Trading Assignment 2: VIX Futures

This trading strategy examines the profitability of shorting or buying the front VIX futures contract that has at least 10 business days to settlement when the VIX futures basis is sufficiently in contango or backwardation and hedging the market risk with E-mini-S&P futures positions.

1. Explain why (in general) investing part of your portfolio in VIX Futures or an ETF that tracks the VIX Futures over a long period of time is a bad idea. (Hint: Most of the time, this market has been in contango, i.e. VIX futures contracts have often been more expensive than the VIX index.)

2. Explain why (in general) holding short VIX Futures or an inverse ETF that tracks the VIX Futures over a long period of time is a bad idea.

3. Create an indicator for buy and sell signals to determine when the VIX term structure is either in contango or in backwardation:

$$B_t = \frac{VIX_1}{VIX_{Spot}} - 1$$

where VIX_{Spot}= Spot VIX opening price and VIX_1 = front VIX futures opening price. If the basis is negative, the VIX term structure is in backwardation, and if it's positive the VIX term structure is in contango.

Implement the trading strategy for four weeks. You will short VIX futures positions when the VIX futures basis is in contango, and the daily roll exceeds 0.10 VIX futures points ($100 per day) and long VIX futures positions when the VIX futures basis is in backwardation and the daily roll is less than -0.10 VIX futures points. The daily roll is defined as the difference between the front VIX futures price and the VIX, divided by the number of business days until the VIX futures contract settles, and measures potential profits if the basis declines linearly until settlement.

Trades are exited when the daily roll is less than .05 VIX futures points for short trades and greater than -.05 VIX futures points for long trades. If these exit conditions are not triggered, trades are exited at the end of 9 business days. A major reason for this additional exit rule is that because trades are entered in the nearest VIX futures contract that has at least 10 business days until settlement, exiting after 9 business days allows us to avoid issues related to the settlement of VIX futures contracts when the first exit rule is not triggered.

4. The size of the E-mini-S&P futures hedge will be based on the historical hedge ratio estimates. These hedge ratios are constructed from regressions of VIX futures price changes on a constant and on (contemporaneous) percentage changes of the front mini-S&P 500 futures contract. The slope of this regression represents the optimal hedge ratio. (Hint: The β coefficient should be significantly negative in light of the tendency of VIX futures prices to move inversely to equity returns.)

Calculate the number of contracts required. (Hint: Assume the September E-mini S&P 500 contract has a price of 1,673.75 with a contract size of $50 per index point. A single contract is then worth $83,687.50 (=1,673.75*$50). Taking the value of the VIX Futures position (the same way as the spot position), dividing it by the value of the E-mini futures contract ($83,687.50), and multiplying the result by the optimal hedge ratio and rounding up or down should give you the number of contracts.).

5. Algo:

At the beginning of each trading day, calculate the basis. If the basis signals backwardation, enter a long position in VIX_1 at the market open, if a long VIX_1 position already is open, proceed to the next day without any execution.

If the basis is in contango at the beginning of the trading day, a short VIX_1 is entered at the market open, unless such position is already open.

The hedging strategy follows the same structure but enters long (optimal number of contracts) E-mini S&P Futures position if the basis signals backwardation and a short E-mini S&P Futures position if the basis signals contango.