Algo 2e Written Report

**Introduction**

Herein I will provide my development process and edge provided in my implementation of a market making algorithm for the Algo 2e case. In summary, the details altered in this implementation are the securities traded, order prices, order volumes and cancellation process in accordance with observations made about the properties of the case. The aim of the algorithm is to price securities with both bid and ask prices in such a way that the orders consistently close and a profitable spread is realized.

**Altered Parameters**

* Traded Securities: Only AC
  + Found that AC by far had the most liquidity
  + AC had the largest spread
  + Lower commission
  + Generally most profitable
* Order Prices: Best Bid/Ask +/-$.10
  + Anon traders consistently ordered large markets orders
  + Ordered 500,000 shares at a time and cleared the top of either book
  + Poorer prices still transacted, and would maximize profit
  + No reason to offer at the bid or ask
* Order Size: 5000 shares
  + Maximized Volume Transacted
  + Maximized Profit as algo generated profit per share traded
* Cancellation Process
  + Ordered cancelled is not filled after 0.25 seconds
  + Open volume tracked to try and avoid fines
  + Open orders cancelled individually, instead of security wide
  + Minimized Fines

**Initial Testing Data**

|  |  |  |
| --- | --- | --- |
| Security | P/L | Volume |
| CNR | 643.20 | 59,400 |
| ALG | 1205.94 | 77,400 |
| AC | 17710.61 | 964,000 |
| Total | 19559 |  |
| Net | Fines Gross Limit | Fine Net Limit |
| -1670.25 | 15,960 | 5,270 |

|  |  |  |
| --- | --- | --- |
| Security | P/L | Volume |
| CNR | 0 | 0 |
| ALG | 0 | 0 |
| AC | 82,568 | 837,600 |
| Total | 19559 |  |
| Net P/L | Fines Gross Limit | Fine Net Limit |
| 68,368.68 | 0 | 7,100 |

*Figure 1: Trading Data from Sample Run*

*Figure 2: Trading Data from Improved Algorithm*

Data from figure 1 was common when trading was done on all three securities, with liquidity too low and commissions too high on CNR and ALG, leaving far better results when AC was the only security traded. Additionally, difficulty managing limits emerged when all three securities and their open orders had to be tracked and monitored in order to avoid fines. Spread size was consistently higher on only AC, meaning dedicating order volume to smaller spread securities sacrificed potential profits trading on AC. The size of automated market orders from bots also cleared out a significant portion of the top of the book, leading to order far off the best bid or ask to consistently close. The algorithm was realizing lots of spread profit, but the position management system was not functioning resulting in many fines

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Run | P/L Net | Gross | Fines | Spread Size | Volume |
| 1 | -10,673 | 5,760 | 16,300 | +/- 0.01 | 326,000 |
| 2 | -10,357 | 21,648 | 31,500 | +/- 0.05 | 1,196,000 |
| 3 | -55,610 | 38,960 | 94,570 | +/- 0.05 | 3,748,174 |

After these runs a more robust position management system was implemented which tracked not only the position, but the volume of open orders on the books in order to ensure fines are minimized.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Run | P/L Net | Gross | Fines | Spread Size | Volume |
| 4 | 13,318 | 25,713 | 13,400 | +/- 0.05 | 852,000 |
| 5 | 35,635 | 42,635 | 7,000 | +/- 0.10 | 859,000 |
| 6 | 28,371 | 42,951 | 14,480 | +/- 0.10 | 1,082,600 |

The new order management system was not infallible, but certainly limited the fines compared to previous runs, keeping them to a much smaller amount. This in turn limited the volume traded but it seemed at this point more volume could not be achieved without venturing into the realm of more fines. Additionally, the listed spread was increased as orders were still consistently closing despite the worse prices. These increased the gross profits yet there were still fines.

**Edge**

Versus the market this strategy did not work too well as there was simply not enough trials in a live trading environment to ascertain the proper data and optimize parameters, so it would have been a game of getting lucky and guessing. In the bot heaving testing environment, this strategy worked fairly well but saw a large drop in traded volume as human traders became involved. Aspects of the strategy were still effective in both environments, such as the less-than-best pricing strategy and fine mitigation efforts, yet these were not entirely effective and could use more improvement. If more opportunity to test is more is attained, optimizing the algorithmic parameters and perfecting the position limiter to balance volume and fines while also reducing down times in order to place more orders, attain more volume and make more money.