Financial Engineering

MA374 Lab – 03

Submitted by –

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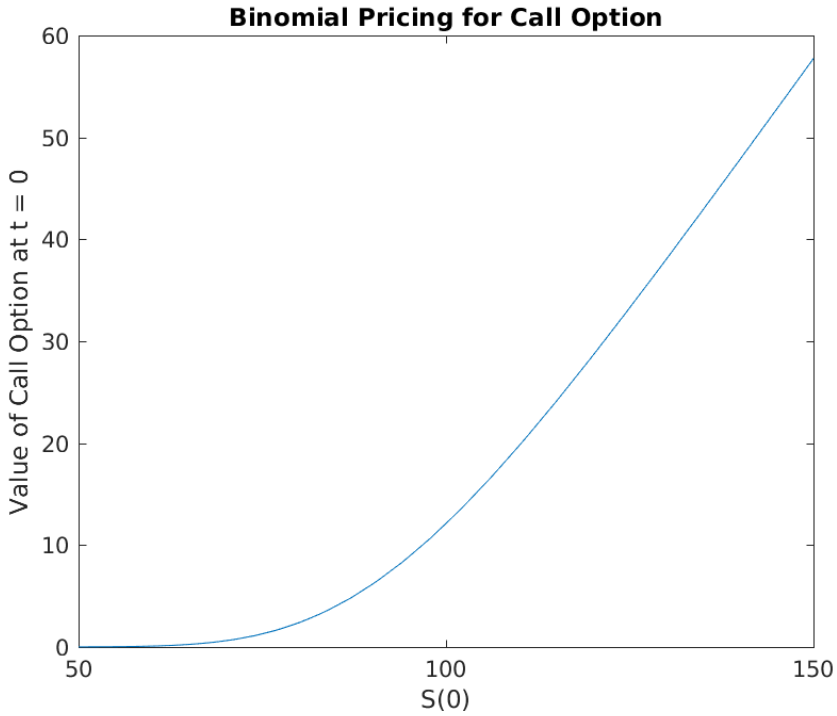
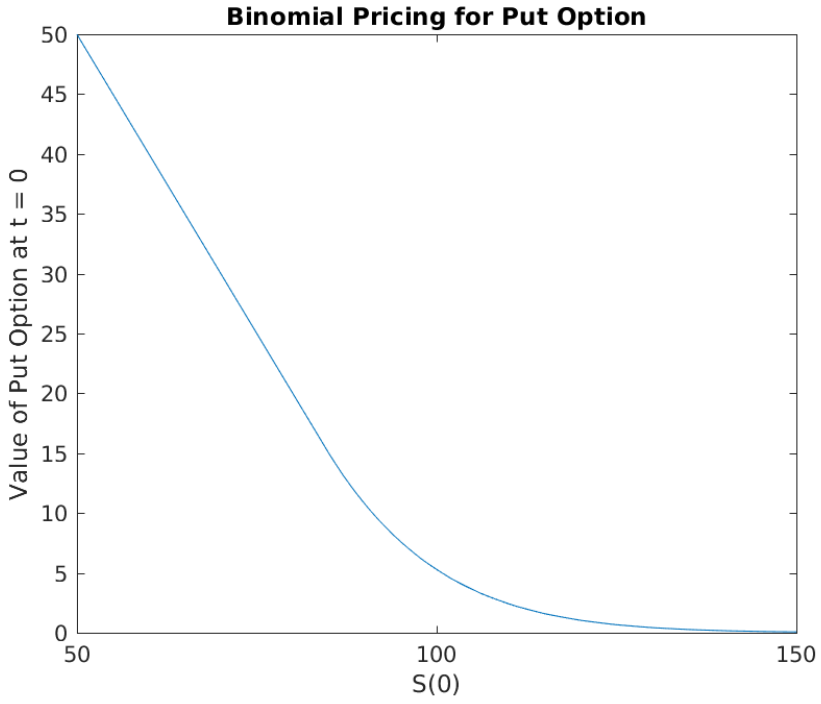
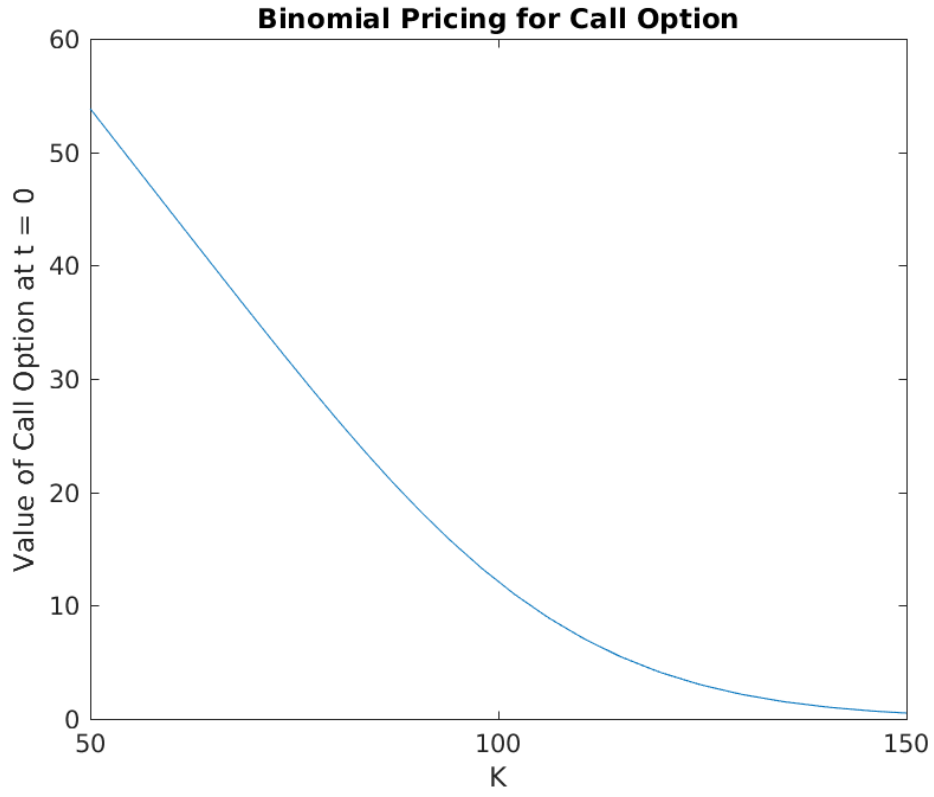
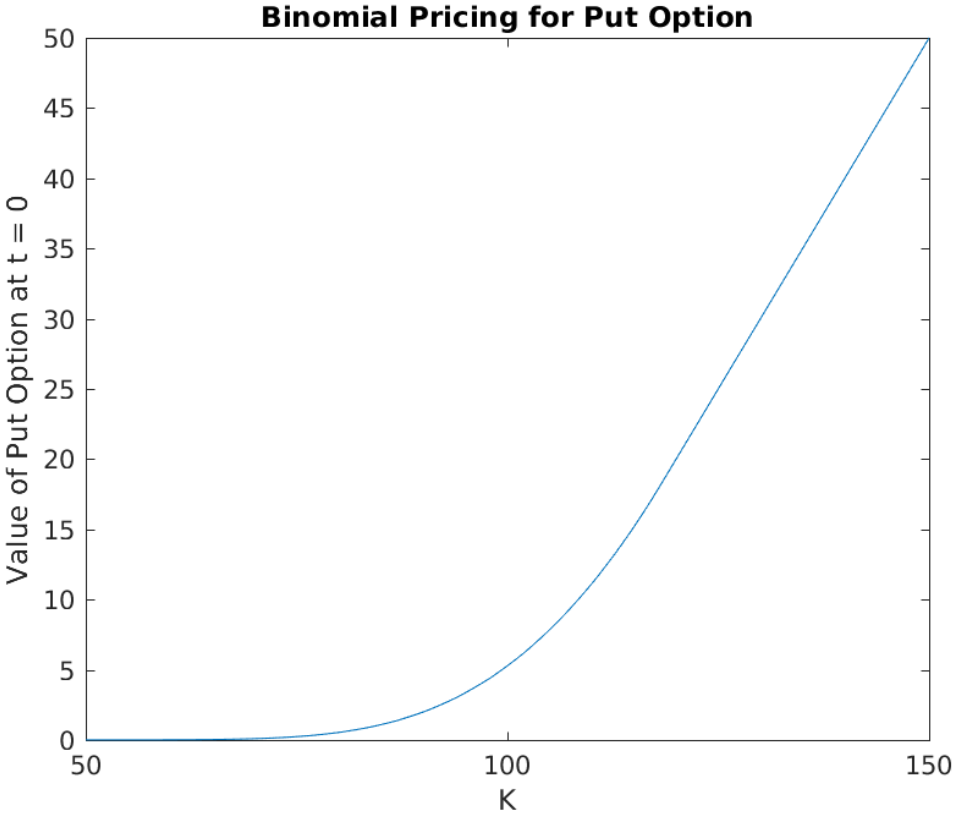
Question 1

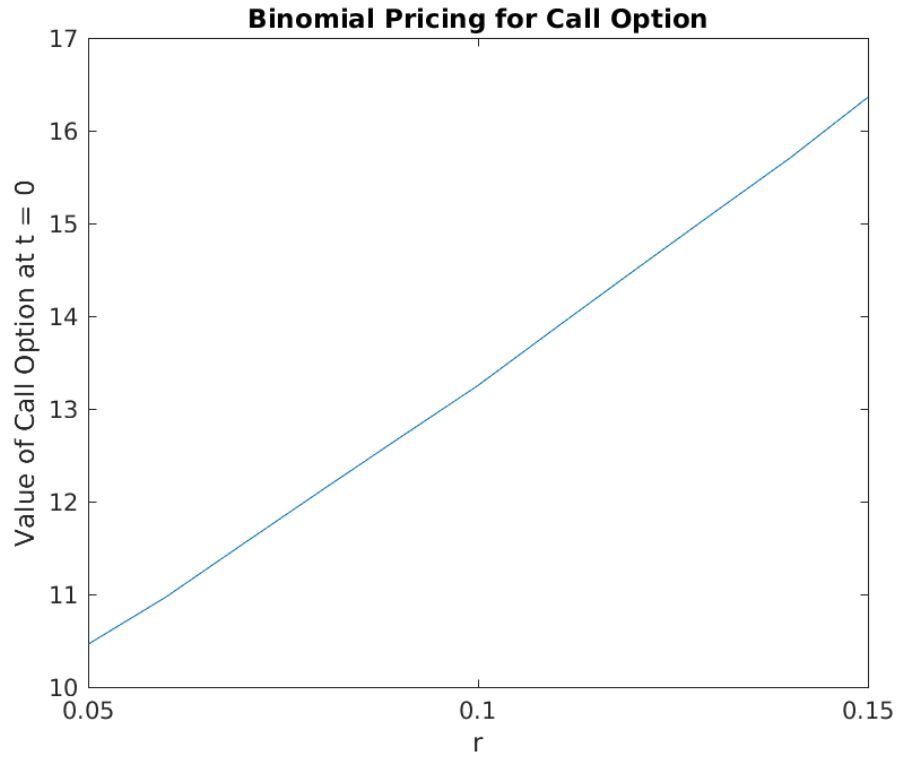
We needed to find the initial values of the American Call and Put options for different values of the variables and here are the results.

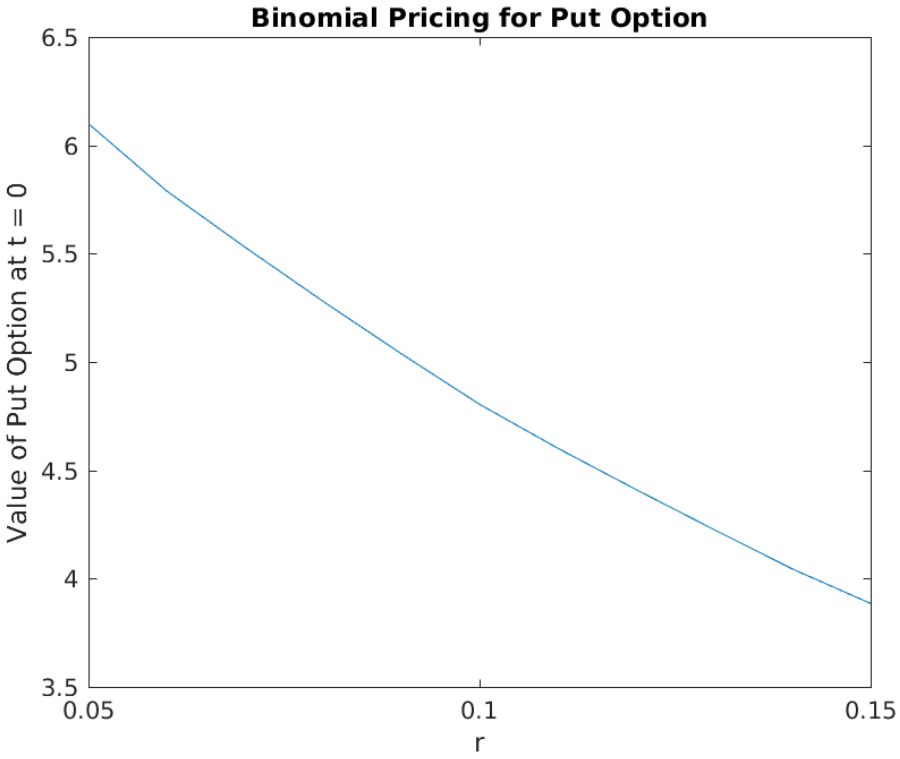


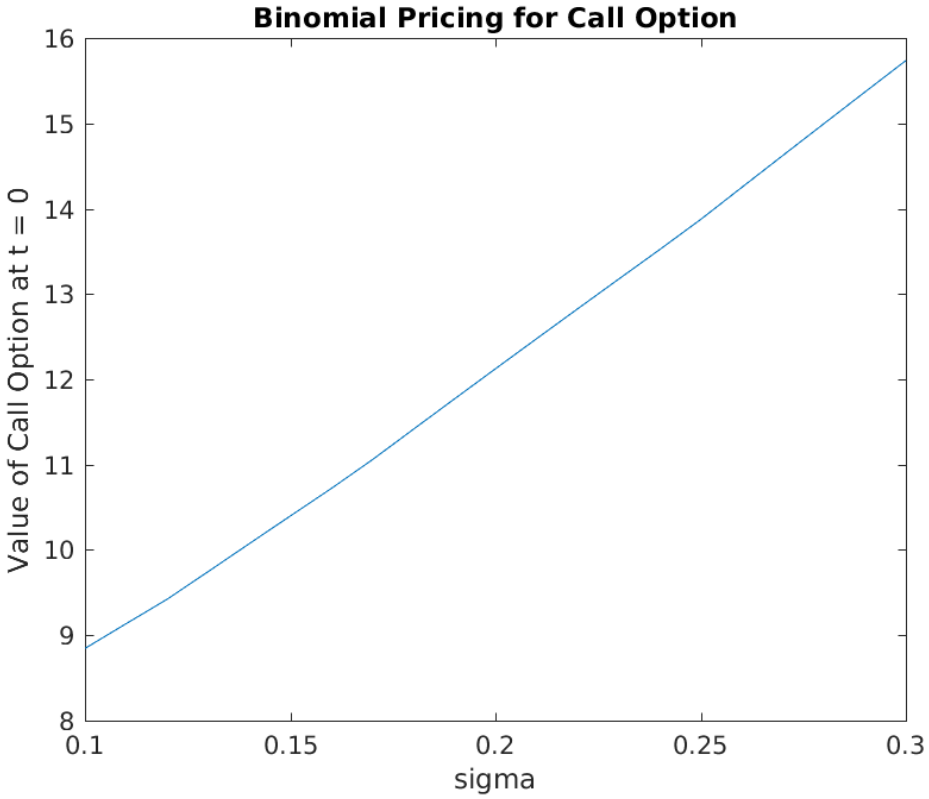


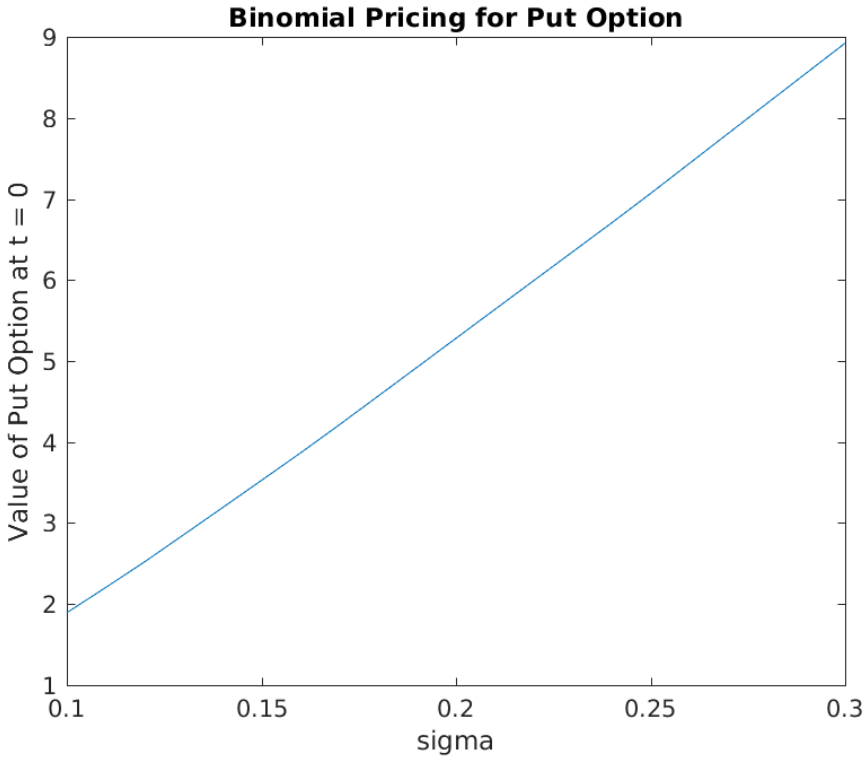

Binomial Pricing for Call Option
Value of Call Option at t = 0
K
60
50
40
30
20
10
0
50
100
150

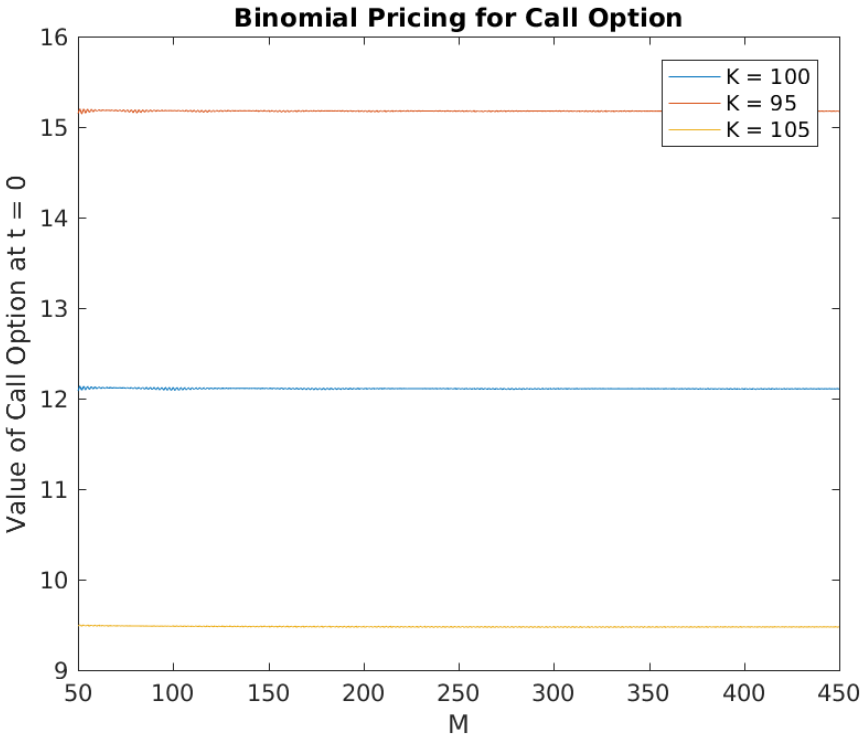

Binomial Pricing for Put Option
Value of Put Option at t = 0
K
50
45
40
35
30
25
20
15
10
5
0
50
100
150

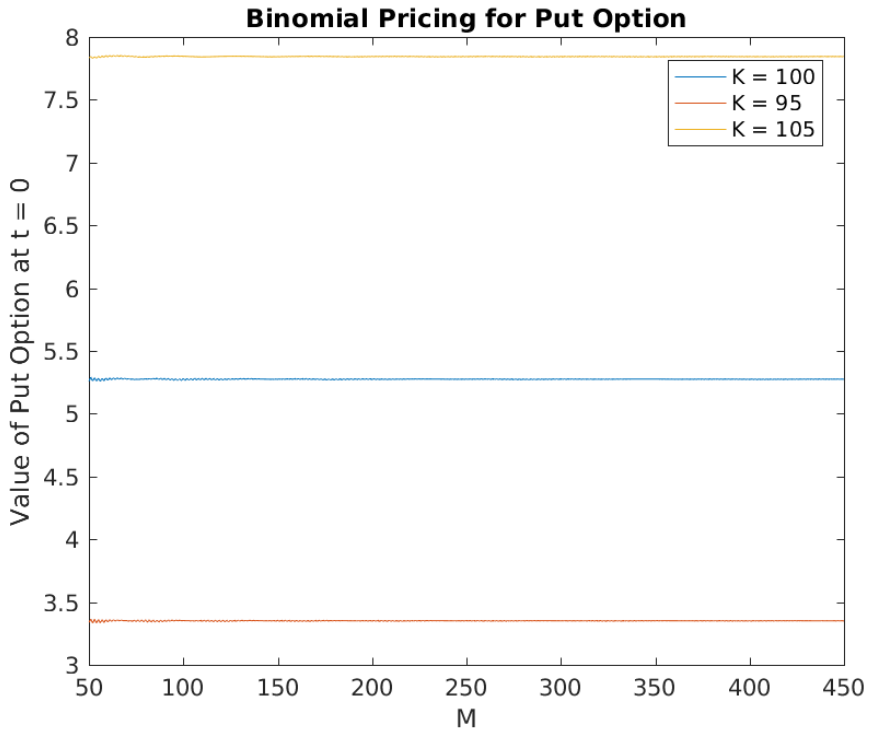

Binomial Pricing for Call Option
Value of Call Option at t = 0
r
17
16
15
14
13
12
11
10
0.05
0.1
0.15


Binomial Pricing for Put Option
Value of Put Option at t = 0
r
6.5
6
5.5
5
4.5
4
3.5
0.05
0.1
0.15


Binomial Pricing for Call Option
Value of Call Option at t = 0
sigma
16
15
14
13
12
11
10
9
8
0.1
0.15
0.2
0.25
0.3


Binomial Pricing for Put Option
Value of Put Option at t = 0
sigma
9
8
7
6
5
4
3
2
1
0.1
0.15
0.2
0.25
0.3


Binomial Pricing for Call Option
K = 100
K = 95
K = 105
Value of Call Option at t = 0
M
16
15
14
13
12
11
10
9
50
100
150
200
250
300
350
400
450


Binomial Pricing for Put Option
K = 100
K = 95
K = 105
Value of Put Option at t = 0
M
8
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
50
100
150
200
250
300
350
400
450

Question 2

The initial value of the lookback option for M = 5 and M = 10 are 9.1193 and 10.0806 respectively. For M = 25 and M = 50, we are unable to run the program using this method due to computational time problems.

The initial value is increasing with increasing value of M here based on the two values obtained.

9.119299	9.027951	8.548076	7.416771	5.501639	0
0	9.50484	9.799119	9.955271	9.571392	11.18141
0	0	7.147916	6.201916	4.60048	0
0	0	12.16866	13.71286	15.63185	19.45269
0	0	0	6.201916	4.60048	0
0	0	0	8.324615	8.003614	9.349917
0	0	0	7.148418	6.680843	6.374517
0	0	0	17.58206	21.18809	25.39456
0	0	0	0	4.60048	0
0	0	0	0	8.003614	9.349917
0	0	0	0	3.846929	0
0	0	0	0	13.07138	16.26637
0	0	0	0	3.846929	0
0	0	0	0	10.6809	13.578
0	0	0	0	10.6809	13.578
0	0	0	0	25.05123	29.4826
0	0	0	0	0	0
0	0	0	0	0	9.349917
0	0	0	0	0	0
0	0	0	0	0	16.26637
0	0	0	0	0	0
0	0	0	0	0	7.818416
0	0	0	0	0	5.330382
0	0	0	0	0	21.23498
0	0	0	0	0	0
0	0	0	0	0	7.818416
0	0	0	0	0	2.90135
0	0	0	0	0	18.80595
0	0	0	0	0	2.90135
0	0	0	0	0	18.80595
0	0	0	0	0	18.80595
0	0	0	0	0	32.10539

Question 3

The initial value of the lookback option for M = 5, 10, 25 and 50 are 9.1193, 10.0806, 11.0035 and 11.5109 respectively.

The initial value is increasing with increasing value of M.

For M = 5, the values are –

(166.06574787682462, 166.06574787682462) :0.0
(150.04587225655362, 138.86445913876912) :11.181413117784501
(150.04587225655362, 150.04587225655362) :5.501638813873981
(138.8644591387691, 138.8644591387691) :0.0
(135.57138705044142, 116.118695507311) :19.452691543130413
(135.57138705044142, 125.46861206060268) :9.57139153170023
(135.57138705044142, 135.57138705044142) :7.416771005131012
(125.46861206060268, 116.118695507311) :9.349916553291678
(125.46861206060268, 125.46861206060268) :4.600479677676438
(122.49321297792528, 116.11869550731102) :6.374517470614265
(122.49321297792528, 97.09864950286031) :25.39456347506497
(122.49321297792528, 104.91706553244704) :15.631851880479829
(122.49321297792528, 113.3650230595177) :9.95527127295782
(122.49321297792528, 122.49321297792528) :8.548076183576446
(116.11869550731102, 116.11869550731102) :0.0
(113.3650230595177, 97.09864950286031) :16.266373556657385
(113.3650230595177, 104.91706553244704) :8.003613780975444
(113.3650230595177, 113.3650230595177) :6.201916453882752
(110.676651999383, 97.09864950286031) :13.578002496522686
(110.676651999383, 104.91706553244704) :6.680842999256647
(110.676651999383, 81.1940548771124) :29.48259712227059
(110.676651999383, 87.73182757949854) :21.188089345345652
(110.676651999383, 94.79602394643446) :13.712862965988537
(110.676651999383, 102.42903178906215) :9.79911875354703
(110.676651999383, 110.676651999383) :9.027951165547757
(125.46861206060267, 116.11869550731099) :9.349916553291678

(125.46861206060267, 125.46861206060267) :4.600479677676438
(116.11869550731099, 116.11869550731099) :0.0
(113.36502305951768, 97.0986495028603) :16.266373556657385
(113.36502305951768, 104.91706553244703) :8.003613780975444
(113.36502305951768, 113.36502305951768) :6.201916453882752
(116.11869550731097, 116.11869550731097) :0.0
(104.91706553244701, 97.0986495028603) :7.8184160295867144
(104.91706553244701, 104.91706553244701) :3.846928884415608
(102.42903178906214, 97.0986495028603) :5.330382286201839
(102.42903178906214, 81.19405487711239) :21.234976911949744
(102.42903178906214, 87.73182757949853) :13.07138097092879
(102.42903178906214, 94.79602394643445) :8.324614669633142
(102.42903178906214, 102.42903178906214) :7.1479157567747444
(100, 97.0986495028603) :2.9013504971397026
(100, 81.19405487711239) :18.805945122887607
(100, 87.73182757949853) :10.680904426029972
(100, 94.79602394643445) :7.1484182081901215
(100, 67.89460596146952) :32.10539403853048
(100, 73.36150254849147) :25.05122945703703
(100, 79.26859549382432) :17.582062714095425
(100, 85.65132955680926) :12.168664659721797
(100, 92.54800352077254) :9.504839866450858
(100, 100) :9.11929898586469