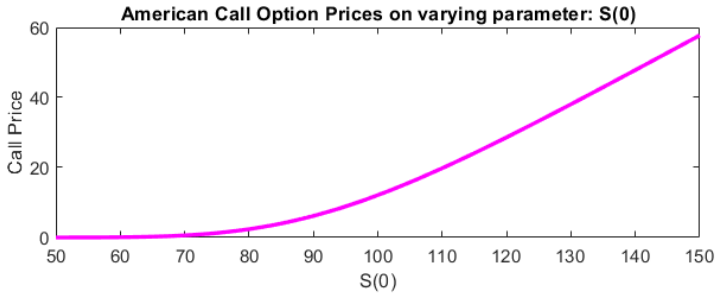
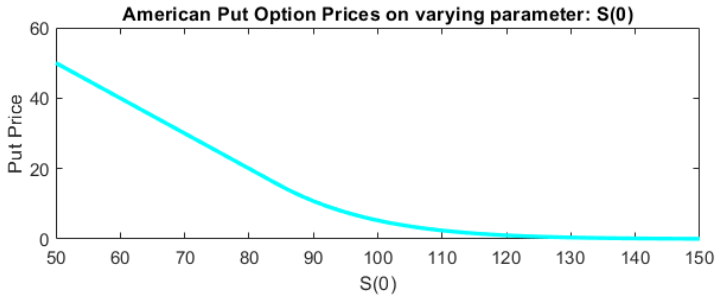
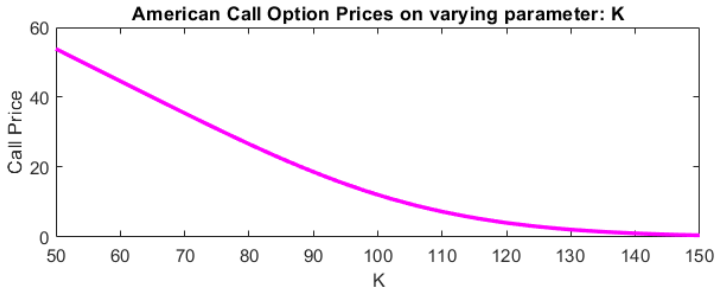
LAB 3

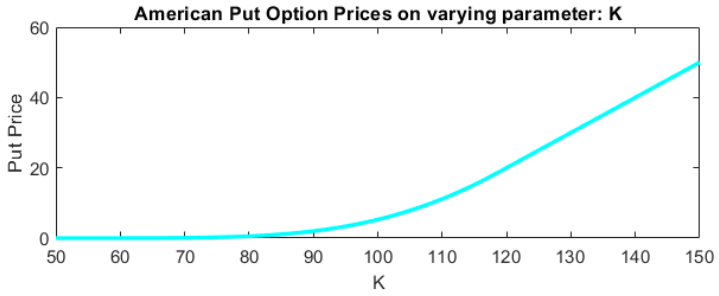
1)

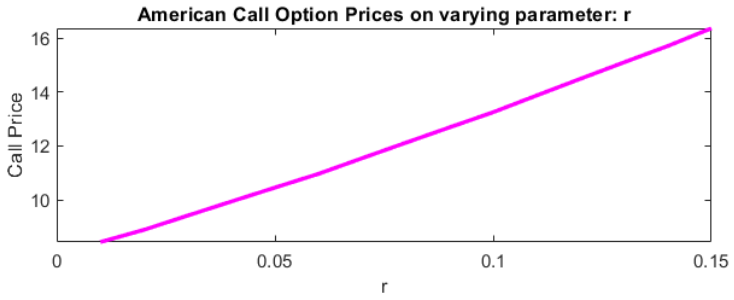
Initial call price: 12.122863
Initial put price: 5.279898

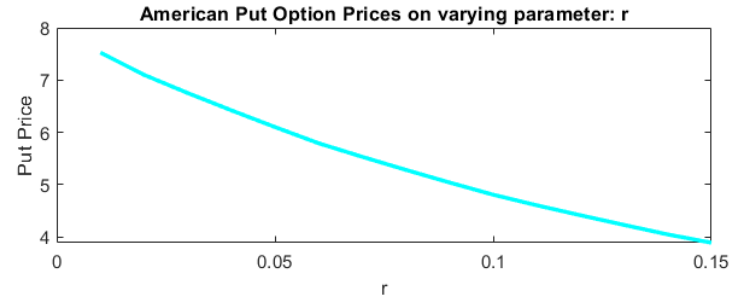


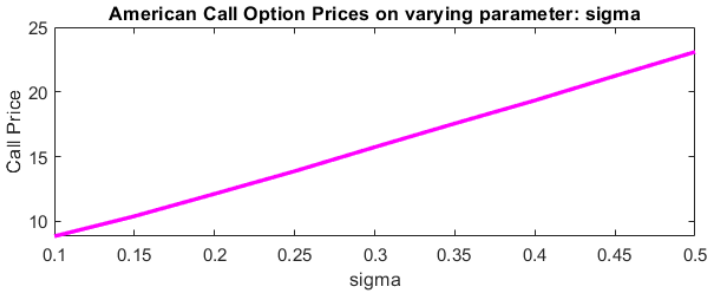


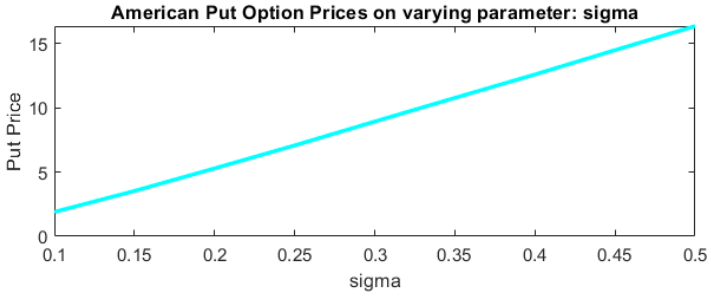


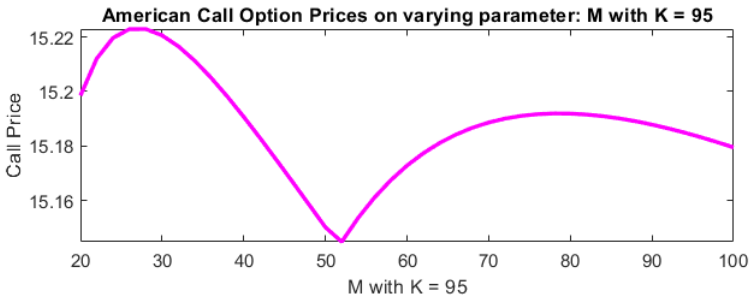


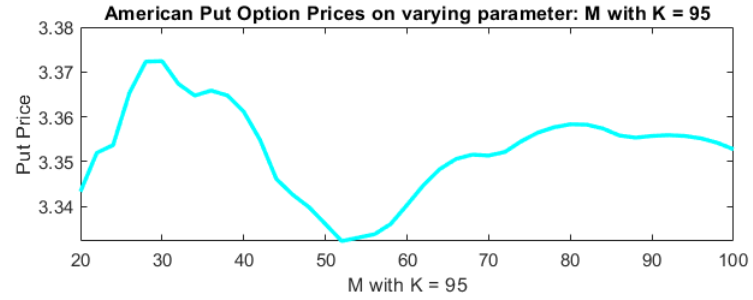

American Call Option Prices on varying parameter: r
Call Price
16
14
12
10
0
0.05
0.1
0.15
r

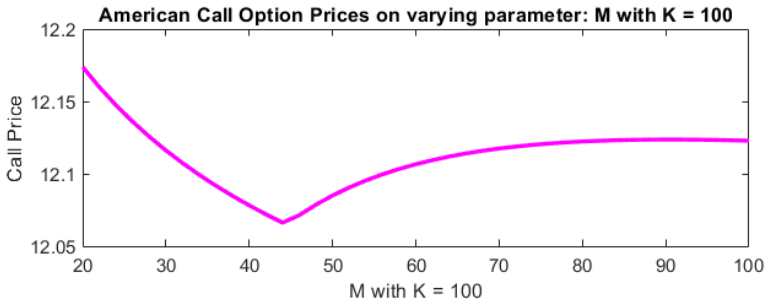

American Put Option Prices on varying parameter: r
Put Price
8
7
6
5
4
0
0.05
0.1
0.15
r

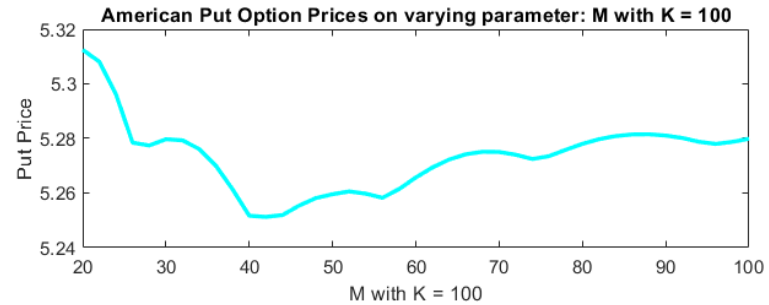

American Call Option Prices on varying parameter: sigma
Call Price
25
20
15
10
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
0.5
sigma

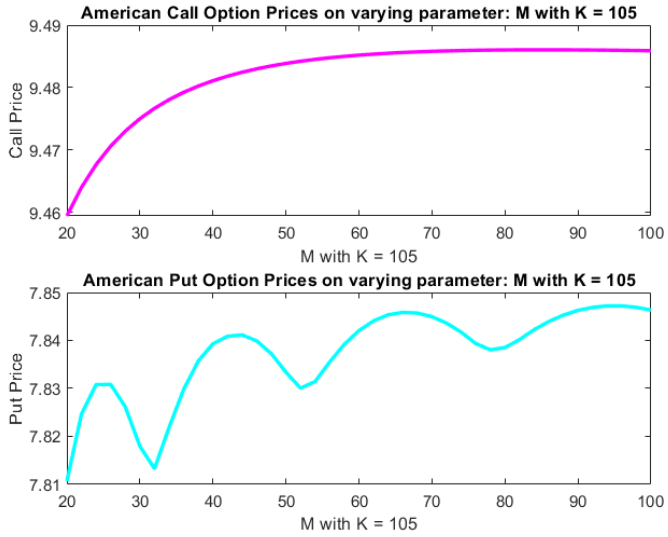

American Put Option Prices on varying parameter: sigma
Put Price
15
10
5
0
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
0.5
sigma


American Call Option Prices on varying parameter: M with K = 95
Call Price
15.22
15.2
15.18
15.16
20
30
40
50
60
70
80
90
100
M with K = 95


American Put Option Prices on varying parameter: M with K = 95
Put Price
3.38
3.37
3.36
3.35
3.34
20
30
40
50
60
70
80
90
100
M with K = 95


American Call Option Prices on varying parameter: M with K = 100
Call Price
12.2
12.15
12.1
12.05
20
30
40
50
60
70
80
90
100
M with K = 100

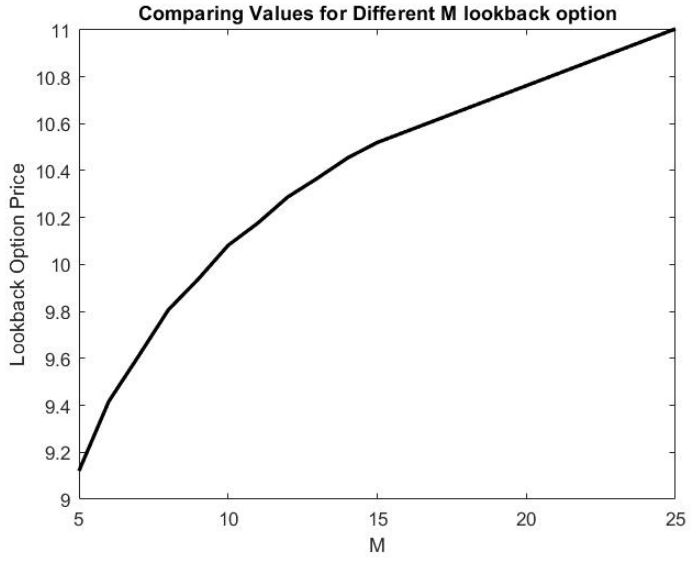

American Put Option Prices on varying parameter: M with K = 100
Put Price
5.32
5.3
5.28
5.26
5.24
20
30
40
50
60
70
80
90
100
M with K = 100



2)a)

M	Lookback Option Price
5	9.12104
10	10.08145
25	11.00384

b)While comparing the following trend was observed:



c)Intermediate values from t=1 to t=0 is given as:

for time t = 1.000000

0.000 11.181 0.000 19.453 0.000 9.350 6.375 25.395 0.000 9.350 0.000 16.266 0.000 13.578 13.578 29.483 0.000 9.350 0.000 16.266 0.000 7.818 5.330 21.235 0.000 7.818 2.901 18.806 2.901 18.806 18.806 32.105

for time t = 0.800000
5.502 9.573 4.601 15.633 4.601 8.005 6.682 21.189 4.601 8.005 3.847 13.072 3.847 10.682 10.682 25.052

for time t = 0.600000
7.418 9.957 6.203 13.715 6.203 8.326 7.150 17.584

for time t = 0.400000
8.550 9.801 7.149 12.171

for time t = 0.200000
9.030 9.507

for time t = 0
9.121

3)

Using markov method for lookback option:
Initial Prices:

M = 5 : 9.11932
M = 10 : 9.9182
M = 15 : 8.81952
M = 20 : 10.2277
M = 25 : 9.7276
M = 50 : 8.35007

Computation Time: 0.22196sec

Using non-markov method for lookback option:
Initial Prices:

M = 5 : 9.121042
M = 10 : 10.081453
M = 15 : 10.519742
M = 20 : 10.805551
M = 25 : 11.003840

Computation Time: 1.519331 sec

From the above observation it is clear that markov method is superior to non-markov method both in terms of time and space complexity. The non-markov method gives memory bound error for calculating price for M=50. In fact, it cannot handle value more than M=25.

4)

Using Markov method for American Option: Initial prices: M = 5 call: 12.159487 put: 5.331739 M = 10 call: 12.275494 put: 5.336744 M = 15 call: 12.050776 put: 5.210123 M = 20 call: 12.173788 put: 5.312502 M = 25 call: 12.136010 put: 5.265085 M = 50 call: 12.084993 put: 5.259564 Elapsed time is 0.033269 seconds.	Using non-Markov method for American Option: Initial prices: M = 5 call: 12.159487 put: 5.331739 M = 10 call: 12.275494 put: 5.336744 M = 15 call: 12.050776 put: 5.210123 M = 20 call: 12.173788 put: 5.312502 M = 25 call: 12.136010 put: 5.265085 M=50 -→ memory error Elapsed time is 1.605226 seconds.

From the above observation it is clear that markov method is superior to non-markov method both in terms of time and space complexity. The non-markov method gives memory bound error for calculating price for M=50. In fact, it cannot handle value more than M=25.