



Quantitative Trading

JULIEN KOCKELKOREN

Make an impact



Assignment 2

THE COST OF A LIMIT ORDER

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Instructions for the assignment

- ◆ The assignments are to be done in groups of 4 or 5 students.
- ◆ Each assignment should be uploaded in Blackboard as a Jupyter file
 - Due date: Jan 26.
- ◆ The Jupyter file should include the following (use Markdown):
 - Section “0” with information about your submission:
 - ◆ Line 1: QT Assignment n
 - ◆ Line 2: Group members: listed alphabetically by last name, where the last name is written in CAPITAL letters
 - ◆ Any comments/challenges about the assignment
 - Section “k” where $k = \{1, 2, \dots\}$.
 - ◆ First type Question k of Assignment n.
 - ◆ Then, below the question, provide your answer.
 - ◆ Your code should include any packages that need to be imported.



Questions

The goal of this exercise is to calculate the cost of a limit order in a highly simplified setting (see lecture 2). We will consider that the bid-ask spread is zero, that the price follows a discrete random walk and a limit order is executed if the price reaches the level at which the order was placed.

1. Generate 10,000 realizations of discrete random walks (increments $\{+1, -1\}$) of length $T=500$.
2. Consider a limit order placed at -10. What is the probability it will be hit?
3. If it is not hit, what is then the average price at the end of the period (i.e. at $t=500$)?
4. Calculate the cost of the limit order with the formula given in the lecture.
5. Repeat the calculation for submission prices $\{0, -1, \dots, -50\}$ and plot execution probability, end price if the order was not hit and cost.
6. Bonus questions: Consider now a mean-reverting random walk, i.e. each increment is slightly anti-correlated to the previous one. How does this change the cost of a limit order? What happens if the random walk is trending instead?



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