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Managing Portfolio Risk with Options on S&P/TSX 60 Index

S&P/TSX 60™ Index Options (SXO) are designed for Canadian investors to manage risk in the domestic stock market. In order to facilitate their utilization by individual investors, the Montréal Exchange recently reduced the multiplier of the SXO options from $100 to $10 per index point. This modification is very good news for individual investors since the smaller contract size will make it easier to add SXO options in their investment strategies.

The initial contract size of $100 per index point limited the use of the SXO for investors with smaller sized portfolios who desired to manage market risk and to establish investment strategies. For example, at the time of writing this newsletter, the value of the S&P/TSX 60 index was close to 655 index points. An SXO option contract using a multiplier of $100 has a notional value of $65,500 (655 $\times$ $100), whereas with a multiplier of $10 the notional value is $6,550 (655 $\times$ $10). Consequently, investors holding portfolios with a notional value exceeding $6,550 that are highly correlated with the S&P/TSX 60 are now able to use SXO options to establish investment strategies and manage market risk.

Amongst the basic options strategies, the purchase of call options allows investors to take advantage of an increase in the value of the S&P/TSX 60 index, whereas the purchase of put options allows investors to take advantage of a decline in the value of the index. On the other hand, the sale of call and put options allow investors to implement strategies for income generation.

Market risk management strategies are generally implemented by investors with portfolios correlated with the S&P/TSX 60 index and who want to hedge their entire portfolios (and not each of the securities in the portfolio). In order to do so, investors must know the beta of their portfolio in relation with the index. Investors must then determine the number of put option contracts required to protect (hedge) their portfolio against an anticipated decline in the value of the index using the following formula:

$$\text{Number of SXO put option contracts} = \frac{\text{Portfolio value} \times \text{Beta}}{\text{SXO strike price} \times \$10}$$

Portfolio beta reflects the variance in the portfolio's value relative to the overall market. In the present case, the beta measures the variance of the portfolio in relation with the fluctuations of the S&P/TSX 60 index. A beta of 0 means that the portfolio is not correlated with the S&P/TSX 60 index. A beta of 1 suggests that the portfolio fluctuates exactly like the index. A beta less than 1 suggests that the portfolio is less correlated with the index, whereas a beta greater than 1 suggests that the portfolio fluctuates in value more than the index. Consequently, the higher the beta of the portfolio, the more put option contracts will be required to hedge the portfolio.

Suppose an investor holds a portfolio of five stocks worth $50,000 with an average beta of 1.21. So, the investor's portfolio is more volatile than the index. For every one per cent increase in the value of the S&P/TSX 60 index, the investor's portfolio should increase by 1.21%. The reverse is true as well; for every one per cent decrease in the index, the investor's portfolio should decrease by 1.21%. To determine the number of put option contracts to purchase, we need to know the strike price of the put option. The selection of put option will take into account the required level of protection (selection of the strike price) and length of the protection (selection of expiration date). The closer the strike price is to the current index level, the greater the level of protection and the higher the put option cost (premium). Conversely, the farther away the strike price (out-of-the-money put) is relative to the current index level, the lower the put option cost (premium) since the protection is not immediate. The difference between the current index level and the strike price is equal to what is called "the deductible" in the insurance world. The lower the strike price is to the current index level, the lower the premium since the investor assumes part of the risk.

In our example, we assume the investor remains bullish on the direction of the market. However, the investor has concerns in the short term. The investor wants to protect the portfolio from an anticipated drop in stock prices over the next three months from the current level of 655 in the S&P/TSX 60 index. Therefore, the investor chooses to buy at-the-money SXO put options (SXO OCT 655) for a price of 26.05 index points. Options quotations are available on MX website at http://m-x.ca/nego_cotes_en.php?symbol=SXO*&image.x=22&image.y=5#cote.

NUMBER OF PUT OPTION CONTRACTS REQUIRED

$$\text{Number of SXO put options contracts} = \frac{\text{Portfolio value x Beta}}{\text{SXO strike price x \$10}}$$

$$\text{Number of SXO put options contracts} = \frac{\$50{,}000 \text{ x } 1.21}{655 \text{ x } \$10}$$

$$\text{Number of SXO put options contracts} = \frac{\$60{,}500}{\$6{,}550} = 9.24 \text{ or } 9 \text{ contracts}$$

The investor will need to buy 9 put option contracts in order to optimally protect the portfolio if the value of the index falls below the level of 655 by the expiration in October. The cost to protect the portfolio is $2,344.50 (26.05 × 9 contracts × $10 per contract). At the expiration, if the S&P/TSX 60 closes at 600 (a drop of 8.4%), the value of the portfolio will decline by 10.2% (8.4% × the beta of 1.21) to $44,919. The value of put options at expiry will be equal to the intrinsic value of 55 index points (strike price of 655 – index level at 600) multiplied by 9 contracts times $10 for a total of $4,950. The total profit of $2,605.50 is obtained by taking the value of the put options of $4,950 minus the premium paid of $2,344.50. Consequently, the value of the portfolio now falls to $47,524.50. The investor has successfully reduced the portfolio's loss by $2,605.50 compared to the scenario where the investor did not protect the portfolio. Conversely, if the S&P/TSX 60 index continues to increase, the value of the investor's portfolio will continue to increase as well without constraint on the upside.

USING THE DELTA FOR FULL PROTECTION

As we can see, even if the strike price of a put option is the same as the current level of the index, the value of the portfolio decreased since the cost of the protection must be taken into account. The purchase of put options establishes a floor price equal to the strike price less the premium paid. An investor who wishes to obtain a complete protection, dollar for dollar, against a decrease in the value of the index could use the delta of the put option to do so. Recall, the delta of an option measures the sensitivity of an option's price relative to changes in the price of the underlying asset. For example, a call option with a delta of 0.50 means that for every increase of $1, or one index point, the call option will increase by $0.50 (delta of 0.50 × increase of $1). The delta of a put option is always negative. Consequently, a put option with a delta of -0.50 will increase by $0.50 in value for every decrease of $1 (1 point) in the underlying value (delta of -0.50 × -$1).

The number of put option contracts required to hedge a portfolio using the delta is calculated using the following formula:

$$\text{Number of SXO put option contracts} = \frac{\text{Portfolio value} \times \text{Beta}}{\text{SXO strike price} \times \$10 \times \text{Absolute delta value}}$$

The SXO OCT 655 put options with a premium of 26.05 index points have a delta of -0.54. Therefore, using the delta we now need to buy 17 contracts in order to obtain complete protection.

$$\text{Number of SXO put option contracts} = \frac{\$50{,}000 \times 1.21}{655 \times \$10 \times 0.54} = 17.11 \text{ or } 17 \text{ contracts}$$

Let's assume the index falls from 655 to 640 before expiration of the put options in October. This 2.3% decline in the index level translates into a decline of 2.8% in the value of the portfolio (or a loss of -$1,385). Given the delta of -0.54, we can determine the variation in the value of the put options. The index lost 15 index points and the investor holds 17 put options contracts with a delta of -0.54. If we multiply the delta of -0.54 by the number of points the index lost (-15), we obtain an increase of 8.10 index points per option contract. By multiplying this result by 17 contracts times $10 per contract, we obtain a total profit of $1,377. The total profit covers almost completely the loss of $1,385 in the value of the portfolio.

The major drawback with this strategy is associated with the higher cost of protection. The cost of the delta strategy is almost double. It cost $2,344.50 to buy 9 contracts (9 contracts × 26.05 × $10 per contract) while 17 contracts cost $4,428.50 (17 contracts × 26.05 × $10 per contract). However, the additional contracts will be very useful if the S&P/TSX 60 decreases to 600 at the expiration of the options in October. The investor could preserve close to 100% of the portfolio's value with the 17 put option contracts, as observed in the following table.

S&P/TSX 60 level	Value of the portfolio with a beta of 1.21	Value of the 9 SXO OCT 655 put options at 26.05	Value of the 17 SXO OCT 655 put options at 26.05
Start : 655	$50,000.00	$2,344.50	$4,428.50
Expiry : 600	$44,919.00	$4,950.00	$9,360.00
Result	-$5,080.15	$2,605.50	$4,931.50
Portfolio value with put options at expiry for an index level of 600		$47,524.50	$49,850.50

We can see that at the expiration of the puts in October with an index level at 600, the portfolio is worth $47,524.50 in the beta scenario (9 put option contracts are bought to hedge the portfolio) whereas the portfolio is worth $49,850.50 in the delta scenario (17 put option contracts are bought to hedge the portfolio). Therefore, the use of delta in this case would have succeeded in preserving close to 100% of the initial value of the portfolio.

REDUCING THE COST OF PROTECTION

As we can see, the cost of protection can be hefty at times. However, many institutional investors use a technique reducing the cost of protection—which technique can also be used by individual investors. This strategy is called a collar and is constructed by selling a call option contract with the same expiration date as the put option contract at a strike price that allows an investor to collect a premium that is sufficiently large that it will reduce the cost of the protection to the desired level.

In the following example, the investor buys 9 SXO put options and sells 9 SXO call options. The SXO OCT 660 call options can be sold for a premium of 20.90 index points. By selling 9 call option contracts, the investor reduces the cost of the protection to $463.50 from $2,344.50 since the investor will receive a premium of $1,881 from the sale of the 9 call options (20.90×9 contracts $\times$ $10). However, this strategy limits the potential profit should the index rise. In fact, the investor will be obligated to sell the index at the 660-strike price if the S&P/TSX 60 is higher than the 660-strike price at the expiration. With this new position, the investor will be able to sell the index at 655 following a decrease under the 655-strike price of the put and the investor will be obligated to sell the index at 660 if it increases above the 660-strike price of the call.

At expiration in October, if the S&P/TSX 60 index closes at 600, the profit will be $4,486.50 (intrinsic value of $4,950 – total cost of the protection of $463.50). The value of the portfolio will now be $49,405.50 (portfolio value of $44,919 following the decline of the S&P/TSX 60 index plus the profit of $4,486.50 from the put options). If the S&P/TSX 60 increases to 700 at the expiration in October, representing an increase of 6.9%, the value of the portfolio without the options will now be $54,156, resulting in a gross profit of $4,156 (rise of 6.9% multiplied by the beta of 1.21 times the initial capital of $50,000). The loss on the call option position is equal to the intrinsic value of the call options plus the cost of the protection, the level of the index of 700 less the strike price of 660 multiplied by 9 contracts times $10 for a total of $3,600. We then add to this result the protection cost of $463.50 for a total loss of $4,063.50. The final value of the portfolio following the increase in the S&P/TSX 60 index will be $50,092.50 ($54,156 - $4,063.50).

To summarize, if the S&P/TSX 60 index declines, the value of the portfolio will be $49,405.50, and if the index increases, the value of the portfolio will be $50,092.50. We can see that the value of the portfolio is higher using the collar strategy when the index falls compared to the scenario where only put options are bought ($49,405.50 compared to $47,524.50). However, the increase in the value of the portfolio is limited if the S&P/TSX 60 index rises since the value of the portfolio is capped at $50,092.50, whereas there was no constraint in the scenario where only put options were bought. The reduced cost to protect the portfolio from a drop in the market comes at the expense of limiting the upside profit potential if the market rises. Therefore, investors will have to consider these variables when they implement their hedging strategies.

SXO options can be used in different ways, and not solely for hedging purposes. They can be used to take advantage of market fluctuations by buying call options if investors expect stock prices to rise or by buying put options if stock prices are expected to decline. SXO options can also be used to generate income by selling call or put options. The collar strategy offers investors protection at a lower cost at the expense of limiting the upside profit potential if stock prices rise. With the reduction in the contract size of the SXO options, individual investors can now use them to implement all of their investment strategies.