MA374 – Financial Engineering II

LAB 01 Report

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Question 1

Observation –

1. The value of call option and put option starts to converge to a specific value as the number of subintervals i.e. M increases.
2. The value of call price is always greater than the put price which is obvious from the put call parity formula also.

The largest value of M –

1. In terms of computational time limit depending on the implementation M should have a max value of 5e4 or 1e9 because if we take M more than that then the calculations will take much more time. The numbers depend on the system on which code is run.
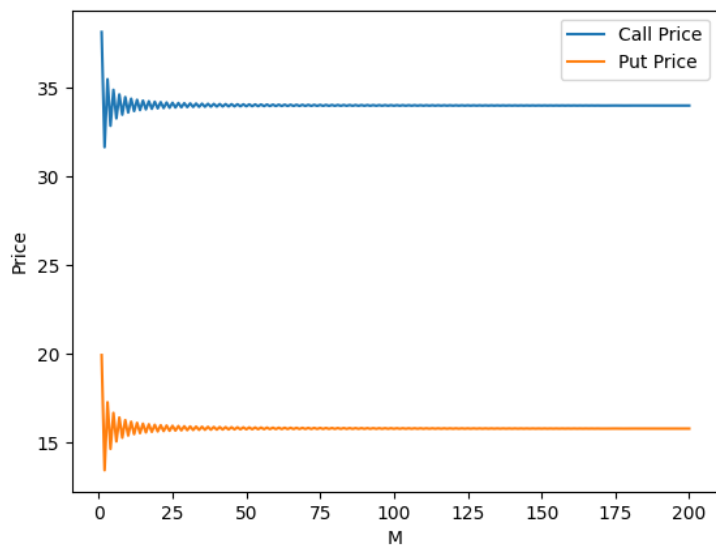
2. In terms of computer error, the max value is around 1e30, after this the u = d because of error, causing the value of p* to undefined.
3. In terms of mathematics, the value can be as large as we want.
4. But having M = 1000 or 10000 is good enough because at this point the option price has negligible error.

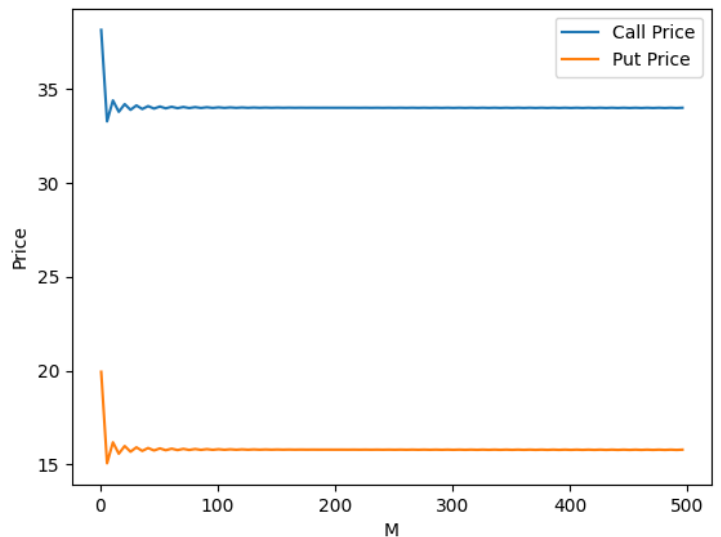## *Question 2*

Graphs –

Steps = 1

Steps= 5

Observation –

1. The price oscillates around the true value for lesser values of M.
2. Once M is more than 100 there is no visible change in the graphs, it has converged.

Tables –

Option prices at time 0:

S.no	Call Price	Put Price
1	33.8594	15.6335

Option prices at time 0.5:

S.no	Call Price	Put Price
1	15.0959	24.6728
2	31.8933	15.4871
3	59.9588	8.4792

Option prices at time 1:

S.no	Call Price	Put Price
1	5.15483	35.9653
2	13.4697	24.9833
3	29.804	15.2694
4	57.7	8.00422
5	100.663	3.50417

Option prices at time 3:

S.no	Call Price	Put Price
1	0	78.2282
2	0	72.3577
3	0	64.4333
4	0.11833	53.8548
5	1.23597	40.5333
6	6.14852	25.955
7	19.7252	13.2218
8	46.9762	4.95819
9	91.1934	1.2357
10	154.842	0.172103
11	242.03	0.00870528
12	359.934	0
13	519.1	0

Option prices at time 1.5:

S.no	Call Price	Put Price
1	1.125	48.305
2	4.1214	36.9701
3	11.7675	25.271
4	27.5732	14.9634
5	55.2954	7.43626
6	98.4389	2.99825
7	160.611	0.942427

Option prices at time 4.5:

S.no	Call Price	Put Price
1	0	95.5341
2	0	93.1293
3	0	89.8832
4	0	85.5015
5	0	79.5868
6	0	71.6028
7	0	60.8254
8	0	46.2776
9	0	26.64
10	8.14917	8.28121
11	36.2515	0.601546
12	83.9506	0
13	149.15	0
14	237.159	0
15	355.959	0
16	516.323	0
17	732.792	0
18	1024.99	0
19	1419.42	0

Observation – At time t the number of unique values of option is int(t/delta_t).