Valuing Stock Options in Compliance with Section 409A

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Internal Revenue Code Section 409A provides the income tax provisions related to deferred compensation—including employee stock options. Section 409A does not prescribe a universal methodology to value employee stock options. However, many analysts apply option pricing models—such as the Black-Scholes option pricing model ("Black-Scholes") or a binomial model—to value employee stock options. This discussion provides (1) a summary of Section 409A and (2) an overview of common option pricing models.

Introduction

Internal Revenue Code Section 409A applies to the compensation that is earned by an employee in one year but is paid in a future year, such as a nonqualified deferred compensation plan.

A nonqualified deferred compensation plan is an arrangement between an employer and an employee to pay the employee compensation in the future.

Such arrangements include the following:

1. Nonqualified retirement plans
2. Elective deferrals of compensation
3. Severance and separation programs
4. Post-employment payments provided for in an employment agreement
5. Equity incentive programs, such as stock options

According to Section 409A, every time a corporation issues a stock option to an employee, there should be a valuation of the corporation's common stock. However, Section 409A does not provide a universally accepted valuation method to value employee stock options.

For this reason, it is up to the employer and its advisers to elect a practical valuation method, or application, to estimate the fair market value of the employee stock options.

Therefore, it is common for analysts to apply an option pricing model to value employee stock options. This is because option pricing models allow analysts to assign probabilistic assumptions to analyze contingent events.

The value of employee stock options is contingent on the economic circumstances that will exist in the future when the employee has the right to receive the shares.

Section 409A Overview

Section 409A requires that all compensation deferred for the taxable year and all preceding taxable years be included in gross income for the taxable year unless there is a substantial risk of forfeiture.

Section 409A applies to all deferred compensation that an employee earns for the taxable year and imposes severe tax penalties on noncompliant deferred compensation arrangements.

In order to avoid noncompliant arrangements, company managements and their analysts should understand how to establish (1) the value of the shares that underlie the option and (2) the exercise price for the stock option.

Noncompliant arrangements may include the following:

1. Stock options and stock appreciation rights that are granted with an exercise price below fair market value at the time of grant

2. Stock options or stock appreciation rights that are not affiliated with the common stock of the company the employee works for or its parent company
3. Rights that are added later to further defer the stock option or stock appreciation rights[1]

According to Section 409A, stock options and stock appreciation rights that are noncompliant may result in significant unfavorable tax consequences for the employee and the employer.

For example, the nonqualified deferred compensation in question will be fully taxable as soon as the employee has a vested right to receive it. In addition, a tax penalty of 20 percent may be applied.[2]

Valuing Public and Private Corporation Stock

To avoid unfavorable tax consequences under Section 409A, the exercise price of the stock option must not be less than the fair market value of the underlying stock as of the date of the grant.

The following valuation guidelines are appropriate for both public and private corporation stock.

Determining Fair Market Value of Public Company Stock

The fair market value of stock that is actively traded on an organized securities market may be based upon:

1. the most recent sale price before the grant,
2. the closing price on the trading day before the grant,
3. the arithmetic mean of the high and low prices on the trading day before or the trading day of the grant, or
4. another reasonable basis using actual transactions in the stock as reported by the market.[3]

Determining the Fair Market Value of Private Company Stock

The fair market value as of the date of the grant of stock that is not traded on a reputable securities market is to be established by reasonable application of a recognized valuation method.

A reasonable valuation method may include one or more of the following considerations:

1. The value of tangible and intangible assets of the company less its liabilities (an asset-based approach valuation analysis)
2. The present value of expected future cash-cash flow of the company (an income approach valuation analysis)
3. Recent arm's-length transactions involving the sale or transfer of the subject stock (a market approach valuation analysis)
4. The market value of stock or equity interest in similar companies (a market approach valuation analysis), based on:
   a. observable trading prices on an reputable securities market or
   b. an amount paid in a recent arm's-length private transaction
5. A method that is regularly used for other purposes that have a material economic effect on the company, its stockholders, or its creditors (which may include relevant factors such as ownership control price premiums or discounts for lack of marketability)[4]

A valuation method is not considered to be reasonable if:

1. it fails to reflect important information that is known or knowable as of the grant date that may materially affect the value of the corporation's stock such as:
   a. the resolution of material litigation or
   b. the issuance of a patent, or
2. the valuation date was more than 12 months prior to the date for which the valuation is being used.[5]

Valuation Safe Harbors for Private Company Stock

The Internal Revenue Service (the "Service") may rebut this presumption by showing that the concluded value of company stock was "grossly unreasonable" by the improper use of the valuation method.[6]

A private company's use of a valuation method is presumed to be reasonable under the following three safe harbor provisions.

Safe Harbor I

The fair market value of the private company stock is estimated by a qualified independent appraiser that has:

"Stock options in the public market differ from a stock option issued by a closely held company because they are issued by a third party rather than the public company itself."

1. met educational and experience requirements or
2. a professional designation recognized by the Secretary of Treasury.

Such requirements must be met 12 months prior to the date for which the valuation of employee stock options is being used.

Safe Harbor II

The fair market value is based on a formula (e.g., multiple of book value or multiple of earnings or a combination of both) that is regularly used for other purposes that have a material economic effect on the company, its stockholders, or its creditors.

Safe Harbor III

The fair market value is estimated by a qualified individual who is not independent of the company. However, this safe harbor provision usually applies only to illiquid stock of a start-up company.

An Employee Stock Option Is a Derivative Security

An employee stock option is a derivative security whose value is contingent on the price of the company stock. A stock option gives the holder the right, but not the obligation, to acquire stock in a company within a specific time period.

In addition, a stock option typically includes an exercise price and a stated expiration date. Unlike futures and forward contracts, options do not have an obligation where final purchases are required.

The following discussion presents a brief description of other common derivatives.

1. A forward contract is an agreement between one party to buy, and the other to sell, an asset at a predetermined price. The price at which the exchange occurs is set at the time of the initial contracting.

   If the value of the asset decreases between the time the contract is entered into and the time it is executed, then the seller has a gain and the buyer has a loss.[7]

2. A futures contract is fundamentally a forward contract. But, future contracts differ from forward contracts in that futures:[8]
   a. are standardized and traded on organized exchanges whereas the terms of a forward contract can be privately negotiated,
   b. are highly regulated compared to forwards, and
   c. are backed by the clearinghouse.
3. A swap is equivalent to a series of forward contracts. A swap is simply defined as an agreement between one party to pay the floating rate of interest on a determined amount of principle, and the counterparty agrees to pay a fixed rate of interest in return.[9]
4. A credit derivative is a contract that provides protection for the lender against default by the borrower.

Stock options in the public market differ from a stock option issued by a closely held company because they are issued by a third party rather than the public company itself.

A "call option" gives its holder the right, but not the obligation, to buy the underlying asset at a predetermined price within a specific time period.

A "put option" gives its holder the right, but not the obligation, to sell the underlying asset at a predetermined price within a specific time period.

The "strike price" is the stated price per share for which underlying stock may be purchased or sold by the option holder upon exercise of the option contract. In other words, the "strike price" represents the exercise price specified in the option contract.

An "expiration date" is the last day for the holder to exercise their right.

An "American option" allows the owner to exercise the option at any time before or at expiration.

A "European option" can be exercised only on the expiration date. Thus, an "American option" has more flexibility than the "European option," so it is worth at least as much and typically more.

If the value of the underlying asset is greater than the exercise price, the option is referred to as being "in the money." Being "in the money" provides a positive payoff if the option is exercised. Conversely, if the value of the underlying asset is below the exercise price, the option is referred to as being "out of the money."

If the value of the underlying asset equals the strike price, then the option is referred to as being "at the money." Thus, the amount that is in the money or the difference between the current price of the underlying asset that is above its strike price is referred to as its "intrinsic value" of the option, and zero otherwise.

The difference between the price of an option and its intrinsic value is referred to as being the "time value" of the option on a certain date.

A "stock warrant" is of a longer duration than a stock option and is issued by the company rather than by third parties. The pricing of a warrant must take into consideration the potential dilution effect on earnings.

Factors Involved with Valuing Stock Options

Many option pricing models incorporate the following six factors:

1. *The current price of the underlying asset*.
   Call options increase in value when the price of the underlying asset appreciates relative to the strike price. Conversely, put options increase in value when the price of the underlying asset depreciates relative to the strike price.
2. *The strike price*.
   A call option is in the money when the strike price is below the price of the underlying asset. Conversely, a put option is in the money when the strike price is above the price of the underlying asset.
3. *The time to expiration*.
   A call or put option is more valuable when the time to expiration is longer and are less valuable as their time to expiration decreases.
4. *The volatility of the underlying asset*.
   Volatility is the annualized standard deviation of returns.[10] A high standard deviation in the pricing of the underlying asset increases the probability that it will be higher than the strike price on the expiration date. Put and call options become more valuable as the volatility of the pricing of the underlying asset increases.
5. *The risk-free rate*.
   As the risk-free rate increases, call options become more valuable and put options become less valuable.
6. *The effect of expected dividends on the underlying asset*.
   In general, an option holder is not entitled to receive the dividend that is paid to the holder of the underlying asset.

   When an investor holds an underlying asset on the ex-dividend date, the underlying asset will usually depreciate in value by the amount of dividends paid per share.

   This is primarily because of the company's retained earnings that could have been reinvested into the company are now being paid out as a dividend—usually as a cash or a stock dividend—to the shareholder, which theoretically should reflect an overall decrease in the company's market cap.

   As a result, call options are usually more valuable when dividends are zero or minimal.

   Conversely, after the ex-dividend has been declared, put options are typically more valuable.

Important Dates

Employee stock option values are usually sensitive to various dates. Therefore, an analyst should understand the following types of dates when valuing stock options:

Grant Date

The grant date is the date when a company issues stock options to the employee. In other words, it is the date when the company and the employee agree to the terms of the employee stock options.

Vesting Period

The vesting period is a restricted time period during which the employee does not yet own the stock options. Cliff vesting is when an employee owns the stock options at an agreed upon date.

Equal annual vesting is when an employee receives an annual right to own a fixed percentage of their stock options.

Similarly, variable annual vesting is when an employee receives an annual right to own their stock option based on a formula.

Exercise Date

The exercise date is the date on which an employee may exercise his or her stock options. Under Section 409A, an employees can only exercise their

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stock options under the following circumstances:

1. An employee separates from service
2. Employee disability
3. Employee death
4. An agreed upon future date
5. A change in control of the business
6. The occurrence of an unforeseeable emergency[11]

Expiration Date

The expiration date is the last day an employee's options may be exercised and is provided in the terms of the contract.

Option Pricing Models

Section 409A does not prescribe a universal methodology to value employee stock options. Many analysts consider using option pricing models such as the Black-Scholes model or a binomial model to value employee stock options.

The Black-Scholes model effectively treats the time between the current time and the expiration of the options as one time period divided into an infinite number of discrete periods.

The binomial option pricing model, on the other hand, divides the time period between the current time and the expiration of the options into discrete periods—most often one year.

The binomial model is sometimes used to estimate the effect on the value of employee stock options of factors such as the following:

1. Vesting periods
2. Employee turnover
3. Blackout periods
4. Change in risk-free rates
5. Volatility

The following discussion gives a brief overview of the Black-Scholes model and the binomial models.

Black-Scholes Option Pricing Model

In 1973, Fisher Black and Myron Scholes developed an option pricing model for the valuation of publicly traded options on non-dividend-paying stocks.

The model was derived from Robert Brown's "Brownian Motion model," which describes the random movements of microscopic particles suspended in a liquid or a gas.

The Black-Scholes model is primarily based on the assumption that an investor could create a perfectly hedged position to eliminate risk by buying an option and selling the underlying stock.

Therefore, any movement in price would be offset by a position in the option and the underlying stock. The value of the call option is equal to the present value, discounted at the risk-free rate, of the expected net proceeds received after closing the hedge at the option's expiration date.[12]

Thus, an option is priced correctly when the perfect hedge yields the risk-free rate.

Some of the other assumptions underlying the Black-Scholes model include the following:

1. There are no commissions or other transaction costs in buying or selling the stock or the option.
2. The short-term risk-free interest rate is known and is constant through time.
3. Trading is continuous through time following a geometric Brownian motion.
4. The underlying stock pays no dividends and makes no other distributions.
5. There is unrestricted access to credit, and the securities are perfectly divisible. However, it is possible to borrow any fraction of the price of a security to buy, or to hold it, at the short-term risk-free rate.
6. The stock price follows a random walk with a log normal distribution.
7. The volatility of the stock is constant over the life of the option.
8. The option can be exercised only at maturity.
9. A seller who does not own a security (a short seller) will simply accept a future date by paying for an amount equal to the price of the security on that date. While this short sale is outstanding, the short seller will have the use of, or interest on, the proceeds of the sale.
10. The tax rate, if any, is identical for all transactions and all market participants.[13]

The Black-Scholes formulas for the prices at time 0 of a European call option on a non-dividend-paying stock and a European put option on a non-dividend-paying stock are as follows:[14]

$$Call\ Value = S_0 \times N(d_1) - Ke^{-rT} \times N(d_2)$$

and

$$Put\ Value = Ke^{-rT} \times N(-d2) - S_0 \times N(-d_1)$$

where:

$$d_1 = \frac{\ln(S_0 / K)+(r + 0.5\sigma^2)T}{\sigma\sqrt{T}}$$

$$d_2 = \frac{\ln(S_0 / K)+(r - 0.5\sigma^2)T}{\sigma\sqrt{T}} = d_1 - \sigma\sqrt{T}$$

The function $N(x)$ is the cumulative probability distribution function for a standardized normal distribution.[15]

In other words, it is the probability that a variable with a standard normal distribution, φ (0, 1), will be less than x.[16]

S_0 is the stock price at time zero, K is the strike price, e is the base of natural logarithms, ln is the natural logarithm, r is the continuously compounded risk-free rate, σ is the stock price volatility, and T is the time to maturity of the option.[17]

There are many assumptions and computations that need to be made to derive the option value using the Black-Scholes formula. In the model (1) dividends are ignored and (2) fluctuations in the geopolitical and macroeconomic environment preclude coherent acceptance of the assumption that investors can borrow or lend at a constant risk free rate.

Robert Merton added an additional computation to account for dividends in the Black-Scholes model (referred to herein as the "BSM model").

The BSM model essentially assumes that dividends are paid continuously over the life of the option as a percentage of the underlying stock price.

Pseudo-American Call Option Model

Unlike the Black-Scholes model, which only values European options on non-dividend-paying stocks, the pseudo-American call option model values American options or employee stock options that can be exercised anytime during the life of the option.

The pseudo-American call option model was developed by Fisher Black and is essentially a modified Black-Scholes model. Fisher Black's model values an option for the possibility of early exercise. This is simply done by valuing an option to each ex-dividend day and choosing the maximum of the estimated call values.[18]

Dividends are adjusted for both the exercise price and the stock price. The procedures in the method are as follows:

1. Compute the adjusted market price of the stock by deducting the present value, using the risk-free rate, of the future dividends payable during the remaining life of the option.
2. For each pseudo-option assumed to expire on a dividend date, deduct from the exercise price of the option the dividend payable on the dividend date and the present value, using the risk-free rate, of all the remaining dividends to be paid after the dividend date during the term of the option.
3. Using the Black-Scholes model, compute the value of the actual option as well, using the adjusted market price and the unadjusted exercise price.
4. The value of the American option is the European option with the highest value.[19]

Some analysts prefer to use the pseudo-American call option model to determine if early exercise of an American call option has value. If it does, then the investor would use a different model to determine the American call option's price, such as a binomial model.

Binomial Model

In 1978, John C. Cox, Stephen Ross, and Mark Rubinstein published a paper entitled "Option Pricing: A Simplified Approach."

The binomial model discussed in this paper contains the Black-Scholes option pricing formula. It is considered as a practical application for valuing special cases of American options, such as employee stock options.

The binomial model separates the price movement in the underlying stock into time intervals, or steps. It is based on the probability that the share price of the common stock can only move to one of two possible prices in the following time period.

The probability of moving these prices or "nodes" should total 100 percent.[20] The amount of up or down movement in the underlying stock price is determined by its volatility and the option's time

to expiration. The possible movements at each step forms a binomial tree or "lattice."

Given the stock price lattice, the method then calculates the individual option at each node of the stock price lattice.[21] The value of the option is the present value of all the individual option and ex-dividend date values at each node of the lattice, weighted by its probability of occurrence.[22]

The binomial model formulas for the prices at time 0 of a American call option on a dividend-paying stock are the following:[23]

$$C = \text{Max}\left((P \times C_u + (1 - P) \times C_d) \times e^{(-r(t/step))}, S - E\right)$$

$$P = \frac{e^{(i-div)(\frac{t}{step})} - D}{U - D}$$

$$U = e^{\sigma\sqrt{t/step}}$$

$$D = \frac{1}{U}$$

where:

C =	Call price at current step
P =	Probability of upward movement in the succeeding step
$(1 - P)$ =	Probability of downward movement in the succeeding step
C_u =	Value of call after upward movement in the succeeding step
C_d =	Value of call after downward movement in the succeeding step
e =	Base of natural logarithms
r =	Continuously compounded risk-free rate
t =	Time to expiration in years
$step$ =	Number of steps or time periods
S =	Stock price at the same step
E =	Exercise price at the same step
i =	Annualized and continuously compounded risk-free interest rate for the same time as the remaining life of the option
div =	Dividend yield
U =	Upward movement during a step
D =	Downward movement during a step
σ =	Stock price volatility[24]

The option may be exercised if the difference between the stock price and the exercise price, at the same step, is greater than the value of the succeeding step, otherwise the option is held to the next step.

There are many assumptions and computations that need to be made to derive the option value using either the Black-Scholes or the binomial models. Analysts need to consider the assumptions of the option pricing model when deciding on which model to use to value specific stock options.

For example, time to expiration, early exercise of the option, dividends, volatility, and the economic environment should be considered when valuing employee stock options.

It is noteworthy that there is no universally accepted model for an option pricing valuation. Thus, two analysts valuing the same company may arrive at different valuations for their stock options. However, when the valuation methodology is consistent across analysts, the results may be closer to one another.

Publicly traded call options do not need to be exercised to realize profits from the underlying stock. This is because the option can be sold to another investor who receives the rights associated with the option contract.

Deferred compensation plans that include stock options do not have this advantage. This is primarily because they are usually nonmarketable. However, the assumptions to value publicly traded options are relevant to most employee stock option contracts.

The Black-Scholes Model versus the Binomial Model

Whether Black-Scholes or binomial, both of these models come from the probabilistic assumptions about the financial world. Both models are derived from the Wiener process or Brownian motion where the underlying stock follows continuous paths in a stochastic process with stationary independent normally distributed increments.

In fact, the binomial model converges with the Black-Scholes model as the number of steps increase in the binomial model. Therefore, the binomial model provides discrete approximations to the continuous process of the Black-Scholes model.

As a result, a European option or an employee stock option can be valued with either model.

For example, let's assume the following scenario:

Asset Price	$30.00
Strike Price	$30.00
Years to Maturity	4
Risk-Free Rate	2.25%

Dividend Yield	2%
Volatility	30%
Number of Shares	5,000

Applying these assumptions in the Black-Scholes model, we arrive at a value of $6.58 per share, and conclude a fair market value of the 5,000 options of $32,906.

For illustration purposes, we use five steps for our binomial model. Exhibit 1 presents a stock price of $30 and will move up or down based on the 30 percent volatility.

As a result, we arrive at a value of $7.07 per share, and conclude a fair market value of the options of $35,338.

Summary

There is no universally accepted analytical method for valuing stock options under Section 409A. The most often used option pricing methods were summarized in this discussion.

In the employee stock option price is derived by applying one of the safe harbor methods, the valuation burden of proof will shift to the Service to determine that the valuation method or its application was "grossly unreasonable."

Employee stock options are issued by an employer who provides the terms. For the employee stock option to have no tax consequence to the employee on the date of the grant, the strike price for the employee stock options is typically equal to or higher than the fair market value of the stock.

Exhibit 1
The Binomial Model
Illustrative Example

Input Values:

Current Stock Price	30	S
Exercise Price	30	E
Divdend Rate	2%	Div_Rate
Dividend	0	Divdend
Present Value of Expected Dividend	$0.00	PV_Dividend
Option Life in Years	4	t
Annuual Risk-Free Rate	2.25%	i
Volatility	30%	Std_dev
Number of Steps	5	Step

Calculated Values:

Current Stock Prices less Dividend S Adjustment	$30.00	= S - PV_Dividend
Up Movement U	1.308	= Exp(Std_dev)^(SQRT(t/Step))
Down Movement D	0.765	= 1/U
Risk Neutral Up Movement Probability P	0.437	= (EXP((i-Div_Rate)*(t/Step))-d)/(U-d)
Risk Neutral Down Movement Probability (1-P)	0.563	= 1-P

Stock Price Lattice:

X/Y	0	1	2	3	4	5
0	30.00	39.23	51.31	67.10	87.75	114.76
1		22.94	30.00	39.23	51.31	67.10
2			17.54	22.94	30.00	39.23
3				13.41	17.54	22.94
4					10.26	13.41
5						7.84

Call Option Price Lattice:

X/Y	0	1	2	3	4	5
0	7.07	12.74	22.19	37.10	57.75	84.76
1		2.90	5.81	11.34	21.31	37.10
2			0.73	1.70	3.96	9.23
3						
4						
5						

Source: Shannon P. Pratt, *Valuing a Business*, 5th ed. (New York: McGraw-Hill, 2008).

The Black-Scholes model is commonly used in practice when valuing employee stock options.

However, one may argue that the binomial model may be more practical to value employee stock options. This is because an analyst can include assumptions such as early exercise, blackout periods, employee turnover, and vesting provisions in the model.

Notes:

1. "A Question and Answer Guide to Code Section 409A" found at http://www.sandw.com/assets/html-documents/CLIENT_ADV._-_A_Question_and_Answer_Guide_409A_(B0778012).PDF
2. Ibid.
3. "Income Tax Regulation Including Proposed Regulations §1.301-1–§1.483-4" (Winter 2016), 33,815.
4. Ibid.
5. Ibid.
6. Ibid.
7. Robert W. Kolb, *Futures, Options, and Swaps,* 4th ed. (London, U.K.: Pearson Prentice Hall, 2003), 3.
8. Ibid.
9. Ibid., 5.
10. Paul Wilmott, *Frequently Asked Questions in Quantitative Finance,* 2d ed. (London, U.K.: John Wiley & Sons, 2009), 162.
11. "A Question and Answer Guide to Code Section 409A" found at http://www.sandw.com/assets/html-documents/CLIENT_ADV._-_A_Question_and_Answer_Guide_409A_(B0778012).pdf.
12. Shannon P. Pratt, *Valuing a Business*, 5th ed. (New York: McGraw-Hill, 2008), 589.
13. Ibid., 589–590.
14. John C. Hull, *Options, Futures, and Other Derivatives*, 7th ed. (Upper Saddle River, NJ: Pearson Education, 2009), 291.
15. Ibid.
16. Ibid.
17. Ibid., 291–292.
18. http://people.stern.nyu.edu/adamodar/pdfiles/valn2ed/ch5.pdf, 18.
19. Pratt, *Valuing a Business,* 593.
20. Ibid., 597.
21. Ibid.
22. Ibid.
23. Ibid., 600.
24. Ibid.

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