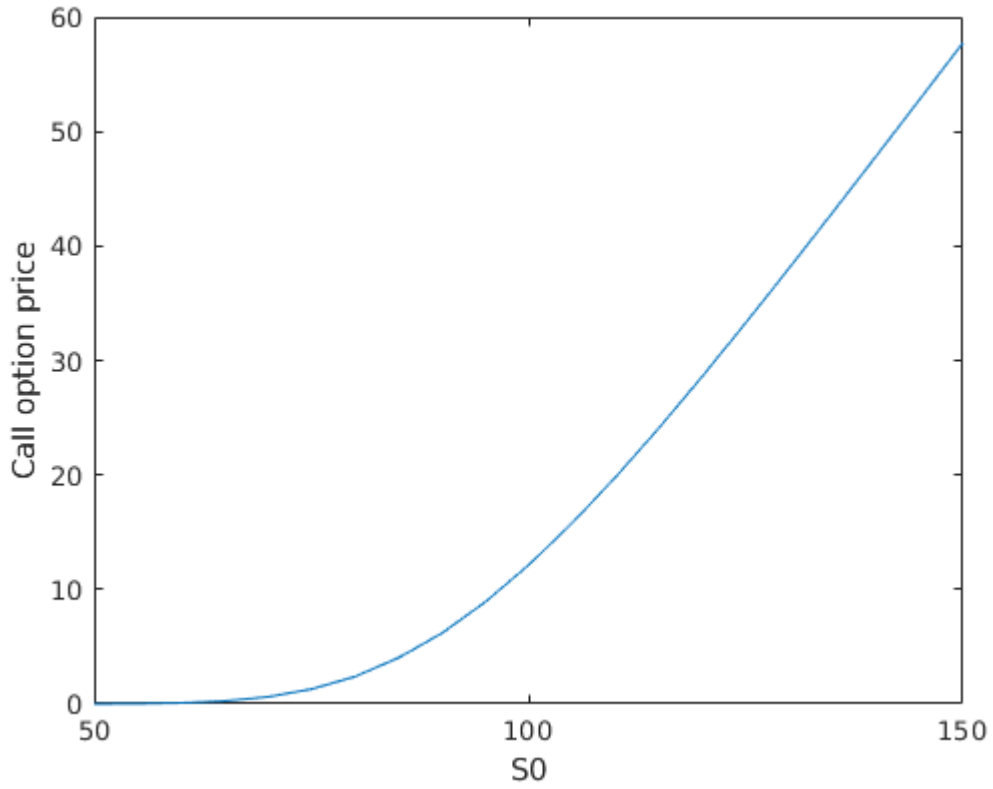
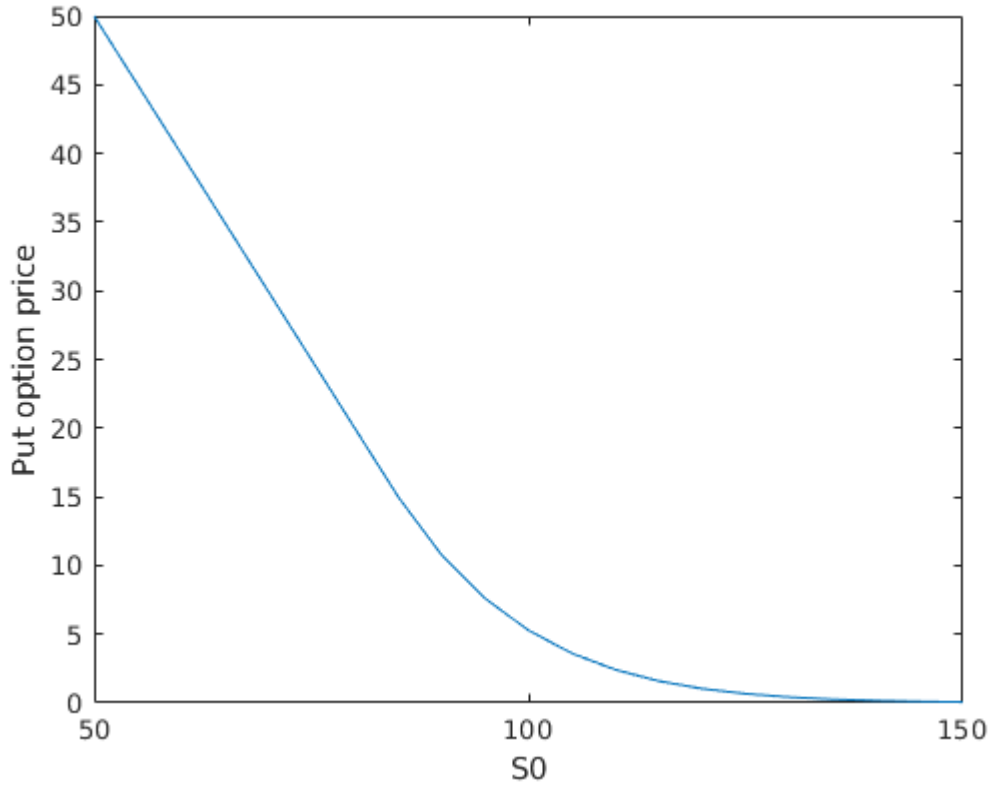
Financial Engineering Lab 3

Question 1

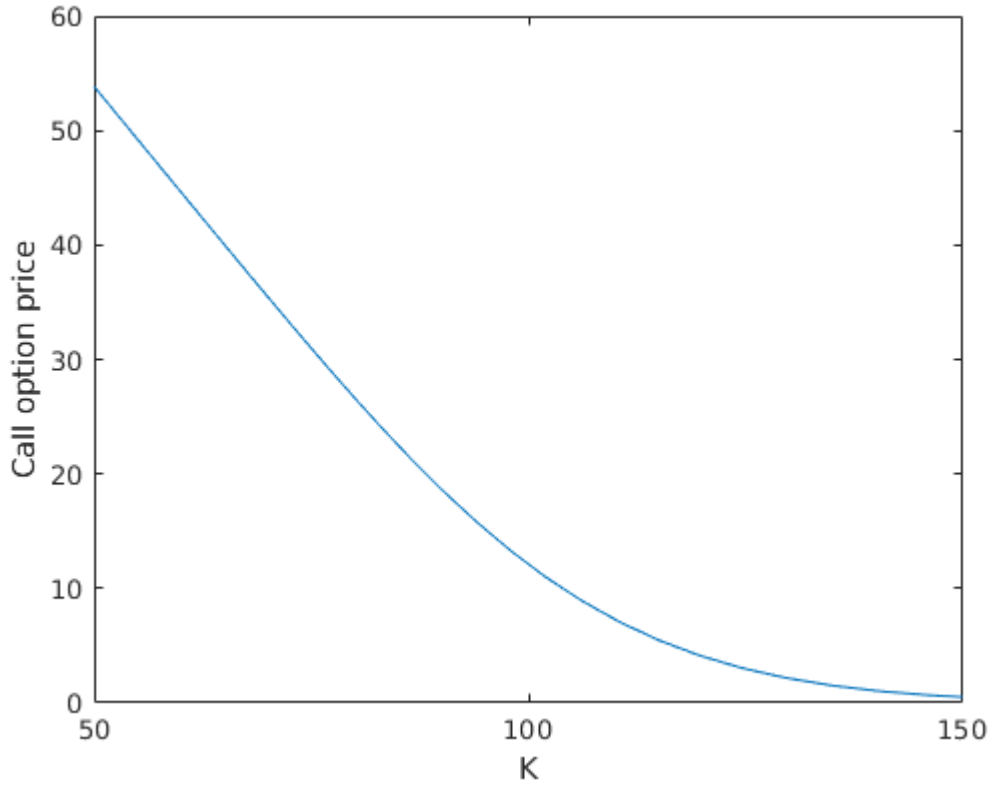
```
The call price for the given Initial Values is 12.123047
The put price for the given Initial Values is 5.279837
```

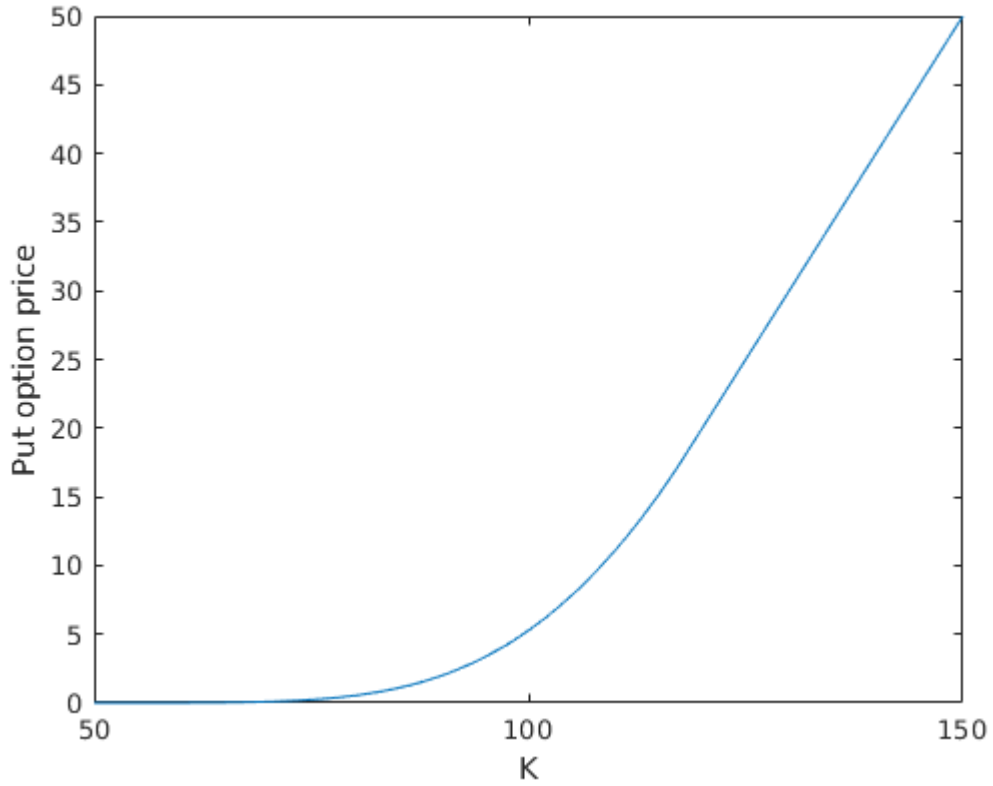
Varying S0



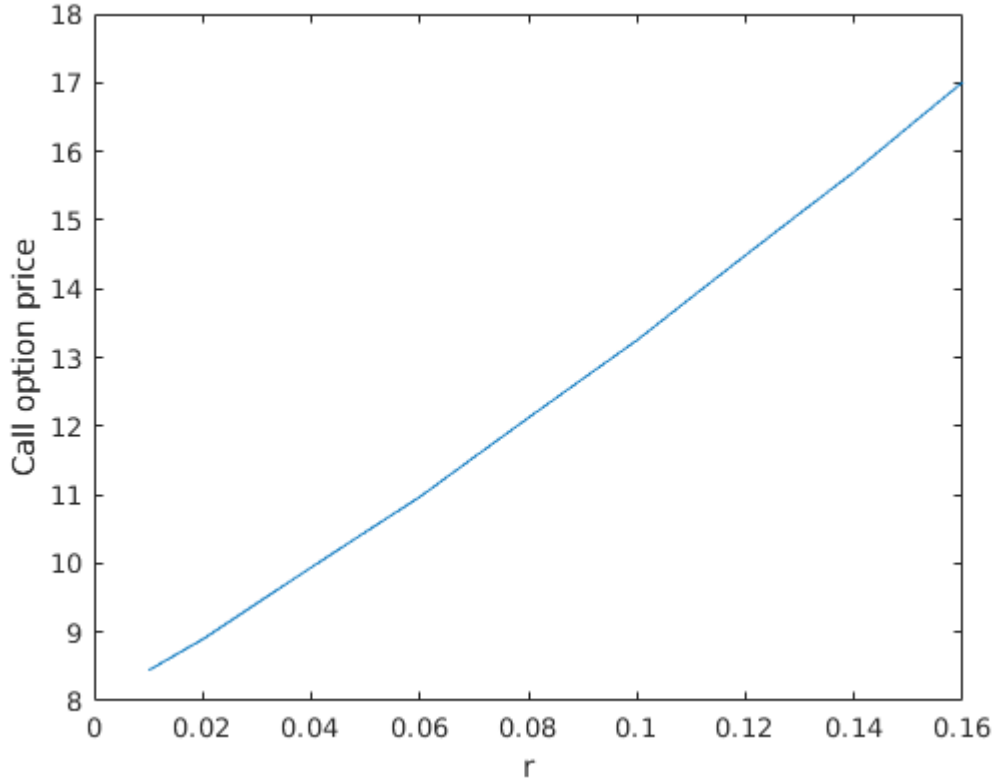

Put option price
S0
50
45
40
35
30
25
20
15
10
5
0
50
100
150

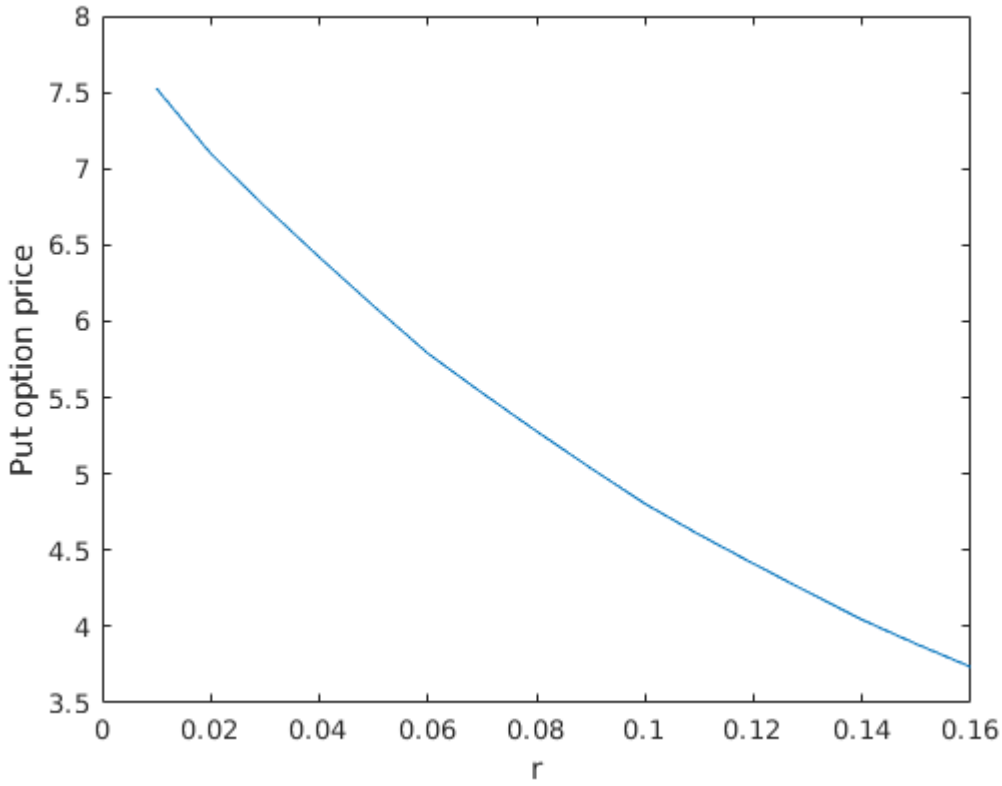
Varying K


Call option price
K
60
50
40
30
20
10
0
50
100
150

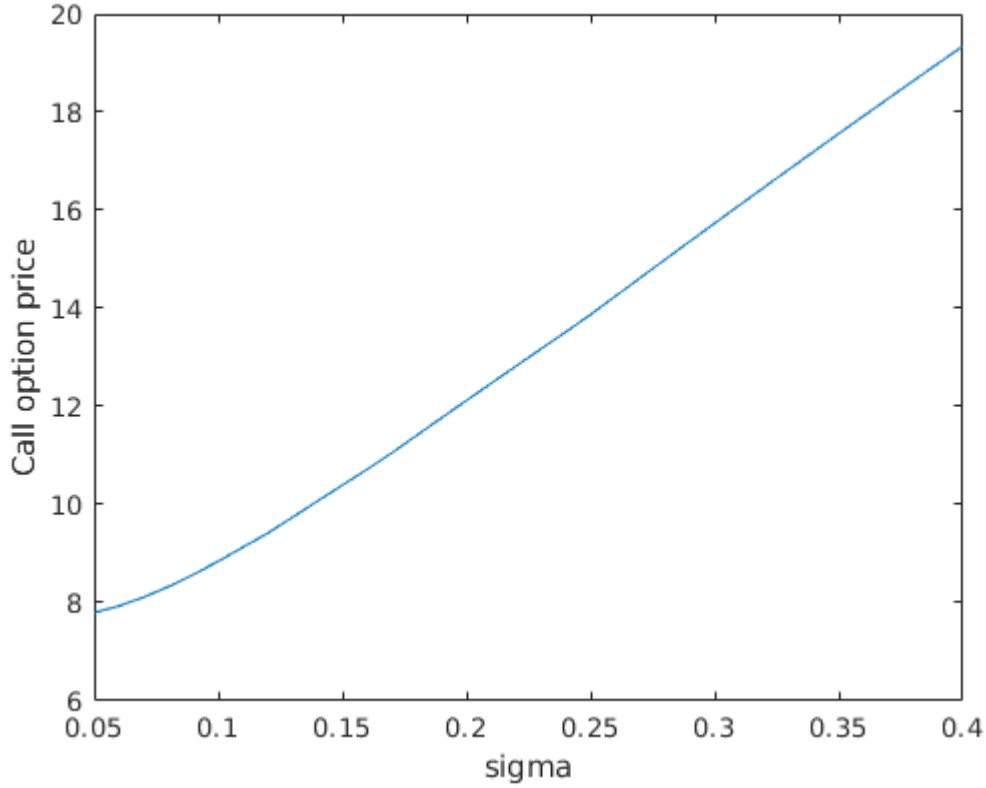

Put option price
K
50
45
40
35
30
25
20
15
10
5
0
50
100
150

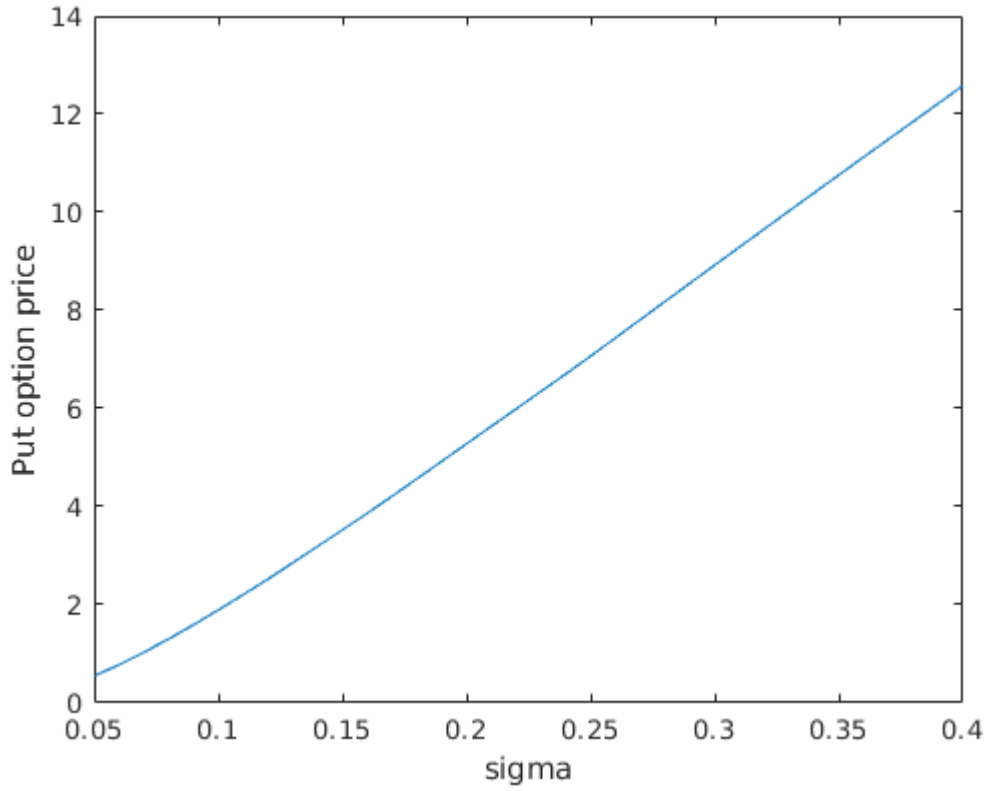
Varying r


Call option price
r
18
17
16
15
14
13
12
11
10
9
8
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16

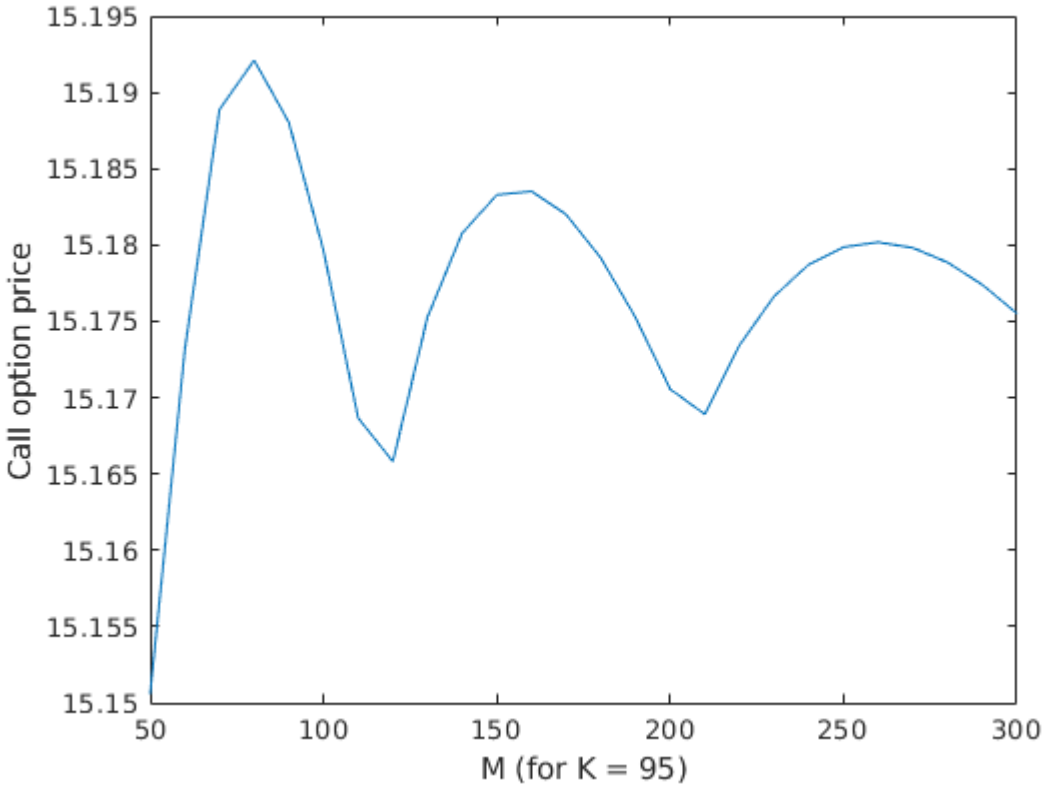


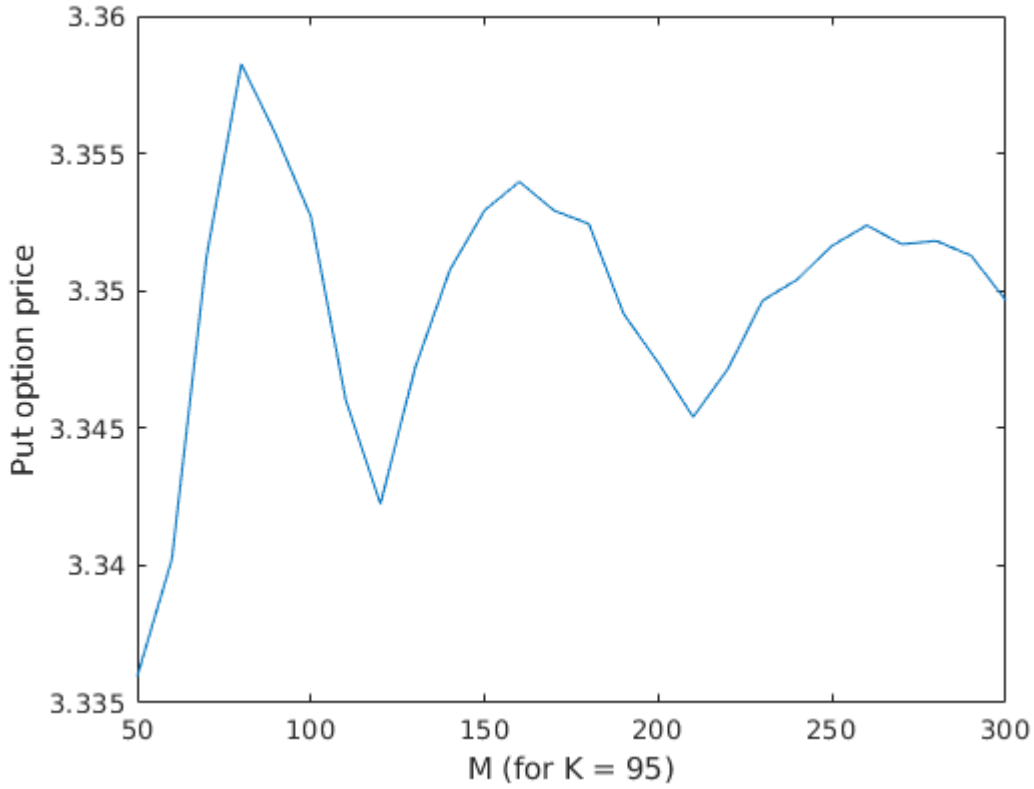
Varying sigma

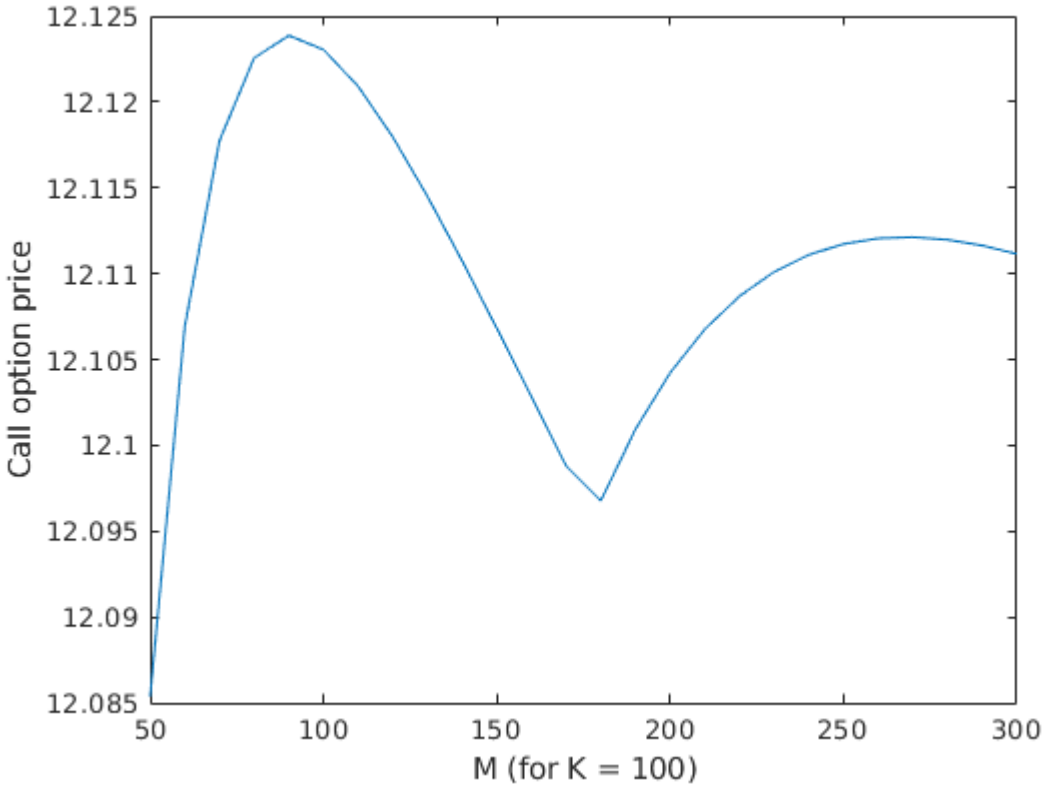


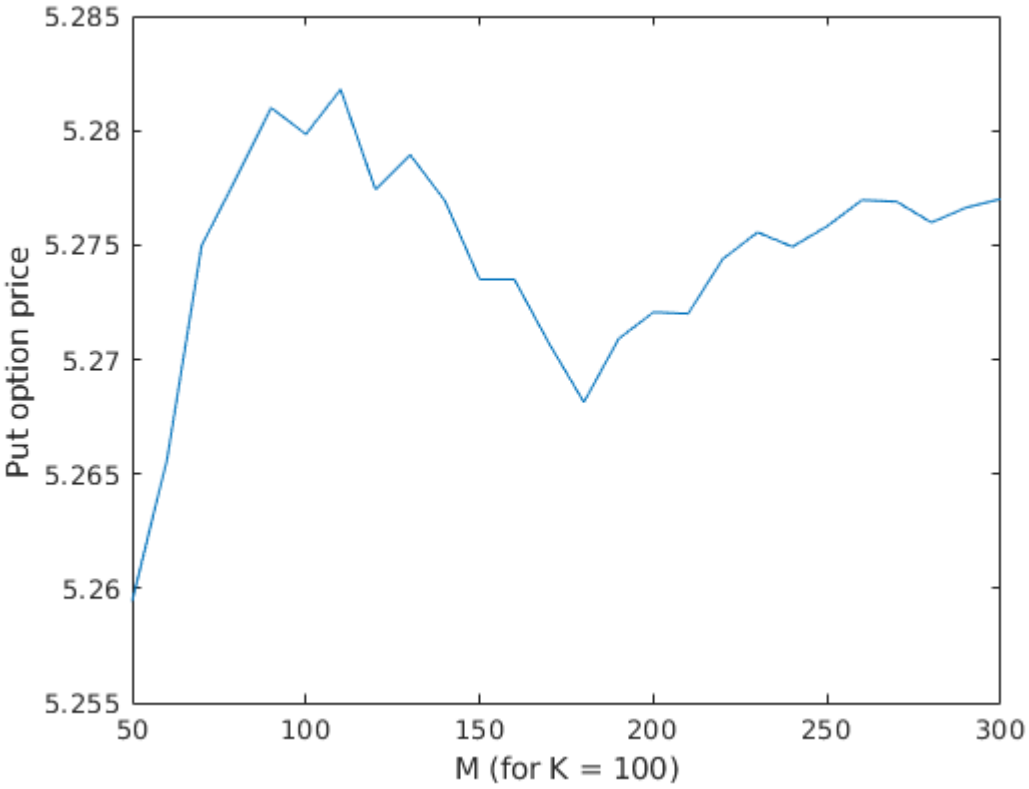


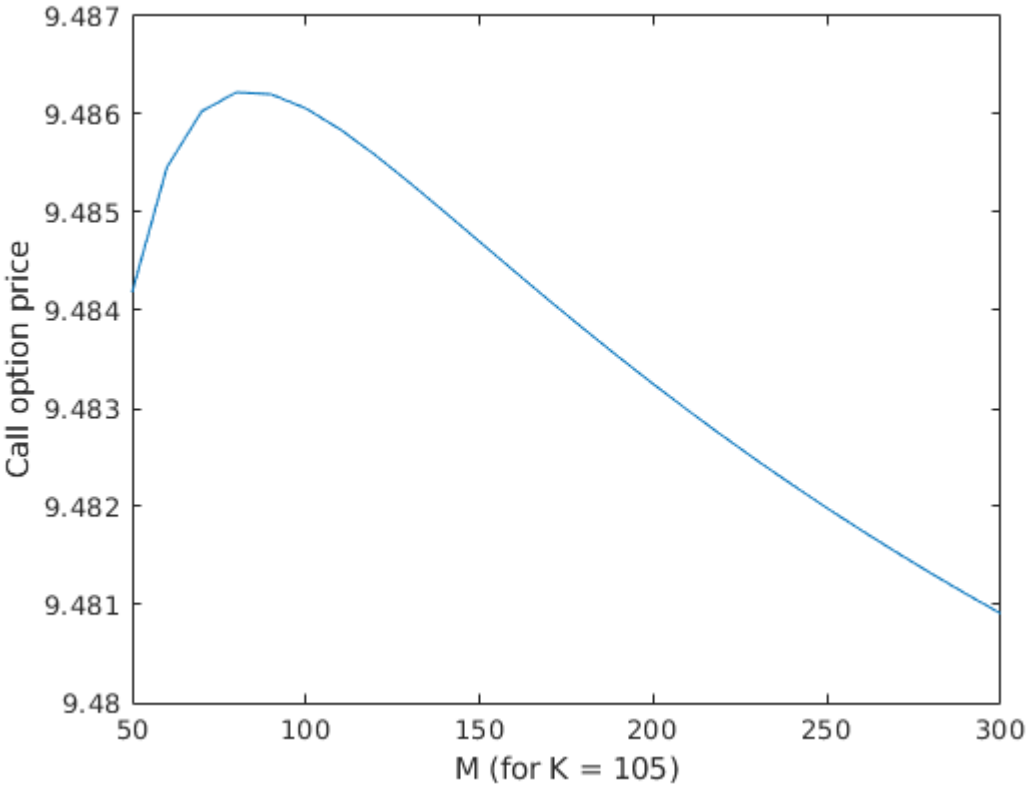
Varying M (for k=95,100,105)

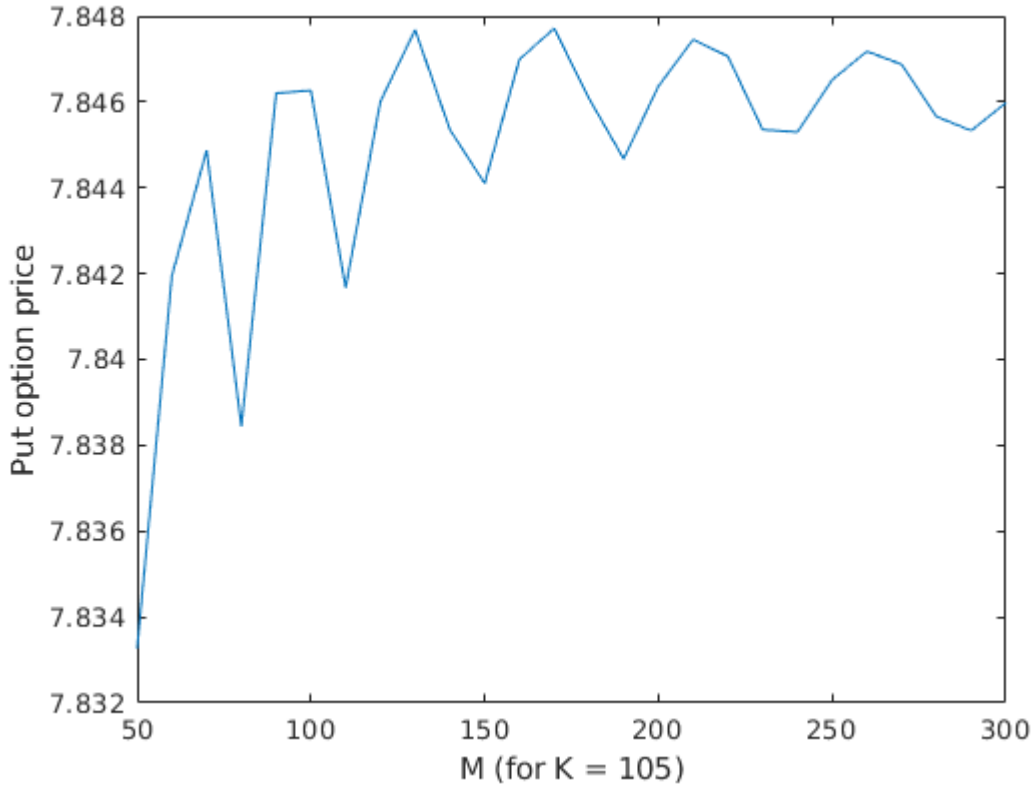



3.36
3.355
3.35
3.345
3.34
3.335
Put option price
50
100
150
200
250
300
M (for K = 95)


12.125
12.12
12.115
12.11
12.105
12.1
12.095
12.09
12.085
Call option price
50
100
150
200
250
300
M (for K = 100)


5.285
5.28
5.275
5.27
5.265
5.26
5.255
Put option price
50
100
150
200
250
300
M (for K = 100)


9.487
9.486
9.485
9.484
9.483
9.482
9.481
9.48
Call option price
50
100
150
200
250
300
M (for K = 105)



Question 2

```
The Basic Binomial Algorithm runs out of space and doesn't work
for M = 50.
Initial price for M = 25 is 11.003495.
Elapsed time is 27.198401 seconds.
Initial price for M = 10 is 10.080583.
Elapsed time is 0.000853 seconds.
Initial price for M = 5 is 9.119299.
Elapsed time is 0.001027 seconds.

For time step = 5, the values of the option are:
   32.1054
   18.8059
   18.8059
    2.9014
   18.8059
    2.9014
    7.8184
         0
   21.2350
    5.3304
    7.8184
         0
   16.2664
         0
    9.3499
```

```
         0
   29.4826
   13.5780
   13.5780
         0
   16.2664
         0
    9.3499
         0
   25.3946
    6.3745
    9.3499
         0
   19.4527
         0
   11.1814
         0


For time step = 4, the values of the option are:
   25.0512
   10.6809
   10.6809
    3.8469
   13.0714
    3.8469
    8.0036
    4.6005
   21.1881
    6.6808
    8.0036
    4.6005
   15.6319
    4.6005
    9.5714
    5.5016


For time step = 3, the values of the option are:
   17.5821
    7.1484
    8.3246
    6.2019
   13.7129
    6.2019
    9.9553
    7.4168


For time step = 2, the values of the option are:
   12.1687
    7.1479
    9.7991
```

```
    8.5481


For time step = 1, the values of the option are:
    9.5048
    9.0280


For time step = 0, the value of the option is: 9.119299
```

Question 3

```
M = 5 : 9.06572
Time taken by function: 436 microseconds
M = 10 : 10.0341
Time taken by function: 2235 microseconds
M = 25 : 10.2972
Time taken by function: 60228 microseconds
M = 50 : 10.5368
Time taken by function: 452861 microseconds

Time Taken using Basic Binomial Algorithm (Q2)
For M = 5: 0.001027 seconds
For M = 10: 0.000853 seconds
For M = 25: 27.198401 seconds
For M = 50: Ran Out of Space
```

Question 4

Using the computationally efficient binomial algorithm we get,

Value of M	Intial European call price
1	13.714212
5	12.163186
10	12.277328
20	12.174708
50	12.085362
100	12.123047
200	12.104226
400	12.101330

Elapsed time is 0.020011 seconds for computing all the values of M, which is a considerable speed up from the basic binomial algorithm.