income. If a company elects to continue to use APB 25 to report employee stock options, the pro forma effect on the financial statements using fair value must be disclosed in the footnotes to the financial statements. In November 2002 the International Accounting Standards Board issued an exposure draft requiring the expensing of employee stock options. As a result of this, and spurred by the recent accounting scandals involving Enron and others, the Financial Accounting Standards Board has also tentatively decided that for fiscal years ending after December 31, 2004 public companies must expense employee stock options based on fair value at grant date. The FASB expects to issue an exposure draft in the first quarter of 2004. Proxy statement disclosure, transfer of ownership (by gift or inheritance), divorce of the employee holding the options, and damage suits involving, for example, breach of contract between an employee and the issuing company also require valuation. Another need for valuation can arise under Sec. 83 of the Internal Revenue Code of 1986. Sec. 83 requires that the value of non-statutory employee stock options with a readily ascertainable fair market value must be included in compensation when granted. Treasury regulations specify that an option has a readily ascertainable fair market value if it possesses all of the following:

1. The option is transferable by the optionee;
2. The option is exercisable immediately in full by the optionee;
3. The option, or the property subject to the option, is not subject to any restriction or condition that has a significant effect on its fair market value;
4. The value of the underlying property (stock) can be ascertained;
5. The probability of any ascertainable value of the underlying property increasing or decreasing can be determined; and
6. The length of the period during which the option may be exercised is known.

As we will see, these variables drive the option pricing models discussed below. Also note that some of these assumptions are incompatible with the valuation of employee stock options, as will be discussed later.

Option Pricing Theory: Historical Background

Modern option pricing traces its history to a book by Charles Castelli entitled The Theory of Options in Stocks and Shares. Castelli's book discussed the speculative aspects of options, but lacked any well-developed theoretical foundation. In 1900, Louis Bachelier devised the earliest known model for options pricing based on Brownian motion, but his formula was flawed. Bachelier's model allowed negative security prices and option prices higher than the underlying stock price. In the 1960s, economist Paul Samuelson, inspired in part by Bachelier, developed his own model using Brownian motion. Unfortunately, Samuelson's formula was largely arbitrary and offered no way for buyers and sellers with different levels of risk tolerance to agree on a price, and valued the option only at exercise.

In its simplest form, the formula for pricing an option (in this example, a call) is $C = S - K$ where C is the option price, S is the current stock price and K is the strike, or exercise price. Analysts call this the *intrinsic* price. The problem is that this formula applies only at the time the option is exercised. How do we price an option today that will be exercised at some point in the future? We need to adjust the basic formula to account for the following variables that determine the option price: stock price, exercise price, time to expiration, volatility and risk free interest rate. In 1973, Fischer Black and Myron Scholes did just that, deriving the Black-Scholes formula for pricing European-style options (European-style options can be exercised only at expiration). This effort won them the Nobel Prize. In the same year Robert Merton refined the formula to account for dividend yield. This model forms the basis for many academic studies continuing today.

In 1979, John C. Cox, Stephen A. Ross and Mark Rubenstein published "Option Pricing: A Simplified Approach." This paper presented a simplified mathematical model for pricing American-style options-the binomial model (American-style options can be exercised at any time prior to expiration).

Since their introduction myriad models have been proposed to attempt to correct theoretical and practical problems with the Black-Scholes and binomial models. Subsequent models have incorporated increasing numbers of variables to try to more accurately determine the value of stock options, with the result that many are difficult to apply in practice. SFAS 123 requires the

use of either the Black-Scholes or binomial models, and most courts readily accept these models as well. The Black-Scholes and binomial models are the ones currently used most often in the valuation profession. This chapter concentrates on these two models, modified to render more accurate valuations.

Black-Scholes Model

Fundamentally, the Black-Scholes model computes the present value of the option price at expiration using a risk-free interest rate and adjusting for underlying stock volatility. To simplify calculations, the Black-Scholes model assumes the following:

1. Only the current value of the underlying asset is relevant for predicting future price changes in the underlying;
2. Selling short with full use of the proceeds is allowed (to allow for investing and borrowing at the same interest rate);
3. There are no transaction costs or taxes;
4. The underlying stock pays no dividends during the life of the option;
5. There are no risk-free arbitrage opportunities;
6. Security trading is continuous;
7. The option is held until expiration (European-style option);
8. The risk-free interest rate is constant and the same for all maturities.
9. The option may be sold or traded at any time.

Note that some of these assumptions are not true of employee stock options (ESOs): ESOs are frequently exercised before expiration and employees are usually restricted from selling their options. See the discussion entitled "Problems" below.

The Black-Scholes formula is: $C = SN(d_1)-K^{-rt} N(d_2)$ where:

C = Theoretical option price
S = Current stock price
t = Time to expiration
r = Risk free interest rate
N = Cumulative standard normal distribution
K = Strike price
ex = Exponential function

$$d_1 = \frac{\ln(S/K)+(r+\sigma^{2}/2)t}{\sigma\sqrt{t}}$$

$$d_2 = d_1 - \sigma\sqrt{t}$$

σ = Standard deviation of stock returns
ln = Natural logarithm

Note that this formula starts with the intrinsic price formula (C=S-K) and adjusts S and K for the variables noted above.

Fortunately, computerized calculators exist to perform this calculation for a given set of variables, many of them accessible via the internet free of charge. Some websites with easy-to-use calculators are as follows:

www.derivativesmodels.com

www.intrepid.com

www.snowgold.com

The Snowgold calculator is downloadable. The Intrepid site also contains a historical volatility calculator.

www.hoadley.net/Options/develtoolsaddin.htm offers proprietary software to calculate option prices as well as a projected stock volatility calculator.

As noted above, Robert Merton modified the Black-Scholes model to incorporate an underlying stock that pays dividends. Most of the calculators mentioned above use this modified approach.

Binomial Model

The Cox-Ross-Rubenstein model is known as the binomial model because it derives from a simple assumption: that at a given point in time the price of a share of stock goes one of two directions. It goes up or it goes down, with a probability assigned to each likelihood. The model is therefore in the form of a decision tree. The value of the option today is the discounted future value using a risk-free interest rate. This same bifurcation ("node") continues for each time period in the future until expiration. Cox, *et al*, calls this a "multiplicative binomial process." Essentially, the present value of a series of calculations of option value at each node results in the current price of the option. The model incorporates stock volatility by addressing the underlying stock price at each node in the tree. Again, on-line calculators exist to perform this series of calculations that, although simpler than Black-Scholes, are numerous and time consuming. Snowgold (above) has a particularly nice binomial calculator.

Finding Information On Variables

To value options, we need to quantify each variable (stock price, strike price, volatility, risk-free interest rate, dividend rate, and time to expiration). In the case of employee stock options of publicly traded companies, we find information on these variables readily available. The information may be obtained from the following:

1. Stock price – the current price may be obtained form the Wall Street Journal or various on-line services such as Reuters Investor (www.investor.reuters.com) or Yahoo! Finance (http://finance.yahoo.com). If valuing at a specific date, historical stock prices are also available here;
2. Strike price – this information is provided to the employee by the issuing company, or may be obtained from the company itself;
3. Time to expiration – this is provided to the employee or may be obtained from the company. It is also frequently disclosed in the notes to the financial statements;
4. Risk-free interest rate – the current zero-coupon Treasury bond rate corresponding to the option term;

5. Underlying stock volatility – this is more problematic. www.hoadley.net sells an Excel add-in containing both historical and projected volatilities for listed stocks. www.intrepid.com also contains historical stock volatilities. Additionally, publicly traded companies report the historical volatility of their stock in the employee stock options footnote to their financial statements as required by SFAS 123.
6. For non-publicly traded stocks, volatility poses a problem. See the section entitled "Problems" below.

Problems

Students of the Black-Scholes model note its application only to European-style options, and question the assumptions made for the model. Many consider the assumptions of constant underlying volatility to be unrealistic. Many also question the fact that the model relies on deterministic volatility, i.e. expected volatility of the underlying stock is described as a known function of the asset price.

Finding volatility data on non-publicly traded stock remains a significant problem. However, a number of approaches exist to solve this problem. First, some suggest that finding a comparable publicly traded stock and using its volatility serves as a proxy for the actual volatility of the stock in question. Another possibility is more cumbersome but appears to offer a more accurate estimate of a non-publicly traded stock's volatility: compute the equity value of the underlying company for several prior periods (say five years) and determine the per share price for each year. From this data you can then generate a volatility percentage using the Excel formula discussed in "Solutions" below.

Employee stock options present additional problems:

1. ESOs generally have a vesting period (that can be as long as four years) during which the option cannot be exercised;
2. When employees leave employment, they usually lose their unvested options and have to exercise vested options immediately;
3. Employees may not sell their options – The Black-Scholes and binomial models assume options are freely traded;
4. Some dilution occurs when employees exercise their options.

Consequently, we must modify the option valuation methods discussed above to account for these differences.

Solutions

The binomial model represents the first attempt to account for non-constant volatility by allowing volatility to change depending on the stock price at each node in the tree. This model remained deterministic in its approach, however. Volatility determined using stochastic (random) probability theory is frequently advanced as a more accurate prediction of future volatility, since stock price movements exhibit random behavior. In 1987 John Hull and Alan White of the

University of Toronto developed a model that allowed volatility to change stochastically over time, and many models based on stochastic volatility have since emerged. Again, because of the complexity of these models and the relative lack of available computational software, valuation analysts do not often use them.

Given the practical limitations just mentioned, the practitioner is frequently forced to use historic volatility for calculation purposes. But what if a record of historical volatility is not available in the financial statements or published in the financial news? Fortunately, the formula for calculating historical volatility is not overly complex and lends itself well to spreadsheet application. The volatility factor is defined as the annualized standard deviation of the lognormal change in stock price over a given period expressed as a percentage. An example from Symantec Corporation illustrates the calculation. The information below was downloaded to an Excel spreadsheet from Yahoo! Finance for the six-day period March 24. 2003 through March 31, 2003:

	A	B	C	D	E	F	G	H
1	Date	Open	High	Low	Close	Volume	In Change	Volatility
2	31-Mar-03	39.30	39.49	38.68	39.18	11056700		
3	28-Mar-03	41.62	41.85	39.86	40.25	31705500	0.0269	
4	27-Mar-03	42.53	42.62	40.68	41.98	6915000	0.0421	
5	26-Mar-03	41.00	42.90	40.65	42.20	7310500	0.0052	
6	25-Mar-03	41.00	41.05	39.56	40.75	12197500	-0.0350	
7	24-Mar-03	40.30	41.20	39.03	39.09	9912400	-0.0416	59.66

In order to calculate historical volatility we perform the following steps:

1. Enter the following formula in cell G3:

   =LN(E3/E2).

2. Copy the formula through to cell G7. This calculates the lognormal daily price change.

3.Enter the following formula in cell H7:

   =(STDEV(G3:G7)*SQRT(260))*100

   This calculates the volatility.

Multiplying by the square root of 260 (the number of trading days) annualizes the volatility factor. In this example the annualized volatility for the six-day period is 59.66%. The volatility for any given period may be calculated with the same formula. Simply copy the first formula into every cell in the date range, then in the second formula enter into the parentheses after "STDV"

the range of cells corresponding to the desired date range. We now have the volatility factor for the option pricing models of choice.

SFAS 123

To address the issues unique to employee stock options, the original SFAS 123 suggested the following procedure:

1. Estimate the expected lifespan of the option;
2. Use either the Black-Scholes or the binomial model to value the option using the expected life (i.e. the expected time until early exercise);
3. Adjust to allow for the possibility of the employee leaving during the vesting period.

The example in Appendix B of SFAS 123 illustrates, using these assumptions:

1. Life of option: 10 Years
2. Vesting period: 3 years
3. Stock Price: $50
4. Exercise price: $50
5. Risk-free rate: 7.5%
6. Expected volatility: 30%
7. Expected dividend yield: 2.5%

The Black-Scholes model values this as a normal option at $20.47. The binomial model values it at $21.43. Now let's suppose that the employee exit rate (forfeitures) is 3% per year and the expected life of the option (i.e. the time until the employee exercises it) is 6 years. Reducing the life of the option to 6 years results in a value of $17.15 using Black-Scholes and $17.25 using the binomial model. The employee exit rate of 3% means that an average of 3% of these values is lost each year until vesting (in this case, three years). Using Black-Scholes, the value of the option would be .97 x .97 x .97 x $17.15 = $15.65. The same calculation using the binomial model results in a price of $15.75. Total value is arrived at by multiplying the per share prices by the number of options outstanding, assuming the exit rate and expected life apply to all options.

"Enhanced SFAS 123"

John Hull and Alan White identify an important theoretical problem with the SFAS 123 approach. In their paper "How to Value Employee Stock Options", published on the Joseph L. Rotman School of Management website, www.rotman.utoronto.ca/finance/papers)(September 2002), Hull and White discuss this problem and propose an "enhanced SFAS 123" valuation model to address it.

The SFAS 123 method uses the expected life of the option as an input. This presents a problem in that:

1. It ignores the real possibility that employees may leave the company after the vesting period; and
2. It fails to consider the employee's early exercise policy.

To attempt to correct these problems, the Hull and White "enhanced SFAS 123 method" uses the binomial model with the following changes:

1. It requires the company to use both pre- and post-vesting exit rates, and
2. It assumes that early exercise occurs when the stock price reaches a certain multiple of the exercise price.

Because the Black-Scholes model only calculates option value when the option is held to maturity, Hull and White adapted the binomial model to account for early exercise.

The pre- and post-vesting employee exit rates can be obtained from historical data on employee turnover rates available from the issuing company, if such data exists. The company may not, however, have ready access to pre- and post-vesting exit rates. If these two exit rates are not available, the next best thing would be to calculate the exit rate from the employee stock option footnote to the financial statements. In this situation, we must assume that the pre- and post-vesting exit rates are equal.

The early exercise multiple will be harder to estimate since few empirical studies of early exercise behavior exist. If we are lucky enough to have empirical data on the early exercise of a particular company's options, we use this data. However, an approximation of this rate may be calculated from the data in the company's employee stock option footnote.

Let's use the footnotes to the Symantec Corporation's financial statements at March 31, 2003 as an example. The following table appears in the footnote "Stock Option Plans":

Stock option activity was as follows:

(In thousands, except weighted average exercise price per share)	Number of Shares	Weighted Average Exercise Price Per Share
Outstanding as of March 31, 2000	20,038	16.34
Granted	18,334	19.57
Exercised	(3,542)	10.30
Cancelled	(3,102)	20.88
Outstanding as of March 31, 2001	31,728	18.43
Granted	8,450	30.26
Exercised	(8,254)	14.56
Cancelled	(3,140)	20.67

Outstanding as of March 31, 2002	28,784	22.77
Granted	3,548	36.12
Exercised	(6,390)	18.92
Cancelled	(2,323)	26.83
Outstanding as of March 31, 2003	23,619	25.42

From this information we need to determine 1) the employee exit rate and 2) the exercise multiple (i.e. that multiple of the strike price at which employees exercise the options).

Employee Exit Rate

No studies of early exercise of options have been performed for Symantec. We must therefore use company data. Since employees forfeit their options when they leave the company, the cancellation rate contained in the table above serves as a proxy for the employee exit rate. For the year ended March 31, 2001, we see that options for 20.038 million shares were outstanding at the beginning of the year and options for 18.334 million shares were granted. This totals 38.372 million shares. Options for 3.102 million shares were cancelled, and the exit rate can be estimated to be 3.102/38.372 or 8.1%. Similar calculations for the subsequent years yield exit rates of 7.8% and 7.2%. The average over the three years is 7.7%. We now have our exit rate.

Exercise Multiple

It is determined from the table that in 2001 the weighted average exercise price per share was $10.30. In 2002 it was $14.56 and in 2003, $18.92. Using the tables in Exhibits I, II and III to this appendix, we accumulate the weekly closing price of Symantec stock for each of the three years in question. For 2001 the weighted average price per share was $47.24, for 2002 it was $50.53 and for 2003 it was $37.75. We then divide each weighted average market price by the weighted average exercise price for each year to estimate the multiple of the exercise price at which, on average, the employees exercised their options. The multiples each year are 4.59 for 2001, 3.47 for 2002 and 1.99 for 2003. The average of these multiples is 3.35.

From Yahoo! Finance we learn that Symantec's dividend yield is 0%.

Example

We now have the necessary data to be able to calculate the value of these options at the end of 2003.

Hull and White have incorporated their "enhanced SFAS 123" into Excel spreadsheets and have graciously made them available for download at John Hull's website at www.rotman.utoronto.ca/~hull. We will use the Hull and White spreadsheet to continue our example.

Let's assume that we have nonqualified Symantec employee stock options with four year vesting, a ten year life and exercise price of $28.75. From the Symantec notes to the financial

statements we have learned that Symantec's risk-free interest rate for 2003 was 3.12% and the expected volatility used in their valuation of options for reporting purposes (again from the footnotes) is 89.58%. Let's further assume that Symantec stock trades at $35.03 on the valuation date. With the exit rate and exercise multiple calculated above, we now have the variables we need for the Hull-White "enhanced SFAS 123" model.

Entering these variables into the "enhanced SFAS 123" model available at John Hull's website, we arrive at a value of $20.07 for each option. By comparison, making the adjustments recommended by SFAS 123 and entering the variables into a standard Black-Scholes calculator, we arrive at a value of $21.96. Because it is more theoretically defensible, the Hull-White approach would appear to be the more accurate of the two approaches.

Proposed Amendments To SFAS 123

On March 31, 2004 the Financial Accounting Standards Board issued an exposure draft of proposed amendments to SFAS 123 (referred to as "Statement 15X"). These amendments require that public companies must expense share-based compensation at time of grant measured by the fair value of the instrument granted. Public companies will no longer be allowed to account for share-based compensation under APB No. 25. Statement 15X recognizes the unique characteristics of employee stock options and now requires that early exercise of options and forfeiture of options be considered when using an option-pricing model.

Observable market prices of identical or similar equity instruments offer the best evidence of fair value, according to the proposed amendments. Absent such information, one should use a "valuation technique that (a) is applied in a manner consistent with the fair measurement objective and the other requirements of this Statement, (b) is based on established principles of financial economic theory and generally accepted by experts in the field… and (c) reflects any and all substantive characteristics of the instrument…" (Paragraph B5). The Statement then identifies "lattice models" (such as the binomial model) and "closed-form" models (such as the Black-Scholes model) as examples meeting the requirements of the Statement. The choice of model depends on the "substantive characteristics of each arrangement and the availability of data necessary to use the model" (Paragraph B10). For example, the Black-Scholes model must be adjusted to take into account early exercise, changing volatility and dividend rates. These adjustments take the form of weighted average assumptions. A lattice (binomial) model, however, can be constructed to incorporate these variables in its design. For this reason, the Statement considers a lattice model to be preferable. The Hull-White "enhanced SFAS 123" model does, in fact, incorporate these factors and appears to address all the requirements of Statement 15X.

Although the Statement considers a lattice model to be preferable, sometimes the data necessary for the model is not available. An entity may lack historical data on employee exercise patterns, for example. The closed-form model may therefore be the only way to provide a reasonable estimate of fair value. Additionally, if compensation cost is not a material element of the financial statements, the values provided by a closed-form model might not be materially different from those provided by a lattice model.

Statement 15X goes on to offer guidance regarding the expected term of employee stock options, expected volatility and expected dividends.

Expected Term of Options

Statement 15X favors incorporating early exercise data in a lattice model. The Statement suggests using an exercise multiple as do Hull and White, e.g., that data indicate that employees will exercise their options when the share price reaches a certain multiple of the exercise price. Employee post-vesting termination rates could also be factored in. The Statement warns against estimating the expected term using averages of widely differing exercise and termination behaviors, however. To avoid misstatement of fair value, options should be grouped in fairly homogeneous groups based on similar exercise and termination data.

Expected Volatility

Although not specifying a particular method of estimating expected volatility, the Statement requires the following factors to be considered (Paragraph B25):

- The term structure of the volatility of the share price over the most recent period that is generally commensurate with (1) the contractual term of the option if a lattice model is used or (2) the expected term of the option if a closed-form model is used.
- The implied volatility of the share price determined from the market prices of traded options. Additionally, the term structure of the implied volatility of the share price over the most recent period that is commensurate with (1) the contractual term of the option if a lattice model is used, or (2) the expected term if a closed-form model is used.
- For public companies, the length of time an entity's shares have been publicly traded. If that period is shorter than the expected term of the option, the term structure of volatility for the longest period for which trading activity is available should be more relevant. A newly public entity might consider the volatility of similar entities. A nonpublic entity that elects the fair-value-based method might base its expected volatility on the volatilities of entities that are similar except for having publicly traded securities.
- The mean-reverting tendency of volatilities. For example, in computing historical volatility, an entity might disregard an identifiable period of time in which its share price was extraordinarily volatile because of a failed takeover bid or major restructuring. Statistical models have been developed that take into account the mean-reverting tendency of volatilities.
- Appropriate and regular intervals for price observations. If an entity considers historical volatility or implied volatility in estimating expected volatility, it should use the intervals that are appropriate based on the facts and circumstances and provide the basis for a reasonable fair value estimate. For example, a publicly traded entity might use daily price observations, while a nonpublic entity might use monthly price observations.
- Corporate structure. An entity's corporate structure may affect expected volatility. For instance, an entity with two distinctly different lines of business of approximately equal size may dispose of the one that was significantly less volatile and generated more cash than the other. In that situation, an entity would consider the effect of that disposition in its estimate of expected volatility.

An entity that uses historical share price volatility as its estimate of expected volatility should also consider the extent to which future experience is reasonably expected to differ from historical experience.

Expected Dividends

The Statement points out that option-pricing models can be designed to use either dividend yields or dividend payments. If the latter is used, the entity's historical pattern of dividend increases should be considered.

The Future of Amended SFAS 123

Members of Congress and technology firms have voiced opposition to the new rule, claiming that start-up companies will lose an important incentive for attracting young talent. Many also express concern that the costs of complying with the new rule will unduly burden small businesses. On May 4, 2004, Robert H. Herz, Chairman of the FASB, and board member George J. Batavick testified before the Capital Markets, Insurance and Government Sponsored Enterprises Subcommittee of the Committee on Financial Services. In their testimony they sought to assuage concerns about small businesses by assuring members of the subcommittee that the FASB is sensitive to the impact of accounting rules on small businesses. They reminded the subcommittee that no federal law exists requiring non-public companies to use FASB standards, so that for most small businesses the use of FASB standards is a private choice.

Additionally, some staffers warned the FASB at its September1, 2004 board meeting that some accounting firms have advised their clients that the revised SFAS 123 preference for a lattice-type (e.g. binomial) model is effectively a requirement. Concerned that this could inhibit the development of more accurate and robust models, the Board tentatively agreed to eliminate stated preferences from the proposal. At the same meeting, the FASB declined to exclude or give special treatment to “out of the money” stock options. Some critics have argued that expensing such options forces a company to record expenses for options that will probably never be exercised.

Opposition to the proposal at this time remains strong, and the ultimate fate of amended SFAS 123 is uncertain.

REV. PROC. 2003-68

This revenue procedure provides the requirements for valuing stock options for the purposes of Sections 280G and 4999 of the Internal Revenue Code of 1986. Section 280G denies a deduction for excess "golden parachute" payments and Section 4999 imposes a non-deductible 20 percent tax on the recipient of these payments. Consequently, stock options granted as compensation as part of an excess parachute payment must be included in the recipient's income at fair value.

The revenue procedure provides that a taxpayer may value a stock option, whether or not publicly traded, using any valuation method:

1. That is consistent with generally accepted accounting principles (such as SFAS 123 or successor standard); and
2. That takes into account the following factors:

    a. The volatility of the underlying stock;
    b. The exercise price of the option; and
    c. The term of the option on the valuation date.

As you can see, both the Black-Scholes and binomial models incorporate these factors, in addition to others. SFAS 123 also designates these two models as acceptable valuation models.

Rev. Proc. 2003-68 further provides a "safe harbor" valuation method that will automatically pass muster. The safe harbor valuation method is based on the Black-Scholes model, and incorporates the following factors:

1. The volatility of the underlying stock;
2. The exercise price of the option;
3. The value of the underlying stock at the time of valuation ("spot" price); and
4. The term of the option on the valuation date.

To value the stock option, one multiplies the number of shares covered by the options by the spot price of the stock, the product of which is then multiplied by valuation factor provided in tables appended to the revenue procedure. Exhibit IV contains the table of factors used in the safe harbor method. To use the table, one must determine the level of volatility. Using the volatility contained, for example, in the notes to the financial statements, one decides whether the stock is low, medium or high volatility. Volatility in the range of 25%, for example, would be considered low. Volatility of 50% would be medium, and 75% would be high. The revenue procedure does not identify the borderlines between the three volatility levels in the table.

The percentage spread between the spot price and strike price is then determined. If the spot price is, say, $24 and the exercise price is $20, the formula (S/E) - 1 is used to determine the spread. In this case, (24/20)-1 = 20%. Finding the spread factor of 20% in the table, the factor for the given volatility and time to exercise is selected. This factor times the spot price yields the per option value.

We thought it would be an interesting exercise to compare the results using the IRS formula with results using the basic SFAS 123 model. We base the experiment on the following assumptions (taken from the example in Rev. Proc. 2002-13):

- Volatility is 50%
- Spot price is $24
- Exercise price is $20
- Remaining term of the options is 60 months

- The employee is 100% vested.

The spread factor is 20%, as calculated above. Volatility of 50% falls into the medium range. Going to the table of factors in Exhibit IV, for a medium volatility, a 20% spread factor and a 60-month term, we see a factor of 50.8%. This factor times the spot price of $24 results in an option price of $12.19. Using the basic FASB model, assuming a risk free interest rate of 2% and a 0% employee exit rate, we get a value for the options of $12.13. Of course, as the risk free interest rate changes, so does the value of the option. As the interest rate increases, so does the value of the option. In addition, the safe harbor method ignores the effects of employee exit rates, and unlike the Hull and White "enhanced" SFAS 123 method, also fails to consider early exercise strategies.

It is important to remember that this safe harbor method is for use in valuing options pursuant to Sections 280G and 4999 of the Internal Revenue Code using Rev. Proc. 2003-68 only. It is not appropriate, in the authors' opinion, for other valuation requirements.

Conclusion

Option pricing theory continues to evolve. At present, valuing stock options is as much art as science. Nonetheless, best practices direct the practitioner to use the Black-Scholes and binomial models as adjusted for specific circumstances. As academia refines pricing models, we can expect option pricing to become more precise. Until then, we must use the best tools at hand.

Stock option activity was as follows:

(In thousands, except weighted average exercise price per share)	Number of Shares	Weighted Average Exercise Price Per Share
Outstanding as of March 31, 2000	20,038	16.34
Granted	18,334	19.57
Exercised	-3,542	10.3
Cancelled	-3,102	20.88
Outstanding as of March 31, 2001	31,728	18.43
Granted	8,450	30.26
Exercised	-8,254	14.56
Cancelled	-3,140	20.67
Outstanding as of March 31, 2002	28,784	22.77
Granted	3,548	36.12
Exercised	-6,390	18.92
Cancelled	-2,323	26.83
Outstanding as of March 31, 2003	23,619	25.42

EXHIBIT I
WEIGHTED AVERAGE PRICE PER SHARE OF SYMANTEC STOCK
52 WEEKS ENDED MARCH 31, 2001

Date	Open	High	Low	Close	Volume	Weighted Value
26-Mar-01	44	45.63	38.81	41.81	1349880	56438482.8
19-Mar-01	41.44	45.63	39.69	44.13	1199720	52943643.6
12-Mar-01	43.56	47.13	40	41.44	1274280	52806163.2
5-Mar-01	47.88	51.5	43.75	44.56	1937840	86350150.4
26-Feb-01	49.16	50.75	44.19	48	1850520	88824960
20-Feb-01	50.25	51.25	46.31	49.63	1690575	83903237.25
12-Feb-01	48.75	53.88	48.63	50.69	1349420	68402099.8
5-Feb-01	48.06	51	43.13	49.19	1925720	94726166.8
29-Jan-01	49.31	54	47.06	48.19	1127660	54341935.4
22-Jan-01	48.75	53.63	48.25	49.69	1835400	91201026
16-Jan-01	42.19	51.31	40.5	49.38	2198825	108577978.5
8-Jan-01	35.13	43.19	33.88	42.56	888180	37800940.8
2-Jan-01	34.13	40.56	31.2	35.56	1340600	47671736
26-Dec-00	32.75	35.81	27.37	33.38	2037550	68013419
18-Dec-00	34.63	37	29	32.75	1811540	59327935
11-Dec-00	38.63	42.75	33.31	34.56	1315820	45474739.2
4-Dec-00	36	39	35	38.13	1328060	50638927.8
27-Nov-00	38.31	38.5	31.81	36.25	1081200	39193500
20-Nov-00	37.06	38.25	34.38	38.06	692875	26370822.5
13-Nov-00	33.81	39.63	32.13	37	971620	35949940
6-Nov-00	38.5	38.5	33.63	33.75	781320	26369550
30-Oct-00	39.25	39.88	36.31	37.75	1016400	38369100
23-Oct-00	37.5	39.75	34.5	38	1418000	53884000
16-Oct-00	44.06	44.5	31.44	36.06	3132180	112946410.8
9-Oct-00	45.25	46.19	41	43.75	1074440	47006750
2-Oct-00	45	47.5	41	44.44	1952700	86777988
25-Sep-00	44.5	47.69	42.13	44	1189920	52356480
18-Sep-00	46.19	46.38	38.75	43.06	1958560	84335593.6
11-Sep-00	47.81	48.75	45.63	45.75	1533300	70148475
5-Sep-00	52.41	52.94	45.75	48	1610625	77310000
28-Aug-00	49.25	52.25	47.56	52.13	997520	52000717.6
21-Aug-00	54.03	54.25	48.13	49.25	923620	45488285
14-Aug-00	48.06	50.8	42.75	50.44	1808460	91218722.4
7-Aug-00	55.06	55.06	47.88	48.38	855720	41399733.6
31-Jul-00	49.88	57.63	46.88	55.06	1534780	84504986.8
24-Jul-00	59.88	65	48.5	49.06	1513640	74259178.4
17-Jul-00	54.31	64.5	46.25	60.5	1452020	87847210
10-Jul-00	50.47	53.5	48.5	52.38	1106600	57963708
3-Jul-00	53.63	55	47.5	50.81	1391650	70709736.5

26-Jun-00	58.53	59.5	52	53.94	1154060	62249996.4
19-Jun-00	68.75	69.12	55.63	58.63	1358600	79654718
12-Jun-00	72	73	68	69.19	622680	43083229.2
5-Jun-00	70.03	73.12	68.5	71.5	623800	44601700
30-May-00	63.5	72.06	62.5	69.94	814000	56931160
22-May-00	61.88	67.75	57.5	62.5	548680	34292500
15-May-00	57.5	66.94	56	62.31	805640	50199428.4
8-May-00	60.31	61	54.38	56.56	760160	42994649.6
1-May-00	62.44	64	56	60.5	802780	48568190
24-Apr-00	57.75	62.56	52.25	62.44	734020	45832208.8
17-Apr-00	51.63	67.37	50.5	59.5	1094100	65098950
10-Apr-00	67.87	67.87	49.13	52.56	816540	42917342.4
3-Apr-00	75.37	76.37	52.38	66.62	1313720	87520026.4
	Totals				67907520	3207798529
	Weighted Average Price per Share					47.24

EXHIBIT II
WEIGHTED AVERAGE PRICE PER SHARE OF SYMANTEC STOCK
52 WEEKS ENDED MARCH 31, 2002

Date	Open	High	Low	Close	Volume	Weighted Value
25-Mar-02	41.98	42.13	38.62	41.21	2756975	113614939.8
18-Mar-02	41.5	43.1	40.31	41.76	2826280	118025452.8
11-Mar-02	41.65	42.72	40	41.46	3539100	146731086
4-Mar-02	37.37	42.11	36.95	41.95	4629180	194194101
25-Feb-02	33.17	37.88	32.98	37.81	4238020	160239536.2
19-Feb-02	35.01	35.87	31.53	32.81	5961900	195609939
11-Feb-02	33.96	37.99	33.05	34.95	3998500	139747575
4-Feb-02	38.09	38.64	30	34.52	6028960	208119699.2
28-Jan-02	77	79.34	37.59	37.68	2826880	106516838.4
22-Jan-02	75.25	77.49	73.37	76.23	3574950	272518438.5
14-Jan-02	70.84	76.76	65.76	75.82	5675560	430320959.2
7-Jan-02	69.22	74.7	67.4	70.75	2505640	177274030
31-Dec-01	67.24	70.35	64.17	68.89	2024325	139455749.3
24-Dec-01	66.05	67.72	63.23	67.42	884150	59609393
17-Dec-01	68.15	70.45	63.63	65.91	2974440	196045340.4
10-Dec-01	66.64	68.63	65.19	67.16	1385180	93028688.8
3-Dec-01	64.85	71	61.75	66.81	3136740	209565599.4
26-Nov-01	63.29	66.7	63.29	64.97	2458180	159707954.6
19-Nov-01	61.07	64.58	60.75	63.17	1653025	104421589.3
12-Nov-01	57.6	62.78	56.44	61.07	1297020	79209011.4
5-Nov-01	57.86	62.64	56.56	57.68	2325240	134119843.2
29-Oct-01	57.3	59.06	53.1	57.35	2361680	135442348
22-Oct-01	54.25	60.15	53.16	57.49	3027780	174067072.2
15-Oct-01	48.07	55.17	47.02	53.88	6596220	355404333.6
8-Oct-01	43.33	49.35	43.15	48.13	3203040	154162315.2
1-Oct-01	34.19	45.75	33.64	43.84	2954920	129543692.8
24-Sep-01	37.05	39.1	31.54	34.67	2506840	86912142.8
10-Sep-01	41.19	42.44	34	36.96	2541366	93928887.36
4-Sep-01	42.62	44.18	40.11	41.6	2454650	102113440
27-Aug-01	41.75	44.76	40.9	42.99	1833080	78804109.2
20-Aug-01	42.93	43.2	38.92	41.9	2284960	95739824
13-Aug-01	47.54	48.09	41.84	42.99	1594560	68550134.4
6-Aug-01	49.35	49.97	45.55	47.71	1498720	71503931.2
30-Jul-01	49.5	50.85	47.7	49.7	844880	41990536
23-Jul-01	46.26	50.83	45.7	49.22	1743560	85818023.2
16-Jul-01	40.44	46.9	37.1	45.93	2405320	110476347.6
9-Jul-01	40.17	43.75	37.25	40.48	1512920	61243001.6
2-Jul-01	42.51	44.31	39.62	40.11	1244725	49925919.75
25-Jun-01	39.02	44	36.36	43.69	2674320	116841040.8

18-Jun-01	51.57	63.67	38.4	38.9	5706460	221981294
11-Jun-01	65.68	65.8	51.65	52.06	2359700	122845982
4-Jun-01	66.99	67.75	63.75	65.63	1139860	74809011.8
29-May-01	69.9	71	66.5	67.21	1411100	94840031
21-May-01	68.55	73.5	67.18	70.51	1304580	91985935.8
14-May-01	64.4	69.49	62.45	68.37	793760	54269371.2
7-May-01	66.7	68.45	62.96	65.78	1081520	71142385.6
30-Apr-01	62.39	67.55	62	67.05	1451560	97327098
23-Apr-01	59.31	66.45	56.39	63.75	2472940	157649925
16-Apr-01	51.7	63.75	50.63	59.5	2252780	134040410
9-Apr-01	47.15	52.96	46.78	52.05	1434025	74641001.25
2-Apr-01	41.94	46.31	38.25	45.56	1271840	57945030.4
	Totals				132663911	6704020340
	Weighted Average Price per Share					50.53

EXHIBIT III
WEIGHTED AVERAGE PRICE PER SHARE OF SYMANTEC STOCK
52 WEEKS ENDED MARCH 31, 2003

Date	Open	High	Low	Close	Volume	Weighted Value
31-Mar-03	39.3	39.49	38.68	39.18	11056700	433201506
24-Mar-03	40.3	42.9	39.03	40.25	13608180	547729245
17-Mar-03	44.7	47.44	41.76	42.56	6793520	289132211
10-Mar-03	43.22	45.5	41.38	44.99	4873120	219241669
3-Mar-03	42.52	43.7	40.85	43.54	6380580	277810453
24-Feb-03	47.15	48.22	40.06	40.47	11700980	473538661
18-Feb-03	44.99	48	44.93	47.81	3487850	166754109
10-Feb-03	45.97	46.15	43.47	44.8	3998900	179150720
3-Feb-03	46.63	48.27	45.59	46.09	3283740	151347577
27-Jan-03	43.99	47	43.54	46.68	4217940	196893439
21-Jan-03	45.26	46.48	43.55	43.91	4290275	188385975
13-Jan-03	46.4	48.3	45.04	45.05	5160500	232480525
6-Jan-03	43.71	46.92	43.06	46.12	3557100	164053452
30-Dec-02	41.75	44.08	40.3	43.85	2656400	116483140
23-Dec-02	42.02	43.62	41.86	41.86	1089550	45608563
16-Dec-02	41.71	44.5	40.65	42.11	3580420	150771486
9-Dec-02	40.75	43.48	39.51	41.26	3042640	125539326
2-Dec-02	43.62	45.13	40.27	41.21	3541100	145928731
25-Nov-02	45.51	45.86	42.75	43.73	2622050	114662247
18-Nov-02	43.37	46.19	40.56	45.53	3451560	157149527
11-Nov-02	39.55	43.5	38.5	43.4	3597080	156113272
4-Nov-02	40.99	42.2	39.25	39.61	3658360	144907640
28-Oct-02	39.75	41	38	40.95	3171140	129858183
21-Oct-02	37.87	40.29	37.25	39.75	3839120	152605020
14-Oct-02	34.1	39.26	33.78	39	6684640	260700960
7-Oct-02	30.01	35.17	29.59	34.4	4339420	149276048
30-Sep-02	33.89	34.34	29.05	30.05	5128480	154110824
23-Sep-02	32.69	34.98	30.57	34.3	4191460	143767078
16-Sep-02	33.7	34.24	31.94	32.82	3234240	106147757
9-Sep-02	31.85	34.34	31.8	33.98	3074860	104483743
3-Sep-02	28.29	32.82	27.21	32.63	6920450	225814284
26-Aug-02	31.95	32.12	28.51	28.6	3984800	113965280
19-Aug-02	32.99	34.67	31.42	31.57	3095300	97718621
12-Aug-02	30.64	33.45	30.09	32.93	3866460	127322528
5-Aug-02	31.15	33.55	29.69	30.83	4617360	142353209
29-Jul-02	32.81	36.67	30.84	31.14	5452260	169783376
22-Jul-02	30.75	34.08	30.39	32.49	4214000	136912860
15-Jul-02	31.4	35	30.01	31.53	6119700	192954141
8-Jul-02	34.33	35.4	30.5	31.07	4684400	145544308

1-Jul-02	32.35	34.62	30.35	34.48	2581975	89026498
24-Jun-02	30.31	33.75	29.03	32.85	3143220	103254777
17-Jun-02	31.1	34.1	30.42	30.47	3377600	102915472
10-Jun-02	31.83	32.88	29.19	30.75	4222920	129854790
3-Jun-02	34.6	34.97	29.1	31.72	4620180	146552110
28-May-02	34.25	35.04	32.51	34.37	3250775	111729137
20-May-02	37.92	38.34	32.54	33.66	3590160	120844786
13-May-02	34.1	39.95	33.59	39.17	3639860	142573316
6-May-02	33.55	37.73	31.01	33.75	4177360	140985900
29-Apr-02	34.3	36.64	32.67	33.88	3726740	126261951
22-Apr-02	37.38	37.85	33.34	34.15	5721620	195393323
15-Apr-02	36.2	37.73	35.6	37.51	2703660	101414287
8-Apr-02	34.9	37.48	33.35	35.87	4503440	161538393
1-Apr-02	40.86	41.99	35.12	35.28	4188440	147768163
	Totals				239714585	9050314594
	Weighted Average Price per Share					37.75