C++ Level 9 Group D

bondxue

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Problem b. The simulation results are shown as follows.

Table 1: SD and SE of Batch 1 Call option

NT	NSIM	SD	SE
100	100000	4.53	0.0143251
200	100000	4.5854	0.0145003
500	100000	4.55679	0.0144098
500	500000	4.51861	0.00639038
500	1000000	4.51633	0.00451633

Table 2: SD and SE of Batch 1 Put option

NT	NSIM	SD	SE
100	100000	6.07197	0.0192013
500	100000	6.04876	0.0191279
500	500000	6.05295	0.00856017
500	1000000	6.04807	0.00604807

Table 3: SD and SE of Batch 2 Call option

NT	NSIM	SD	SE
100	100000	13.183	0.0416881
500	100000	13.2419	0.0418746
500	500000	13.1544	0.0186031
500	1000000	13.1506	0.0131506

Table 4: SD and SE of Batch 2 Put option

NT	NSIM	SD	SE
100	100000	10.4598	0.0330769
500	100000	10.4072	0.0329104
500	500000	10.4213	0.014738
500	1000000	10.4074	0.0104074

As we can see that SD is stable around a certain number no matter how large we increase NT and $NSIM$.It make sense since all the prices are generated by stock paths which in turn are generated by normal random variable follows N(0,1). They are not going to be too far from each other. Even if there are some extreme cases happen, the results will average out as $NSIM$ going to infinity.

For SE, we can see that it will not decease when we increase NT. However, when we increase $NSIM$, SE will decrease and approach to 0. This performance is easily to explain by the formula

$$SE = \frac{SD}{\sqrt{NSIM}} .$$

Since we already show that SD will be stable around a certain number, we can that SE is inversely related to $NSIM$.