

## Planning for stock option wealth

### 1. Overview

Stock options granted by an employer corporation to its employees offer many benefits. They: (i) provide optionees with incentives to increase the stock price of the firm; (ii) serve as “golden handcuffs” that bind optionees to firms during the vesting period; (iii) allow optionees to recognize income at times that coincide with favorable tax treatment or personal liquidity needs; and, (iv) may be treated as “off income statement compensation” by the employer for financial statement purposes. Of course options also have costs. They: (i) dilute existing shareholders’ interests in the firm (but increase cash inflows to the firm); (ii) expose optionees to the risk of fluctuations in the employer’s stock price; and, (iii) cause optionees to trade in their employers’ stock and therefore put them at risk of violating insider trading rules.

To an employer, stock options are part of a compensation program (also including salary, pension, bonuses, and fringe benefits) that fosters employee loyalty and productivity. Both the cost of the compensation package to the employer and the incentives for loyalty and productivity created for employees depend on when employees exercise their options. Once an employee has exercised his options and sold all the stock acquired on exercise of the options, there may no incentives at all. To prevent this, many employers grant employees new options every year and require a specified time to pass before the options vest, or become exercisable. Consequently, employees commonly hold unexercised stock options from several different grants, even if they exercise every option as soon as it vests.

Options from different grants have different strike prices and expiration dates. Choosing the best time to exercise each grant of options so as to maximize the benefits to the employee is a very complicated problem. Since the employee cannot trade freely in either the option or the underlying stock, the value of the option to the employee and the optimal exercise policy do not follow the usual arguments that apply to exchange-traded options.

It is important to distinguish employee stock options (ESOs) from exchange-traded stock options (TSOs). While the exercise of a TSO does not affect the welfare of holders of the underlying stock, the exercise of

an ESO is dilutive since the corporation issues new stock to the optionee. Thus, ESOs are a type of warrant. While TSOs generally expire within one year of the date of issue, ESOs may be exercised in a window of time that extends over many years (see figure 1). ESOs, in common with TSOs, are usually “American” not “European” options (i.e., they can be exercised any time during the exercise window, not just at maturity). After options vest, there are typically few restrictions on when they may be exercised, though corporate compensation committees may impose conditions on the exercise of ESOs, like attainment of specific accounting or performance targets, which do not apply to TSOs.

This note summarizes some recent research findings and suggests analyses employees can conduct before deciding whether to exercise. Particular attention is paid to tax considerations.

## **2. When to exercise stock options**

### **2.1 General rule for TSOs**

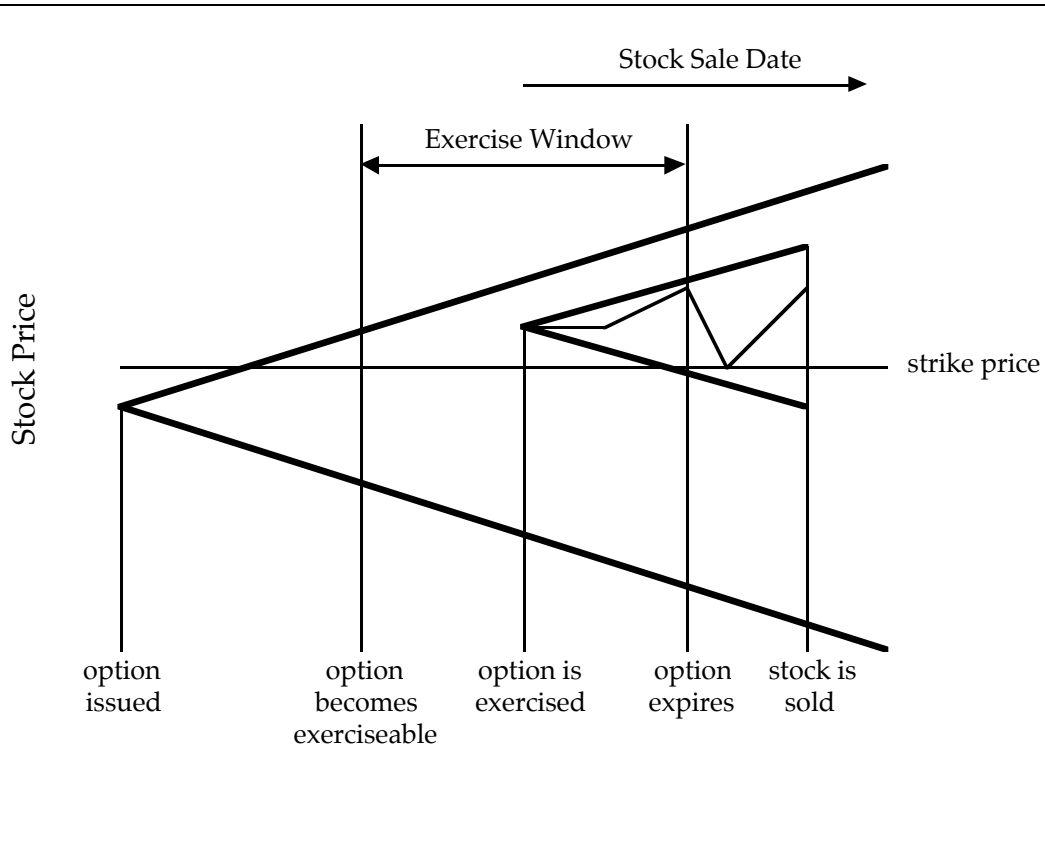
Finance models developed with TSOs in mind further imply that call options should only be exercised at maturity, i.e., immediately before they expire.<sup>1</sup> The pricing and optimal exercise policies for TSOs, which rely on the absence of arbitrage opportunities between the option and a portfolio that duplicates the return of the option, do not apply to ESOs. Since the employee cannot trade freely in either the option or the underlying stock, the value of an ESO to the employee, the optimal exercise policy, and the cost to the employer do not follow the classical arguments in the option pricing literature. Factors like risk aversion and liquidity needs in imperfect capital markets complicate exercise behavior and make valuation more difficult. These complications lead to exceptions to the general rule as detailed below.

### **2.2 Exception for dividends**

Dividends reduce the share price by an amount roughly equal to the dividend. Since the value of a call option decreases with reductions in the share price, dividends reduce the value of an ESO. Thus, one cost of holding an ESO rather than exercising to hold the stock is the foregone stream of dividends.

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<sup>1</sup> Obviously, an option should not be exercised if it is out of the money.



**Figure 1. Nature of employee stock options.**

Employee stock options often are not exercisable for some years after issuance. The option may be exercised before expiration. Generally, the employee may sell the stock at any time after he exercises the option.

Counter-balancing the loss of dividends is the fact that early exercise means the strike price is paid sooner than necessary, resulting in a loss of time value. Also, when the option is near-the-money, the large upside potential of the option compensates for the loss of dividends. The further the option is in the money, the less significant is the upside potential and the more significant are the dividends, which can lead to situations where exercise before expiration of the option is optimal.

As a rule of thumb, when the value of the dividend stream exceeds the time value of deferring the payment of the strike (i.e., the dividends paid

on the underlying stock exceed the risk-free interest rate multiplied by a call option's strike price), consideration should be given to exercising the option. This can happen for some deep-in-the-money ESOs at dividend-paying companies.

A related point is that exercise of an option immediately before the date of record for a dividend payment is preferable to exercise immediately afterward. Exercise before this date means the option holder will receive the dividend. Exercise afterward means the dividend is lost.

### **2.3 Exceptions for termination of employment or change in control**

Stock options plans often provide that termination of employment accelerates the date on which options expire. Often, options expire three months after employment terminates. In the event of a change in control, expiration and vesting both may be accelerated so that all options are immediately exercisable, but expire when control changes. In these circumstances, in-the-money options should be exercised before the revised expiration date.

### **2.4 Exception for reload options**

A reload feature is a provision that stipulates new options are granted to an executive at the time the executive exercises the original options. The reload options typically have an exercise price equal to the then-current market price and expire at the same time as the original options. The number of shares on which reload options are granted per share on which options are exercised varies. Commonly, a reload option on one share is granted for each share tendered by the executive in payment of the exercise price on the original options. Sometimes, the new options themselves may be reloaded. A reload feature affects the timing of exercise of the initial option. Developing an exercise strategy requires that both the number of reloads allowed and the ratio of shares on which new options are granted per share acquired from exercising existing options be taken into account.

The Black-Scholes formula does not measure the value of a reload feature since the formula neither anticipates optimal early exercise nor assigns value to the reloaded options. Other algorithms have been derived that (i) identify when exercise of reload options is optimal, and (ii) value reload options. For further details, see Jane Saly, Ravi Jagannathan, and Steven Huddart, 1999, Valuing the reload features of executive stock options, *Accounting Horizons* 13, 219–240.

## 2.5 Exception for private information

In timing stock purchases and sales, an informed trader benefits from buying before a stock price increase and selling before a decline. Similarly, private information held by employee-optionees may affect exercise decisions. An option holder expecting a drop in share price profits by exercising his options and selling the underlying shares before the drop in price. While prohibitions on insider trading may damp information-based motivations for exercise, some evidence suggests exercise at all levels within an organization is based in part on private information. Accordingly, financial advisers should be attuned to their clients' beliefs about future stock price movements, and build these beliefs into client strategies.

## 2.6 Exceptions for liquidity needs and risk aversion

Since ESOs are non-transferable, employees cannot sell them. In most cases, the only way an employee can get cash from options is by exercising them. Employees often exercise ESOs early (i.e., before expiration) because they need cash or because they prefer to hold a less risky, more diversified portfolio of assets.

To understand how such factors affect exercise decisions, it is helpful to consider measures of option value sacrificed by early exercise. One measure of the value that would be sacrificed on exercise is the ratio of the intrinsic value of the option to its Black–Scholes value.<sup>2</sup> An option's intrinsic value is the difference between the market price of the stock,  $S$ , and the option's strike,  $X$ . The intrinsic value,  $S - X$ , is the cash the option holder would get (before taxes) from a cashless exercise, in which (i) the option is exercised, (ii) the stock acquired on exercise is immediately sold, and (iii) the exercise price is paid with proceeds from the stock sale. If options are transferable (and employee stock options are not), then they could be sold in the marketplace for roughly the Black–Scholes value, denoted  $W$ . The measure  $(S - X)/W$  is the amount of cash the employee would receive by exercising the option now per dollar of value the employee could expect to receive by waiting to exercise the option at expiration, appropriately discounted.

A web page that automates computation of the measure  $(S - X)/W$  for any listed stock is available at:

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<sup>2</sup> The Black–Scholes value of the option is just the famous formula tailored to the options held. Note that the Black–Scholes value applies to stocks that do not pay dividends. For dividend-paying stocks, a related value, the Barone-Adesi and Whaley value replaces the Black–Scholes value in the analysis described here.

<http://www.smeal.psu.edu/faculty/huddart/ValuatorExperimental/index.shtml>.

The measure has the following nice properties:

- The measure is always between 0 and 100%.
- At expiration, if the options are in the money, the measure is 100%.
- If the options are under water, the measure is 0%.
- The measure gets bigger as:
  - the market price rises above the strike,
  - the time to expiration of the option decreases, or
  - the volatility of the stock decreases.

Typically, people exercise when the measure is about 75%.

Before expiration, if the measure is 100%, the expected present value from holding the option is equal to the value obtained from exercising the option today, so exercising today is optimal.

Here are some ways to interpret a measure of 90%: A fair price in the marketplace for a tradable option that has the same strike and expiration as the employee stock option is 100%/90% or 111% of the value obtained by exercising the options today. Or, exercising today yields about 90% of the fair value of your options, where fair value is measured using a pretty good model of how tradable options are priced in the market. Or, by exercising the options now (say to hold something less risky) the option holder gives up something worth 10% of the fair value of a tradable option.

In contrast, suppose the measure is 15%. Then the option holder must give up about 85% of the fair value of a tradable the option for cash today. The option holder sacrifices a much greater potential for upside gain by exercising when the measure is 15% than when it is, say, 90%.

Comparing the measure over time as the stock price and time to expiration change may help in deciding when to exercise. Comparing these values at a given point in time for options from different grants may help in deciding which options to exercise. Generally, options for which the measure is highest should be exercised first.

Recognize that this type of analysis is, at best, right on average. A company's stock may soar or plummet after exercise.

## 2.7 Exception for taxes

Taxation is a key factor in setting option compensation and realizing maximal value from that compensation. Exercise at opportune times may enhance the net-of-tax value of options to employees or reduce net-of-tax costs to the employer. For example, a change in tax rates may induce a preference for early or delayed exercise.

### 2.7.1 *Non-qualified options*

Suppose that employee marginal tax rates are about to change from  $t_1$  to  $t_2$ .<sup>3</sup> Let  $S$  be the current stock price;  $X$ , the strike; and  $W$ , the pretax value the employee would accept today in place of the option. The employee favors exercise immediately before the tax rate change when the net-of-tax payment from exercise now exceeds the net-of-tax payoff from exercise after the tax rate increase, i.e.,

$$(S - X)(1 - t_1) > W(1 - t_2), \quad (1)$$

or

$$\frac{S - X}{W} > \frac{1 - t_2}{1 - t_1}. \quad (2)$$

Intuitively, if the employee exercises a deep-in-the-money, short-maturity option before a tax rate increase, he captures a large fraction of the option's expected total value and benefits from having this value taxed at a low rate. See figure 2. Conversely, if tax rates are about to drop, so  $t_1 > t_2$ , then inequality (2) can be also be used to measure the benefits from delaying exercise.

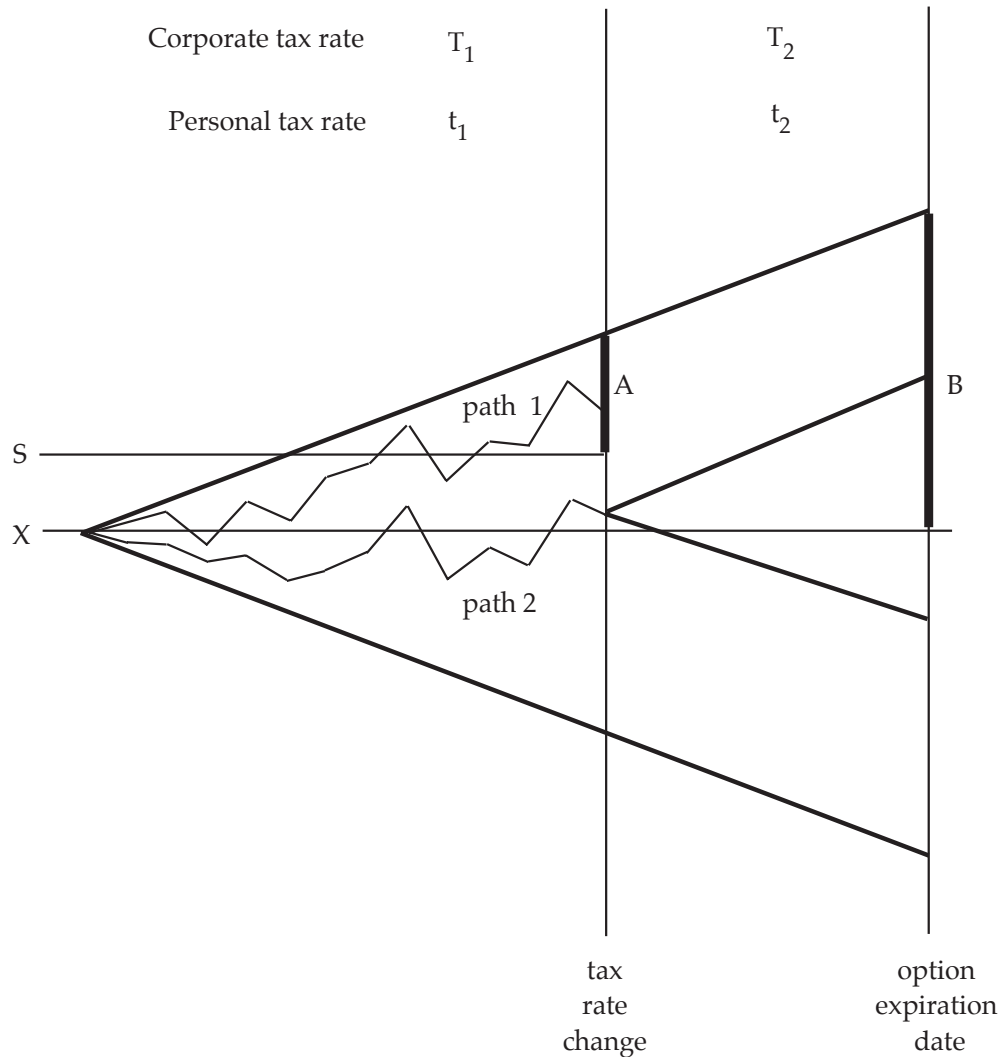
This analytical framework also can be used to determine whether it is worthwhile to exercise options early to avoid bunching income in a later year and thereby having this income taxed at a higher rate. Early exercise of some options may be worthwhile when the options will be subject to tax at a lower rate.

### 2.7.2 *Empirical evidence from 1992*

There is evidence that tax considerations affect employee exercise decisions. A natural experiment occurred in November and December of 1992

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<sup>3</sup> Additional considerations apply if employer tax rates are changing as well.



**Figure 2. Relationship between stock price and exercise decisions.**

Consider an option on a stock that does not pay dividends. In the figure,  $X$  is the strike price and  $S$  is the least stock price at which exercise before the tax rate increase is worthwhile. The horizontal axis represents time. The vertical axis represents stock price. An employee may choose to exercise an option just before a tax rate increase (region  $A$ ) provided the stock price is high. Otherwise, the employee will exercise the option at maturity if it is in the money (region  $B$ ). The exercise decision depends on the dynamics of the stock price process and characteristics of the option. It is not optimal to exercise near-the-money options, but it may be optimal to exercise deep-in-the-money options.

following the election of Bill Clinton. Since Clinton's platform included a proposal to raise tax rates in 1993 and beyond, it likely was worthwhile for high-income individuals to exercise certain deep-in-the-money, short-maturity options late in 1992. Figure 3 more exercise for high-income individuals holding such options compared to: lower-income people holding such options in 1992; high-income individuals holding near-the-money, long-maturity options in 1992; and, all kinds of options held by individuals at all income levels in years when tax rates were not expected to change. This evidence also suggests that about two-thirds of the individuals who stood to benefit most from early exercise in this period failed to do so. In turn, this suggests opportunities exist for financial planners to improve the decisions made by these individuals.

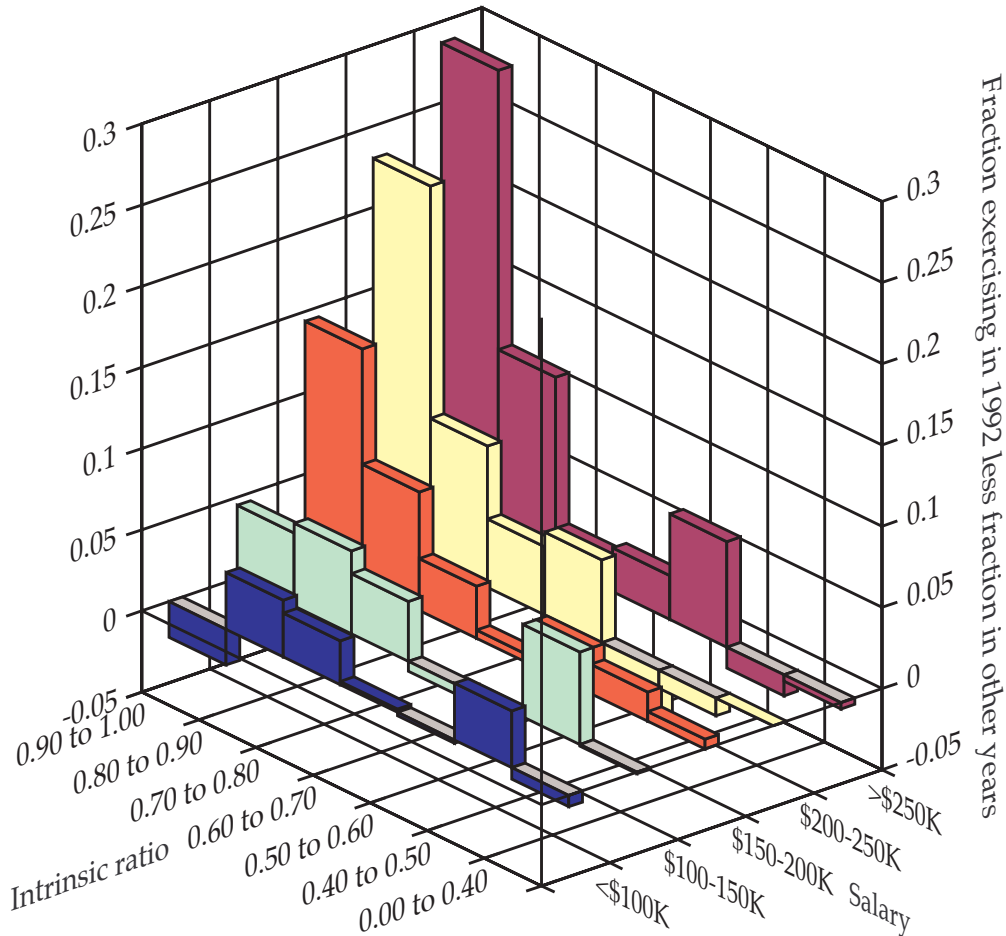
### *2.7.3 Early exercise of NQOs to benefit from capital gains tax treatment*

This section derives a condition on anticipated stock returns that make it worthwhile for the employee to exercise a non-qualified option early so that subsequent appreciation in the stock is taxed at capital gains rather than ordinary rates.

To exercise the option and hold the stock, the employee must pay his employer the exercise price,  $X$ . Also, the employee must pay tax on the appreciation realized at the time of exercise. The employee pays tax (withheld at the time of exercise) of  $(S_1 - X)t$ , where  $S_1$  is the current (i.e., time 1) stock price and  $t$  is the ordinary tax rate. Requiring that the early exercise strategy be self-funding implies the employee must borrow  $X + (S_1 - X)t$  until the stock is sold. Assume the employee plans to hold the stock long enough to qualify for capital gains treatment. Further assume the option is sufficiently far in the money that the probability the option will be out of the money over the remainder of its life is remote enough to be ignored. Let the price of the stock at the time the employee would exercise the option and sell the stock absent tax consideration be  $\tilde{S}_2$ . Let  $r$  be the optionee's net-of-tax cost of borrowing. Exercising the option at time 1 so that future appreciation is taxed at capital gains rates is preferred if

$$\tilde{S}_2 - (\tilde{S}_2 - S_1)g - [X + (S_1 - X)t](1 + r) > (\tilde{S}_2 - X)(1 - t).$$

The left-hand side of this expression represents the cash flows at time 2 from the employee's perspective if the option is exercised at time 1 and the stock



**Figure 3. Increase in exercise before a tax rate increase.**

This figure plots differences between the fraction of options exercised in the period November 4 to December 31, 1992 by employees at four companies and the fraction exercised in the corresponding 58 day periods in 1990, 1992, and 1993. The frequency of exercise is broken down by the salary level of the employee and by the intrinsic ratio of the option,  $(S - X)/W$ . The intrinsic ratio measures the fraction of the option's total value that is captured on exercise. Total value is the Barone-Adesi and Whaley (1987) value of the option.

acquired on exercise is held until time 2. There are no cash flows at time 1. At time 2, the employee receives  $\tilde{S}_2$  on sale of the stock. The employee pays tax on appreciation of the stock from time 1 to time 2 at rate  $g$ , the capital gains tax rate. The capital gains tax due on the sale is  $(\tilde{S}_2 - S_1)g$ . Also, the employee must repay the funds borrowed at time 1 to fund payment of the strike and withholding taxes,  $[X + (S_1 - X)t](1 + r)$ . For early exercise to be attractive, this amount must exceed the cash flow at time 2 assuming the option is held until that time. The proceeds from holding the option until time 2 are represented on the right-hand side of the inequality. Collecting terms reduces this expression to

$$(\tilde{S}_2 - S_1)(t - g) > [X + (S_1 - X)t]r.$$

The left-hand side represents the benefit from having the appreciation of stock from time 1 to time 2 taxed at capital gains rather than ordinary rates. The right-hand side of the expression represents the cost of borrowing the strike price and withholding tax until time 2. Dividing through by  $S_1$ , and collecting terms gives

$$\frac{\tilde{R}}{r} > \frac{t + \frac{X}{S_1}(1 - t)}{t - g}, \quad (3)$$

where  $\tilde{R} = (\tilde{S}_2 - S_1)/S_1$  is the pretax return on the stock from time 1 to time 2. This expression offers some additional intuitions. Holding other factors constant, the deeper the stock is in the money at time 1, the more attractive is early exercise. This is so because the right-hand side of (3) decreases in  $S_1$ .

This suggests a simple bound on the anticipated appreciation in the stock from time 1 to time 2 that is necessary for early exercise to be worthwhile when tax rates are constant over time. As  $S_1$  increases, the right-hand side of (3) tends to  $t/(t - g)$ . If the anticipated appreciation in the stock, relative to the cost of borrowing does not exceed this ratio, then early exercise to benefit from taxation of future appreciation at the capital gains rate is not worthwhile. This bound holds for any current stock price and strike. If capital gains are not subject to tax and the strike price is negligible, then the bound is one. This means the anticipated pretax return on the stock must exceed the net-of-tax cost of borrowing for early exercise to be worthwhile. However, if capital gains tax is substantial, then

the hurdle may be high. For instance, if  $t$  is 40% and  $g$  is 20%, then the anticipated pretax return on the stock must be at least twice the net-of-tax cost of borrowing for early exercise to be worthwhile when the strike price is negligible compared to the current market price.<sup>4</sup> The multiple must be higher when the strike price is substantial. For instance, if the strike price is one-third of the current market price and the pretax return on the stock is three times the net-of-tax cost of borrowing, early exercise is worthwhile.

#### 2.7.4 *Reverse vesting*

It is becoming more common to grant options with a “reverse vesting” provision in situations where the stock may appreciate sharply in value, like start-ups. Under this provision, the options vest immediately, but the employee forfeits the stock acquired on exercise if he separates from the corporation before certain times. Reverse vesting combined with a section 83(b) election allows the employee to exercise the options immediately and have all appreciation taxed at capital gains rates and the employer forgoes any tax deduction. The attractiveness of this strategy to the employee hinges on the considerations above. Note that the employer loses a potential future tax deduction when the employee exercises early and makes the election.

#### 2.7.5 *Incentive stock options*

##### ISOS ARE TAX-INEFFICIENT

Given current tax rates, ISOs generally are tax-inefficient relative to NQOs when both employer deductions and employee taxes are taken into account. A compensation plan in which an employee is offered ISOs by a corporation that faces a marginal tax rate close to the statutory rate can be altered to benefit both the employee and the employer by substituting NQOs for ISOs. For the employee to prefer receiving NQOs to ISOs, the number of shares under option must be increased. Granting options on more shares has a higher pretax cost to the employer, but this is more than offset by the value of the eventual tax deduction.

##### DISQUALIFYING EVENTS

Shares acquired upon exercise of an ISO must be held for one year from the date of exercise and two years from the date of grant for the difference between the share price on sale date and the strike price to be taxed as a

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<sup>4</sup> This is often the case for employees holding options granted before, and expiring after, their employer’s initial public offering.

capital gain. If these holding periods are not met, then the ISO is said to be disqualified. For tax purposes, disqualified ISOs are treated as NQOs.

Disqualifying dispositions effectively transform ISOs into NQOs, enabling the employer corporation to reap tax deductions. Microsoft is among the large U.S. corporations that have had in place a program to reward employees for disqualifying the ISOs they hold so that the corporation can receive the related tax deduction.

#### ALTERNATIVE MINIMUM TAX (AMT)

This problem haunts many tax planners because of the uncertainties inherent in strategies designed to avoid the AMT. A common recent problem for ISO holders has been that exercise of ISOs in the early part of 2000 may have generated a substantial potential AMT liability. In many cases, those shares have declined substantially in value. In some cases, the AMT liability may be more than the current value of the securities.

In such cases, a disqualifying disposition of the shares before the end of the year will erase the AMT. The holder is subject to ordinary income tax, but in some cases that tax can be considerably lower than the AMT.

For employees who hold both ISOs and NQOs, a strategy of combining exercise of NQOs with ISOs can avoid AMT by increasing the regular tax.

### **3. Strategies to manage risk and realize cash**

An important restriction on ESOs is that they cannot be sold by the employee to whom they are issued, and it is often impractical for an employee to implement a trading strategy that would have the same effect as selling the option.

Finding ways for employees to manage risk and realize cash without sacrificing option value is an area ripe for the introduction of new financial products and services.

#### **3.1 Exercise the option**

This strategy has the advantage of being simple. When options are deep in the money and time to maturity is short, little value is lost by early-exercising the options.

Significant value is lost when near the money options far from maturity are exercised. Further, the stock price may be adversely affected if executives are seen to be bailing out of the company's stock.

### 3.2 Buying puts

To lock in an existing gain, yet participate in possible future stock price increases, the option holder could buy puts on the stock underlying the ESOs he holds. An advantage of this strategy is that it preserves the upside potential of the ESOs. This upside potential is most valuable for near-the-money, long-maturity ESOs on volatile stocks. A drawback of this strategy is that cash is required to buy puts. The “paper rich, cash poor” may not have the resources to buy puts. In this situation, exercising some ESOs and using the proceeds to buy puts protecting the value of unexercised ESOs is possible.

The strike price of the put is the value of the stock that is protected. The more value the ESO holder wants to protect, the higher the strike price on the put. Buying a long-dated put allows the option holder to protect the value for several years.<sup>5</sup> The longer the life of the put and the higher the strike price, the more the put will cost. Quotes are available from:

<http://finance.yahoo.com/q?&d=o>.

Buying puts locks in a minimum value that the employee will receive for his options. By buying puts with a strike price of, say, 80% of the current market price, the employee guarantees that, his ESOs and the puts together are worth at least  $80\%S - X$  before tax, where  $S$  is the current share price and  $X$  is the ESO strike price.

### 3.3 Bull spread

In this strategy, puts are purchased and calls are written. This, combined with the existing long position in ESOs create a payoff structure resembling a bull spread. The purchased puts create a lower limit on the value the ESO holder will receive. The calls written create an upper limit on the value the ESO holder will receive.

The premium income from the calls can be used to buy the puts, reducing the cash needed to implement this strategy relative to one of buying puts. A consequence of writing calls is that the option holder effectively gives up participation in stock price appreciation above the strike price of the calls written.

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<sup>5</sup> Long-Term Equity Anticipation Securities (LEAPS) are long-term stock or index options. LEAPS are available in two types, calls and puts. They have expiration dates up to three years in the future.

### 3.4 Borrow against option wealth

The value of any call option is maximized by leaving it unexercised as long as the intrinsic ratio  $(S - X)/W$  is less than one. Substantial risks are imposed on employees who follow this prescription without hedging. Further, employees must delay the use of wealth tied up in options until the options are exercised. Borrowing against option wealth, combined with a hedging strategy would allow employees to realize cash from their ESOs without sacrificing option value. Certain impediments make such transaction impractical for all but the highest net worth individuals; however, this a planning area ripe for innovation.

The next section provides an overview of the impediments that limit planning in this area.

## 4. Impediments

Three categories of impediments that limit the use of the strategies described above are: (i) insider trading rules, (ii) income character mismatch, and (iii) margin requirements. Each is discussed in turn below.

### 4.1 Insider trading and Rule 10b5-1

One impediment to hedging strategies that require periodic adjustment of long or short stock positions, or transactions in traded stock options, has been the insider trading laws, which broadly prohibit trading on the basis of material, nonpublic information. A safe harbor is provided by new SEC Rule 10b5-1: Trading “on the Basis of” Material Nonpublic Information, which was adopted August 15, 2000.

The full text is available at

<http://www.sec.gov/rules/final/33-7881.htm>.

Rule 10b5-1 provides that, for purposes of insider trading, a person trades on the basis of material nonpublic information if a trader is aware of the material nonpublic information when making the purchase or sale. The rule establishes certain exceptions to liability. These exceptions permit a person to trade in specified circumstances where it is clear that the information is not a factor in the decision to trade, such as when trades are made pursuant to a pre-existing plan. Since Rule 10b5-1 specifically identifies what is allowed, it provides insiders guidance about how they can safely trade in their companies’ securities. This rule may prove particularly

important to stock option holders seeking to implement hedging strategies that require periodic portfolio adjustments.<sup>6</sup>

New Rule 10b5-1 prohibits trading on the basis of material nonpublic information, and further specifies that a trade is “on the basis of” inside information if the trader was “aware” of the information when he made the trade. In adopting this Rule, the SEC explained that “the awareness standard reflects the common sense notion that a trader who is aware of inside information when making a trading decision inevitably makes use of the information.”

The SEC also adopted rules, in the form of affirmative defenses that specify how individuals trade in their own holdings of the company’s securities and avoid legal jeopardy. The individual or entity may:

- enter into a binding contract to purchase or sell the security;
- provide instructions to another person to execute the trade for the instructing person’s account; or,
- adopt a written plan for trading securities.

To be eligible for the affirmative defense, the person seeking to assert the defense must be able to demonstrate that:

- the contract, instructions, or plan was established before the individual became aware of the material, nonpublic information.
- either a written formula or algorithm determines the amount, prices or dates of the trade; or any person who influenced the trades was not aware of the material nonpublic information when influencing the trades.
- the trade was made pursuant to the contract, instructions, or plan.

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<sup>6</sup> Federal courts of appeals have disagreed about what establishes liability for prohibited insider trading. Under a strict standard, trades are improper if an insider merely possesses nonpublic information at the time of the trade. An alternative standard, further required that the insider used the information and made the trade because of the information.

## 4.2 Character mismatch

The tax considerations that arise from hedging employee stock options are complex. The primary tax difficulty encountered in hedging NQOs is that these options produce ordinary income, but gains or losses from any TSOs that hedge the NQOs are capital in nature. So, if the stock underlying the NQOs appreciates after the hedge is put in place, NQO gains will be ordinary but the offsetting losses from the hedge will be capital losses. Because capital losses cannot offset ordinary income, the capital losses will be deferred.<sup>7</sup>

For example, assume an optionee has NQOs to buy 10,000 shares of stock at \$10, and the stock is currently trading \$100. The optionee enters into a hedge that leaves him exposed to price fluctuations between \$90 and \$110. To accomplish this, the optionee buys an exchange-traded put options at \$90 and sells an exchange-traded call options at \$110. Setting aside the put premium paid and the call premium received, the hedge locks in pretax proceeds of at least \$800,000 (i.e., the put value of \$900,000 less the NQO strike of \$100,000), but limits the value of the position to at most \$1,000,000 (i.e., the value of the stock up to \$110 per share or \$1,100,000, less the NQO strike price of \$100,000).

However, the after-tax proceeds are eroded as the underlying stock appreciates. Suppose the stock price rises to \$140. Then the NQO produces \$1,300,000 of ordinary income. The puts expire worthless and the calls written give rise to a \$200,000 capital loss. Note that the potential capital loss on the hedge is unlimited, since it grows with the company's stock price.

## 4.3 Margin requirements

ESOs are not transferable and do not have margin value. Therefore, option holders hedging ESOs by selling listed equity options, must post other collateral to meet margin requirements. The margin requirement is based on the value of the underlying stock and the strike price of the option. The option holder may be required to post additional margin as the underlying stock price changes.

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<sup>7</sup> For individuals, \$3000 of capital loss can offset ordinary income each year.

## 5. Glossary

### American Option

An option contract that may be exercised at any time between the date of purchase and the expiration date.

### Binomial Option Pricing Model

This is a model for pricing stock options. The Black–Scholes value is a special limiting case of the Binomial Option Pricing Model.

Fundamental to the Binomial Option Pricing Model is the idea that stock price movements are well-approximated by assuming the stock price can only move to two possible values in a short interval of time. The first step is to construct a price tree that probabilistically describes future stock price movements over time. The time from the grant date to the expiration of the options is divided into short periods. Over each period, the stock price is assumed to either rise or fall by a fixed factor with a fixed probability. Every node in the tree corresponds to a particular time to expiration and stock price level. Each node in one time period is connected to two nodes in the next time period, representing a rise or fall in the stock price by a fixed factor. Next, the value of the option is calculated at each node, working backwards recursively from the expiration date. At expiration, valuing the option is straightforward. At each earlier node, the value of the option can be determined from a particular recursive equation that depends only on the (already computed) values of successor nodes and parameters used to describe the stock price tree. The value of the option at every node is determined by computing the value at expiration, and then working backward to nodes one period prior to expiration, then two periods prior to expiration, and so on.

Binomial methods are sufficiently versatile to value executive stock options with a reload feature at the time of the initial grant.

A seminal paper on binomial methods is J.C. Cox, S.A. Ross, and M. Rubinstein, 1979, Option pricing: a simplified approach. *Journal of Financial Economics* 7, 229–263.

### Barone-Adesi and Whaley value

The value provided by a method for pricing tradable call options on dividend-paying stock. Uses the stock price, the exercise price, the risk-free

interest rate, the time to expiration, the expected standard deviation of the stock return, and the dividend yield.

See Giovanni Barone-Adesi and Robert E. Whaley, 1987, Efficient analytic approximation of American option values, *Journal of Finance* 42, 301–320.

### **Bearish**

A viewpoint that anticipates a price decline, referring either to an individual security or to the entire market. Related: bullish.

### **Black-Scholes value**

The value provided by a formula for pricing tradable call options. Uses the stock price, the exercise price, the risk-free interest rate, the time to expiration, and the expected standard deviation of the stock return.

See Fischer Black and Myron Scholes, 1973, The pricing of options and corporate liabilities, *Journal of Political Economy* 81, 637–654.

### **Bull spread**

This strategy can be implemented using either call options or put options.

Using calls, the strategy is a long position in a call with strike price  $X_1$  combined with a short position in a call with strike price  $X_2$ , where  $X_1 < X_2$ . Both options have the same expiration date. A bull spread created from calls requires an initial investment.

Using puts, the strategy is a long position in a put with strike price  $X_1$  combined with a short position in a put with strike price  $X_2$ , where  $X_1 < X_2$ . A bull spread created with puts involves a positive cash flow to the up front and payoff that is either negative or zero.

Upside potential and downside risk are both limited.

### **Bullish**

A viewpoint that anticipates a price rise, referring either to an individual security or to the entire market. Related: bearish.

### **Call option**

The right to buy the stock at a predetermined price, known as the strike price, at any time before the expiration date.

**Cliff vesting**

An arrangement under which all options vest at the same time.

**European option**

An option that may be exercised only on the expiration date.

**Expiration date**

The day when an option contract becomes void. Unless the holder exercises his rights, the contract becomes worthless or void after this date. For exchange-traded stock options, the expiration date is the Saturday after the third Friday of the month of the contract.

**Fair value**

The amount at which an item could be exchanged in a current transaction between willing parties, other than in a forced or liquidation sale; if a quoted market price is available for an item, the fair value is the product of the number of trading units of the item times that market price.

**Hedge**

Any combination of long and/or short positions taken in securities, options, or commodities in which one position reduces the risk of the other.

**In the money**

Any option that has intrinsic value is in the money. A put option is in the money if the underlying security is below the strike price. A call option is in the money if the underlying security is traded above the strike price.

**Insider trading**

The securities laws broadly prohibit fraudulent activities of any kind in connection with the offer, purchase, or sale of securities. These provisions are the basis for many types of disciplinary actions, including actions against fraudulent insider trading. Insider trading is illegal when a person trades a security while in possession of material nonpublic information in violation of a duty to withhold the information or refrain from trading.

### **Intrinsic value**

The value received before tax from immediate exercise of an option; the amount by which the option is in the money. For call options, it is the share price minus the strike price if the number is positive, and zero otherwise. For put options, it is strike price minus share price if the number is positive, and zero otherwise.

### **Liquidity need**

A pressing need for cash.

### **Margin**

The amount of money or securities that an investor must deposit with a broker to secure a loan from the broker. Brokers may lend money to investors for use in trading securities. To procure such a loan, an investor must deposit cash with the broker. The cash represents the equity, or margin, in the investor's account.

### **Option pricing**

Several mathematical models exist to calculate an approximation of the fair value of an option. The values provided by these models depend on at least the following factors:

- strike price,
- current market price of the underlying security,
- statistical volatility of the stock,
- time until the expiration date, and
- current risk-free interest rate.

Implicitly or explicitly, these models also rely on particular assumptions about the processes of innovations in the underlying security price, dividends, and interest rates; transferability of the option right; and the operation of tax law.

### **Out of the money**

An option that has no intrinsic value. A call option is out of the money if the stock price is lower than the strike price. A put option is out of the money if the stock is higher than the strike price of the option.

Exercising a call option that is under water would cause the option holder to pay a higher price for shares of stock than the current market price. Similarly, exercising a put option that is under water would cause the option holder to sell shares of stock at a lower price than the current market price.

### **Performance-based vesting**

Under performance-based vesting, options vest only if specified performance criteria are met. For example, options may vest if annual earnings per share exceed a certain target by a certain date.

### **Premium**

When speaking of traded stock options, the total price of an option contract, the sum of the intrinsic value and the time value premium. This is the amount the option buyer pays and the option seller receives for the rights granted by the option.

### **Put option**

The right to sell stock at a predetermined price, called the strike price, at any time before the expiration date.

### **Restricted stock**

Stock is restricted if it is subject to a vesting schedule, which can be time- or performance-based, or other limitations on its transferability or sale imposed by the issuing company.

Stock may also be restricted pursuant to Securities and Exchange Commission regulations that limit the conditions under which stock acquired by certain individuals in certain circumstances may be traded.

### **Reverse vesting**

An increasingly common vesting schedule in stock option plans offered by pre-IPO companies. Under this arrangement, an option holder is allowed to exercise options immediately they are granted. For each option exercised, the option holder receives a share of restricted stock, which itself is subject to vesting requirements. The restricted stock may be forfeited if the vesting requirements are not met.

The employer corporation usually holds the restricted stock in an escrow account until vested. The company may retain the right to repurchase any unvested restricted stock if the holder's employment is terminated.

Exercising stock options immediately they are granted can be attractive when combined with a so-called section 83(b) election under the Internal Revenue Code. Reverse vesting is mechanism intended to facilitate this tax planning technique.

### **Risk aversion**

To illustrate the concept of risk aversion in the context of options, imagine a fair coin will be tossed a year from now. If the coin comes up heads, you will receive \$1 million. If the coin comes up tails, you receive nothing. Note that the coin toss is a kind of option. The expected value of the payment you will receive in one year is \$500,000, which is half of \$1 million. If the discount rate is 11% per year, the present value of the expected payment in one year is \$450,450, which is \$500,000 divided by 1.11. The amount \$450,450 is the fair value of the right to receive either \$1,000,000 or zero in one year depending on the outcome of the coin toss. That is, it is the fair value of the option. A risk-neutral entity is indifferent between \$450,450 and the option. A risk-averse individual strictly prefers a sure payment today of \$450,450 to the right to receive either \$1,000,000 or zero in one year depending on the outcome of the coin toss. In other words, a risk-averse individual would willingly exchange the option for a cash payment of less than \$450,450.

Individuals typically are risk-averse. Entities such as corporations that pool the financial interests of many shareholders are typically thought to be nearly risk-neutral. Thus, it is entirely consistent that the cost of the option to the corporation, which the Financial Accounting Standards Board labels the option's fair value, exceeds the cash payment the employee would willingly accept in exchange for the option.

### **Section 83(b) election**

Under the usual Internal Revenue Code rule for restricted property (including, e.g., employee stock options), income tax is postponed until the property is no longer subject to a substantial risk of forfeiture or the property is transferable. However, a service provider (including an employee) may elect to be taxed in the year of transfer rather than waiting until the property

vests. If the election is made, the recipient of restricted property is treated as receiving ordinary income to the extent of the difference, if any, between the fair market value of the property without regard to any lapse restriction and the amount, if any, the recipient paid for the property. In the case of pre-IPO stock options, the difference between the strike price of the option and the fair value of the stock is often small, and the tax due is negligible. An advantage of early exercise in this case is that appreciation in the value of the stock subsequent to exercise is taxed at the lower capital gains tax rate.

The election must be made by the person who performs the service for which the property is received. A taxpayer making the election must notify the person for whom the services were performed that he has elected early recognition of income on the property. The election must be filed not later than 30 days after the date the property is transferred.

### **Split-adjusted**

In a stock split, the number of shares outstanding increases and the share price becomes a fraction of the pre-split price.

For instance, in a two-for-one stock split the number of shares outstanding is doubled. Each existing shareholder receives new stock that doubles the number of shares he owns. Since every other shareholder also receives more stock, each shareholder has the same stake in the firm as before the split. The value of each share of stock falls (in this case by half) on the split date.

The split date is the date on which the stock split takes effect.

The ratio by which a corporation's number of outstanding shares of stock is adjusted on the split date is called the split ratio. In the example above, the split ratio is 2.

Another common way to split a stock is 3-for-2, in which case the split ratio is 1.5.

Stock options are split-protected when the number of shares under option increases by the split ratio and the strike price of each option is reduced by dividing it by the split ratio on the split date. The strike price therefore depends on the history of stock splits since the grant date. The exercise price adjusted for splits is called the split-adjusted strike.

### **Strike price**

The price the holder of the option must pay to exercise it.

### **Underlying security**

The security that one has the right to buy or sell according to the terms of the option contract.

### **Under water**

A casual synonym for out of the money.

Exercising a call option that is under water would cause the option holder to pay a higher price for shares of stock than the current market price. Similarly, exercising a put option that is under water would cause the option holder to sell shares of stock at a lower price than the current market price.

### **Vesting schedule**

The timetable that specifies when options vest, or become exercisable. A typical vesting schedule is 25% per year on the anniversary of the grant date. This means that after one year, options may be exercised to acquire up to 25% of the shares covered by the grant; after two years, up to 50%; after three years, up to 75%; after four years, all of the grant.

As another example, cliff vesting describes a vesting schedule in which all options become exercisable on a single date.

Performance-based vesting and reverse vesting are other examples of vesting schedules.

### **Volatility**

A percentage that reflects recent fluctuation of the stock price. The moving average of this parameter is used in certain option pricing models to calculate the fair value of options. Volatility is generally expressed as the annual standard deviation of the daily price changes in the security.

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