Group Project

Part 1 due Monday, April 22, 2019; final report due Wednesday, May 1, 2019
10% weight in the determination of the course grade

Instructions. This is a group assignment. Groups may include up to 5 people. Deadlines for the two parts of this project are below.

The article by Helen Bartholemew in *Risk* titled "Old dispersion product signals new vol regime" discusses dispersion trades. Dispersion trades try to exploit the fact that sometimes implied volatilities of index options are not consistent with the implied volatilities of the options on the index components. They typically involve writing index straddles, and then buying straddles or strangles on the index components.

To keep things simple, you will consider a dispersion trade that involves writing DJX (Dow Jones Index) straddles, and buying straddles on the index components. In each case, you will hold the options on the index components in proportion to their underlying stocks' weights in the index.[1] The *Risk* article discusses two variations of the trade:

(a) In a vega-neutral dispersion trade, the sum of the vegas of the index and component options is zero.

(b) In a theta-neutral dispersion trade, the sum of the thetas of the index and component options is zero.

Your mission

Your first mission is to build a system to measure the risks of a dispersion trade. The inputs should consist of the prices (and relevant terms) of the 62 options (1 index put, 1 index call, 30 component puts, and 30 component calls), the quantities of each of the options,[2] relevant historical data on the returns of the underlying stocks, and perhaps relevant historical data on option implied volatilities. At a minimum, the outputs should include the value-at-risk of the portfolio of options and the various Greek letter risks of the portfolio.

Your second mission is to illustrate your system using the option prices, stock prices, and index level from a particular day. You may collect the prices and other relevant information from Bloomberg, or you may pick a day from (or before) December 2017 and collect the data from WRDS/OptionMetrics.

Your third mission is to prepare a report describing your risk measurement system, the approach or approaches you selected (and why you selected that approach or approaches), and your

[1] Specifically, if the index weights are w_1, w_2, w_3, etc., then the notional amounts of the component options will be kw_1, kw_2, kw_3, …, where k is chosen to make the trade either vega-neutral or theta-neutral.

[2] The quantities can be any rational number. This makes sense if the trade is executed in the form of an OTC derivative.

illustrative results. You should discuss your results and the risks of the portfolio, including the risks that are not captured by your risk measurement system.[3]

Deadlines

Part 1: Monday, April 22, 5:00 p.m. (2 points) Upload a .doc, .docx or .pdf file describing your methodology. This can be a draft of the relevant section of your report.

Part 2: Wednesday, May 1, 5:00 p.m. (8 points) Complete your risk measurement system by Wednesday, May 1, and write your report describing the system, the approach or approaches you selected (and why you selected that approach), and your illustrative results. Upload your R scripts and/or other compute programs to the Compass site.

[3] Is it possible for you to be correct in your volatility forecasts, but still lose money on the trade?