Name: **Lalhriemsang Faihriem** RollNo.: **210123036**

Lab-3

1)

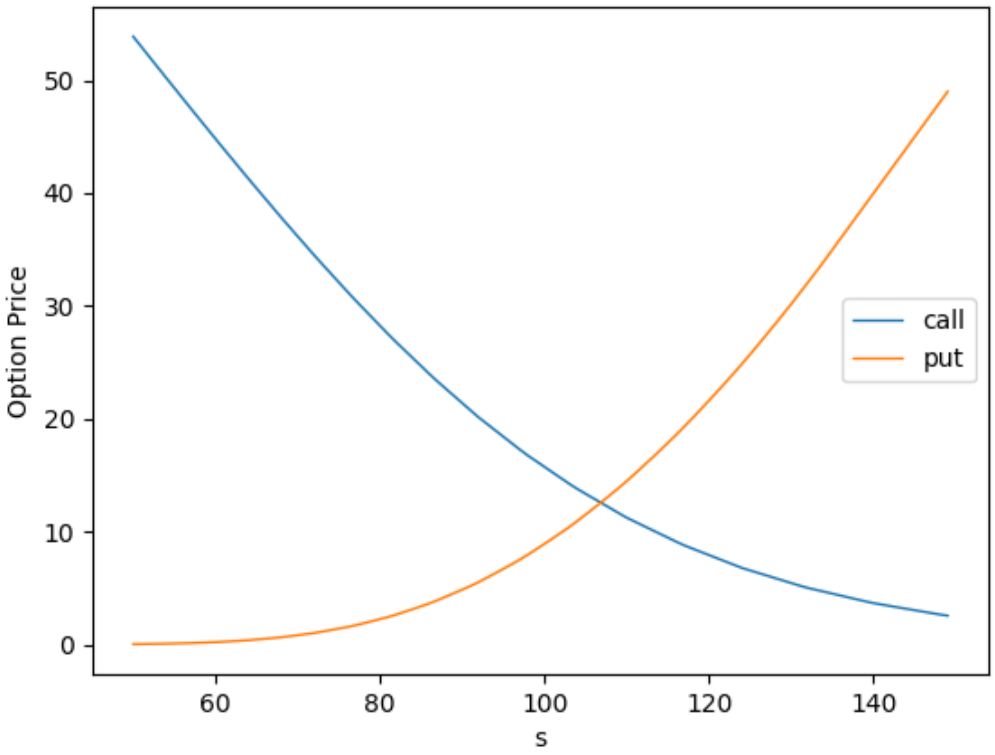
M = 100

Call Price: 15.73677862618573 **Put Price**: 8.923113287677717

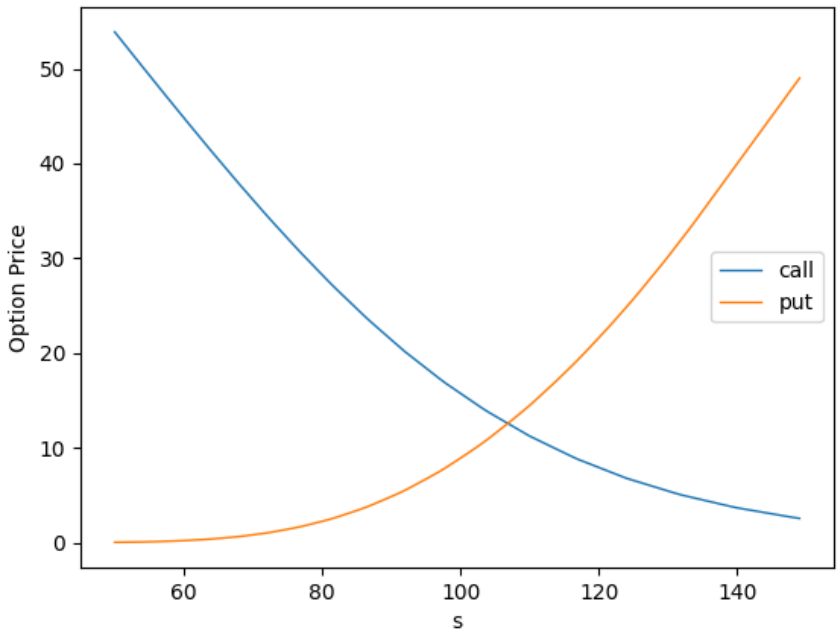
a)

S0

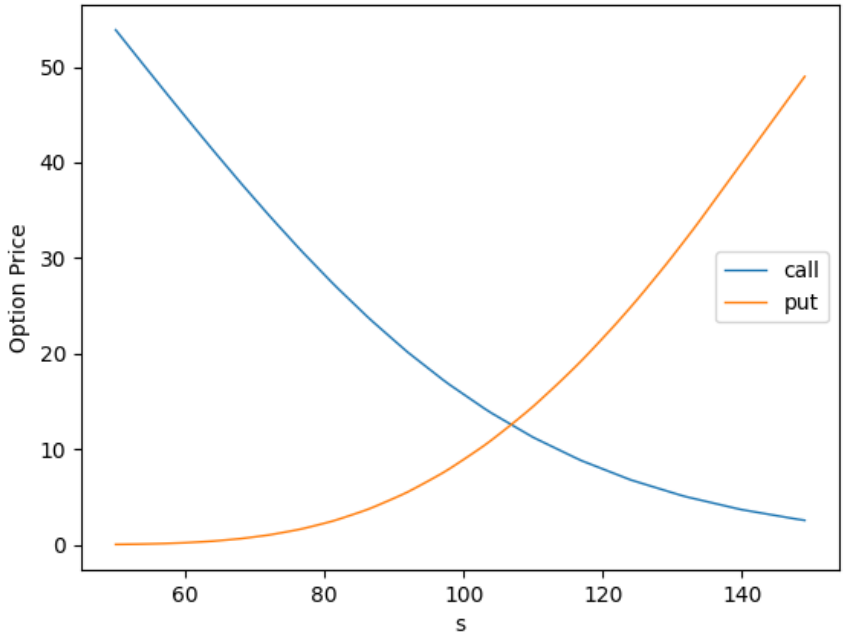
K=95



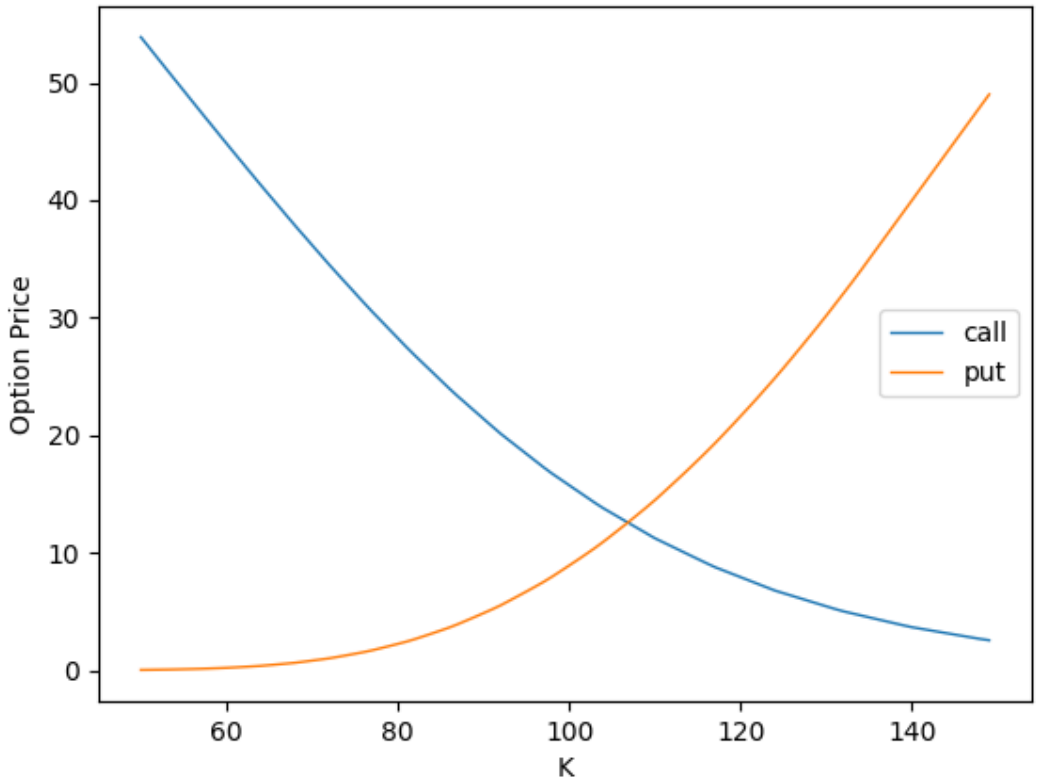
K = 100


Option Price
50
40
30
20
10
0
60
80
100
120
140
s
call
put

K=105

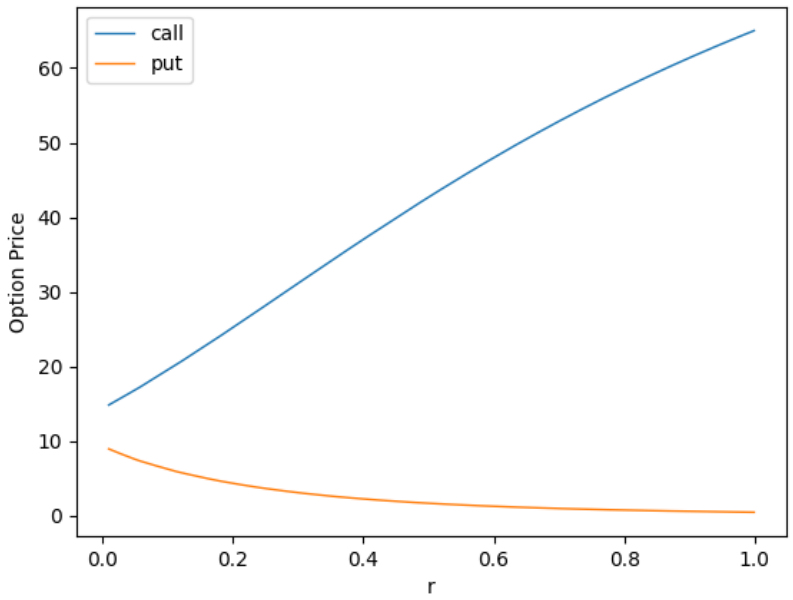

Option Price
50
40
30
20
10
0
60
80
100
120
140
s
call
put

b) K varies for option price vs K

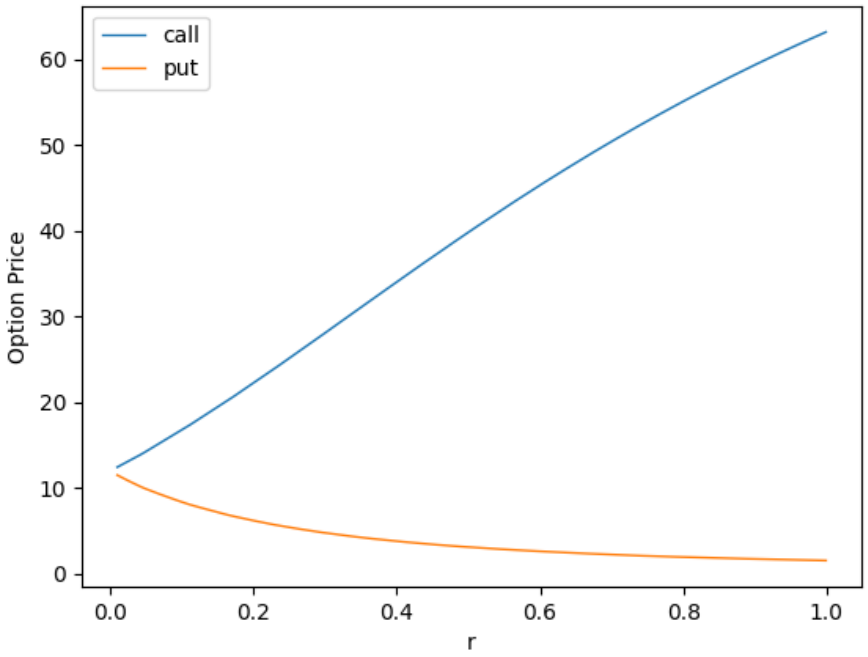


c) r

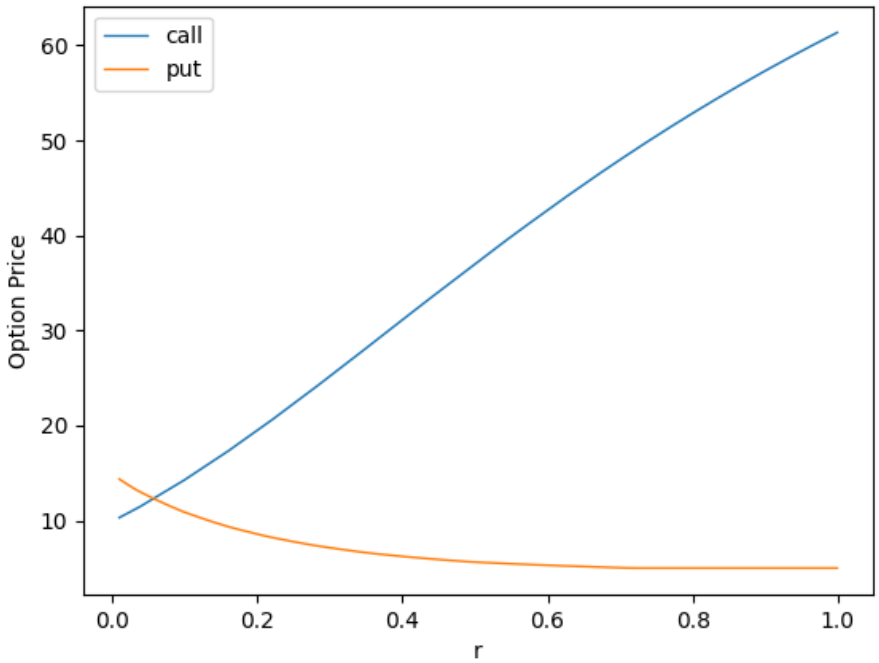
K=95



K=100

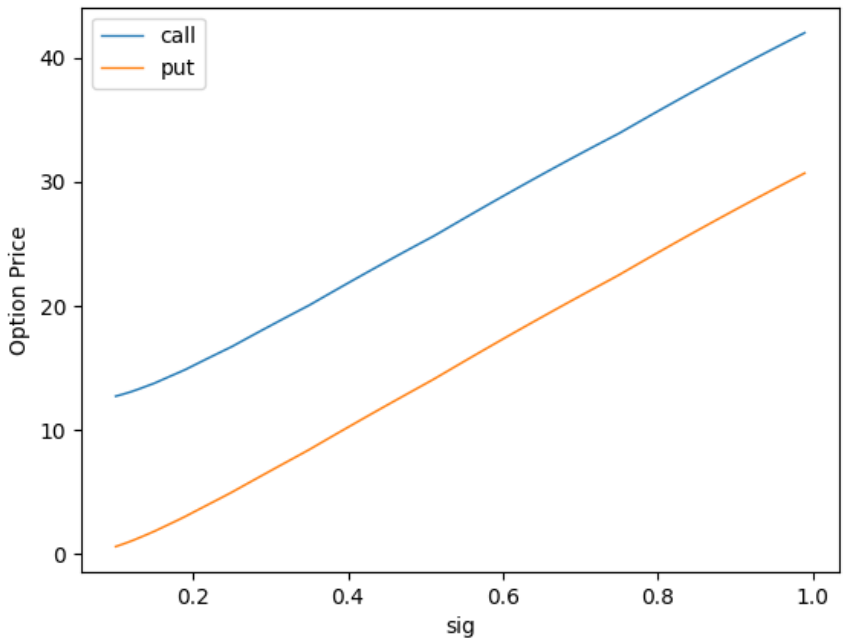

call
put
Option Price
r
0
10
20
30
40
50
60
0.0
0.2
0.4
0.6
0.8
1.0

K=105

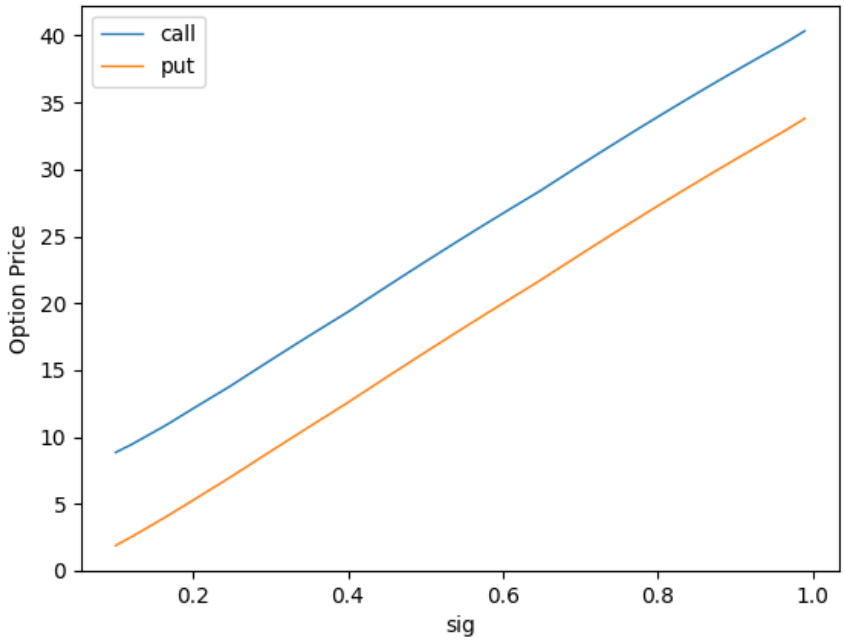

call
put
Option Price
r
10
20
30
40
50
60
0.0
0.2
0.4
0.6
0.8
1.0

d) Sigma

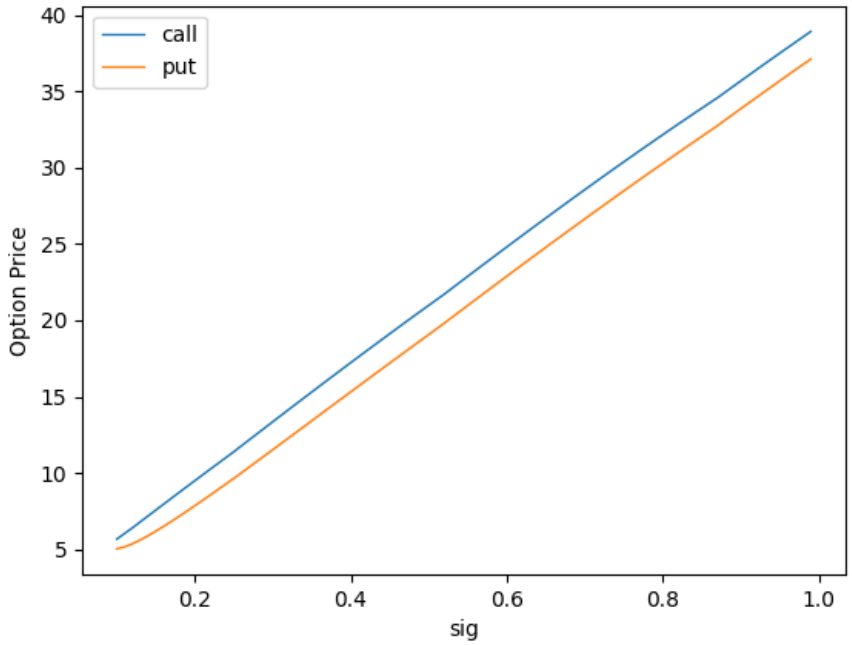
K=95



K=100

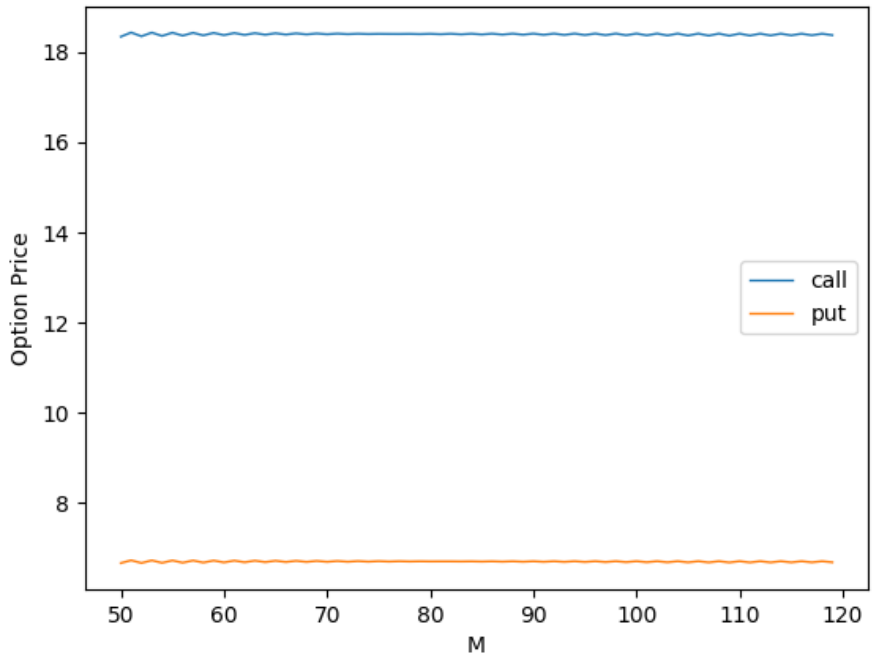


K=105

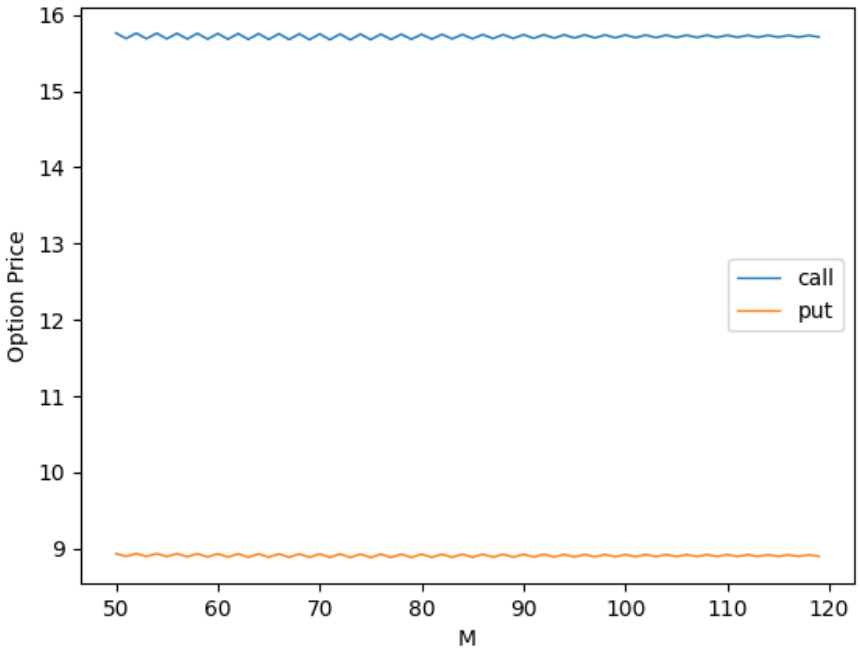

call
put
Option Price
sig
40
35
30
25
20
15
10
5
0.2
0.4
0.6
0.8
1.0

e)

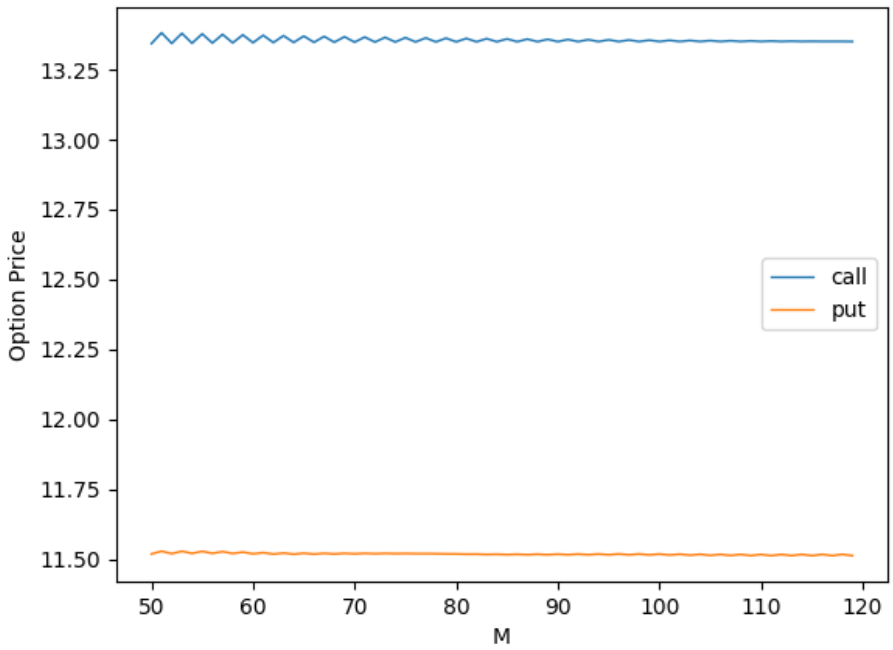
K=95


call
put
Option Price
M
18
16
14
12
10
8
50
60
70
80
90
100
110
120

K=100


16
15
14
13
12
11
10
9
Option Price
call
put
50
60
70
80
90
100
110
120
M

K=105


13.25
13.00
12.75
12.50
12.25
12.00
11.75
11.50
Option Price
call
put
50
60
70
80
90
100
110
120
M

2.

a)

M=5

Option Price: 15.372952215663785

M=10

Option Price: 16.950340491777677

M=25

Option Price: 18.53378150009417

M=50

Infeasible to calculate.

b)

Option price is increasing as M increases, the reason that maximum stock price grows as M increases.

c)

t=0 : [15.372952215663785]

t=0.2 :

[15.532131468492961,15.709699760878115]

t=0.4 :

[15.199750099616733, 16.365773501799982, 11.622592457585522, 20.305310141288484]

t=0.6 :

[13.386169289151377, 17.504464673898433, 10.235825536366997, 23.026215406441327, 10.235825536367, 13.384908157013324, 12.702323203700724, 28.566489442465265]

t=0.8 :

[10.332480622856941, 16.872978416162187, 7.900801695311675, 27.67676028588705, 7.900801695311675, 12.902037888217313, 12.103285439254643, 34.696462804744556, 7.900801695311675, 12.90203788821732, 6.0414018382528445, 21.163223292550345, 6.0414018382528445, 19.775755431345573, 19.77575543134555, 38.28243217635734]

t=1 :

[0.0, 21.002491662264447, 0.0, 34.29714522948986, 0.0, 16.05969832296735, 14.189941164644068, 42.06197481701972, 0.0, 16.05969832296735, 0.0, 26.225545739139193, 0.0, 24.601948051238253, 24.601948051238267, 45.914488453717624, 0.0, 16.05969832296735, 0.0, 26.225545739139207, 0.0, 12.280157724719814, 10.850435176426544, 32.162975578905915, 0.0, 12.280157724719814, 9.440589282577335, 30.75312968505669, 9.440589282577307, 30.753129685056678, 30.753129685056678, 47.04990888934698]

3)

M	Brute Force(time in secs)	Optimized(time in secs)
5	0.0009992122650146484	0.0
10	0.0014739036560058594	0.0
25	72.03921818733215	0.05056238174438476 6
50	Infeasible	1.3953382968902588
M	Look-back Call Price	Look-back Call Price
5	15.372952215663785	15.372952215663787
10	16.950340491777677	16.95034049177768
25	18.53378150009417	18.53378150009417
50	Infeasible	19.390465235522427

For the unoptimized algorithm, for M=25, it takes more than a 72 secs and it can't handle M larger or equal to 50

For the optimized algorithm it can handle M=50 and takes 38.80 secs to evaluate for M=100 hence the optimized algorithm can handle larger values of M but that too with increasing execution time.

4)

M	Brute Force(time in secs)	Optimized(time in secs)
5	0.0	0.0
10	0.0	0.0
25	58.10744571685791	0.0
50	Infeasible	0.0029993057250976562
M	European Call Price	European Call Price
5	16.200135785709474	16.200135785709477
10	15.749706920472518	15.749706920472518
25	15.746918255600486	15.746918255600464
50	Infeasible	15.761196879829424

As similar to the previous problem, the unoptimized algorithm cannot handle M larger or equal to 50 as for the optimized algorithm

it can handle larger values of M but with increasing time for execution.