IN 15 MINUTES

PROTECTING AN EQUITY PORTFOLIO FROM DOWNSIDE RISK

Derivatives instruments allow investors to modify the risk and return profile of their portfolios without having to sell, or to buy more of, the assets they hold. In this note, we address ways to protect portfolios from downside equity risks, with the help of equity futures contracts and option strategies.

The risk of a market correction has increased after the strong rally in equity markets in 2019. US-China trade tensions have escalated to new heights recently and equity markets should continue to be volatile in the near term. In such environment, investors may consider hedging their equity portfolios.

Investors looking to reduce their exposure to market risk can sell part of their exposure, but it might not be optimal when taking into account the transaction costs and the taxes incurred, such as capital gains tax. Instead, investors can choose from multiple alternatives, from selling equity futures contracts, to using different kinds of option strategies. In this short note, we focus on listed instruments and do not cover over-the-counter products such as forwards, swaps or structured products for example.

UNDERSTANDING FUTURES

Futures contracts are legal agreements to buy or sell a particular asset at a predetermined price at a specified time in the future. The buyer of a futures contract is taking on the obligation to buy the underlying asset when the futures contract expires. On the other hand, the seller of the futures contract is taking on the obligation to provide the underlying asset at the expiration date. A September 2019 futures contract on S&P 500 with a price of 2’811.50 allows investors to buy or sell the S&P 500 index at the predetermined index value of 2’811.50 on 20 September 2019[1].

Futures contracts are standardised and trade on a futures exchange. Futures on major equity indices are fairly liquid, in particular e-mini S&P 500 futures. Furthermore, given that they are settled on a daily basis on an exchange, there is little counterparty risk.

1 - 3rd Friday of the expiry month.

Futures on S&P 500 (e-mini) have quarterly expiry, in March, June, September and December. If necessary, as the expiry date gets closer, investor can roll from one maturity, say June for example, to the next one, September in that case. This maintains the long or short exposure to the underlying asset after the initial futures contract expires.

The pricing of a futures contract is mainly driven by the spot price and the dividend yield of the underlying asset as well as interest rates and the time to maturity. With a few assumptions, the price of a futures can be described as: $F_0=S_0e^{(r-d)T}$ where r is the interest rate, d the expected dividend yield and T the time to maturity.

For example, as of 13 May 2019, the price of a September S&P 500 e-mini futures was equal to 2'811.50 while the index itself was worth 2'811.87 points. The very small difference between the spot price, S_0, and the futures price, F_0, is explained by the fact that the dividend yield of the S&P 500 is currently close to the US short-term interest rate.

The total dollar value of a futures contract is a function of its multiplier: in the case of a S&P 500 e-mini futures contract, the multiplier is equal to 50 which means that a single futures contract has a dollar exposure equal to [futures price * 50]. If the futures price is equal to 2'811.50, then the dollar exposure is worth USD 140'575 (2'811.50*50).

Given the fact that a futures contract is an obligation to buy or sell an asset a later date, no money is exchanged at contract initiation. However, both parties are required to pay an initial margin in a margin account. In the case of S&P 500 e-mini futures, it represents around 5% of the total exposure of the futures contract. The futures position is settled daily, which means that each party may need to add more cash to the margin account as the underlying assets move. This is to ensure that both buyers and sellers of futures can meet their obligation on expiry date.

Another key difference between investing using futures versus directly in the underlying asset is the foreign exchange (FX) exposure. Assume a Euro-based investor invests in US equities for one year but measures his performance in Euro. If the investor buys for USD 10 million worth of S&P 500 ETFs (Exchange Traded Fund), the performance will be affected by the S&P 500 1-year return as well as changes in USD/EUR currency rate over that same period. In the event that the S&P 500 closes in one year at the same level as of today, the performance could still be different from zero, depending on how the Euro depreciates or appreciates versus the US Dollar.

If the strategy were implemented using futures, the FX exposure would be limited to the gain or loss and not to the overall notional: if the S&P 500 closes in one year at the price at which the futures contract was entered, then the FX exposure is almost null[2].

PORTFOLIO PROTECTION USING FUTURES

To protect a portfolio against a risk of correction on equity markets using futures contracts, an investment manager can sell futures contracts. This will synthetically modify the risk and return profile for a given period of time. If the market trends down, the reduced exposure to equity markets will be beneficial to investors. However, if markets continue to go up, the investor will only receive the performance equivalent to the remaining exposure to equity markets.

One way to determine the number of contracts to sell for hedging is to adjust the portfolio's beta[3], i.e. the exposure to market risk. To make such adjustment, we need to measure the beta of the equity portfolio to be hedged, as well as the beta of the futures contract, both measured with respect to the reference index as shown in the appendix.

Futures contracts are also useful to reallocate the exposure within the equity asset class. For example, if an investment manager wants to simultaneously reduce the exposure to small-capitalisation equities ("small caps") by selling futures on a US small cap index and increase the exposure to large-capitalisation equities ("large caps") by buying futures on a US large cap index.

HEDGING EXAMPLE USING FUTURES

An investor has USD 10 million worth of US equity assets and would like to reduce the impact of a downside in equity markets. His benchmark is the S&P 500 Index and the current beta of his equity portfolio against the S&P 500 is 1.1. Let assume that his objective is to reduce the beta to 0.5. As a result, a 1% drop in equities should translate into a limited drop of 0.5% on the equity portfolio, provided that historical betas were the same than ex-post betas during the period when the portfolio is hedged, and that the investor's portfolio is perfectly correlated with the S&P 500 Index in the period when the portfolio is hedged.

The beta on the futures contract is 1.002. On 13 May 2019, the price of September 2019 S&P 500 e-mini futures contract is 2'811.50 and the total value per contract is therefore USD 140'575 (2'811.50*50).

$$\textit{Number of contracts} = \left(\frac{0.5-1.1}{1.002}\right)\left(\frac{10'000'000}{140'575}\right) = -42.60$$

Sell 42 contracts at 140'575

For a total value of 42*140'575 = USD 5'904'150.

2 - One would still need to account for the FX exposure to the margin account.
3 - Beta describes the sensitivity of a security's returns to market's returns. A security's beta is calculated by dividing the covariance of the security's returns and the market's returns by the variance of the market's returns over a specified period. A Beta of 1.5 roughly means that the portfolio should move up 1.5% when the market is up 1%, and decrease by 1.5% when the market decreases by 1%.

LIMITATIONS

Perfect hedging is nearly always impossible. Basis risk, indeed, occurs when the futures contract on the index is not a perfect match to hedge a portfolio of stocks. For example, the portfolio composition might differ quite significantly from the composition of the index used, in our example, the S&P 500 Index. Moreover, the betas used in the hedge calculation are historical betas, and can change meaningfully in the future. The fact that the number of contracts is rounded is another limitation to perfect hedging.

HEDGING DOWNSIDE RISK WITH OPTIONS

Options are derivatives based on underlying securities, such as stocks. An option contract offers the buyer the right, but not the obligation, to buy (call option) or sell (put option) the underlying asset, at a pre-specified price, also called the strike price. The seller of the option is obligated to buy or sell if the buyer decides to exercise the option.

A major distinction between a futures contract and an option is therefore that an option gives its holder **the right but not the obligation** to buy (call) or sell (put) an asset. Therefore, the option's premium is paid upfront and there is no need to add any margin throughout the life of the option.

Calls and puts on S&P 500 are also fairly liquid and display little counterparty risk as long as they are exchange-listed.

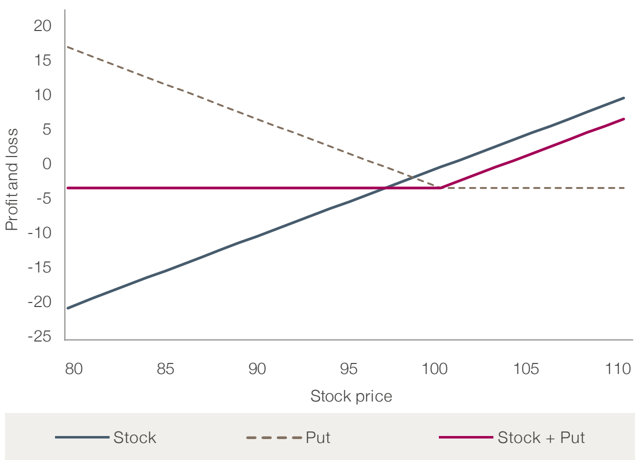
Options are sensitive to the same factors as futures: spot price, expected dividend yield, interest rates and time to maturity. Given that options have a non-linear payoff and that you can choose the strike price, they are also a function of this strike price and how volatile the underlying asset is.

PUT OPTIONS

Investors looking to hedge their equity portfolios could choose to buy a put option on an equity index, such as the S&P 500. When an investor holds a stock and buys a put on that particular stock, it is called portfolio insurance, or "protective put". The cost of this "insurance" is the put premium. Investor will still participate to the increase in the price of the underlying, in this case the index, and reduce the downside to the exercise price of the put. If the index closes above the strike price on the exercise date, the option will not be exercised and no profit on the option will be made. This is equivalent to insuring a car or a house: the insurance is paid annually but in the absence of accident, no payment would be made by the insurance company.

The buyer of a European put option benefits if the price of the underlying is lower than the exercise price. If an investor bought a put option on S&P 500 with a strike price of 2'800, and the index closes at 2'750 on the exercise date, the investor will chose to exercise the put option and make a profit of 50 index points (2'800 – 2'750) minus the initial price paid for the option. Similarly, buying a put option with a strike price of 2'900 would have initially cost more but if the index closes at 2'750 on the exercise date, the payoff would be 150 index points (2'900-2'750). If the index closes above 2'900 at maturity of the option, then the payoff would be zero as the put holder would have no incentive to exercise the option.

PROTECTIVE PUT



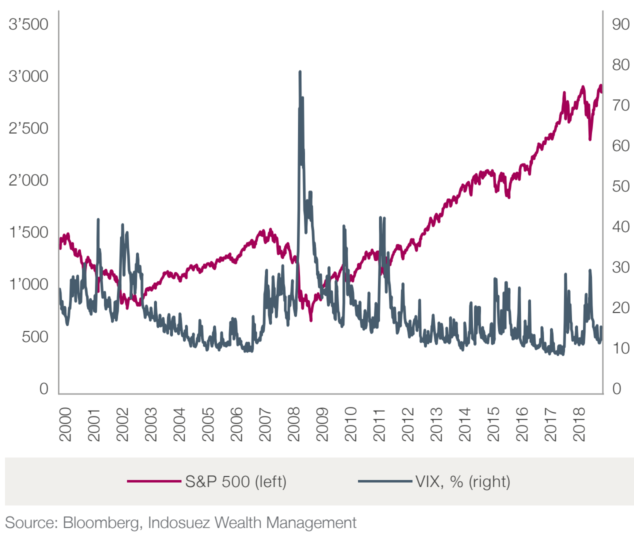
Source: Indosuez Wealth Management

THE COST OF HEDGING USING OPTIONS: IMPLIED VOLATILITY

The cost of a put is directly related to the implied volatility of the underlying asset. Implied volatility measures how risky an asset is perceived to be by market participants until the option's expiry date. Implied volatility can therefore differ from one asset to another, over time and as a function of the strike price. When investors become more concerned about a potential market downturn, implied volatility tends to increase, which leads to higher put prices (as well as call prices).

Investors can follow the volatility index of the S&P 500 Index, called the VIX, to assess if volatility on US stocks is currently high or low versus history. The VIX index is calculated from the prices of options (both puts and calls) on the S&P 500 index[4].

IMPLIED VOLATILITY



Source: Bloomberg, Indosuez Wealth Management

4 - See our publication: "In 5 Minutes- Higher Volatility – Time to understand the VIX" published on 13th June 2018.

HEDGING EXAMPLE USING PUTS

For example, on 13 May 2019, the cost of a 2'800 September put on S&P 500 was USD 106.20[5]. Such a put would become profitable if the index were to fall below 2'693.80 (2'800-106.20) at maturity. A put premium of USD 106.20 with the S&P 500 trading at 2'811.87 represents a cost of 3.78% (106.20/2'811.87).

An investor with a USD 10 million portfolio consisting of 40% US equity (for a total value of USD 4'000'000), with risk and return characteristics similar to those of the S&P 500 Index, wants to limit the downside to 2800 between 13 May and 20 September. Each option represents 100 times the strike price which implies that the dollar value of a put with a 2800 strike is equal to USD 280'000. To protect this portfolio, one would have to buy:

$$\textit{Number of contracts} = \left(\frac{4'000'000}{280'000}\right) = 14.28$$

*Buy 14 contracts at USD 10'620 (106.20*100)*

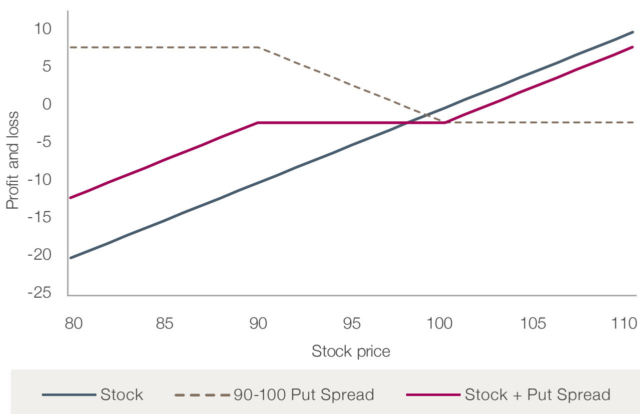
The total cost of hedging the portfolio in this way would be USD 148'680 (14*106.20*100), or 3.70% (148'680/4'000'000) of the value of the equity portfolio.

PUT SPREAD

Instead of buying a single put, investors can combine several options to create an option portfolio that better fit their hedging requirements and their view regarding the direction of the market. The simplest strategy is the put spread, or bear spread, which is a combination of a long put and a short put with a lower strike. For example, a 2'800-2'600 September put spread on the S&P 500 is a combination of a long put position with a 2'800 strike and a short put position with a 2'600 strike, both with September 2019 expiry dates. By selling a 2'600 put, the investor reduces the initial cost of the strategy. However, the portfolio will not be hedged if the S&P 500 index falls below 2'600 at maturity.

For example, on 13 May 2019, a 2'600 September put on S&P 500 was trading at USD 51.90 (bid). The cost of a 2'800-2'600 is thus USD 54.30, versus USD 106.20 for a 2'800 September put on the same underlying asset. However, the maximum gain is capped at 200 index points (2'800-2'600).

PUT SPREAD

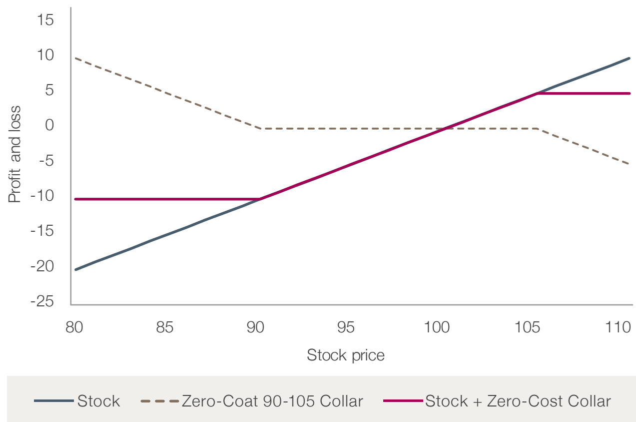


Source: Indosuez Wealth Management

COLLAR

A collar is the combination of a protective put (see below) and covered call (the investor holds the underlying asset and sells a call on the asset). The usual goal is for the owner of the underlying asset to buy a protective put and then sell a call to pay for the put. If the premiums of the put and the call are equal, it is called a zero-cost collar. Both the upside and downside are limited, the downside by the long put and the upside by the short call.

COLLAR



Source: Indosuez Wealth Management

To implement a collar, an investor could buy a 2'575 September put for USD 48.50 and write a 2'925 call and receive USD 48.0, for a net cost of USD 0.5 (or 0.02% of the S&P 500 price on 13 May 2019). The investor return is thus capped at 2'925 (104% of the price of the S&P on 13 May), and the downside is limited to 2'575 (92% of spot price which means a 8% downside).

5 - All pricing are indicative, using bid-offer prices at close.

CONCLUSION

Investors can protect their portfolio in multiple ways. In the end, the choice will depend on the view of the direction of equity markets, the level of market conviction and the price one is prepared to pay.

If the investor is convinced that the equity markets will fall, selling futures to cover all or part of the risk exposure will be costly if the markets trends up instead. A protective put allows the buyer of the put to retain the upside potential, but the price of such portfolio insurance can be quite elevated. If the investor is willing to give up some upside potential, a collar reduces the cost of the protective put. Investors can also implement a put spread strategy and tailor the option's portfolio to better fit their view by choosing specific strike prices and maturity.

While this note introduces the concept of hedging using listed products, investors can access a wider range of solutions by using structured products and exotic options such as best-of put in the case of tail risk hedging.

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APPENDIX

Let assume that β_T is the desired portfolio beta, β_P the portfolio beta and β_f the futures contract beta. If an investor has an equity portfolio worth V_p and the futures contract has a price and a multiplier respectively equal to P_f and m, then the formula to apply is :

$$\textit{Number of contracts} = \left(\frac{\beta_T - \beta_P}{\beta_f}\right)\left(\frac{V_P}{P_f * m}\right)$$

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