Employee Stock Options for the Participant

Part IV: Hedging an ESO Position

By J. Gregory Vermeychuk, Ph.D., CAIA

In this fourth and final part of our series of white papers on employee stock options (ESOs) for the recipient, we will take a brief look at some of the techniques which may be used to hedge a position in ESOs which have vested. In a broad sense, "hedging" refers to the practice of establishing a counter-position to an asset in one's portfolio which will reduce the volatility or risk of the original position. The counter-position or "hedge" is chosen so that its value will move by an equal magnitude but in the opposite direction to the movements in the value of the position to be hedged. A simple example will illustrate the process. Let us say that a manufacturing business has a contract to deliver a number of items one year from today at a pre-determined fixed price. The primary raw material in these items is copper. The price of copper is not fixed, but is determined by supply and demand factors on a global scale. Therefore, the price of the metal may vary over a wide range and cannot be reliably predicted. If our manufacturer used the price of copper today to estimate the price of items to be delivered one year hence, he has assumed a risk, in that his profit will increase if the price of copper falls in the next year, or will decrease if the price rises. We assume that the time to manufacture the items is relatively brief, so that the actual physical supply of copper is required only several days before the agreed-upon delivery date.

In quoting the price and executing the contract, the manufacturer has assumed a short position in physical copper. He knows the price today, but has no control over the future price. What can the manufacturer do to limit his risk?

One possible tactic is to buy the necessary supply of copper at today's price and store it until it is needed to produce the contracted items. The risk of price fluctuation has been removed, but additional expenses have been incurred. The funds used to purchase the supply could have been invested elsewhere, so the return on the potential investment is foregone. Also, there may be expenses involved in physical storage. Notwithstanding the additional expense, this technique is common and widely used in manufacturing industries. In estimating his costs, the manufacturer simply figures in the time value of money and storage costs. The contract price reflects these costs of doing business. The manufacturer has hedged his future obligation to deliver copper (a short position) with a long position acquired when the price is quoted.

Another way to handle this situation is for the manufacturer to purchase exchange-traded copper futures which represent the quantity of the metal required to fulfill the manufacturing requirements. The expiration date of the futures contracts should coincide as closely as possible with the date that the physical copper will be required. The manufacturer has locked in the price he will pay for a set amount of copper to be delivered at a future date approximately one year hence. In most cases, the manufacturer will not take delivery on his futures contracts, but simply sell them as the date of expiration approaches. If the spot price of the metal has risen, so too have the value of the futures contract. The profit on the sale of the contract will, in principle, compensate for the increased cost of the physical metal. Of course, if the spot price of the physical metal falls, so does the price of the futures contract. The savings on purchasing the metal will compensate for the losses on the sale of the futures contracts.

By using the commodity futures markets to hedge his requirements, the manufacturer has insulated himself from potential cost increases by foregoing the extra profit he could make if the price of his raw material were to fall. This is a simplified example. A good overview of the operation of commodity futures markets and their use in hedging may be found in such texts as those by Hull[1] or Geman[2]. What we demonstrate here is the use of a financial instrument (commodity futures) to counteract the risk inherent in the holding of an asset (short position in physical copper).

Before moving on, it is worthwhile to point out an important difference between the two example hedges. In the physical hedge, the purchase price of the copper is known, as are the storage costs, interest rate, and the cost used in the contract estimate. This is a so-called "perfect hedge." When commodity futures contracts are used, the difference between the spot and futures price of the commodity may vary somewhat over time, introducing what is known as "basis risk." The presence of basis risk means that the hedge will not necessarily totally offset movements in the market price. The market risk is substantially reduced.

Let us now apply these concepts to the case of an individual with vested employee stock options. Although the individual has invested no capital nor incurred any tax exposure, he has acquired a long position in call options on his employer's stock. This position, even if the options are out of the money or "underwater" has value. This value has two components, intrinsic and extrinsic. The extrinsic, or time value, dissipates over time and become zero upon the date of expiration. One may argue that the holder of vested employee stock options is suffering a continuous loss of value from the date of vesting until the date of exercise or the date of expiration. This leads us to the first hedging opportunity.

Realization of Extrinsic Value

The first type of hedge we will consider is designed to allow the holder of vested ESOs to extract some of the extrinsic value from his options without exercising them. Let us first consider the case of vested options which are underwater. We recall the conditions of the hypothetical award used in previous examples:

Date of Award:	January 30, 2013
Size of Award:	1,000 units (call option on 1,000 shares of ABC common stock)
Type of Award:	Non-Qualified Stock Option
Share Price on Award Date:	$40.00
Exercise Price:	$40.00 per share
Vesting Period:	Three years (No exercise is possible before January 30, 2016.)
Contractual Period:	Ten Years (Award expires and becomes worthless on January 30, 2023.)
Type of Vesting:	Cliff (All units vest at the same time)
Exercise Type:	Cashless
Tax Withholding:	Yes
Restrictions on Stock:	None

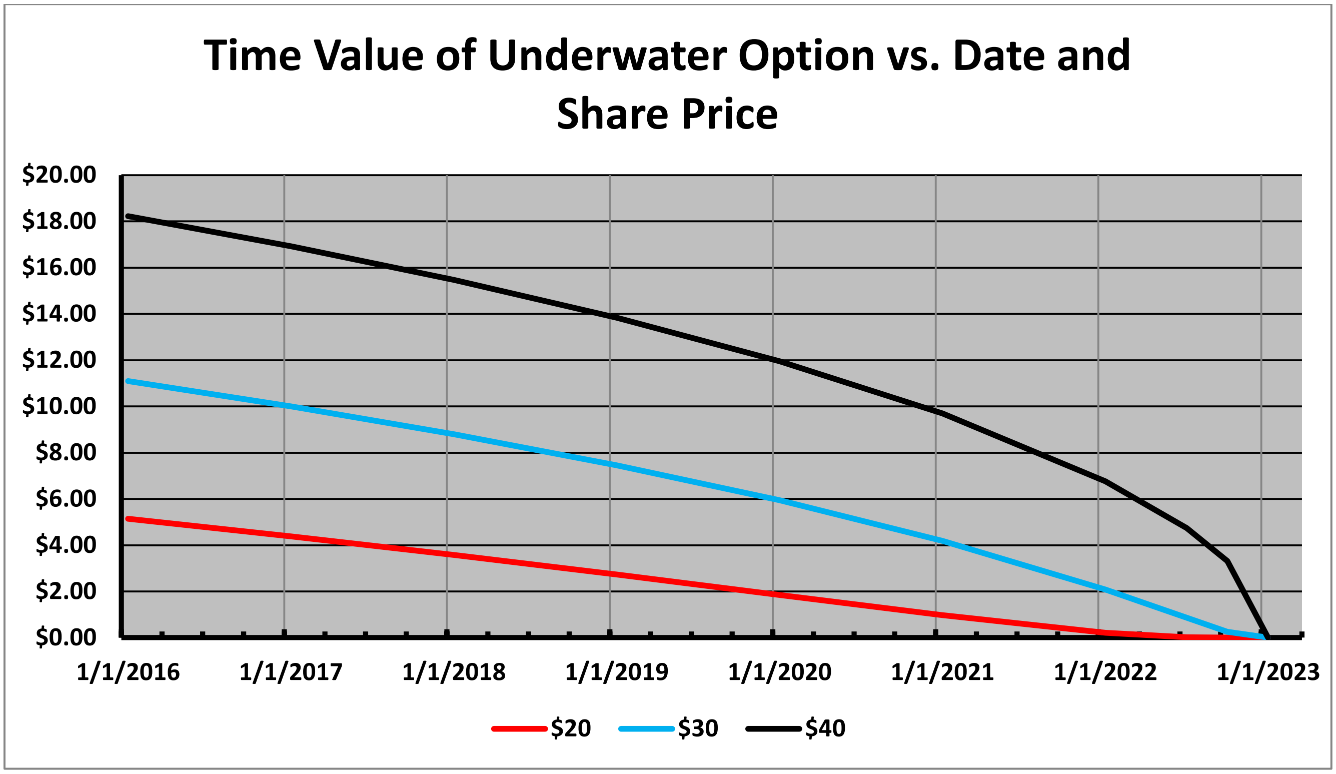
Let us assume that the options have vested and have seven years left until expiration. We will use a risk-free interest rate of 2.5% and assume that ABC stock pays no dividend. Further, let us assume that the volatility of ABC shares is 40.0%. On the date of vesting, if the share price is unchanged at $40.00, the Black-Scholes model yields a call option value of $18.2315. Therefore, the vested award of 1000 units has a value (entirely extrinsic) of $18,231.50 with seven years or 2555 days to go until expiration. One year (365 days) later, this value has declined to $16,921.20 if the stock price remains unchanged. The loss of a bit over $1,310 is due solely to the passage of time. If the share price has gone down in the intervening year to $35.00, the value of the 1000 units is now $13,332.90. How can the participant tap into some of this declining extrinsic value before it decays to zero?

Since the participant has a long position in call options on ABC shares, he may implement a hedge by establishing a short position, or selling calls in ABC shares. This practice, known as "writing naked calls," can be very risky and should be approached with extreme care and full knowledge of the risks and potential losses involved. If managed carefully, this process can extract significant value from a position with a well-defined maximum level of downside risk. In fact, it can be argued that the calls being written are not "naked" at all, but rather "covered," due to the writer's long position in call options on the underlying stock. In practice, however, the stock is not owned outright when the calls are written, so we will characterize this strategy as one of writing naked calls. We proceed with a simple example and some guidelines.

Example 1: The Underwater Option

A call option is said to be "under water" when the price of the underlying stock is below the strike price of the option. If exercised, the owner would be buying stock at a price above the current market price. The intrinsic value of such an option is zero. Because of this, many ESO owners mistakenly think that their underwater options have no value at all. This is not the case. Depending upon the time remaining until expiration, significant time value may exist. This example discusses how some of that time value may be extracted.

Let us consider the option in our earlier example. Suppose it is January 31, 2016 and the options have just vested. We will also imagine that during the three years from the award date to the vesting date, the price of a share of ABC Company has declined from $40.00 to $30.00. Our plan participant can just wait, with the expectation that the share price will rally above $40, but this is not guaranteed. He may also take action immediately in order to obtain some of the time value embedded in the option. Since the owner may exercise his options at any time until the expiration, seven years in the future, we may use the Binomial Model[3] to calculate the theoretical time value. As before, we use a risk-free interest rate of 2.5% and a volatility of ABC shares of 40%. The shares pay no dividend. The chart below shows the total value of one underwater option at annual intervals from 1/30/2016 until expiration at 1/30/2023. The different curves correspond to share prices of $20, $30, and $40. The share value is assumed to be constant with time. Note that these underwater options all have time value, which approaches zero as the option draws closer to expiration.



Focusing on the blue line, which indicates a share price of $30, we see that on the vest date of 1/30/2016, although our option has zero intrinsic value (it is underwater) the time value is a bit over $11.00. Assuming that the share price remained fixed at $30, the time value would slowly decline to zero over the seven years remaining until expiration. The owner of this ESO may be able extract part of this time value right now, while waiting for the share price to advance and put his options into the money.

Please note that the following description is of a generic example, and does not constitute actual trading or investment advice. If options on ABC company shares are traded on an exchange, bid and asked prices will be available for put and call options with maturities of up to nine months. Some companies have longer term options, or LEAPS®, available with maturities out to two years. Let use assume that ABC company has traded options but no LEAPS. The basic strategy is to sell short or write call options on ABC stock with the anticipation that the stock price will not advance to the exercise price of the options sold. The exchange-traded calls will then expire worthless, and our participant will keep the premium. This process is repeated throughout the life of the ESO at such times when it appears favorable to do so. The participant then captures time value, even though the employee stock options he owns are under water and have no intrinsic value.

This strategy entails several risks and is not for beginners. A solid grounding in the nature and use of exchange-traded options should be gained before using such a strategy. The interested person should start out with the general publication provided by the OCC[4] and then consult books such as the ones by McMillan,[5] Natenberg,[6] and Hull[7] to obtain the necessary background. The following example is presented along with the associated risks.

Assume that it is Monday, February 2, 2016 and a participant has 1,000 ESO units which have just vested. The strike price of the units is $40.00 and ABC shares are trading at $30.00. All other characteristics of the ESO are as previously described. We also assume that exchange-traded options on ABC stock are available.

In particular, there are a number of call options expiring on April 22, 2016 with various strike prices. Bid and asked prices are available for these options. They may be either bought or sold on the exchange. In addition to the bid and asked prices, or ***market value***, each option has a ***theoretical value***, which may be obtained through application of the Black-Scholes, binomial, or another model. The table below presents these theoretical values for options of different strike prices which expire on 4/22/2016, which is 59 trading days hence.

Theoretical Value of ABC Call Options at Various Strike Prices

Today's date	**2/2/2016**	**2/2/2016**	**2/2/2016**	**2/2/2016**	**2/2/2016**
Share Price	**30.00**	**30.00**	**30.00**	**30.00**	**30.00**
Strike price	**40.00**	**37.50**	**35.00**	**32.50**	**30.00**
Call Expiration Date	**4/22/2016**	**4/22/2016**	**4/22/2016**	**4/22/2016**	**4/22/2016**
Volatility	**40%**	**40%**	**40%**	**40%**	**40%**
Risk-free rate (short term)	**0.30%**	**0.30%**	**0.30%**	**0.30%**	**0.30%**
Dividend	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**
Theoretical Value - BS	**0.17467**	**0.35822**	**0.70007**	**1.29377**	**2.24404**
Delta	**0.07475**	**0.13649**	**0.23353**	**0.37032**	**0.53864**
Gamma	**0.02517**	**0.03899**	**0.05458**	**0.06732**	**0.07078**
Theta	**(0.00498)**	**(0.00772)**	**(0.01082)**	**(0.01336)**	**(0.01408)**
Vega	**0.01980**	**0.03068**	**0.04295**	**0.05297**	**0.05569**

Note that the call option with 59 trading days to expiration and a strike price of $30.00 has $2.24 of time value, even though the intrinsic value is zero. The further the strike price is from the actual share price, the lesser the time value. This reflects the likelihood that in the next 59 days, the value of ABC shares may increase, bringing the option into the money. The further away from the money the option is to begin, the lesser the likelihood that the option will expire in the money 59 days later. The values for **Delta, Gamma, Theta, and Vega** are known as ***Option Greeks***, and are useful in the planning and adjustment of option positions. The Greeks are also obtained from the option pricing model, in this case, Black-Scholes. Here, we will concentrate only on the theoretical value of the option.

After some consideration, our participant writes, or sells, 10 exchange traded calls (representing 1,000 shares of ABC) expiring on 4/22/2016 with a strike of $35.00. If these calls expire worthless, the participant has earned a premium of $700. This trade may be repeated to earn more premia throughout the remaining life of the ESO. Note that the actual market price of the option in this example may differ significantly from the theoretical. One thing our participant may want to consider in his implementation of this strategy is whether the traded options are priced cheap or rich compared to their theoretical value. In selecting the proper strike and maturity, the values of the Greeks may be useful. Although these topics are beyond the scope of this particular article, they are required study for the aspiring options trader.

The trade described above is not without risk. Suppose the price of ABC shares, originally at $30.00, begins to climb. Since the call option is now approaching closer to the money, its market price will increase. Our participant does not want the options he has sold to be exercised, because then he will be obligated to deliver ABC stock to the option buyer. If the price of ABC shares reached $37.00 and the option buyer exercised, our participant would have to purchase 1,000 shares at $37 and deliver them to his broker for a price of $35, thus losing $2,000. Therefore, the participant would buy back his call options at a higher price, and still sustain a loss.

Because this risk exists, the sale of uncovered call options is not free. The participant would be required to post a margin in the form of cash or securities in order to put on the trade. The amount of margin would be determined by the brokerage house, subject to the rules of the exchange. In any case, a commitment of funds is necessary to initiate the trade described above. Clearly, the call-selling strategy would work the best for a seasoned investor with knowledge of options and other holdings which may be posted as margin.

Reduction of Market Risk

The second hedge is designed to protect the positive intrinsic value of an ESO position which has not yet been exercised. Let us say that our fictional participant has 1,000 units of the ESO described earlier. It is June 29, 2018, and the shares of ABC Company are trading at $100.00. The ESO position has an intrinsic value of $60,000, which will be realized upon exercise (net of taxes, of course). Suppose further that our participant has had an excellent year and has received large commission payments and has seen significant appreciation on his other investments. For various reasons, he wants to delay exercise of his ESO units into calendar year 2019 in order to reduce his overall tax burden. He may simply wait for six months, but he assumes the risk that the price of ABC shares will decline, reducing the intrinsic value of his position. Conversely, the price of ABC shares may rise, adding to the participant's profit. Our participant adopts the "bird in the hand" approach, and decides that he will forego potential future gains as long as he can insulate himself from potential future losses.

Since the unexercised ESO represents a potential long position in ABC stock, the participant may use exchange-traded options to construct a synthetic short position in ABC stock which precisely balances out any variation in the ABC share price. If the long position gains, the short position loses and vice versa. In practice, variation of the value of a long position in shares may be ***"collared"*** between an upper and lower bound. Suppose the shares are trading for $100. By buying a put struck at $90, the overall value of the position may decline to $90, but no lower, since the put confers the right to sell the stock at $90. Writing a call struck at $110 limits the upside on the position to $110, since if the share price exceeds $110, the stock will be called away and must be delivered for $110 per share. Thus, the combination of long stock, long put, and short call with appropriate strike prices is referred to as a **"collar."**

Example 2: Collaring the In-the-Money ESO

Let us continue the previous example. ABC is trading at $100 on 6/29/2018. Our participant wants to delay exercise of his 1000 ESO units into January 2019. On the exchange, there are puts and calls expiring on January 18, 2019 trading at various strike prices. The theoretical values and Greeks are displayed in the table on the next page. The participant instructs his broker to sell 10 January 2019 ABC 110 calls for $813.32 and to buy 10 January 2019 ABC 90 puts for $689.06. These are theoretical values, actual market values may differ. The participant has collared his proceeds on the 1000 shares of ABC resulting from the future exercise of his ESO units to lie between $90,000 and $110,000 for the next six months, and has earned a net premium of $124.26.

Depending upon the provisions of the employment agreement or company stock plan, there may be some limitations placed upon such a collar strategy. One may argue that it makes more sense to set the strike of both the calls and puts to $100, thus fixing the price of the shares at exercise, but this may be precluded by the presence of a ***"constructive sale rule"*** which may prohibit the participant from shorting the stock of his employer, either directly or by establishing a synthetic position. In this example, the limits on the collar are set at ±10% of the current share price, which may be sufficient to avoid such restrictions. The establishment of a collar under certain conditions may also be treated as a constructive sale for tax purposes. One should consult with a competent tax advisor before employing this hedge.

As in the previous example of writing uncovered calls, there may be a margin required, which introduces the necessity to post funds to initiate the trade. As we have stated previously, hedging strategies are simple in concept yet complex in implementation. There should be a clear objective in mind when establishing the position and the risks should be fully understood. The uncovered call position may require adjustment during the life of the trade, while the collar is generally put on and left until just before expiration. In some cases, establishing the collar may result in a net debit, in others a net credit. The strike prices of the put and call may be selected to establish a ***"costless collar"*** under particular circumstances. The practicality of these measures is dependent upon the market prices of the options involved.

The central message of the examples above is that although exchange-traded options incorporate many speculative elements, it is possible to use these instruments to reduce overall risk, especially where equity compensation is involved.

Theoretical Value and Greeks of Puts and Calls

	Calls				
Today	6/29/2018	6/29/2018	6/29/2018	6/29/2018	6/29/2018
Share Price	100.00	100.00	100.00	100.00	100.00
Strike Price	90.00	95.00	100.00	105.00	110.00
Expiration	1/18/2019	1/18/2019	1/18/2019	1/18/2019	1/18/2019
Volatility	40%	40%	40%	40%	40%
Rate	0.30%	0.30%	0.30%	0.30%	0.30%
Dividend	0.00%	0.00%	0.00%	0.00%	0.00%
Theo. Value	17.04060	14.31024	11.93036	9.88028	8.13318
Delta	0.69425	0.62805	0.56149	0.49648	0.43457
Gamma	0.01176	0.01268	0.01321	0.01337	0.01319
Theta	(0.02619)	(0.02819)	(0.02933)	(0.02964)	(0.02921)
Vega	0.26151	0.28206	0.29398	0.29751	0.29351

	Puts				
Today	6/29/2018	6/29/2018	6/29/2018	6/29/2018	6/29/2018
Share Price	100.00	100.00	100.00	100.00	100.00
Strike Price	90.00	95.00	100.00	105.00	110.00
Expiration	1/18/2019	1/18/2019	1/18/2019	1/18/2019	1/18/2019
Volatility	40%	40%	40%	40%	40%
Rate	0.30%	0.30%	0.30%	0.30%	0.30%
Dividend	0.00%	0.00%	0.00%	0.00%	0.00%
Theo. Value	6.89056	9.15187	11.76365	14.70524	17.94980
Delta	(0.30575)	(0.37195)	(0.43851)	(0.50352)	(0.56543)
Gamma	0.01176	0.01268	0.01321	0.01337	0.01319
Theta	(0.02546)	(0.02741)	(0.02851)	(0.02878)	(0.02830)
Vega	0.26151	0.28206	0.29398	0.29751	0.29351

The brief discussion here has passed quickly over many of the features of exchange-traded options. More so than many other financial instruments, options offer the diligent and committed student the opportunity to achieve success in trading which is proportional to the amount of study and practice expended on learning about the instruments themselves and how to trade them. Employee Stock Options are a commonly used form of incentive. The prudent recipient will invest the time to learn about the peculiarities of these instruments and how best to manage them to achieve a desirable result.

Disclaimer

The foregoing is intended for educational purposes only and is not to be regarded as investment advice. The examples are illustrative and do not represent actual employee stock options. The circumstances of every investor are unique. One should consult with licensed professionals before making any investment decision.

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Montgomery Investment Technology, Inc.
200 Federal Street - Suite 245
Camden, NJ 08103
Tel: 610.688.8111
Fax: 610.688.5084
URL: *www.fintools.com*
Email: *miti@fintools.com*

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