Employee Stock Options vs. Exchange-Traded Options
Employee Stock Options (ESOs) are similar to exchange-traded call options in that both provide the option holder the right to buy an underlying stock at a pre-determined price (the exercise or strike price) over a specified period of time. However, a critical distinction is that ESOs *cannot* be traded and are not marketable. Additionally, the ability to exercise the options may be constrained by the employer.

Exchange-traded options typically sell for more than their **intrinsic value** (the difference between the market price of the stock and the exercise price of the option). This premium over intrinsic value is referred to as the option's **time value**, and unless the option is at expiration, time value will always be greater than zero.

This means that the price at which the exchange-traded option can be sold (intrinsic value plus time value) is *greater* than the profit that can be secured by exercising the option and selling the stock. Accordingly, it is *virtually never optimal to exercise exchange-traded options early*. If an investor prefers to no longer hold the option, she can realize more value by selling the option than by exercising it.

Should ESOs ever be exercised early?
The inability to sell ESOs can make early exercise a rational choice. There are five general reasons that an employee/retiree would voluntarily exercise an ESO early:

- **Liquidity/cashflow needs**
- **Portfolio diversification/risk reduction**
- **Changes in tax rates**
- **Outlook for the stock** (relative to reinvestment portfolio)
- **Dividend capture** (dividends accrue only to shareholders, not option holders)

Consequently, early exercise decisions may require assumptions about the future including price of the stock, applicable tax rates, and reinvestment rate for the assets.

What is the downside of early exercise of ESOs?
Early exercise sacrifices both the investment **leverage** of the option and the continued **tax deferral**.

For example, let's say 10-year ESOs are granted for 1,000 shares at an exercise price of $50, resulting in an exercise cost of $50,000. In year five, the stock price is $75; as a result, the ESOs control underlying assets worth $75,000 (1,000 shares at $75 each), and carry an equity value of $25,000 ($75,000 minus the $50,000 exercise cost).

Consequently, an additional 1% increase in stock price increases the asset value by $750 (1% of $75,000), but increases the equity value by 3% ($750 as a percentage of $25,000). This is the **power of leverage** – a 1% increase in stock price produces a 3% increase in equity value for the option holder. However, leverage applies in both directions: a 1% decrease in stock price results in a 3% decline in the equity value of the option.

If the ESOs were cashed out in year five at the $75 share price, the option holder would capture the pre-tax equity value of $25,000. Assuming a total tax rate of 40%, the $25,000 gross option proceeds becomes

$15,000 in investable assets net of tax. In this example, the combined benefit of leverage and tax deferral allows the employee/retiree to deploy $75,000 of investment assets versus only $15,000 upon ESO exercise.

It is because of the leverage opportunity provided by ESOs, and potentially the tax deferral benefit, that it may be appropriate to reduce portfolio concentration risk *first* through the liquidation of any existing shares of company stock.

However, for an employee/retiree holding **deep-in-the-money** (high equity value relative to exercise cost) ESOs, the options may represent a substantial percentage of her wealth. The cost of reducing downside risk and concentration risk (by cashing out the options and redeploying the proceeds) is the abandonment of the option's remaining time value. If the ESO is deep-in-the-money, this opportunity cost may be small relative to the benefit, even if the option will not expire for several years.

How can the leverage of an ESO be measured?
The leverage opportunity is highest in **out-of-the-money** (no equity value) or **near-the-money** (small equity value) options. Returning to the previous example, near-the-money may mean a stock price of $55 on the $50 options. This equates to a gross share value of $55,000 compared to an exercise cost of $50,000. The equity value of $5,000 is only 9% of the pre-exercise share value of $55,000 – therefore the leverage value is *high* (a 1% increase in stock price would represent an 11% increase in equity value).

The leverage opportunity is lowest in deep-in-the-money options. Again revisiting our example, deep-in-the-money may mean a stock price of $100 on the $50 options. This equates to a gross share value of $100,000 compared an exercise cost of $50,000. The gross cash-out proceeds of $50,000 represent 50% of the pre-exercise share value of $100,000 – therefore the leverage value is still significant, but far reduced (a 1% increase in stock price would represent a 2% increase in equity value).

Other things being equal, an option's leverage value is *lower* the more the underlying stock's price rises *above* the exercise price of the option.

Can option-pricing models be applied to ESOs?
Any discussion of mathematical option valuation usually mentions the Black-Scholes model. There are other mathematical approaches for valuing options, but Black-Scholes is the most well known. However, the Black-Scholes option-pricing model was developed for exchange-traded options, not for ESOs.

In addition to ESOs not being marketable, ESOs typically have much longer terms than traded options. And Black-Scholes unrealistically assumes that volatility is constant over the entire life of the option. As a result, the more volatile the stock, and the longer the expected term to exercise, the higher the valuation.

"Because employee stock options have durations of five to 10 years, are complicated by not vesting immediately, are contingent on continued employment and subject to various restrictions, it is virtually impossible to put a precise estimate on the option's value. Moreover, employee options cannot be sold, violating one of the key Black-Scholes assumptions."

- Burton G. Malkiel, Professor Economics, Princeton University, and William J. Baumol, Professor of Economics, New York University, "Stock Options keep the Economy Afloat," The Wall Street Journal, April 4, 2002.

Can the equity value of ESOs be effectively hedged?
While **put options** (providing the option holder the right to sell stock at a pre-defined price) can likely be purchased on publicly traded stock underlying an ESO, this provides only a partial hedge given the leverage inherent in the stock option. Additionally, most exchange-traded options carry a short term-to-maturity and the cost of purchase may significantly negate the potential benefit. For these reasons, hedging may be most applicable when then tax benefits of *delaying exercise into the next tax year* are significant.

Two types of ESOs
Non-Qualified Stock Options (NQSO): Upon exercise, NQSOs are taxed as *ordinary income* to the holder on the difference between the exercise price and market price. Ordinary income tax rates apply to this value *regardless* of how long the acquired shares are held post-exercise. *Under virtually no circumstances is it advisable to hold the acquired stock* upon exercise of NQSOs since there is no potential tax benefit and the acquired shares carry concentration risk.

Incentive Stock Options (ISO): Typically taxed only when the stock acquired from the exercise is sold (though an Alternative Minimum Tax may be triggered upon exercise). Tax applies to the difference between the exercise price and the sale price. Because the gain will be taxed as a *long-term capital gain if shares are held for one year after the option exercise*, exercise strategies can be more complex and warrant detailed discussion.