

Homework: efficient delta hedging with transaction costs

Objective: Suppose you are delta-hedging 1Y at-the-money call option on a stock you purchased at an implied volatility of 0.2 and you believe (rightly) the actual volatility is 0.23. Assume the initial stock price is 100 and interest rates/dividends are both zero. Simulate 10,000 paths with 1,000 steps for the underlying instrument in a Monte Carlo experiment and answer the following questions:

1. What is the expected value of your P/L and its standard deviation assuming portfolio rebalancing to net zero-delta occurs at every step (5 points)?
2. If each trade in the underlying stock costs 0.1%, which would be more efficient (5 points each):
 - (a) reducing the number of rehedgeings from 1,000 to 100 (equally spaced); or

- (b) reducing the number of rehedgings from 1,000 to 10 (equally spaced); or
- (c) adopting a trigger-based rehedging strategy whereby portfolio is rebalanced only if delta changes by 5 percentage points.

Base your judgment on the analysis of P/L distributions (histograms) and the associated expected values and standard deviations. The superior outcome is one which delivers highest expected P/L with lowest standard deviation.

Deadline: Prepare a report of 2-3 pages containing the most important results. Homework reports will be collected in hard copy on Jan 8 lecture. Neither late nor early submissions will be considered.