

Investment Research

Decision Model for Non-Qualified Stock Options¹

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Executive Summary

This paper analyzes various strategies for an individual who holds a non-qualified stock option and who desires to maximize the amount of after-tax wealth generated by the option.

Contrary to most people's expectations, assuming that the expected pre-tax return on the option is greater than zero, the optimal strategy for maximizing after-tax wealth is almost always to hold the option for as long as possible. By "hold the option for as long as possible", we mean that the option holder should delay exercising the option for as long as is practical, taking the option expiration date, the employer's policies, and personal cash flow constraints into account. Premature exercise is not likely to be advantageous, unless the option is in-the-money as of the decision date, and the underlying stock is expected to produce a zero or negative return between the decision date and the option expiration date.

If a non-qualified stock option is expected to produce a positive return by its expiration date, the optimal strategy for maximizing after-tax wealth is usually to hold the option for as long as possible. Exercising an option early is seldom advantageous while the stock is trending up.

This conclusion holds true even if the difference between the ordinary income tax rate and the capital gain rate is high, and even if the underlying stock is expected to have a very high appreciation rate.

This paper also compares the amount of after-tax wealth created by cashing out an option early in order to make an investment in an alternative investment versus early exercise of the option and then holding the option shares for long term capital appreciation.

¹ The key equations in this document originally appeared in an article by Philhours, Joel Ph.D., CPA., and Charles T. Hays, PhD, CPA. June, 1999. "Non-qualified Stock Options: Fold or Hold?" The Journal of Financial Planning. This paper explains the details of how the equations were developed. Our paper shows how the equations can be used to analyze various strategies. In a related document, we show how the equations in this paper can be used to solve for optimal strategies for an 83(b) election, incentive stock options, stock appreciation units, and restricted stock awards.

1. Non qualified stock option decision chart

The flow chart on page 10 shows the various strategies that are available to an individual who holds a non-qualified stock option. There are four possible strategies, which are represented by A, B, C and D on the flowchart. Outcome E (option expiring with no value) is a possibility, but not a strategy.

2. Purpose of the model

The purpose of the model is to describe the various stock option strategies using linear equations, and then to solve the equations to determine which strategy is best under various circumstances.

The questions that the model is designed to address include:

- A. When am I better off to hold my options and exercise them just prior to the expiration date? If I do that, should I then:
1. hold the option stock for long term capital appreciation, or
 2. cash out and invest in some other investment that I believe will have a better return than the option stock?
- B. When am I better off to exercise my option early to minimize the tax on option income? If I do that, should I then:
1. hold the option stock for long term capital appreciation, or
 2. cash out and invest in some other investment that I believe will have a better return than the option stock?
- C. What if I expect an increase in the tax rate on ordinary income? How large must the increase in the tax rate be for it to be advantageous for me to exercise my options early?

- D. If I believe that the option stock is the best investment that I can make, what is the optimal strategy to maximize my after-tax wealth?

The factors taken into account in our model include:

1. Holding period return for stock options
2. Holding period return for option shares
3. Holding period return for an alternative investment (this is any investment that the option holder would consider making as an alternative to holding the stock options or an alternative to holding the option shares).
4. Ordinary income tax rate
5. Capital gain tax rate
6. Changes in tax rates during the holding period

The model measures the amount of after-tax wealth that is available to the option holder at the end of the holding period, assuming that all investments are cashed out at the end of the holding period, and all taxes are paid at that time.

The model can be used at any point during the holding period, because it is designed to measure results from today through the end of the holding period. We assume that the values of the variables described below are constantly changing as new information becomes available.

Unless otherwise noted, the model assumes that the executive will exercise options by surrendering option shares. This is known as a “cashless exercise” and it results in the executive receiving a number of shares whose market value on the date of exercise exactly matches the after tax cash value of the options that were exercised. That is the way that most executive stock option plans work.

Because the model measures holding period returns, we are able to employ linear equations rather than exponential equations.

3. Defined variables

p = the strike price of the non-qualified stock option

c = the cumulative appreciation of stock price today over the strike price. For example, if the stock price today is \$60 and the strike price is \$35, then:

$$c = \frac{[60 - 35]}{35} = 0.714$$

We assume that $c > 0$, since no one would consider exercising an option whose strike price is above the current market value of the underlying stock.

s = the expected cumulative holding period appreciation of the company stock between today and the end of the holding period (before tax). For example, if the stock price today is \$60 and the stock price at the end of the holding period is forecasted to be \$90, then:

We assume that $s > 0$, since if $s \leq 0$ and $c > 0$, it is obvious that the optimal strategy is to exercise the option immediately and sell the option shares so as to make some other investment whose expected return is greater than 0.

a = the expected cumulative holding period appreciation of an alternative investment between today and the end of the holding period (before tax). For example, if the alternative investment's price today is \$10 and the price at the end of the holding period is forecasted to be \$30, then:

$$a = \frac{[30 - 10]}{10} = 2.0$$

Again, we assume that there is at least one alternative investment where $a > 0$.

²The tax rate used for g should be the rate that the executive believes will be in effect at the time when the stock on which the option is written or the alternative investment is sold. In both cases the asset must have been held for longer than one year.

³Later in this paper we consider which strategies are most effective when the executive believes that taxes on wages will increase during the holding period by a material amount.

Note that the holding period cumulative appreciation values described above are all calculated in the same manner. We assume that all holding periods end on the same date. All holding period returns are pre-tax. Also, we assume that the alternative investment, a , will be taxed at long term capital gain rates.

4. Assumed values

g = the capital gain tax rate (long term), state and federal tax combined.² For a Massachusetts resident in 2012, the correct value is mostly likely to be 20.3%, assuming that the individual is taxed under the Alternative Minimum Tax, which is the most likely scenario for someone reporting a large gain.

m = the combined tax rate for wages (federal and state income tax rate, and payroll taxes combined).³ For a high income Massachusetts resident in 2012, the correct value is most likely to be about 41.75%, assuming that the individual is taxed under the regular tax system.

5. Equations

The price per share today of the stock on which the option has been granted is:

$$\text{stock price today} = p(c + 1)$$

The following equation gives the after-tax value of vested options today, if options are cashed out in a cashless exercise ("early exercise and sale"), where the strike price is paid by surrendering option shares:

$$\begin{aligned} & [p(c + 1) - p] (1 - m) \\ & = pc(1 - m) \\ & = E \end{aligned}$$

The after-tax value of options at the end of the holding period, assuming that options are exercised on the last day of the holding period and the option stock is sold immediately (“late exercise and sale” where the strike price is paid by surrendering option shares⁴) is given by:

$$\begin{aligned} & [p(c + 1)(s + 1) - p](1 - m) \\ & = p(1 - m)[(c + 1)(s + 1) - 1] \end{aligned}$$

The after-tax value of alternative investment, if options are exercised today in a cashless exercise and the after-tax proceeds from an immediate stock sale are reinvested in the alternative investment is found by:

$$\begin{aligned} & (1 - g)[E(a + 1) - E] + E \\ & = (1 - g)E(a) + E \\ & = E[(1 - g)a + 1] \\ & = pc(1 - m)[a(1 - g) + 1] \end{aligned}$$

We assume that once it is acquired, the alternative investment is held until the end of the holding period, at which point we measure its after-tax value.

6. The decision model

The decision model is designed to compare the results of an early exercise versus a late exercise. If the options are exercised early, the executive has two choices:

- A. hold the option shares for later sale, or
- B. sell the option shares immediately and reinvest the after-tax proceeds in an alternative investment vehicle.

⁴Surrendering option shares to pay the strike price and to pay income taxes is consistent with the purpose of the model described in this paper. The purpose of the model is to determine which strategies produce the maximum after-tax wealth under various circumstances. If cash from other sources is used to pay the option exercise price and income taxes, the after-tax wealth results would be the same.

⁵ In this equation, we assume that tax rates do not change during the holding period. Later we will consider the impact of changes in tax rates during the holding period.

The case of exercising options today and then holding the option shares for later sale can be represented in this model by setting the holding period appreciation rate for the alternative investment vehicle equal to the holding period appreciation rate of the company stock. So, there is really just one choice to consider: early exercise of the options v. late exercise of the options.

The model determines the breakeven rate of return required for the alternative investment vehicle between the alternatives of early exercise v. late exercise.

The equation that gives us the after-tax, end of holding period value for early exercise, and then reinvesting the proceeds in the option stock or some other investment is:

$$pc(1 - m)[a(1 - g) + 1]$$

The equation that gives us the after-tax, end of holding period value for late exercise is:

$$p(1 - m)[(c + 1)(s + 1) - 1]$$

The breakeven point⁵ is found by:

$$\begin{aligned} p(1 - m)[(c + 1)(s + 1) - 1] & = pc(1 - m)[a(1 - g) + 1] \\ (c + 1)(s + 1) - 1 & = c[a(1 - g) + 1] \end{aligned}$$

$$cs + c + s = c[a(1 - g) + 1]$$

$$s + \frac{s}{c} + 1 = a(1 - g) + 1$$

$$s \left[\frac{1}{c} + 1 \right] = a(1 - g)$$

$$s = \frac{a(1 - g)}{\left[\frac{1}{c} + 1 \right]}$$

So, one should hold the options whenever the following condition is true, and one should exercise the options, cash out, and purchase the alternative investment whenever the following condition is false:

Breakeven Equation

$$s > \frac{a(1-g)}{\left[\frac{1}{c} + 1\right]}$$

Note that the above equation contains only one tax parameter, g . This demonstrates that, assuming that tax rates do not change during the holding period, there is no tax arbitrage opportunity with nonqualified stock options to minimize the ordinary income tax upon exercise and then to hold the option shares for long term capital gain treatment. If there were a tax arbitrage opportunity, then both the long-term capital gain tax rate, g , and the ordinary income tax rate, g , would appear in the above equation.

The value of $(1 - g)$ for a resident of Massachusetts in 2012 is $1 - 0.203$, or 0.797 . The value of c can be any value other than zero. If $c < 0$, then the option is out-of-the-money and the option position has zero value.

For positive values of c , as c approaches zero the value of the denominator of the right side of the equation becomes very large, which means that the value of the right side of the equation approaches zero. The equation confirms the obvious conclusion that an executive is unlikely to exercise options when the spread is close to zero, if the executive expects the stock price to trend up.

$$s > \frac{a(1-g)}{\left[\frac{1}{\lim_{c \rightarrow 0} c} + 1\right]} \approx \frac{a(1-g)}{\infty} \approx 0$$

⁶ The upper limit will change if the federal or state capital gain tax values change. The upper limit will also vary based on individual state capital gain tax rates.

And, for very large values of c , the right side of the equation has an upper bound of $0.797a$ because the denominator of the right-hand side of the equation approaches 1, and $0.797a$ divided by 1 is $0.797a$.⁶

$$s > \frac{a(1-g)}{\left[\frac{1}{\lim_{c \rightarrow \infty} c} + 1\right]} \approx a(1-g) = 0.797a$$

So, the value of the right side of the equation must be between zero when the option spread, c , is close to zero and $0.797a$ when the option spread, c , is very large.

The above equation can be expressed in this simplified form:

$$\frac{s}{a} > (1-g)$$

Now we have a simple test that we can use to determine when it makes sense to exercise the option, cash out, and invest the proceeds in an alternative investment. Translated into English, the equation says that the executive should hold the non-qualified stock option whenever the ratio between the expected holding period return on the option stock (measured from today) and the expected holding period return on the alternative investment is greater than one minus long-term capital gain tax rate that is expected to be in effect at the end of the holding period.

7. Use of decision model to analyze strategies

Now we can return to the strategy questions that we posed at the beginning of this paper and use the equations to answer them.

- A. *When am I better off to exercise my option early to minimize the tax on option income, and then to hold the option stock for long term capital appreciation?*

Answer: Only if you expect a very large increase in the difference between the tax rate for wages and the tax rate for long term capital gains, and the option already has a large embedded gain. (See question E, following.)

If the decision is between exercising the option very close to the expiration date (“late exercise”) versus exercising early and holding the option shares for appreciation (“early exercise and hold”), then:

- J For “early exercise and hold,” s and a are the same investment and must have the same value, and
- J For “early exercise and hold,” the breakeven equation becomes:

$$s > (1 - g)s$$

and it is obvious that the above condition will be true for all positive values of s , and

- J the breakeven analysis shows that (assuming no change in the tax rate for wages) there is no combination of positive values of s and c for which early exercise produces a higher after-tax value than a late exercise. Only if s is zero or negative does early exercise make sense. But, if s is zero or negative, then the executive should be looking for an alternative investment with a better return. Holding the option stock is not the optimal choice if there is a better investment available.

Therefore, assuming that there is no change in the difference between the tax rate for wages and the tax rate for long term capital gains during the holding period, there is no economic advantage to be gained by exercising early and holding the option shares. The exceptions to this general advice are:

- J If the employer’s plan has a holding period requirement, either for a minimum number of shares or for a specified period of time, then it may not be possible to sell the shares immediately.
- J If the executive believes that the employer’s stock is a more attractive investment than any alternative investment, taking all relevant factors into account, then the executive will desire to hold the shares.
- J If the executive desires to accumulate a larger position in the employer’s stock for control purposes or for other reasons, then that objective may override other considerations.

B. When am I better off to exercise my option early to invest in some other investment that I believe will have a better return than the

$$\frac{s}{a} < (1 - g)$$

option stock?

Answer: Whenever the following condition is true:

If you are able to tolerate the risks associated with holding a concentrated investment position, you are better off to continue to hold the options unless you are very confident that there is an alternative available that will produce a substantially better return than the return on the option stock.

Specifically, the stock option will produce after-tax wealth that that is equal to or greater than the after-tax wealth produced by an alternative investment even if the option stock’s holding period return is only about 80% of the holding period return of the alternative investment

⁶ The upper limit will change if the federal or state capital gain tax values change. The upper limit will also vary based on individual state capital gain tax rates.

(assuming that the combined federal and state tax on long-term capital gain is about 20%).

C. When am I better off to hold my options for as long as possible before cashing out?

$$\frac{s}{a} > (1 - g)$$

Answer: If you can tolerate the risk associated with holding a concentrated investment position, and if you believe that the holding period appreciation of the option stock will satisfy the condition

then you should hold the options for as long as possible. The decision to cash out and select an alternative investment v. continuing to hold the option shares will depend upon both your tolerance for concentration of risk and the relationship between *s* and *a* at that time.

D. When am I better off to hold the option stock for long term capital appreciation after exercising my options?

Answer: Only when you believe that the expected return on the option stock is more attractive than any alternative investment that you could have made with the amount of capital that is represented in the market value of the option stock as of the exercise date, or if one of the exceptions mentioned in the answer to question A applies to you.

Some executives fall into the trap of thinking that the cost of an option share is the strike price, or perhaps the strike price plus taxes paid on the option gain. As one executive put it:

“I have an option to purchase a \$50 stock for \$10, so my cost per share is only about \$38 for the strike price plus the taxes I have to

pay. Why would I want to sell a \$50 stock that only cost me \$38?”

The problem with the executive’s logic is illustrated by the following two charts.

Diagram 1: Incorrect logic

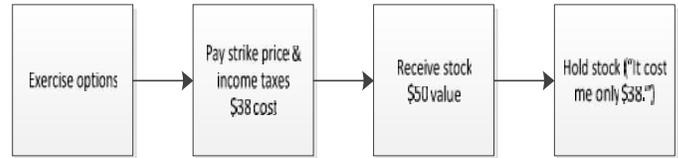
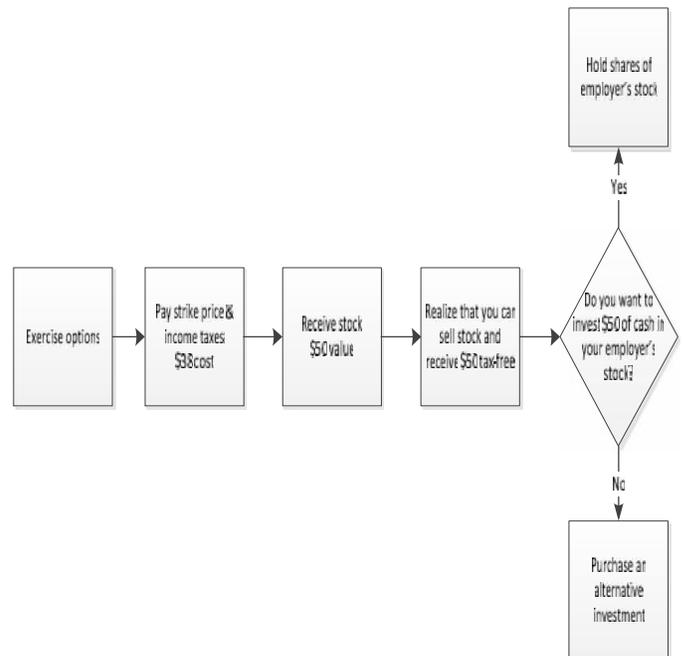


Diagram 2: Correct logic



The point that the executive is misunderstanding is that he or she could have sold the stock immediately after exercising the option and received \$50 tax-free.⁷

The executive should consider what other investments could have been made with that cash value. Would the executive take cash from other sources to purchase more of the option stock today? If the answer is “no”, then the executive is probably making the wrong decision by continuing to hold the option shares. If the answer is “yes”,

⁷ An immediate sale will be tax-free because the executive’s tax cost basis in the option stock is equal to the market value on the date that the option was exercised. Taxes are triggered by the option exercise, not by the immediate sale of the option shares.

then the executive is making the right decision by holding the option shares. In either case, the after-tax amount at risk is \$50, not \$38.

E. What if I expect an increase in the tax rate on ordinary income? How large must the increase in the tax rate be for it to be advantageous for me to exercise my options early?

Answer: Exercising the option early is likely to be beneficial only if all three of the following conditions are true:

-) the difference between the tax rate for wages and the tax rate for long term capital gain is expected to increase by 10% or more (e.g. from 42% to 52% or more) during the holding period; and*
-) there is no significant change in the tax rate for long term capital gains, and*
-) the option is already highly appreciated.*

These conditions are not likely to be fulfilled.

If the option is highly appreciated (e.g. the stock price is more than four times the strike price), and you expect the stock to continue to appreciate, then it may make sense to exercise the option and hold the option shares. But for most executives, it will make more sense to diversify and purchase an alternative investment.

There are six variables involved in the above problem: c (the embedded gain in the option), s (the option stock holding period return), a (the alternative investment holding period return), g (long-term capital gain tax rate), m_{today} (today's wage tax rate), and m_{future} (the future wage tax rate), which probably explains why many executives find this problem difficult to solve!

The relationship between late exercise of the option v. early exercise of the option to invest in an

alternative investment is expressed by the following equation:

$$p(1 - m)[(c + 1)(s + 1) - 1] = pc(1 - m)[a(1 - g) + 1]$$

To address the above question, we need to modify the equation to include the current and future tax rates on wages, and we need to substitute s for a , since the executive intends to hold the option stock after exercising the option.

m_{today} = the tax rate for wages today and m_{future} = the tax rate for wages in the future. The long term capital gain rate, g , is always the rate that the executive expects will apply at the end of the holding period.

$$p(1 - m_{future})[(c + 1)(s + 1) - 1] = pc(1 - m_{today})[s(1 - g) + 1]$$

$$\frac{(1 - m_{future})}{(1 - m_{today})} = \frac{c[s(1 - g) + 1]}{[(c + 1)(s + 1) - 1]}$$

The executive should continue to hold the options when the following condition is true, and should exercise the options and hold the option shares when this condition is false:

$$\frac{(1 - m_{future})}{(1 - m_{today})} > \frac{c[s(1 - g) + 1]}{[(c + 1)(s + 1) - 1]}$$

But, if the tax rate for wages increases, then the tax rate for long term capital gain is likely to increase also. Therefore, the equation above is likely to hold true even if tax rates increase – indicating that continuing to hold the option is still the best strategy.

F. If I believe that the option stock is the best investment that I can make, what is the optimal strategy to maximize my after-tax wealth?

Answer: The optimal strategy is probably to hold the options for as long as possible, and to purchase as much additional stock as you can afford to purchase, taking into account your tolerance for concentration of risk.

Rather than exercising options early to try to gain an advantage from the lower tax rate for long term capital gains (a strategy that is not likely to be effective), the executive should use cash from other sources to purchase additional shares.

8. Terminology

Cashless exercise – In a “cashless exercise,” the option holder exercises options to receive shares, but then immediately surrenders some of the shares to pay the strike price and the taxes that are due on the option gain. The result is that the executive receives a number of shares whose market value on the date of exercise exactly matches the after tax cash value of the options that were exercised.

Expiration date – The date on which the option will expire. If it is not exercised before that date, the option will cease to exist as of the expiration date.

Holding period return – The amount of appreciation that occurs between any given date and the end of the holding period. For example, if the market value of an investment today is \$1, and the value at the end of the holding period is expected to be \$10, then the holding period return is 9 times the original investment.

In-the-money – An option that is “in-the-money” has a strike price that is below the current market value of the option stock. This is another way of saying that the option has an embedded gain.

Net shares – The number of shares of stock that remain after an option has been exercised and the strike price and taxes are paid by immediately surrendering some of the shares of stock from the option exercise.

Non-qualified stock option – The right to acquire a share of stock at a fixed price before the expiration date. They are usually issued as part of a compensation plan, and they are generally not transferrable.

Option plan – The legal document that describes the rules governing a particular company’s issuance of non-qualified options and redemption of option shares. Non-qualified options may be issued by both public and private companies to key employees and independent contractors. The option plan document typically describes who administered the option plan and who is eligible.

Option shares – The shares of stock that are acquired by exercising options.

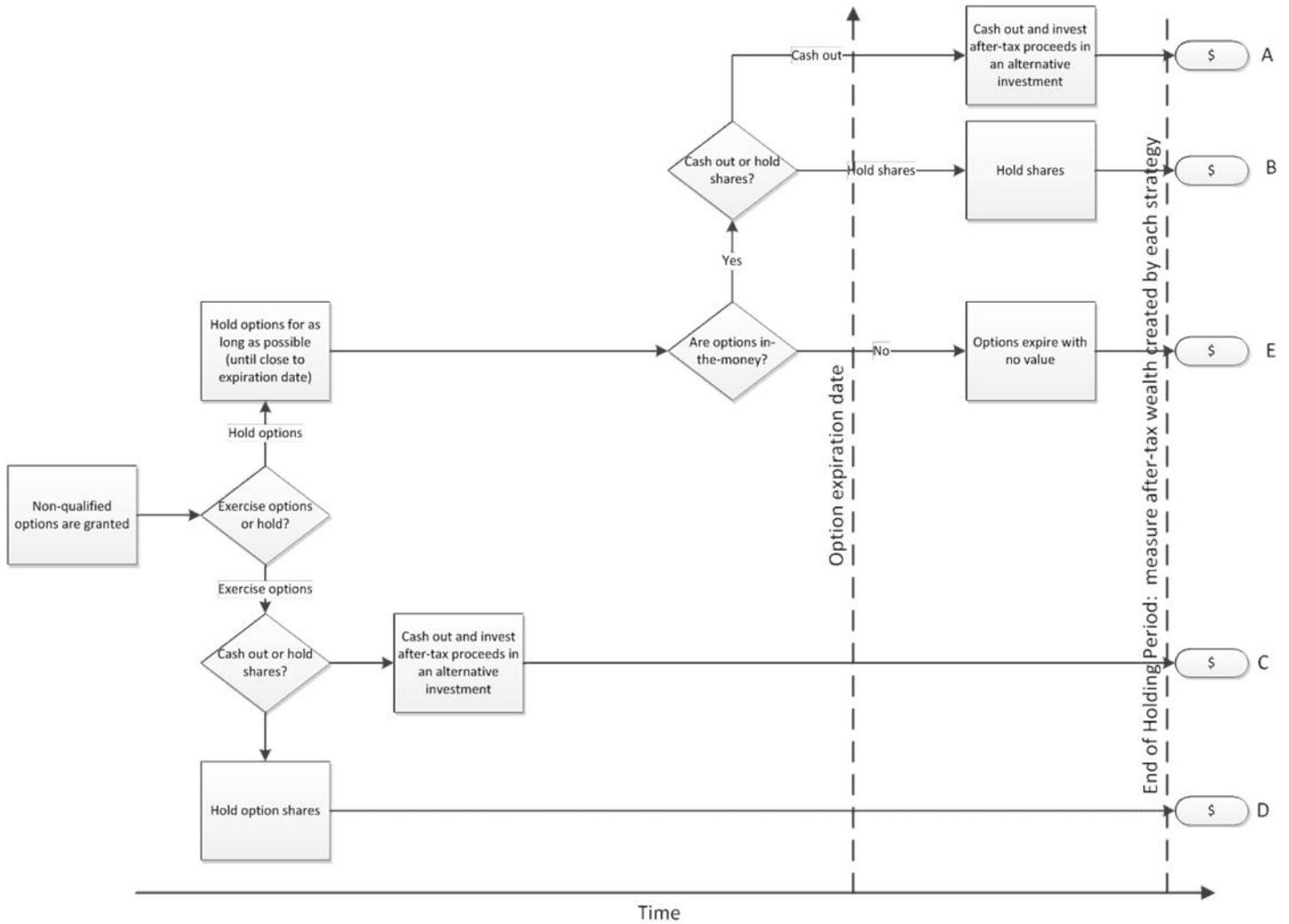
Option spread – The difference between the strike price and the fair market value of the underlying stock.

Option grant – An award of options that may include various tranches with different strike prices and different expiration dates. Option grants are sometimes subject to vesting.

Out-of-the-money – An option that is “out-of-the-money” has a strike price that is above the current market value of the option stock. A non-qualified compensatory option that is out-of-the-money has no value.⁸

Vesting date – The date on which the option vests and becomes exercisable. An option cannot be exercised prior to its vesting date.

Option strike price – The amount that must be paid to exercise an option to acquire one share of stock.



About Roy C. Ballentine, ChFC, CFP®

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