LAB 1- REPORT

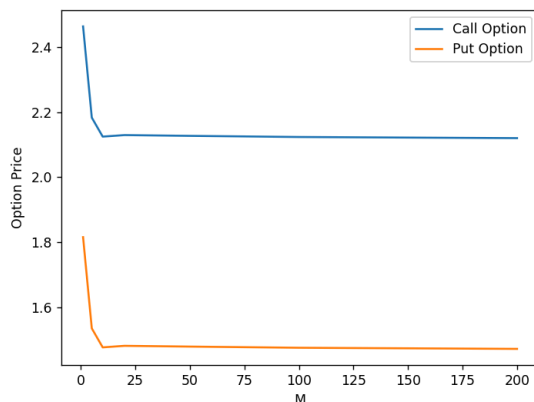**RAMINENI HARDHIKA**
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Q1) The initial option prices for the European Call and Put Options are:

M	Call Price	Put Price
1	2.4634	1.8161
5	2.1832	1.5359
10	2.1248	1.4775
20	2.1296	1.4823
50	2.1272	1.4799
100	2.1237	1.4764
200	2.1202	1.4729

- In order for no arbitrage to exist, following relation must exist: d < R < u where, R = e^r.δt

At t=T the option prices are calculated as follows:

```
C = np.maximum(ST - K, 0)
P = np.maximum(K - ST, 0)
```

Cn (M)is the nth possible price of the call option for the Mth interval, and Pn (M) is the nth possible price of the put option for the Mth interval.
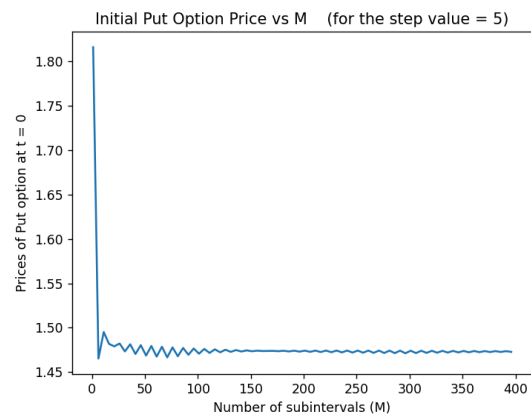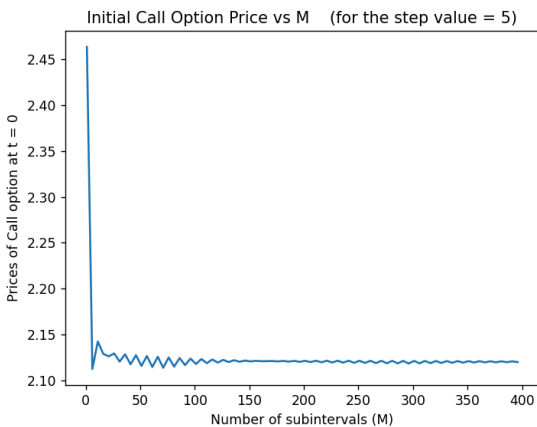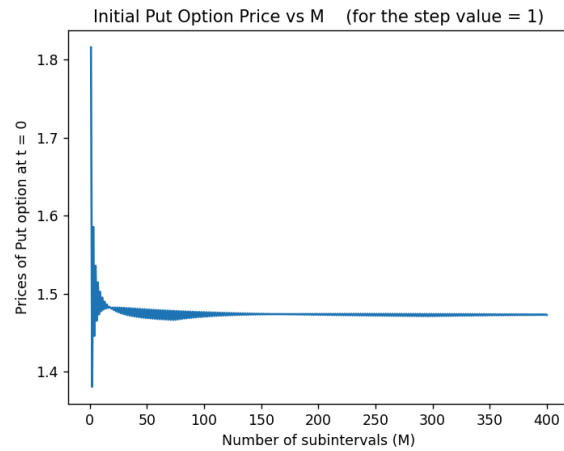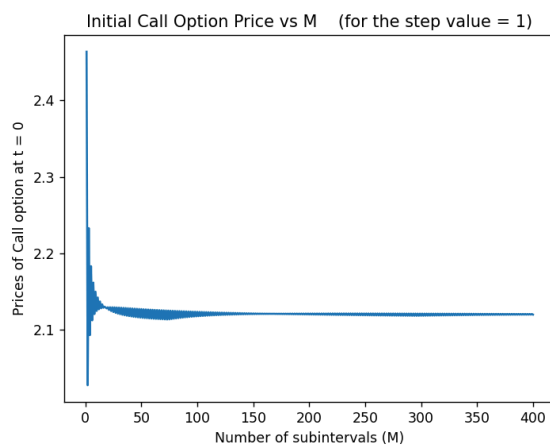- Using the following relations we can find the required option prices.

Cn(i) = (1 − p) . Cn+1(i+1) + p . Cn(i+1) , 0 <= n <= i & 0 <= i <= M - 1
Pn(i) = (1 − p) . Cn+1(i+1) + p . Pn (i+1) , 0 <= n <= i & 0 <= i <= M - 1

C0 (0) and P0 (0) are the initial option prices.

Q2)

Based on all of the plots, we can see that the starting price of the Call and Put options converges to approximately 2.12 and 1.47 respectively.
When the step value is 5, the plot converges more quickly. The variations from the
When M is smaller, the convergence value is higher. We can observe that the convergence of the values is fast enough as not too many iterations are required to approximately attain the converged value.

Q3)t = 0
Call Option   Put Option
2.13   1.48

t = 0.3

Call Option	Put Option
3.72	0.82
2.00	1.46
0.95	2.29

t = 0.75

Call Option	Put Option
7.74	0.21
4.68	0.51
2.54	1.06
1.21	1.84
0.49	2.80
0.16	3.81

t = 1.5

Call Option	Put Option
20.28	0.00
14.19	0.01
9.39	0.05
5.72	0.21
3.07	0.60
1.39	1.32
0.49	2.34
0.13	3.48
0.02	4.58
0.00	5.51
0.00	6.26

t = 2.7

Call Option	Put Option
66.06	0.00
50.32	0.00
37.85	0.00
27.97	0.00
20.13	0.00
13.92	0.00
9.00	0.00
5.10	0.00
2.15	0.14
0.46	0.91
0.00	2.39
0.00	3.93

0.00	5.15
0.00	6.12
0.00	6.89
0.00	7.50
0.00	7.98
0.00	8.36
0.00	8.66