MACRO RISK ADVISORS: INITIAL ASSESSMENT FOR DERIVATIVES STRATEGY CANDIDATES

Submit your results to pravit@macroriskadvisors.com within 24 hours of the agreed-upon start time. Your submission will be judged on 1) accuracy, 2) efficiency, 3) good coding or spreadsheet design practices, and 4) presentation of results.

PYTHON ASSESSMENT

An investor has a record of their buys and sells in several different stocks with the quantity, price, and date of transaction. The historical price and transaction data is provided in the Excel sheet "stock_trading.xlsx" on separate tabs.

Write Python code to create a running tally of their position in each stock, the market value of their position, and the cumulative P&L of the portfolio. Plot the market value and cumulative P&L over time. Plot the running position and cumulative P&L in each stock.

Present your results as iPython Notebook HTML output with code blocks and outputs. **Include both the .ipynb file and the HTML output file. Your code must use Pandas DataFrames.**

Questions:
1) Did the portfolio make or lose money? How much?
2) Which stock accounted for the biggest share of profits? The biggest share of losses?
3) What was the average transaction size (in dollars)?

See next page for details on the Excel Assessment.

EXCEL ASSESSMENT

In Excel, backtest a strategy that sells at-the-money put options on the S&P 500 index with 91 calendar days to expiry (if expiry happens to be a weekend, then assume it expires on the following business day).

Assume you start with an initial $1,000,000 in cash, and you sell put options sized on a 1:1 strike notional to your cash. For example, if you have $1,000,000 and the strike of the put option is 2,000, then you sell $1,000,000/2,000 = 500 put options.

At any given time, you only have **ONE** "live" option position on the books. In other words, you do not initiate a new option position until 1) the day the existing option position expires, or 2) the **"roll criteria"** is met.

Roll Criteria: The position should be rolled (the old option is bought back, and a new option is sold) if the put option has a delta **SMALLER IN MAGNITUDE** than -5%. **In other words, the put option is rolled when it goes far out-of-the-money.** Otherwise, they are held to expiry, at which point they are cash-settled at P=max(0, K-S) and a new option is sold **ON THE SAME DAY.**

In addition, you also earn the risk-free rate on your cash (assume interest is paid daily).

Be very careful about the logic of your P&L on & around roll dates!

All of the necessary underlying price, volatility, rates, and dividend data is provided in the Excel sheet "option_backtest.xlsm". There is also a VBA Black-Scholes function included in the sheet for your use.

No VBA (apart from calling the Black-Scholes function) may be used. All mechanics of the sheet must be done using spreadsheet formulas.

Your final sheet should include a chart showing the value of your portfolio **(net of cash and options)** through time, on a daily basis. **The value of the portfolio should reflect the continuously changing, daily mark-to-market of the live option position.**

In addition, please write a brief analysis of this investment strategy. What are the pros and cons? Would you recommend this strategy to clients? Why or why not? What are some metrics you would consider in evaluating this strategy?