Group C Answers

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(b)

Because the Monte Carlo is a simulation, we cannot get the exact same answer as the exact solution. As shown in the four screenshots below, we can see that by increasing NT (time steps) to around 500, and increasing NSIM (simulations or draws) can simulate prices continue to asymptotically approach the exact price. However, there is no guarantee that larger NT (time steps) and NSIM will output better results. Sometimes the accuracy goes down as NT (time steps) or NSIM goes up. So, we can also observe that there is not necessarily a linear relationship between NT/NSIM and error (accuracy) for Monte Carlo.

Time to expiry can be a factor. Since, the longer the time to expiry, the higher NT/NSIM will be in order to achieve a relatively equivalent measure of accuracy. This pattern is evident in the data shown below. Batch 1 has T = 0.25, whereas in Batch 2, T = 1.0.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | NT | NSIM | Call | Put |
| Batch 1 | 100 | 10, 000 | 2.1378 | 5.90807 |
| 100 | 100, 000 | 2.13043 | 5.87321 |
| 100 | 1,000, 000 | 2.13271 | 5.85125 |
| 500 | 10, 000 | 2.12704 | 5.93754 |
| 500 | 100, 000 | 2.14863 | 5.83818 |
| 500 | 1,000, 000 | 2.13249 | 5.84333 |
| Batch 2 | 100 | 10, 000 | 7.94097 | 8.06336 |
| 100 | 100, 000 | 7.94362 | 8.0079 |
| 100 | 1,000, 000 | 7.9625 | 7.97439 |
| 500 | 10, 000 | 7.93258 | 8.13742 |
| 500 | 100, 000 | 8.01256 | 7.95795 |
| 500 | 1,000, 000 | 7.96142 | 7.95663 |

(c)

It seems to be more difficulty to get the accuracy than batch 1 and batch 2. The closed solution for call is 92.1757, pull is 1.2475. Based on below table, the 2 accuracy place didn’t be gotten. The closest is NT = 500 and NSIM=1000000. And based on the result, increasing NT will make more effect on the accuracy than NSIM.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | NT | NSIM | Call | Put |
| Batch 4 | 100 | 10, 000 | 87.7119 | 1.31043 |
| 100 | 100, 000 | 90.1399 | 1.29849 |
| 100 | 1,000,000 | 89.5241 | 1.29275 |
| 500 | 10, 000 | 91.1309 | 1.30124 |
| 500 | 100, 000 | 93.4061 | 1.25552 |
| 500 | 1,000,000 | 91.845 | 1.25428 |