**======HW 9.C Report======**

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b) Simulated price for different NT/NSIM

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Batch 1 | NT | NSIM | Simulated Put | Relative Err | Simulated Call | Relative Err |
| 100 | 10000 | 5.90807 | 1.06% | 2.1378 | 0.21% |
| 100 | 100000 | 5.87321 | 0.46% | 2.13043 | 0.14% |
| 100 | 1000000 | 5.85125 | 0.08% | 2.13271 | 0.03% |
| 300 | 10000 | 5.98696 | 2.41% | 2.10303 | 1.42% |
| 300 | 100000 | 5.85221 | 0.10% | 2.168 | 1.63% |
| 300 | 1000000 | 5.85369 | 0.12% | 2.11876 | 0.32% |
| 600 | 10000 | 5.97616 | 2.22% | 2.14295 | 0.50% |
| 600 | 100000 | 5.85448 | 0.14% | 2.14173 | 0.39% |
| 600 | 1000000 | 5.84197 | 0.07% | 2.13166 | 0.08% |

**(Batch 1: The exact Put Price is 5.84628, The exact Call Price is 2.13337)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Batch 2 | NT | NSIM | Simulated Put | Relative Err | Simulated Call | Relative Err |
| 100 | 10000 | 8.06336 | 1.23% | 7.94097 | 0.31% |
| 100 | 100000 | 8.0079 | 0.53% | 7.94362 | 0.27% |
| 100 | 1000000 | 7.97439 | 0.11% | 7.9625 | 0.04% |
| 300 | 10000 | 8.19128 | 2.83% | 7.82149 | 1.81% |
| 300 | 100000 | 7.99066 | 0.32% | 8.05391 | 1.11% |
| 300 | 1000000 | 7.98455 | 0.24% | 7.95239 | 0.27% |
| 600 | 10000 | 8.18155 | 2.71% | 7.9311 | 0.43% |
| 600 | 100000 | 7.98522 | 0.24% | 7.98808 | 0.28% |
| 600 | 1000000 | 7.9605 | 0.06% | 7.97312 | 0.09% |

**(Batch 2: The exact Put price is 7.96557, The exact Call Price is 7.96557)**

**Conclusion: We can see that the relative error decrease while NT and NSIM increases. The accuracy increases while NT and NSIM increases. When setting NT to 600 and NSIM to 1000000, we can achieve with accuracy above 99.9% on both batches’ put and call price. Another observation is when NSIM is small, lower NT can achieve higher accuracy than higher NT. However, when NSIM is large, higher NT can achieve higher accuracy than lower NT.**

c) Stress test for MC

**(Batch 4: The exact Put Price is 1.24750, The exact Call Price is 92.17570)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Batch 4 | NT | NSIM | Simulated Put | Relative Err | Simulated Call | Relative Err |
| 100 | 100000 | 1.29604 | 3.29% | 89.4248 | 2.98% |
| 100 | 1000000 | 1.29275 | 3.63% | 89.5241 | 2.88% |
| 600 | 100000 | 1.26075 | 1.06% | 92.1948 | 0.02% |
| 600 | 1000000 | 1.25442 | 0.55% | 91.5996 | 0.63% |

**We find the performance in this test is less stable than the performance in the previous test. However, we can still observe general trends that accuracy improves while NT and NSIM increases. The best accuracy we achieved for Put Price is 99.45% with NT=600 and NSIM=1000000 and for Call Price is 99.98% with NT=600 and NSIM=100000.**