Dear Candidate,

We would like you to complete a case study. This will help us asses your coding skills, see how you work on open ended problems, and give you a better understanding of the work you could expect to do at PrismFP.

Task 1

There are two csv files attached containing financial time series representing the price of two futures contracts, A and B, respectively. We would like you to write code that:

- Loads the data from the CVSs into memory
- Implements the following systematic trading strategy:
  - Buys or maintains a long position of size L>0 in futures A every time the price of futures B falls more than X standard deviations (calculated over the previous N days) in a day
  - Sells or maintains a short position of size S<0 in futures A every time the price of futures B rises more than Y standard deviations (calculated over the previous N days) in a day
  - Closes any position in futures A if neither of the above two conditions are met
  - The strategy pays costs of C x abs(size) each time it trades
- Produces a chart of cumulative profit and loss of the strategy over time
- Produces a chart of drawdown (absolute loss at time T / maximum achieved profit before T) over time
- Prints the annualised return, Sharpe ratio and max(drawdown) of the strategy where X, Y and N, L, S, C are user defined variables.

You are free to use any open-source libraries. You may assume that:

- The risk-free rate is zero
- You are allowed to take a short position on a futures contract (i.e., the net number of futures contracts of the same type in instantaneous possession may be negative)

The code you write should be modular and easily allow additional trading strategies to be analysed on different datasets. We recommend that you use object-oriented programming.

We are primarily interested in your coding approach here and not the profit or loss of the strategy.

Please see the next page for the second task.

Task 2

Now assume you are market-making, and you get paid for entering positions, but you do not get to choose when you trade.

Assume that at each timestep you are forcibly entered into a long position of size = S contracts with probability p1 and independently a short position of size S with probability p2 (you may simultaneously get entered long and short, in which case your final additional position is 0). In each of these transactions you get paid $M x S to be entered into the trades.

You must manage your risk – you are not allowed to have an open position larger than L.

You are free to employ any additional strategy you like to manage your risk, but any additional trading strategies would incur trading costs (per contract) of size $C. You may assume any risk management strategy can be employed immediately after market making activities, I.e., if S > L then you may (and must) close at least [S – L] contracts immediately.

Typically, C > M.

For what values of p1, p2, S, M, C, L would you expect to make money? Do these values change for different trading conditions? Do your conclusions change if p2 is dependent on p1? Can you think of a situation where you make money when M = 0, or even, M<0?

Good luck!