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

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b) Simulated price for different NT/NSIM

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

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

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%

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.