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The Many Faces of Short Volatility Trades – TARF vs. Hedge Funds

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In this article we will touch upon a very important concept known as “short volatility strategy” and bring some insight into the intricate relationships that exist among seemingly different asset classes.

From the basics of portfolio management, we all know that diversification is key to reducing the overall volatility of a portfolio and to limiting tail risk. Traditionally, portfolio managers sought to reduce volatility by investing in asset classes which exhibit low correlations with each other. In this article, we will challenge this traditional view and showcase the complexity of portfolio diversification. The message we would like to leave you with is this: traders and portfolio managers need to develop an in-depth understanding of the true risk drivers of each and every asset they trade/manage and fully understand the intricate relationships that exist between these drivers. It is these risk factors that will ultimately control the impact and benefits of portfolio diversification.

Short Volatility Strategies

A short volatility strategy is created as follows: you sell a put option and collect the option premium. If the option expires unexercised you get to keep the premium; however, if an event triggers a fallout in prices then your losses will extend to as much as the asset price can fall to. Thus, a short volatility trade is one in which you sell insurance and hope for no events that would trigger a collection from the buyer of the option. This strategy is well known and has shown time and time again that it’s one of the most profitable and consistent trades. Probably a better name for this class of trades is a “Probability Trade”. The logic is simple: market turmoil does not happen often and thus the probability of the asset price falling low enough to trigger a collection on the insurance contract is very small. Thus you can sell put options and collect premiums for many years before a meaningful market disturbance occurs. There are two problems with this logic though; one is old and one is new:

1. When an event does eventually happen the losses can be so substantial that it can wipe out all the profits collected over the years and still some more;
2. The notion that market turmoil does not happen often is based on an erroneous assumption that markets behave according to a normal distribution which does not have any tail risk. This erroneous notion is at the heart of almost all finance and financial modeling! But markets have never behaved according to this assumption; markets have always exhibited a much higher tendency for tail events. This tendency has in fact increased substantially over the years and today both the frequency and magnitude of experiencing market disturbances have increased.

Based on the above, you normally wouldn’t want to expose yourself to a prolonged period of short volatility exposures. The problem is that it’s not always obvious that you are exposed to short-volatility exposures as these exposures come in many different forms. We will illustrate two classes of trading strategies that seem to have almost nothing to do with each other. One strategy class is probably the purest form of a short volatility trade. The other strategy class is also a short volatility trade; however the short volatility exposure is created synthetically!

Target Redemption Options (“TARF”): Pure Short Volatility Trade

To a quantitative analyst, TARF is a fascinating product! It’s a highly intuitive product whose purpose and payoff profile could be understood within a few minutes, yet it embodies the most advanced and sophisticated mathematical structure in finance. It’s also fascinating because all of this sophistication is meant to accomplish one single goal: to make it much more likely that the “buyer” of the insurance through a put option will eventually collect on the insurance!

To take you back to Calculus 101, you probably remember that probabilities are measured using areas of regions; the TARF structure is meant to increase the size of the area that contains the disturbance events as to make it a lot more likely that an event will eventually fall into this area during the tenor of the TARF contract. Let’s briefly discuss the mechanics of a TARF trade and examine what the payoff profile looks like.

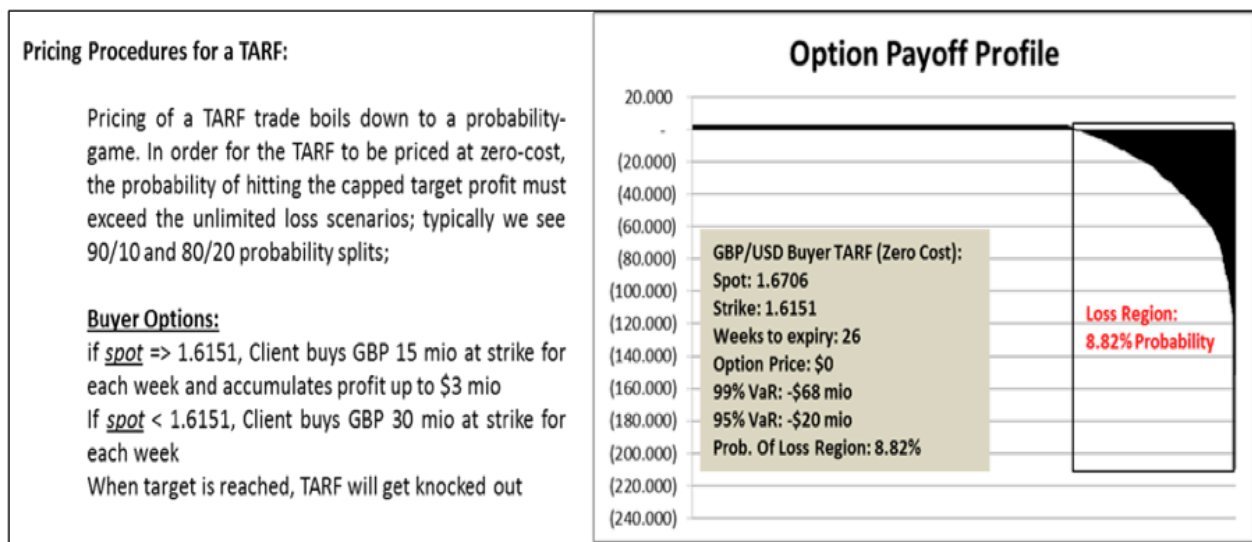
Let's take you back to 2014 and assume that you bought a GBP vs. USD TARF with the following structure:

Amounts GBP 15/30MM
 Strike 1.5855
 Target: USD 3MM
 6 months/ 26 weekly fixings
 Start date : 10Feb14
 End date : 04Aug14

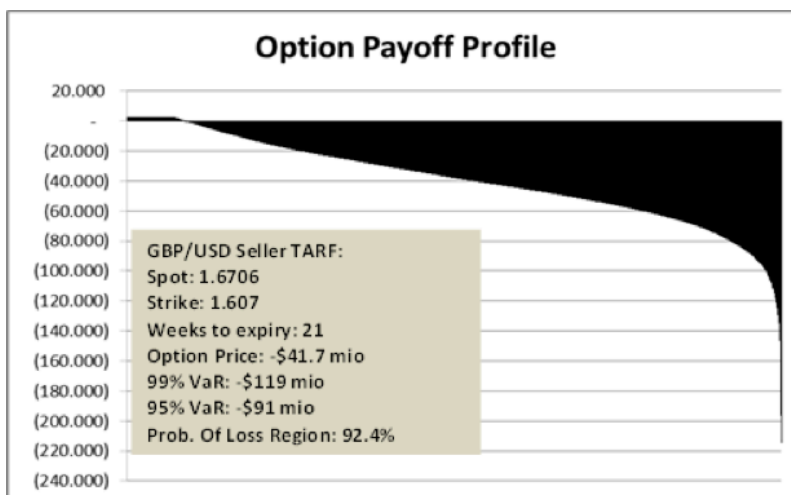
This means the following: at each weekly fixing date, if the GBP **spot is at or above** the strike of 1.5855, you'll get to buy GBP 15MM at the strike rate for each week and accumulate profit up to USD 3MM. On the other hand, if the GBP **spot moves against you and is below** the strike, you'll have to buy GBP 30MM at the strike rate for each week without any limits on your potential losses. Sounds pretty simple, doesn't! In addition a TARF is made even more attractive because it is structured as a zero-cost option; it's free!

In this structure, you "the buyer" are selling volatility because in the event of a negative move in the GBP against USD you'll have to bear the cost of the higher strike price without any limits to how much losses you could incur. On the other hand, your profit is capped at USD 3MM.

Without getting into the technical details of pricing this structure it suffices to say that in order to price this trade we need to determine the possible price-paths of the GBP/USD rate each day for the full duration of the trade. Such a problem can only be solved with sophisticated Monte Carlo ("MC") simulations. In addition, the MC process cannot be done just randomly; rather the process has to be controlled such that the pricing model can re-price all current options in the market for the duration of the trade! The model we have chosen to build to price a TARF trade is the well-known Heston Stochastic Volatility model; and for those of you who are technically oriented you can simply google the Heston model for more details. What we will do next is to show a graphical display of the payoff profile for this trade. Again this payoff profile illustrates the purest form of a short volatility trade; namely: capped profits (insurance premium) and potentially unlimited losses during market turmoil.

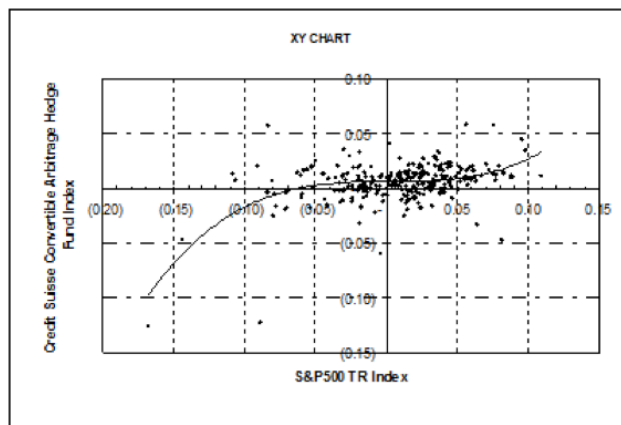
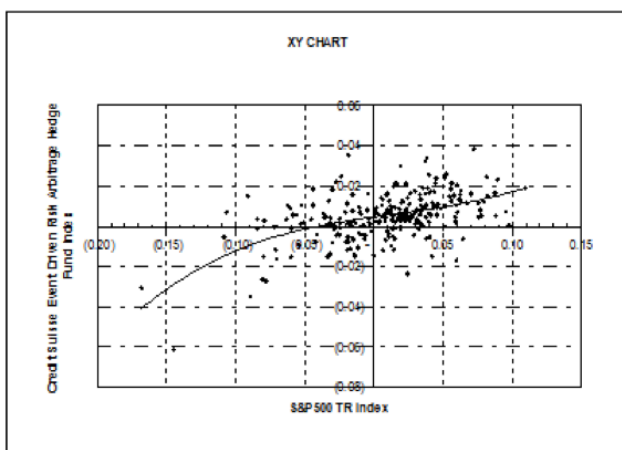
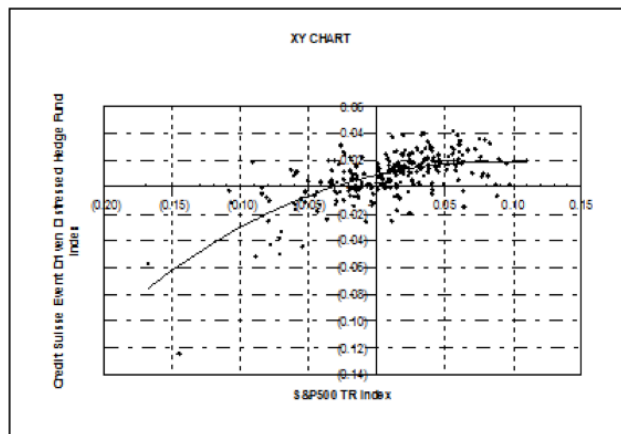
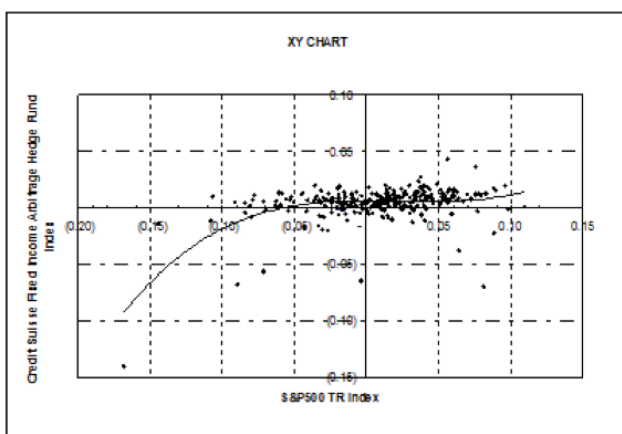


So as the example and graph above illustrate; you get to collect on the premium for up to USD 3MM unless the market experiences a volatility event that causes a significant and unfavorable change in the GBP/USD rate in which case you'll have to bear the losses shown in the graph. This is the exact payoff profile of a short volatility strategy. During the life of this trade; the loss region will likely move further and further to the left until it looks more like this one (next page):



Fixed Income and Hedge Fund Strategies: Synthetic Short Volatility Strategies

You don't have to sell put options to sell volatility; there are many trading and investment strategies with which you can create a synthetic short volatility payoff. Any trading strategy with limited upside during good times and unlimited downside during bad times is a short volatility strategy. If a trade is a short volatility trade, it's very important to understand why it is so because it is more likely than not that the short volatility nature of the trade is actually the very essence of the trade. Here, and without getting into details, we will show you the payoff profiles of four hedge fund strategies including a fixed income strategy all of which have the characteristics of short volatility strategies when their returns are regressed against the S&P 500 Index (the market index):



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