भारतीय प्रौद्योगिकी संस्थान गुवाहाटी
INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI

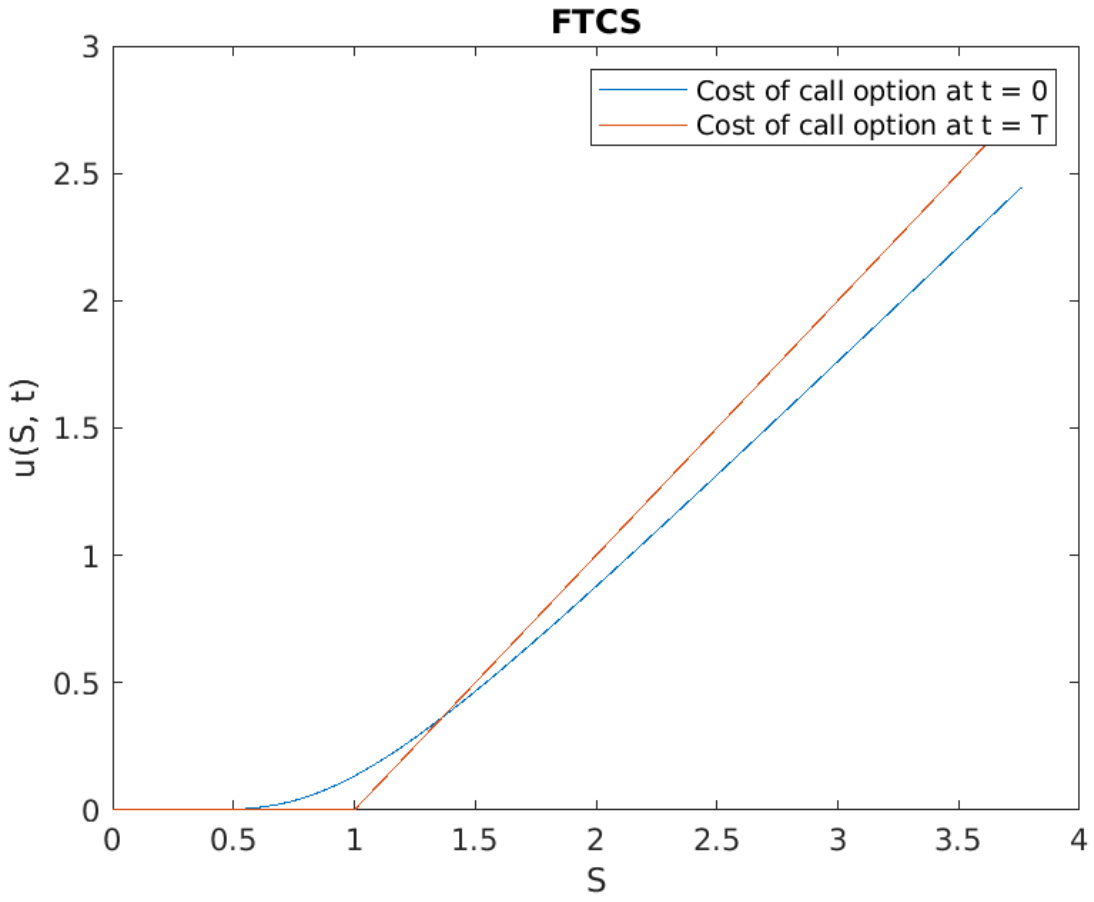
MA 473: Computational Finance Lab

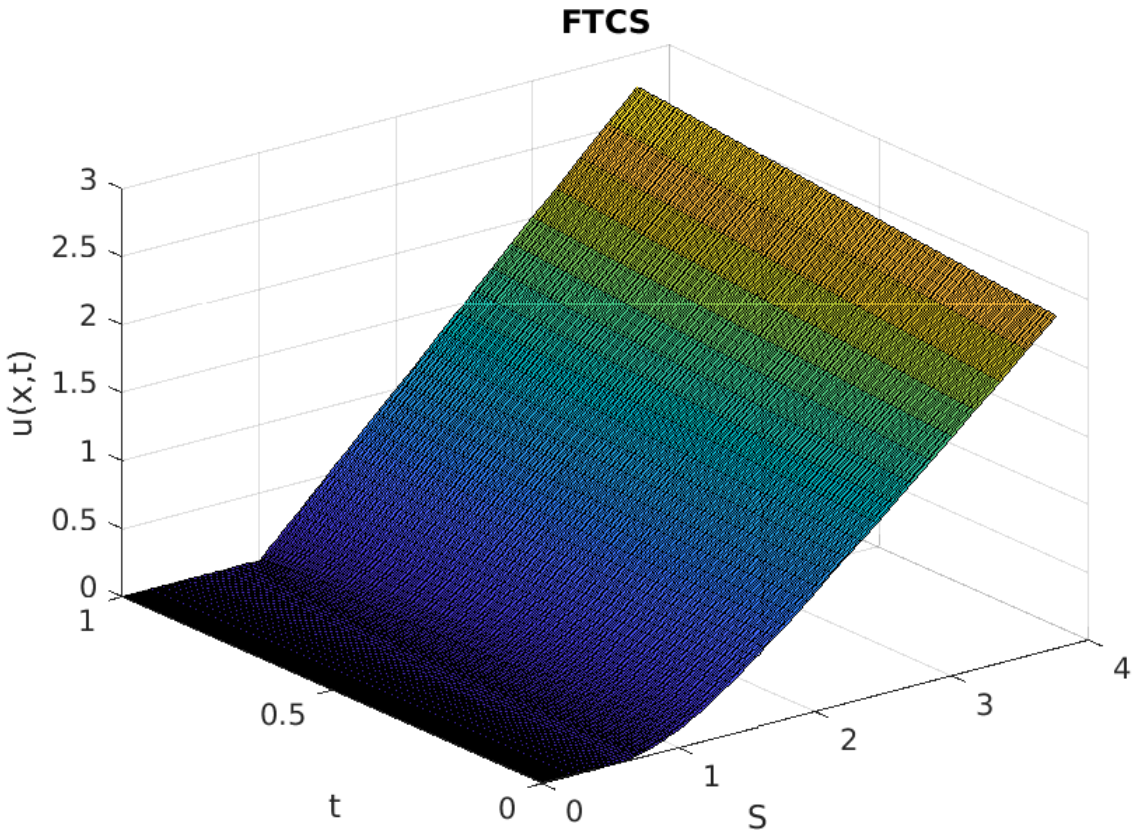
Lab 04

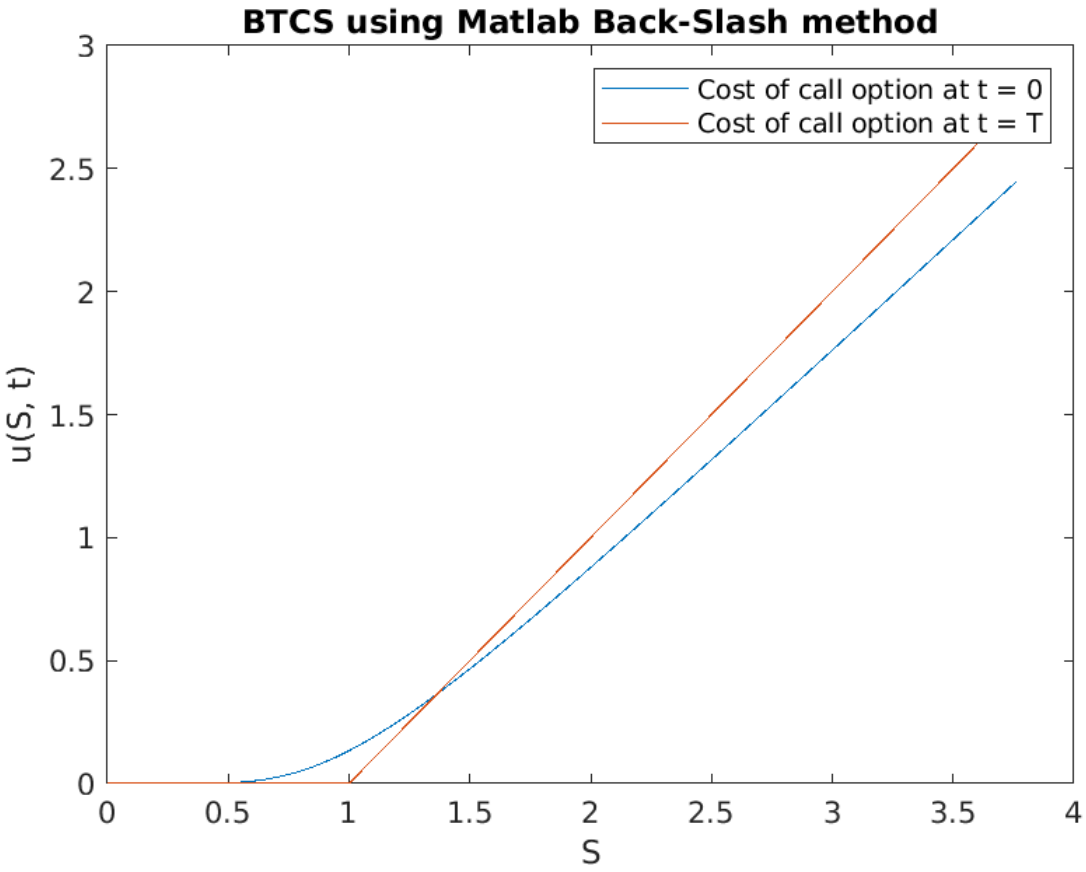
AB Satyaprakash (180123062)

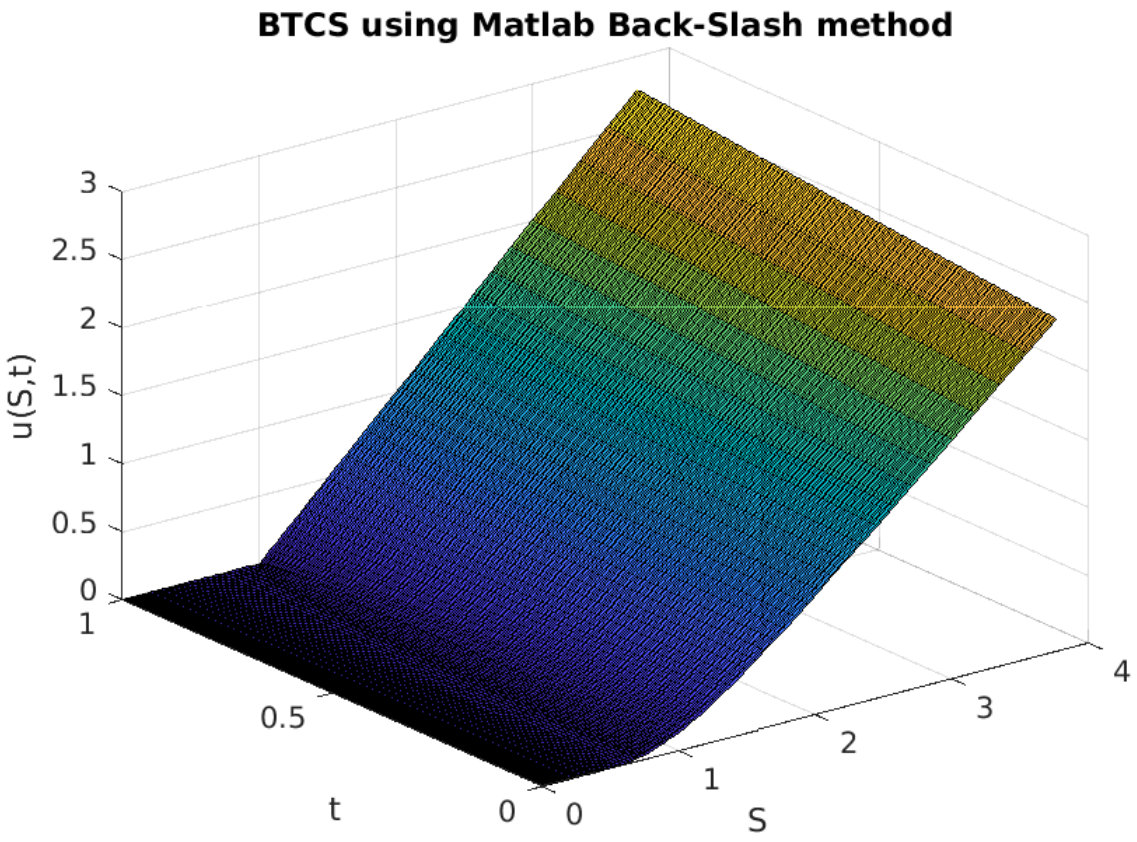
5 Sept 2021

Question 01.


FTCS
Cost of call option at t = 0
Cost of call option at t = T
u(S, t)
S
0
0.5
1
1.5
2
2.5
3
3.5
4


FTCS
u(x,t)
3
2.5
2
1.5
1
0.5
0
1
0.5
t
0
0
1
2
3
4
S


BTCS using Matlab Back-Slash method
Cost of call option at t = 0
Cost of call option at t = T
u(S, t)
S
0
0.5
1
1.5
2
2.5
3
3.5
4


BTCS using Matlab Back-Slash method
u(S,t)
3
2.5
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1.5
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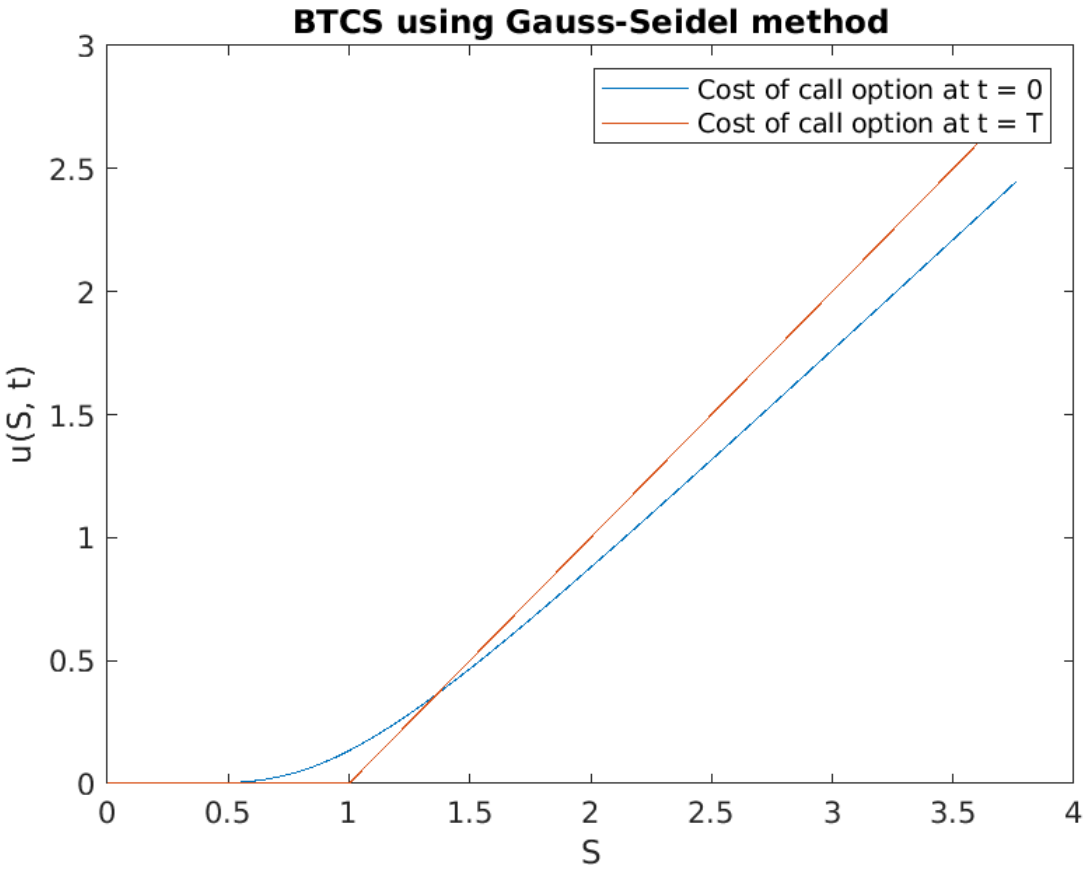
0.5
0
1
0.5
t
0
0
1
2
3
4
S


BTCS using Gauss-Seidel method
Cost of call option at t = 0
Cost of call option at t = T
u(S, t)
S
0
0.5
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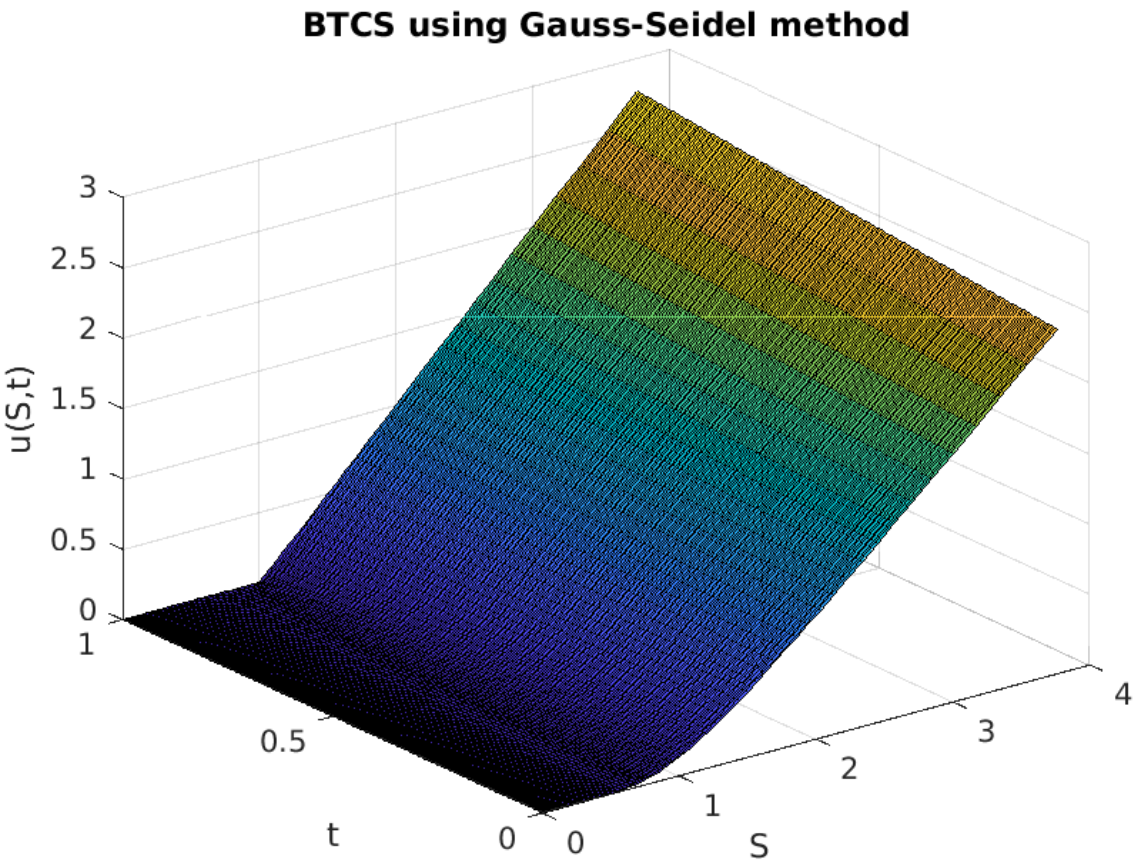
1.5
2
2.5
3
3.5
4


BTCS using Gauss-Seidel method
u(S,t)
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1.5
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1
0.5
t
0
0
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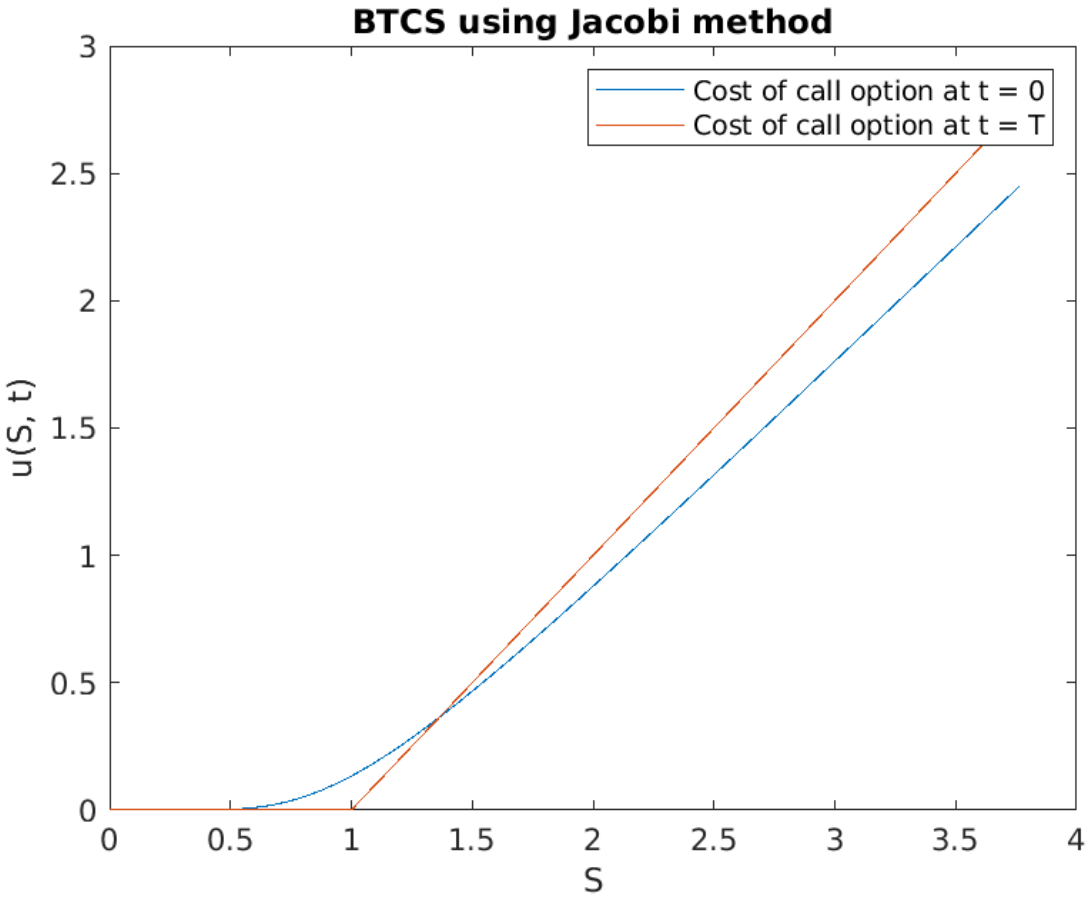
2
3
4
S


BTCS using Jacobi method
Cost of call option at t = 0
Cost of call option at t = T
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0
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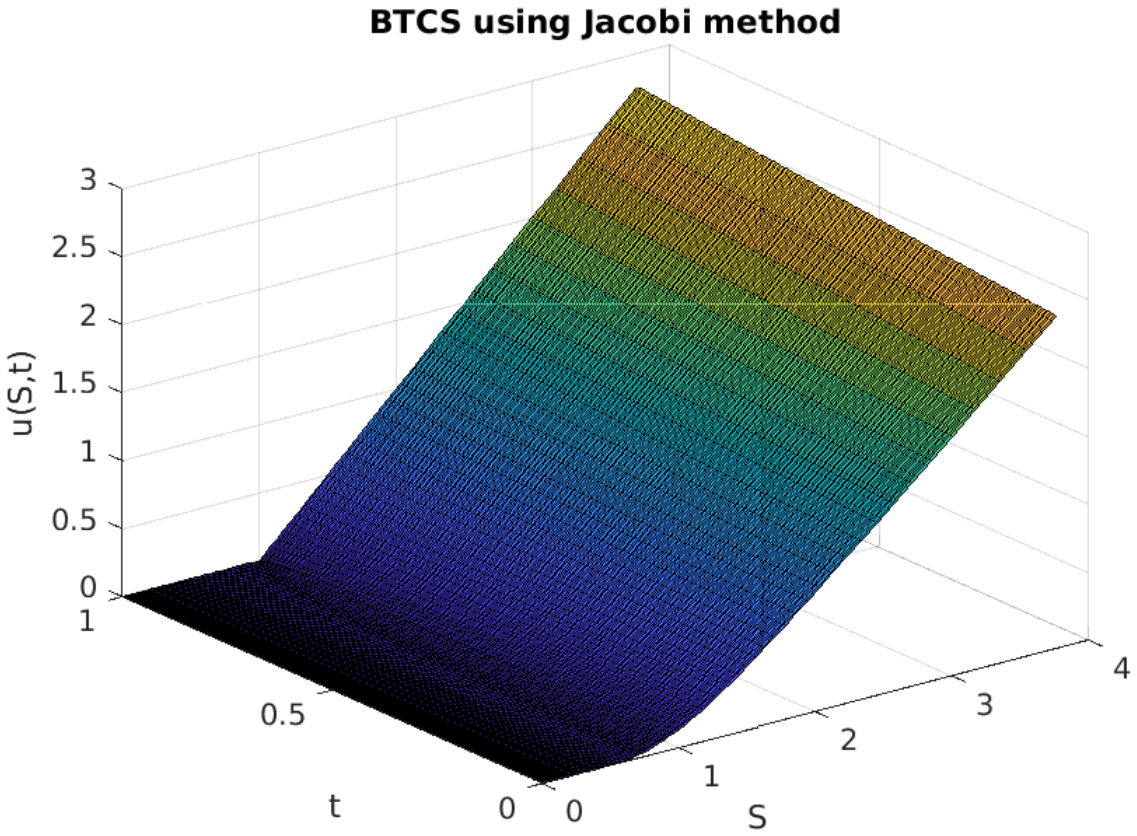
1.5
2
2.5
3
3.5
4


BTCS using Jacobi method
u(S,t)
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2.5
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1.5
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0.5
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1
0.5
t
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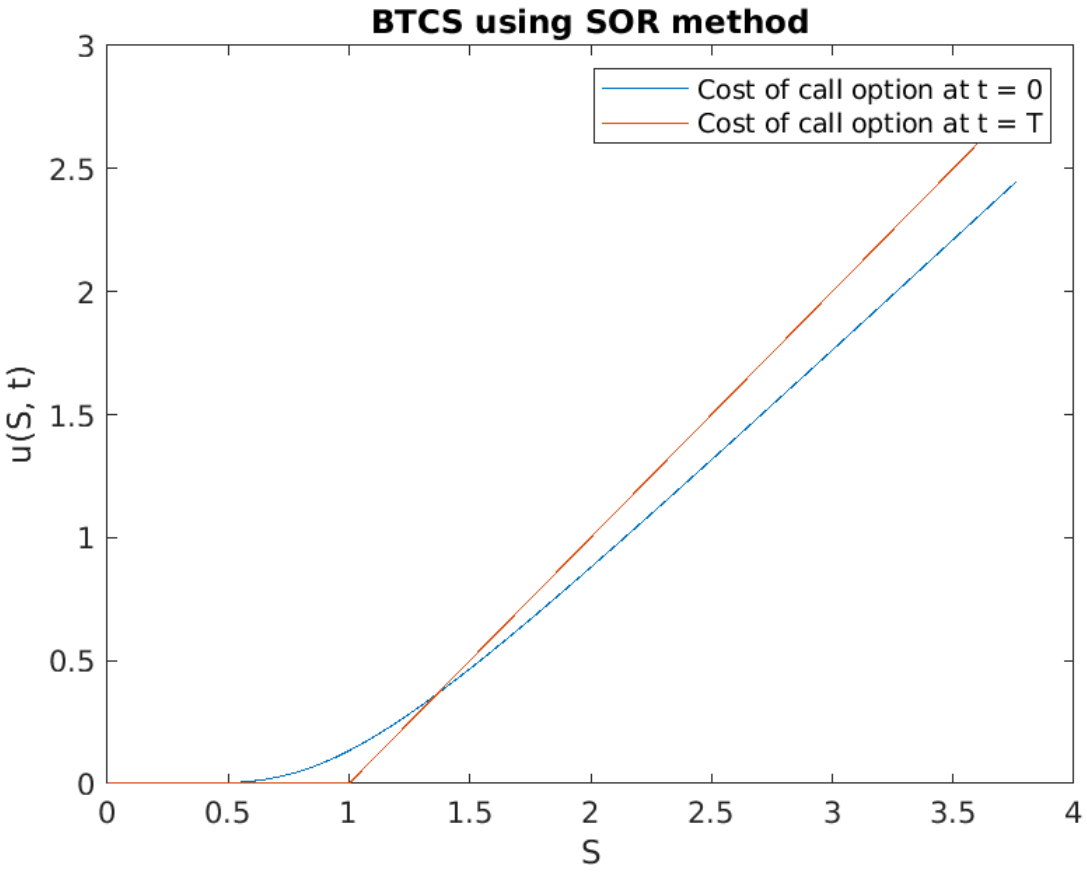
0
1
2
3
4
S


BTCS using SOR method
Cost of call option at t = 0
Cost of call option at t = T
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S
0
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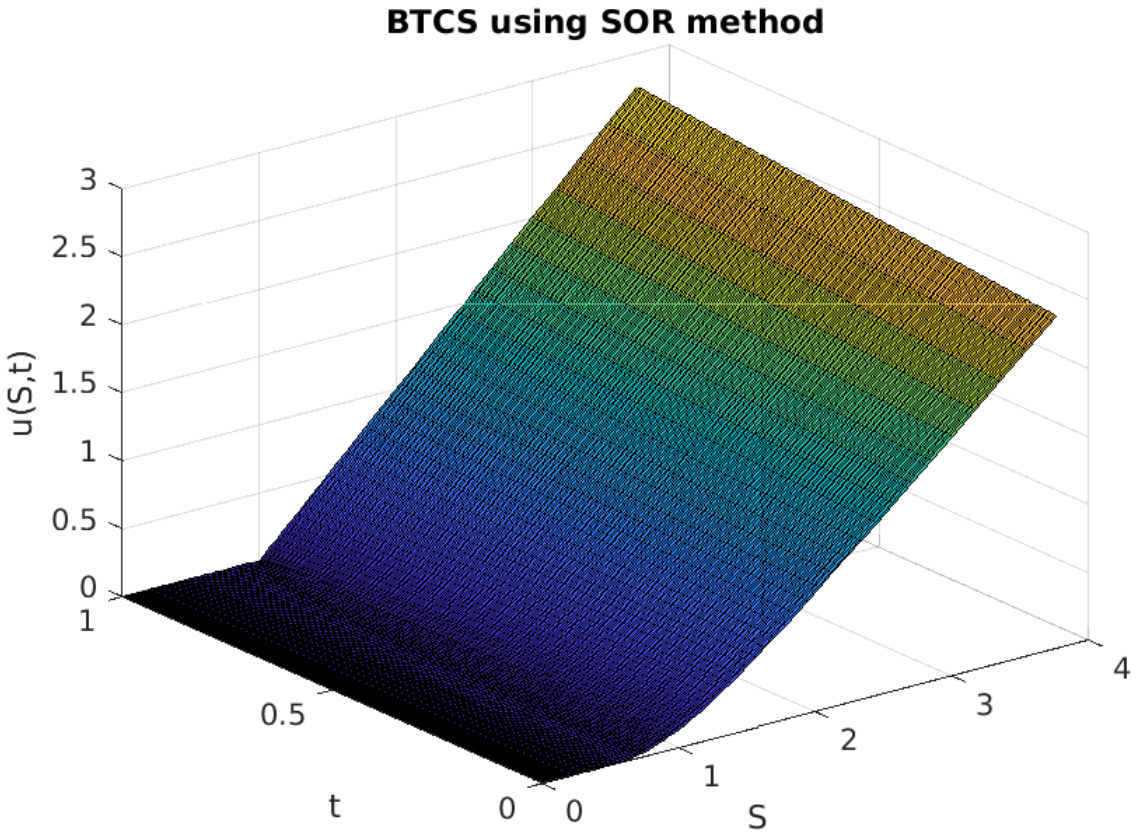
1.5
2
2.5
3
3.5
4


BTCS using SOR method
u(S,t)
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2.5
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1.5
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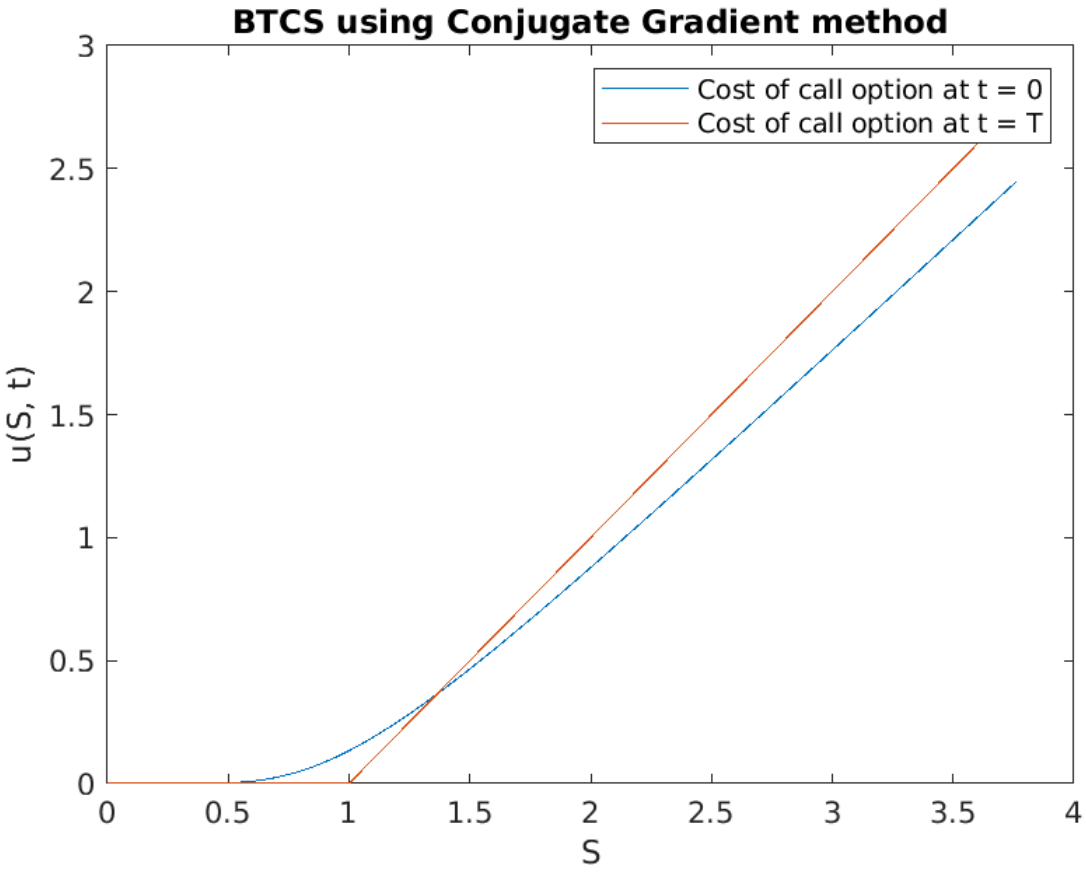
0.5
0
1
0.5
t
0
0
1
2
3
4
S


BTCS using Conjugate Gradient method
Cost of call option at t = 0
Cost of call option at t = T
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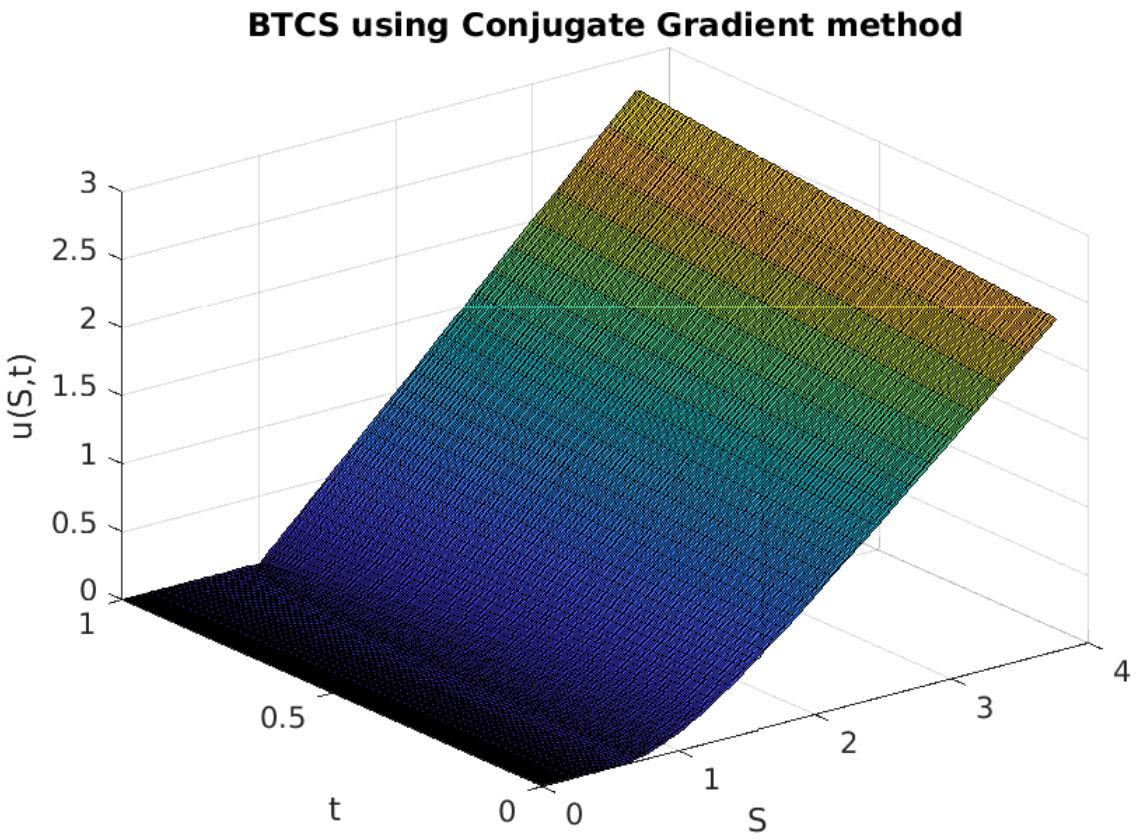
0
0.5
1
1.5
2
2.5
3
3.5
4


BTCS using Conjugate Gradient method
u(S,t)
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2.5
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1.5
1
0.5
0
1
0.5
t
0
0
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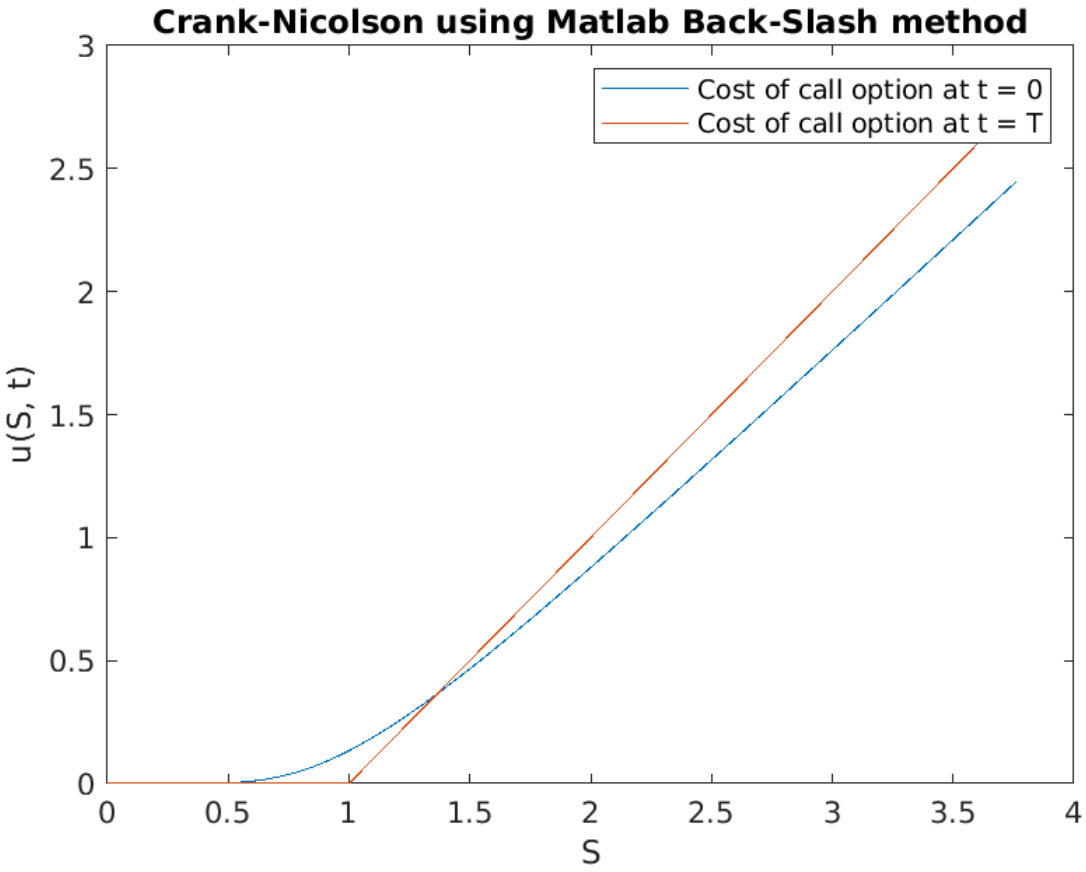
2
3
4
S


Crank-Nicolson using Matlab Back-Slash method
Cost of call option at t = 0
Cost of call option at t = T
u(S, t)
S
0
0.5
1
1.5
2
2.5
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3.5
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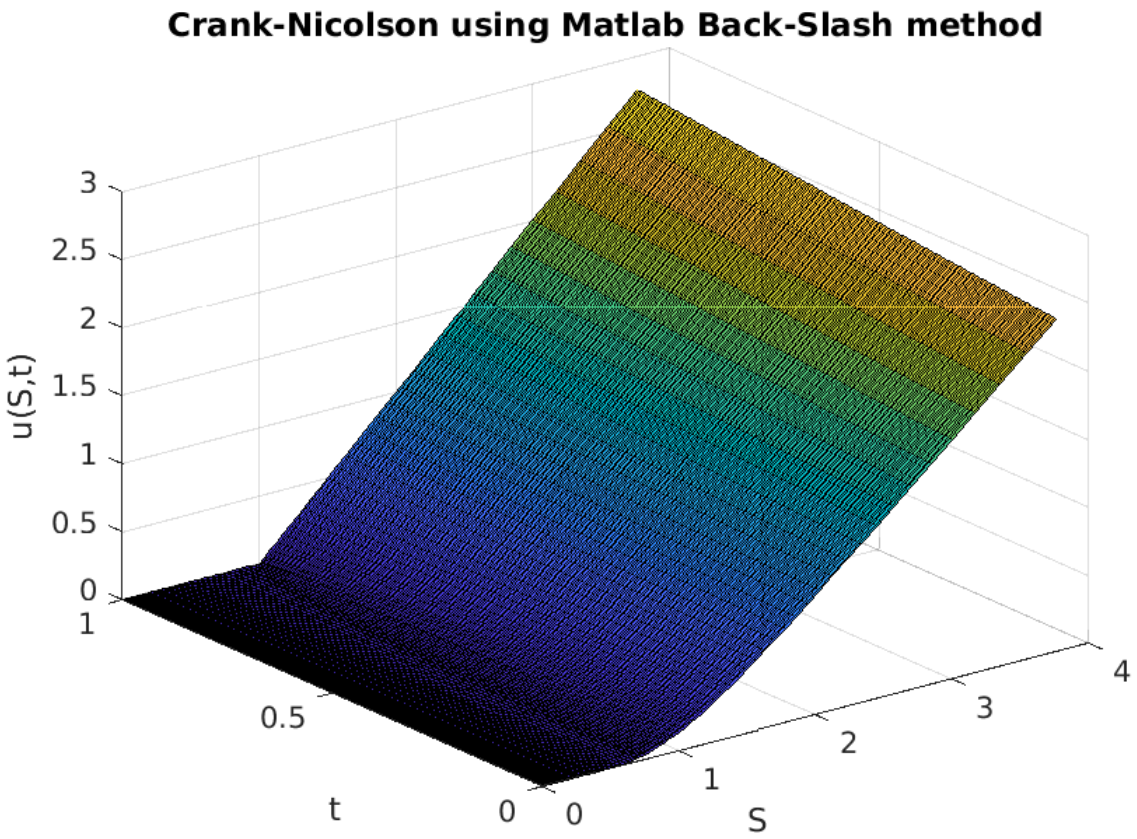
Crank-Nicolson using Matlab Back-Slash method
u(S,t)
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2.5
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1.5
1
0.5
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1
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t
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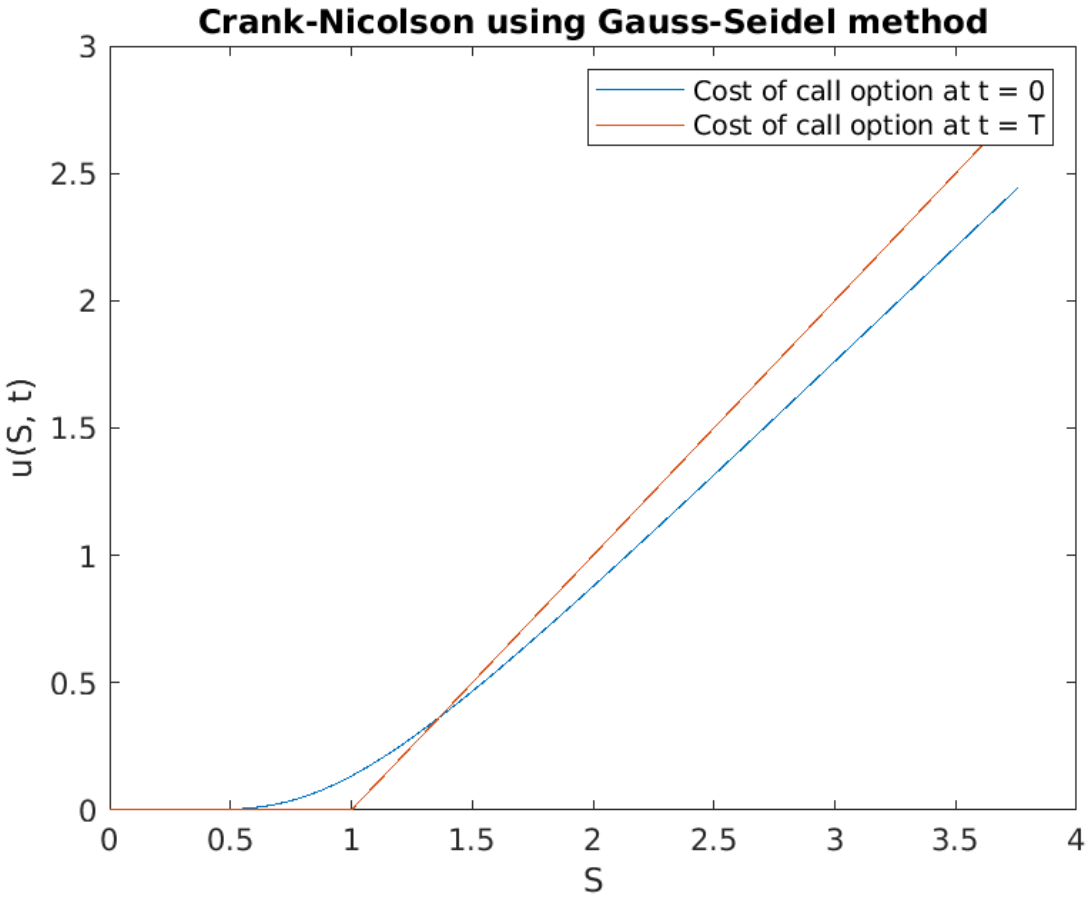
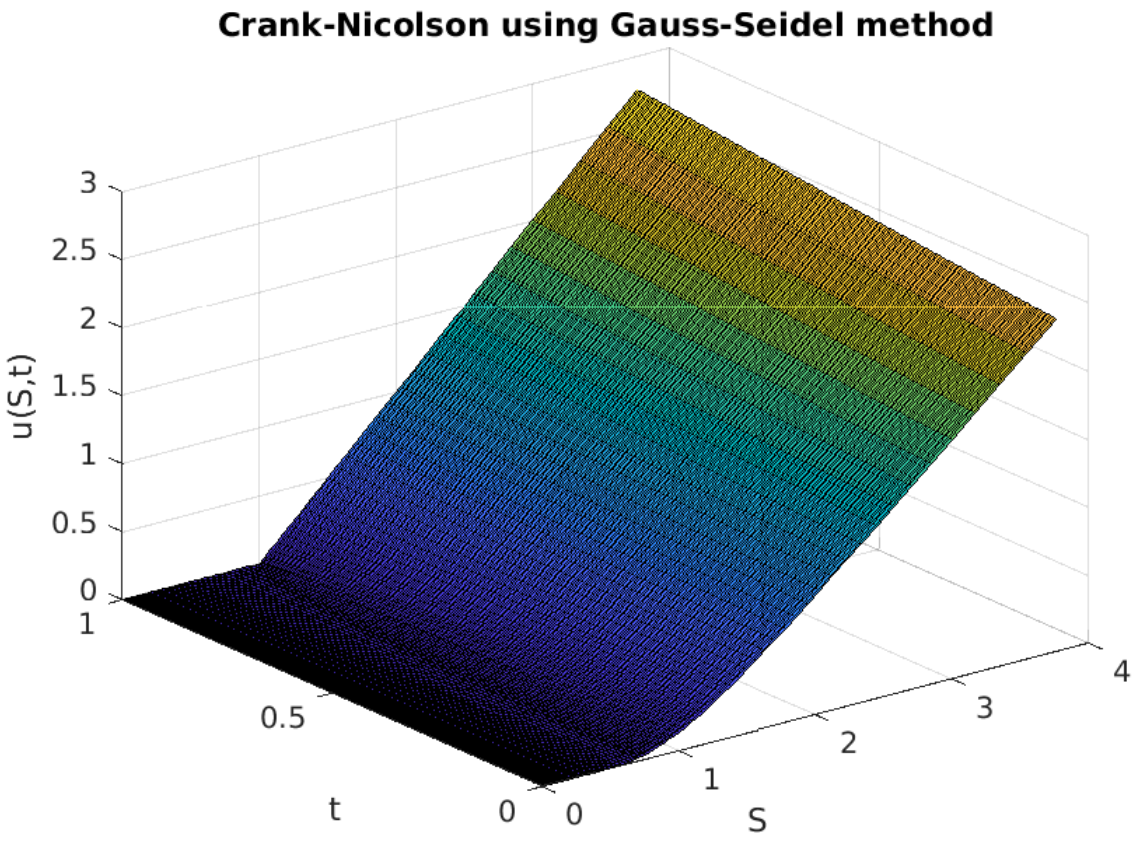
4
S


Crank-Nicolson using Gauss-Seidel method
Cost of call option at t = 0
Cost of call option at t = T
u(S, t)
S
0
0.5
1
1.5
2
2.5
3
3.5
4


Crank-Nicolson using Gauss-Seidel method
u(S,t)
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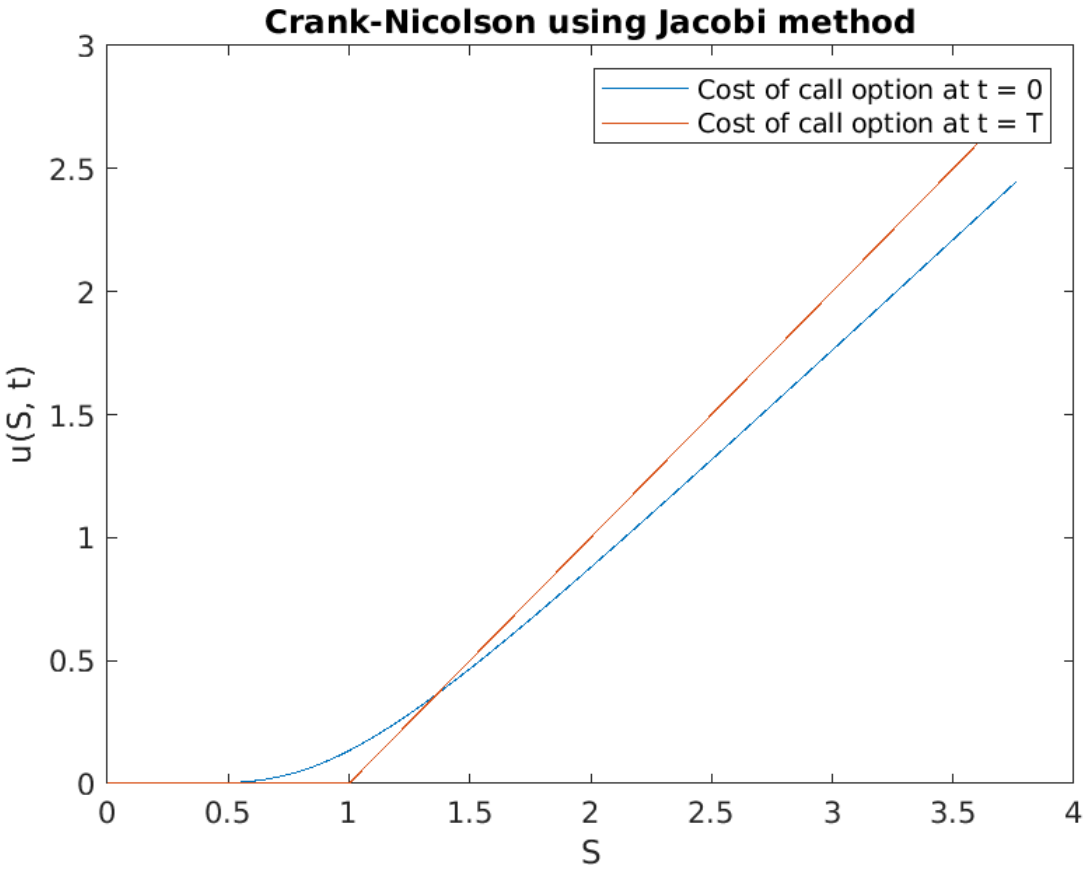
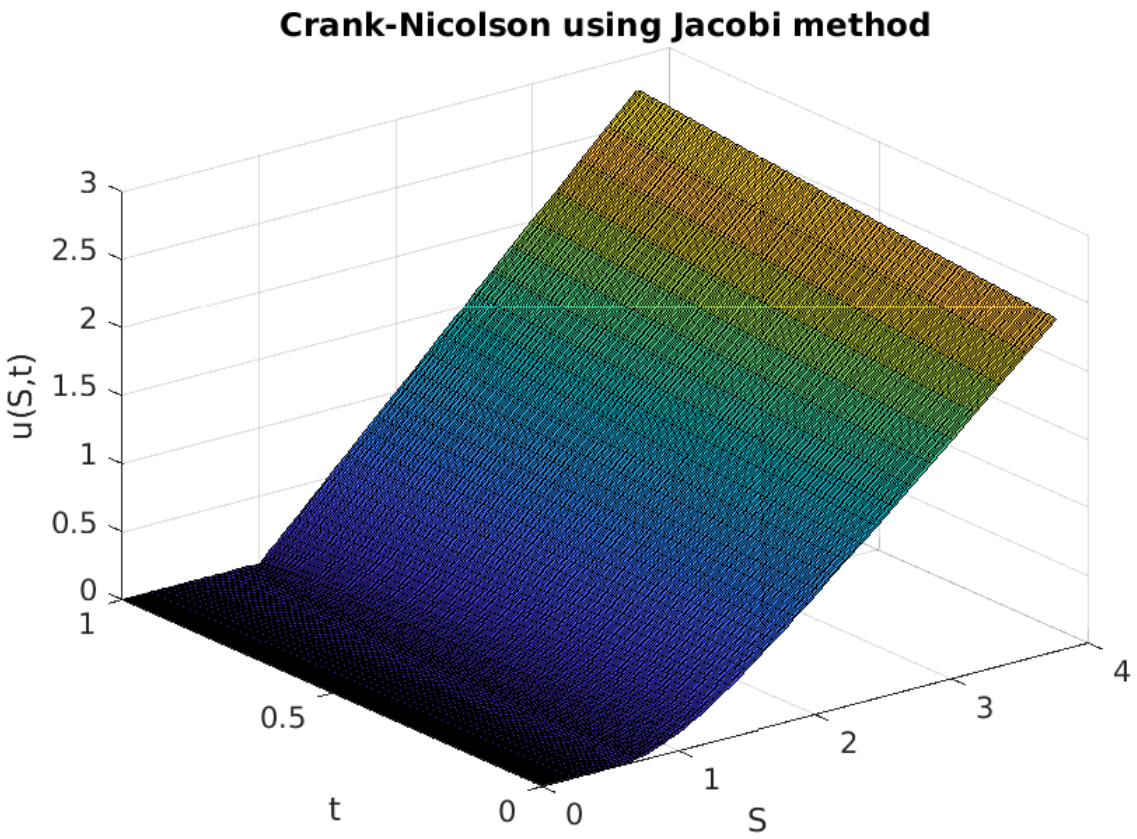
2.5
2
1.5
1
0.5
0
1
0.5
t
0
0
1
2
3
4
S


Crank-Nicolson using Jacobi method
Cost of call option at t = 0
Cost of call option at t = T
u(S, t)
S
0
0.5
1
1.5
2
2.5
3
3.5
4


Crank-Nicolson using Jacobi method
u(S,t)
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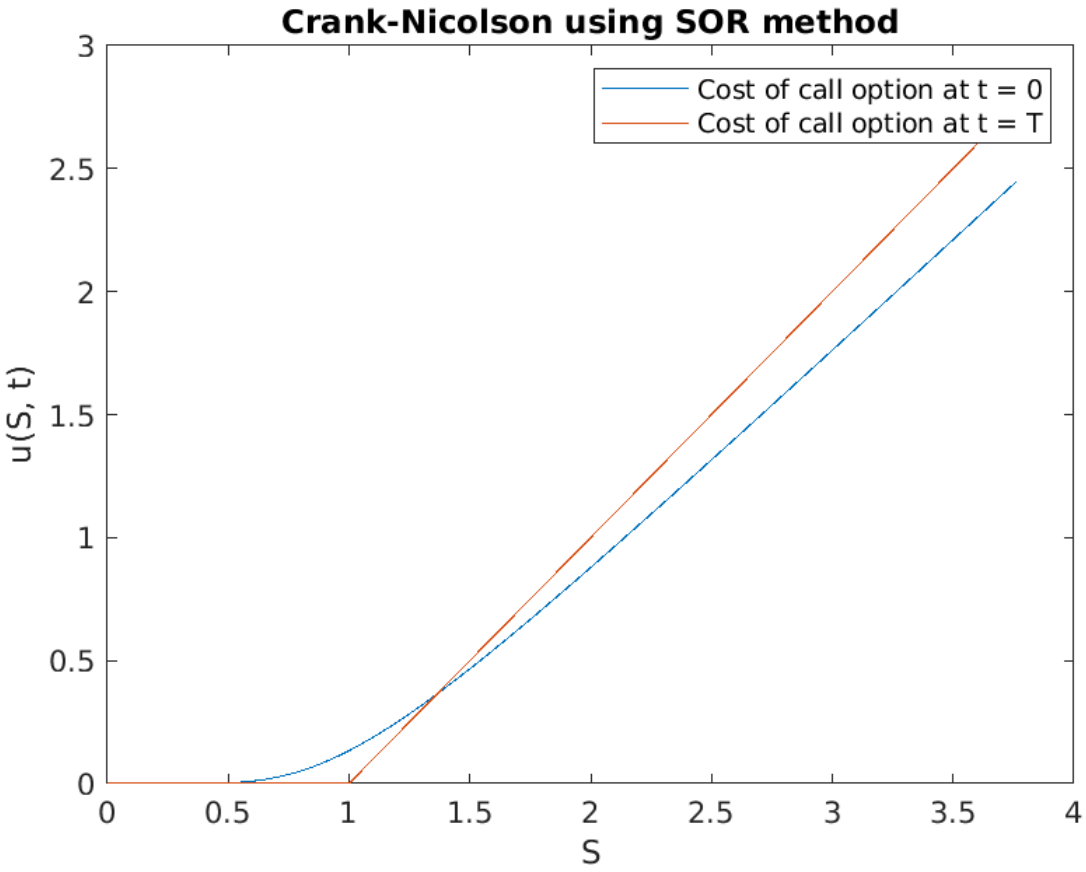
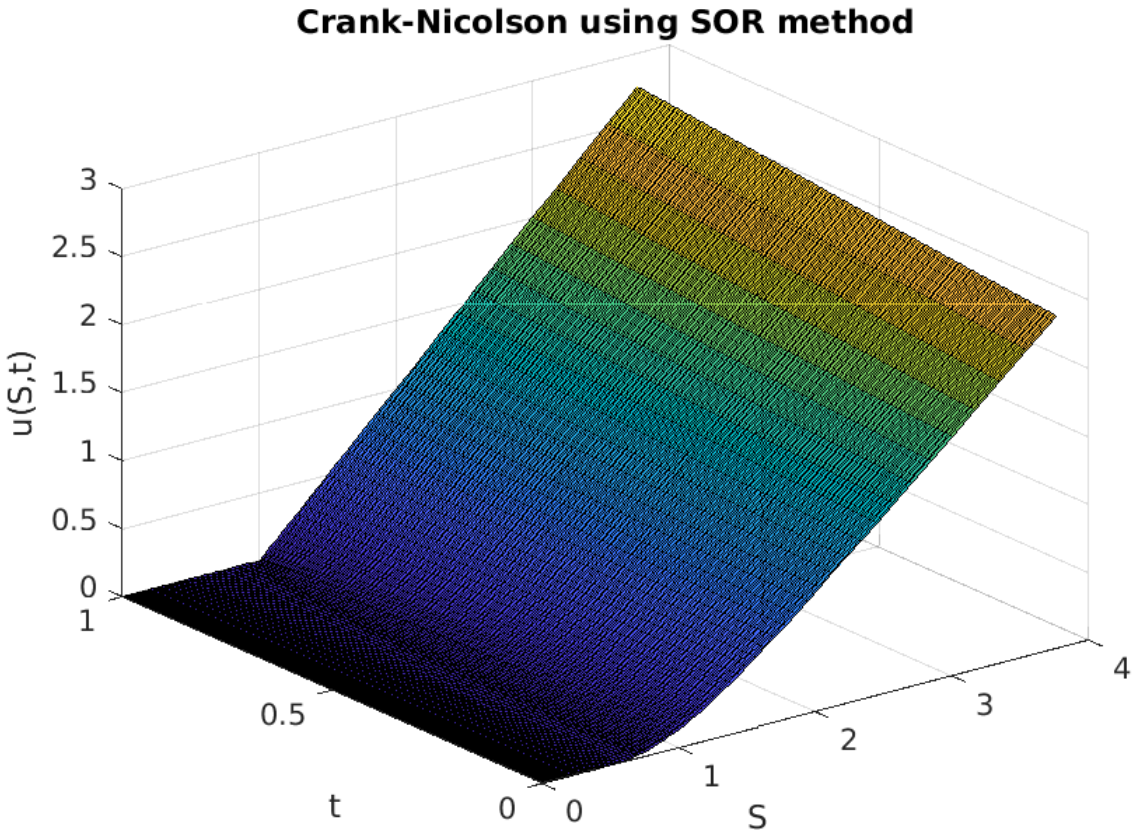
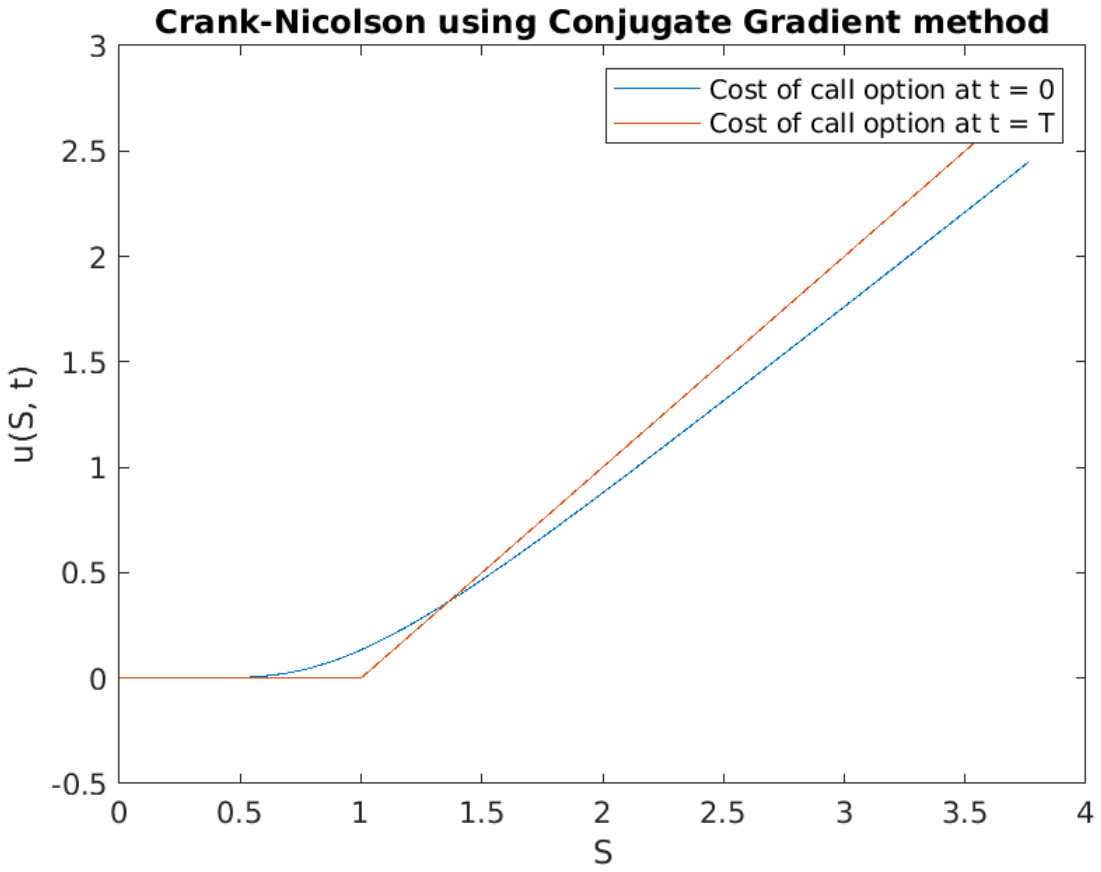
2.5
2
1.5
1
0.5
0
1
0.5
t
0
0
1
2
3
4
S


Crank-Nicolson using SOR method
Cost of call option at t = 0
Cost of call option at t = T
u(S, t)
S
0
0.5
1
1.5
2
2.5
3
3.5
4


Crank-Nicolson using SOR method
u(S,t)
3
2.5
2
1.5
1
0.5
0
1
0.5
t
0
0
1
2
3
4
S


Crank-Nicolson using Conjugate Gradient method
Cost of call option at t = 0
Cost of call option at t = T
u(S, t)
S
3
2.5
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0.5
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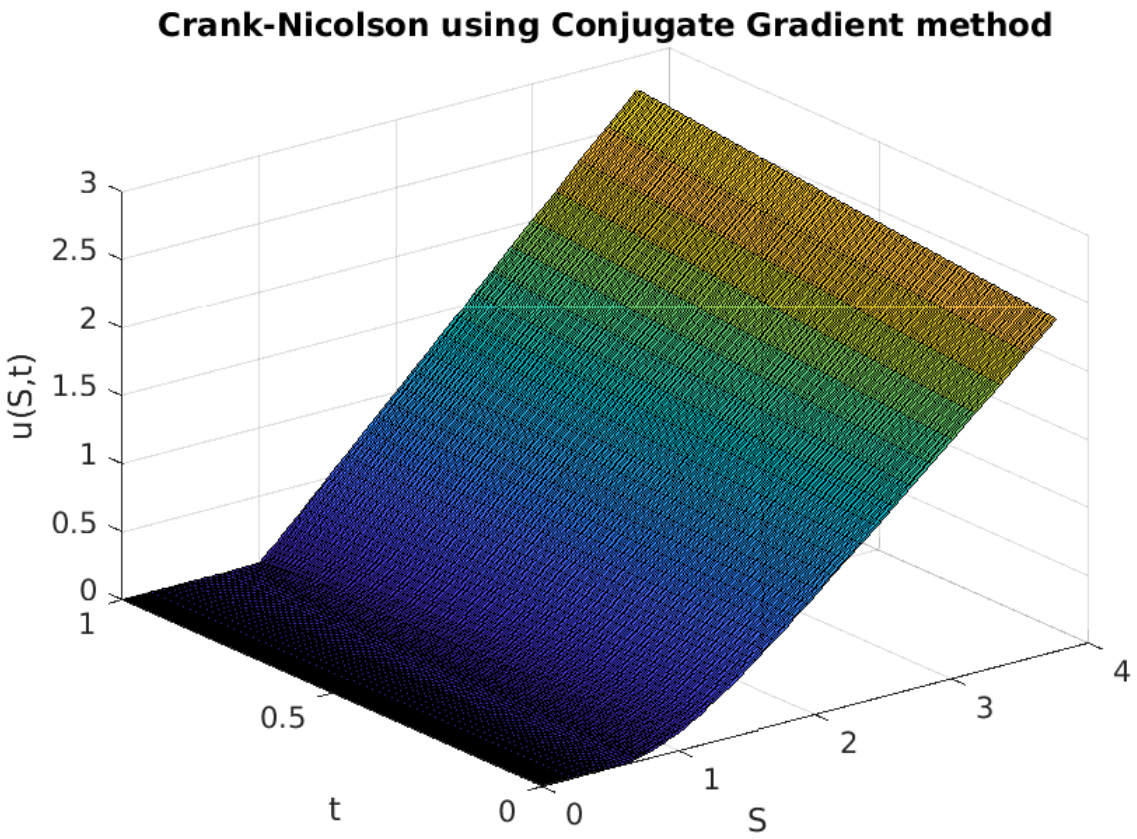
0
0.5
1
1.5
2
2.5
3
3.5
4


Crank-Nicolson using Conjugate Gradient method
u(S,t)
3
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1
0.5
t
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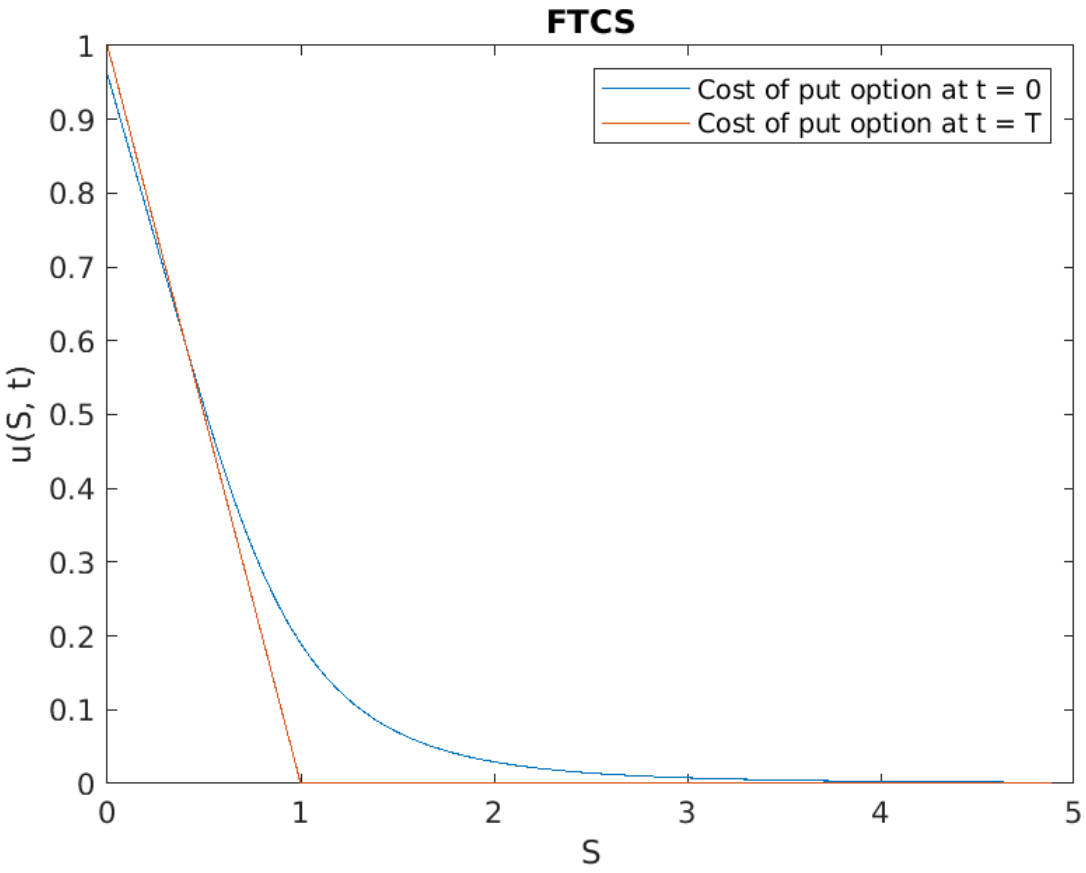
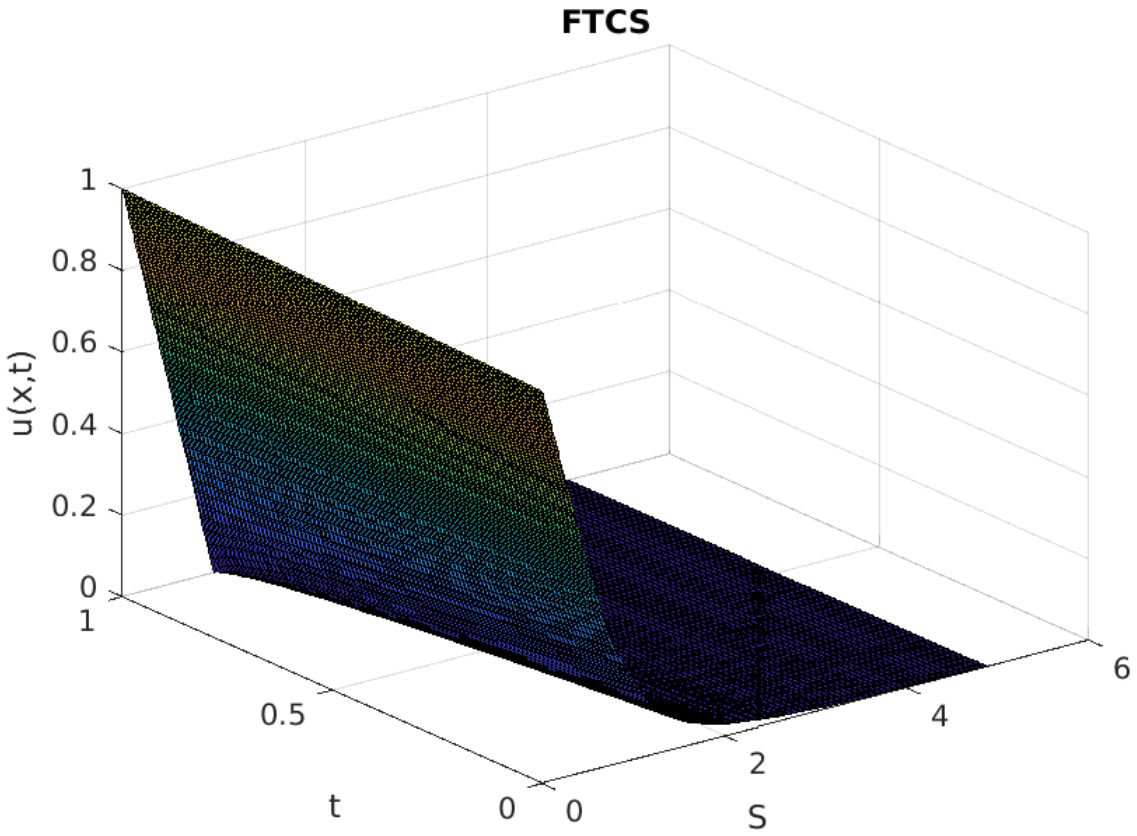
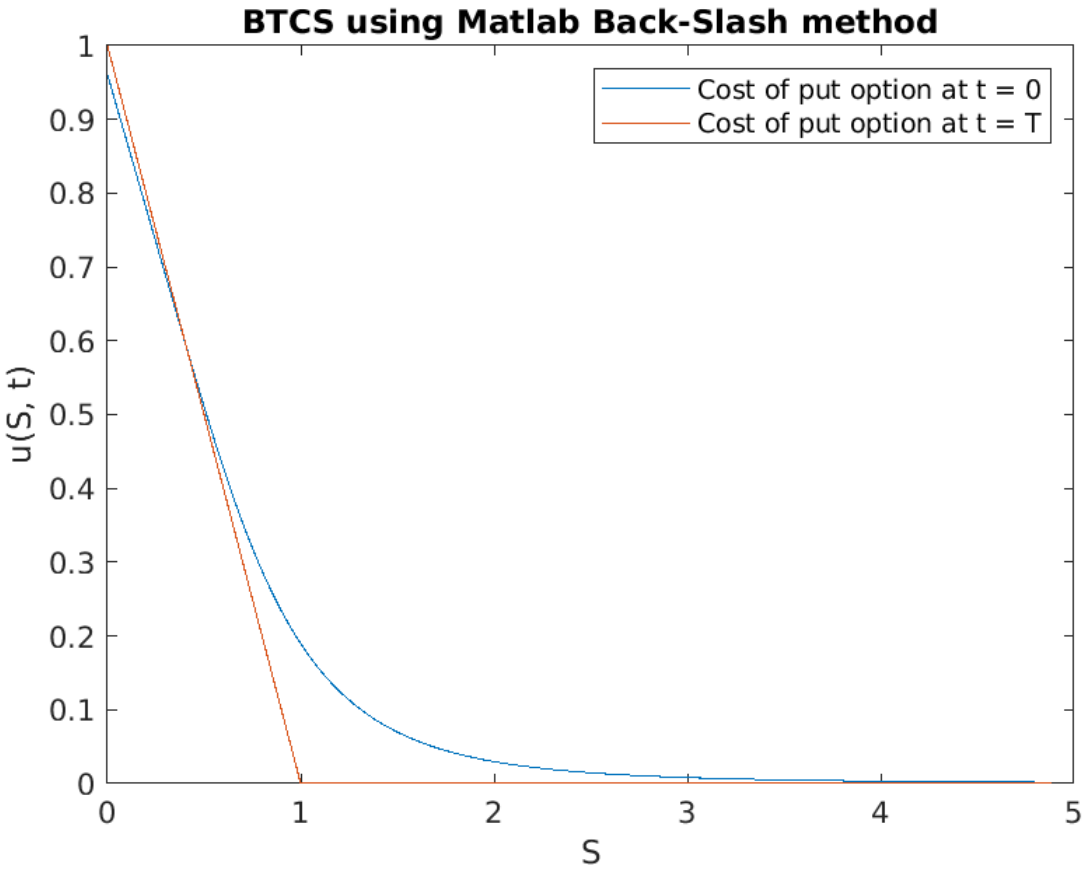
0
1
2
3
4
S

Question 02.


FTCS
Cost of put option at t = 0
Cost of put option at t = T
u(S, t)
S
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0
1
2
3
4
5


FTCS
u(x,t)
1
0.8
0.6
0.4
0.2
0
1
0.5
0
t
0
2
4
6
S


BTCS using Matlab Back-Slash method
Cost of put option at t = 0
Cost of put option at t = T
u(S, t)
S
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0
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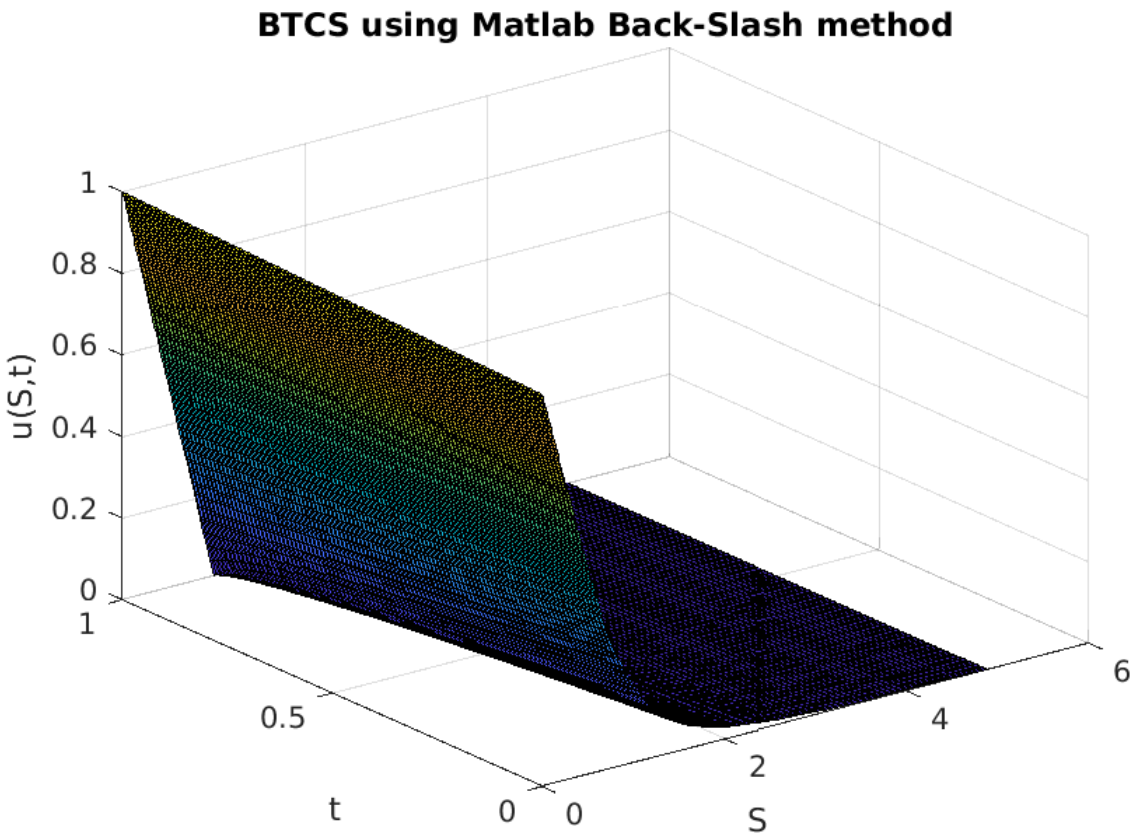
BTCS using Matlab Back-Slash method
u(S,t)
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0.2
0
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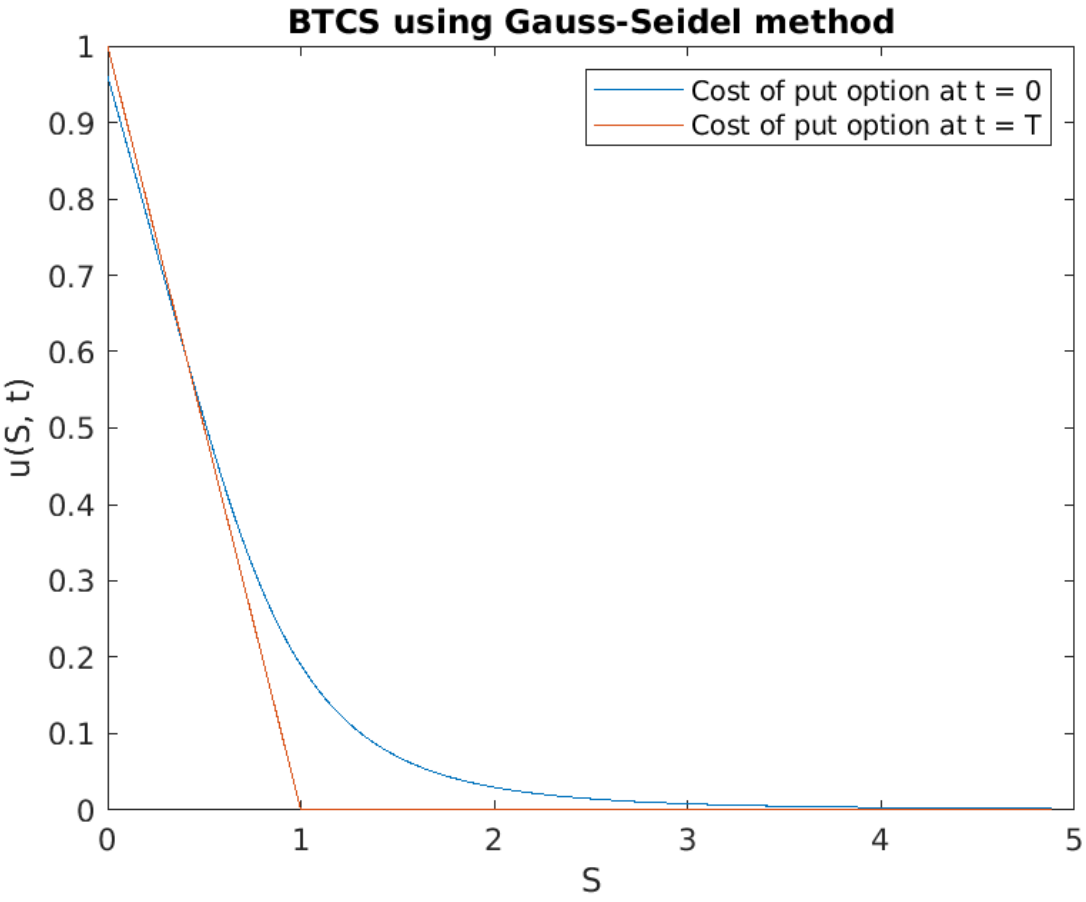
0.5
0
t
0
2
4
6
S


BTCS using Gauss-Seidel method
Cost of put option at t = 0
Cost of put option at t = T
u(S, t)
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0
0.1
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0.7
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0.9
1
0
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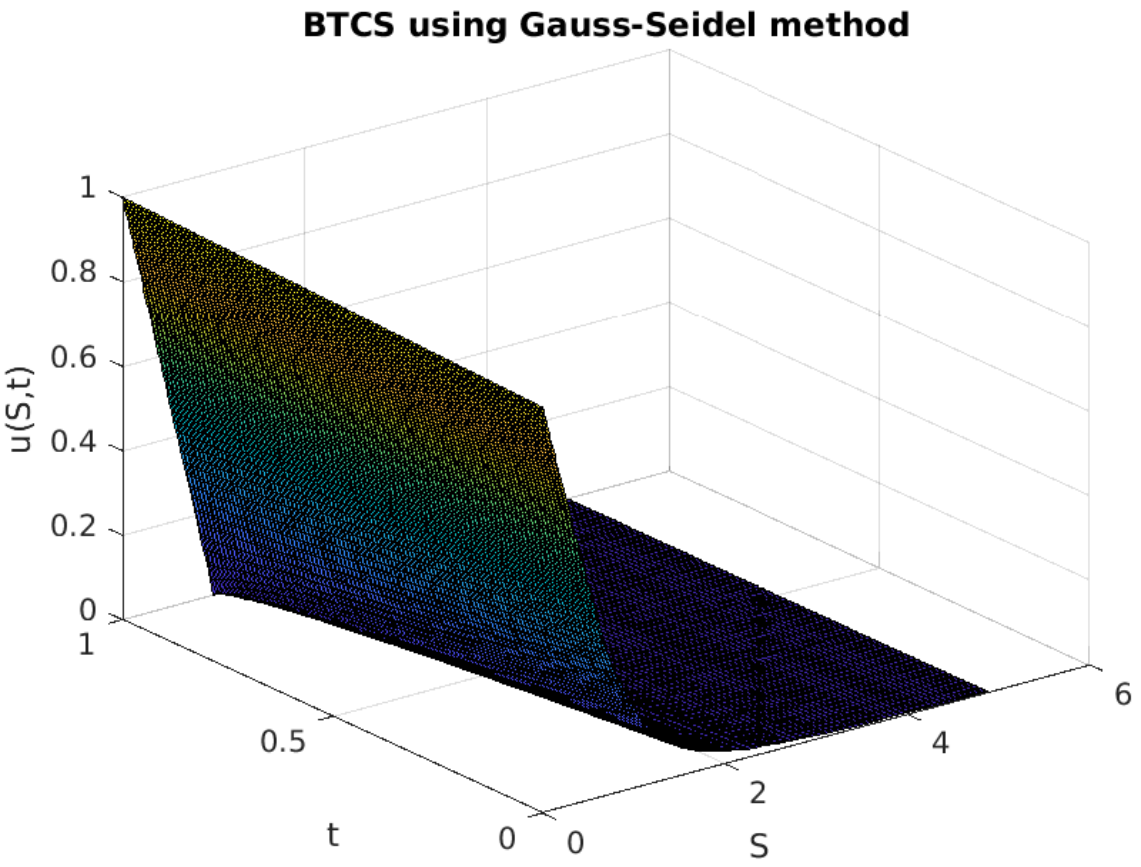
BTCS using Gauss-Seidel method
u(S,t)
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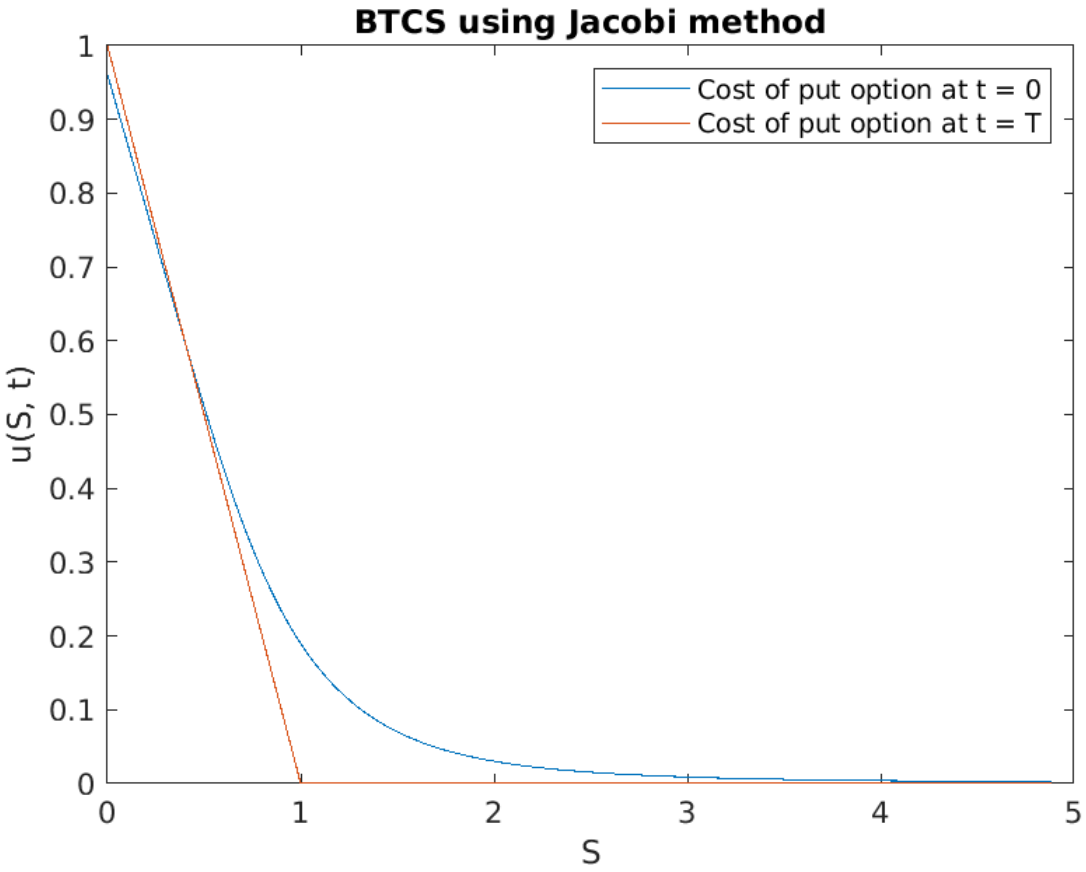
0.6
0.4
0.2
0
1
0.5
t
0
0
2
4
6
S


BTCS using Jacobi method
Cost of put option at t = 0
Cost of put option at t = T
u(S, t)
S
0
0.1
0.2
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0.4
0.5
0.6
0.7
0.8
0.9
1
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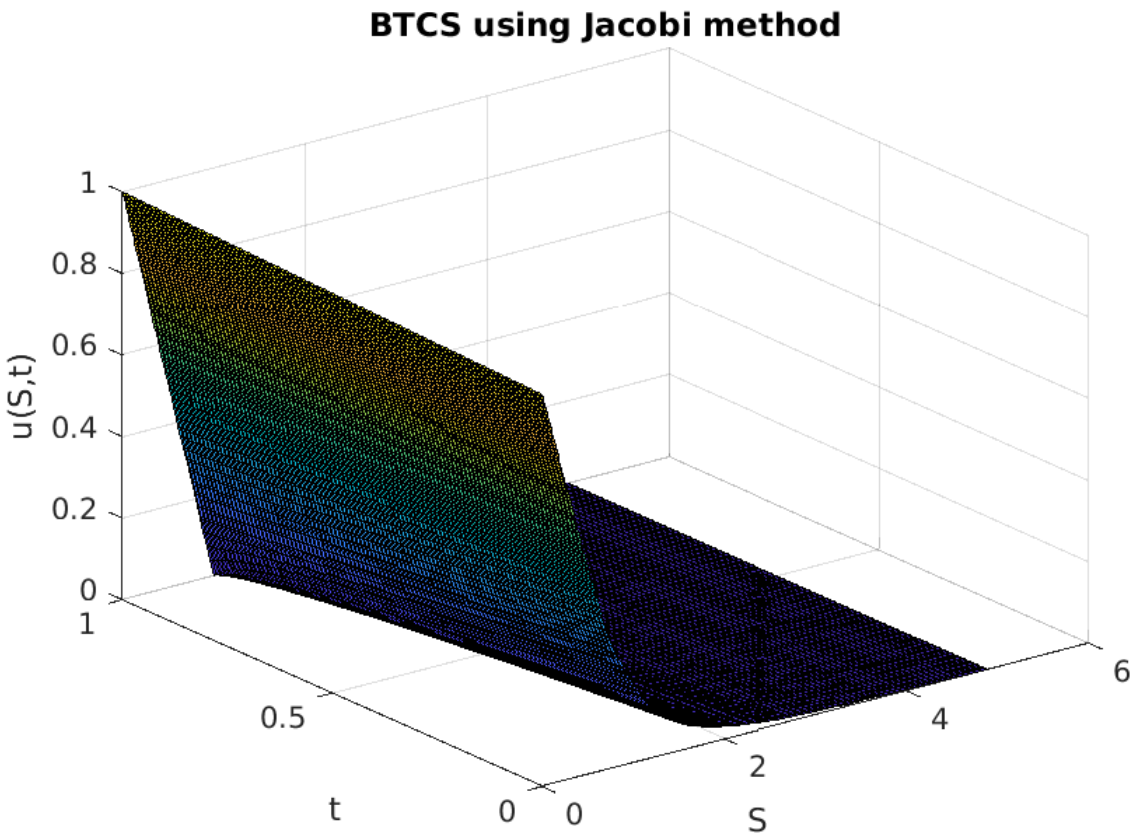
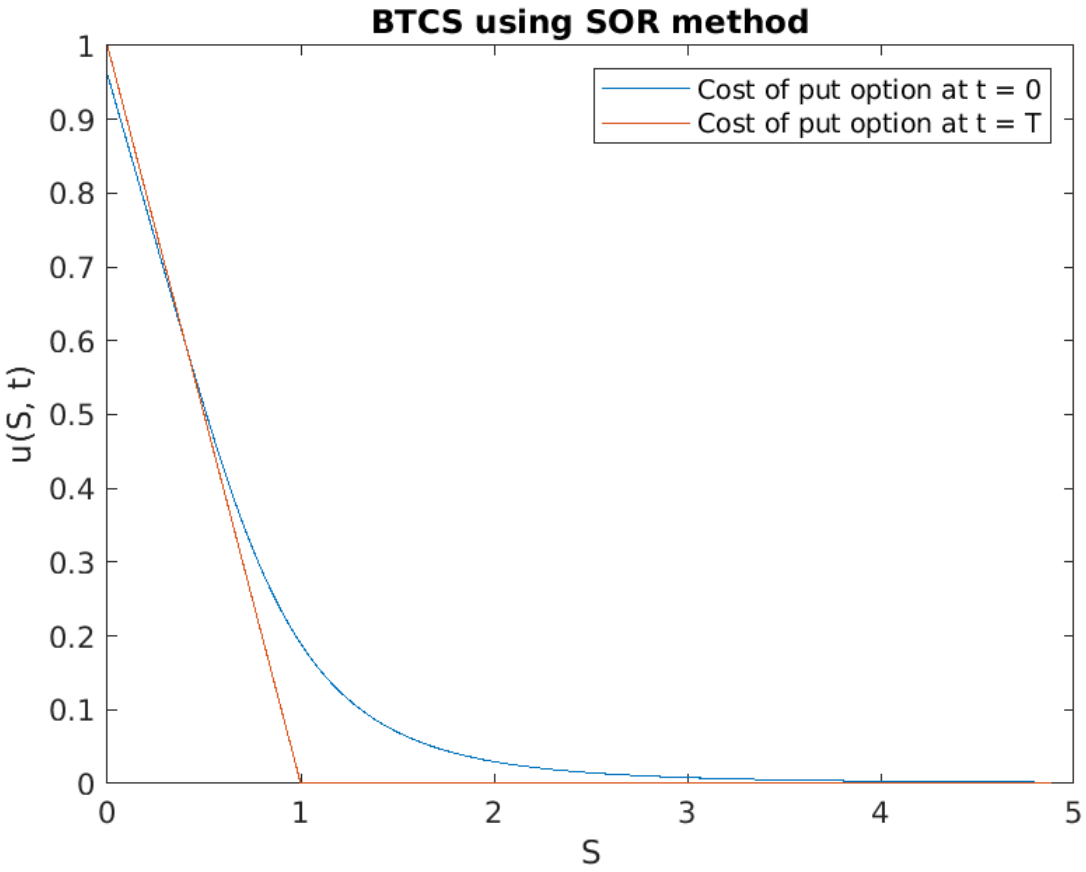

BTCS using Jacobi method
u(S,t)
1
0.8
0.6
0.4
0.2
0
1
0.5
t
0
0
2
4
6
S


BTCS using SOR method
Cost of put option at t = 0
Cost of put option at t = T
u(S, t)
S
0
0.1
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0.4
0.5
0.6
0.7
0.8
0.9
1
0
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2
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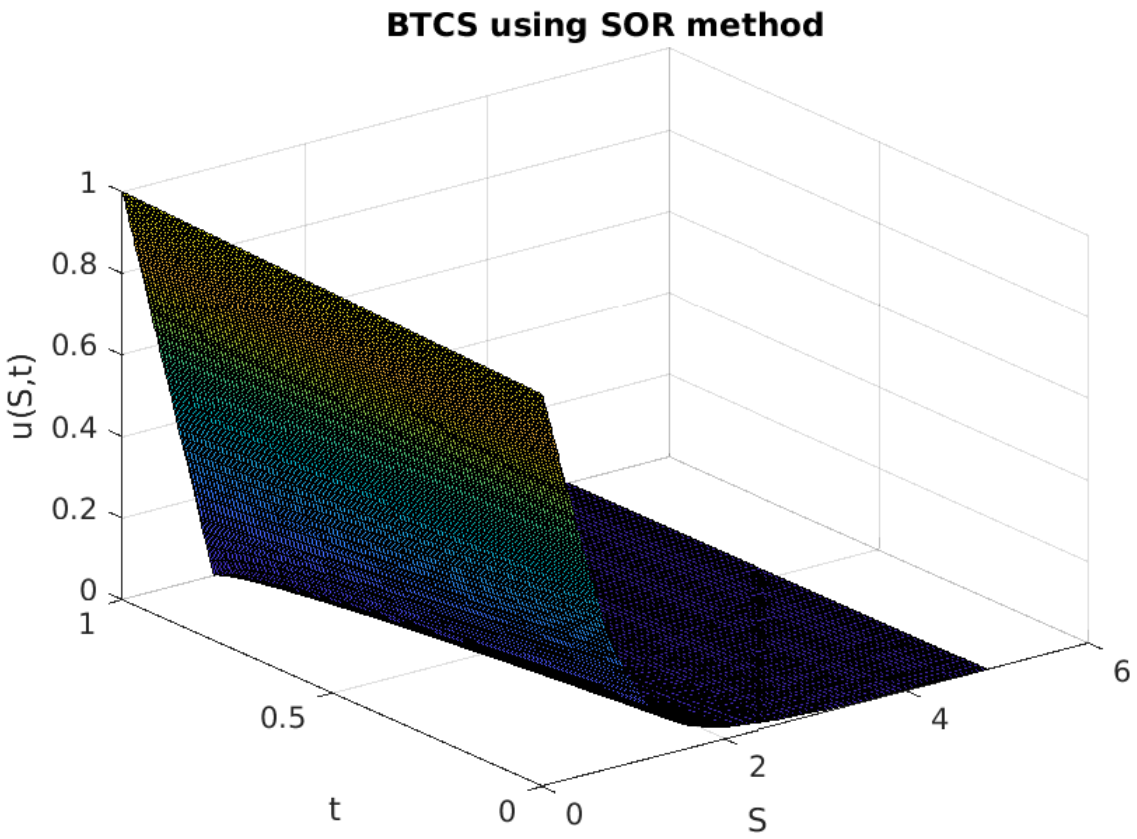
BTCS using SOR method
u(S,t)
1
0.8
0.6
0.4
0.2
0
1
0.5
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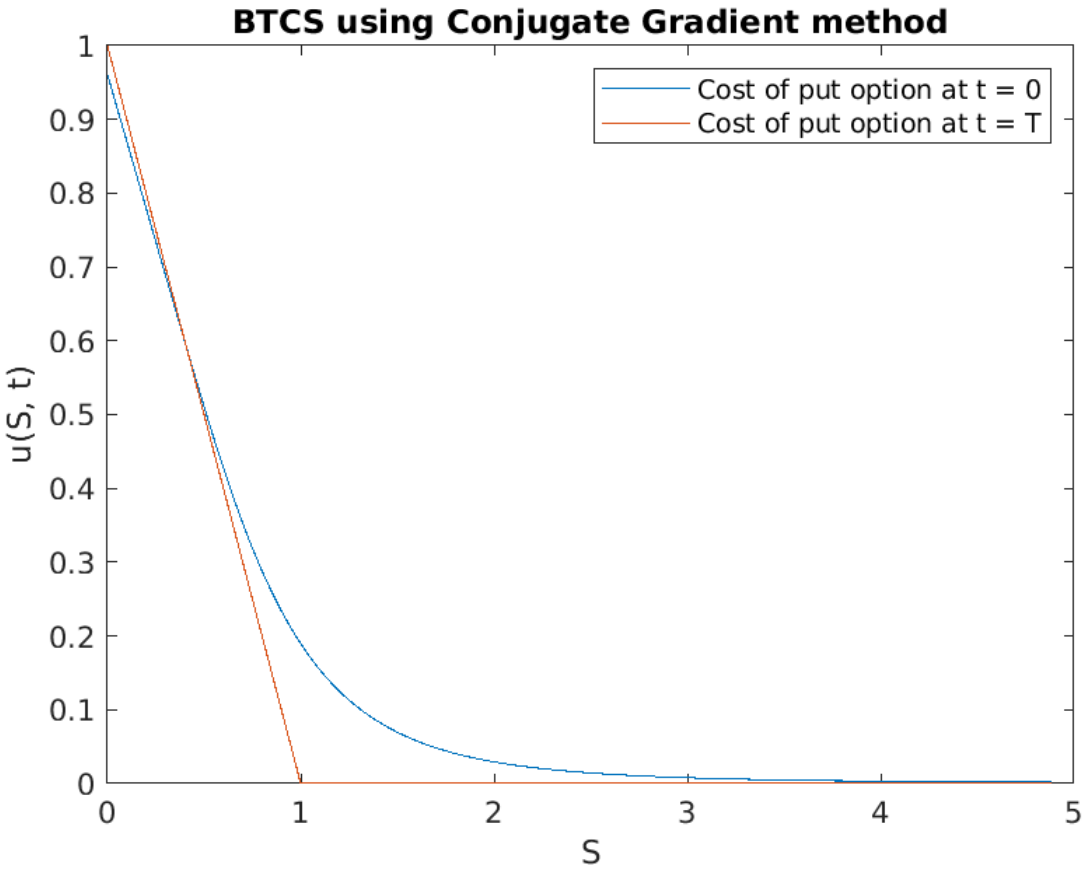
4
6
S


BTCS using Conjugate Gradient method
Cost of put option at t = 0
Cost of put option at t = T
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0.1
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0.3
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0.8
0.9
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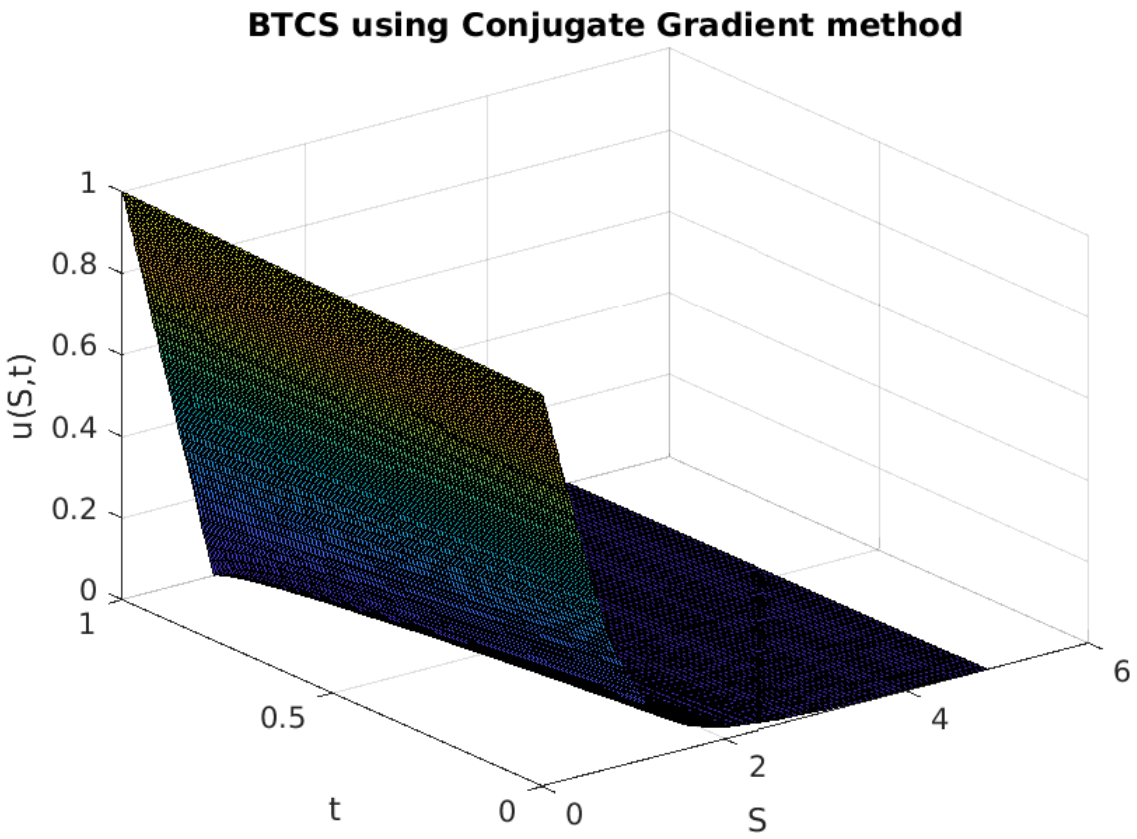
BTCS using Conjugate Gradient method
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0.6
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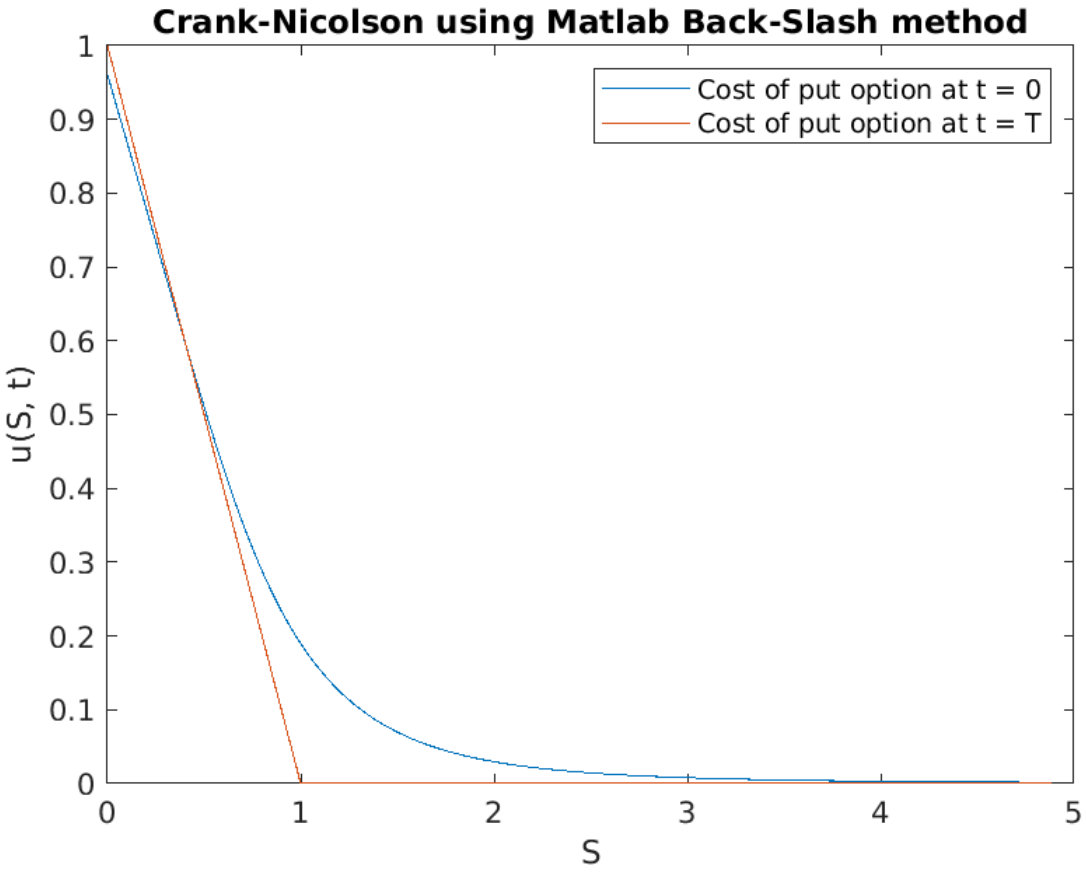
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Cost of put option at t = T
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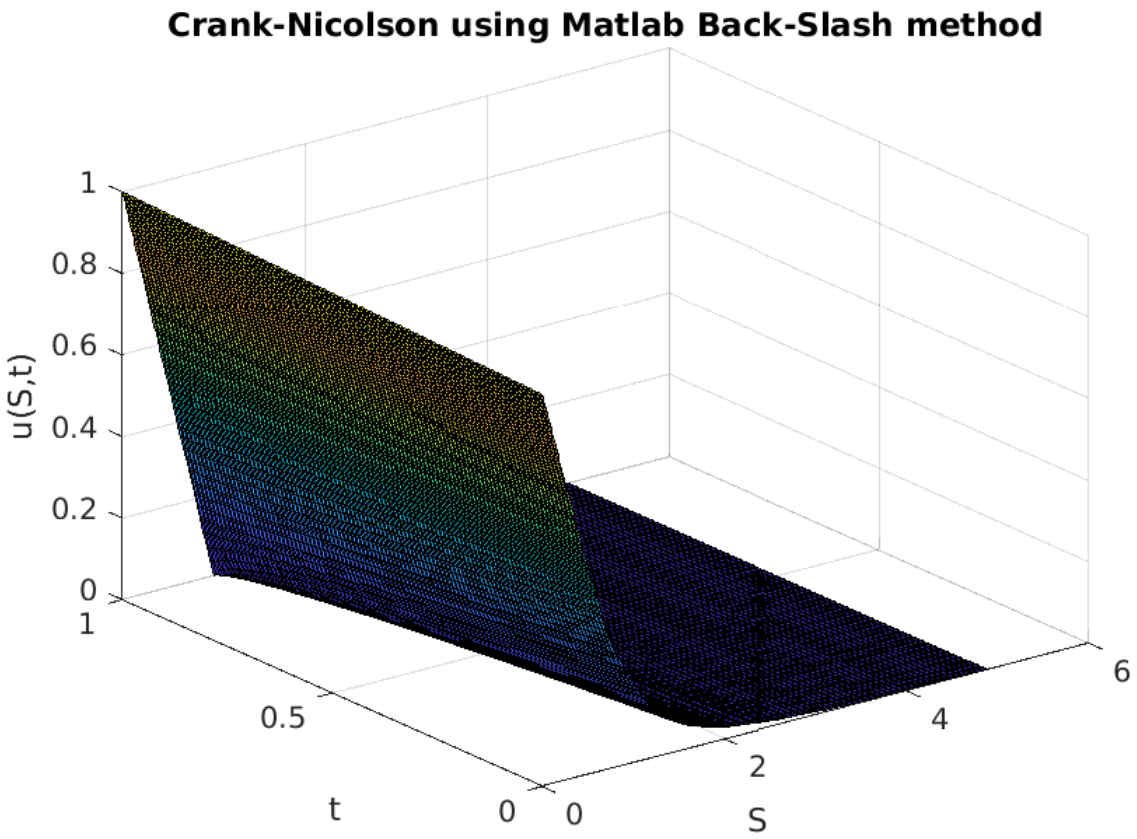
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1
0.5
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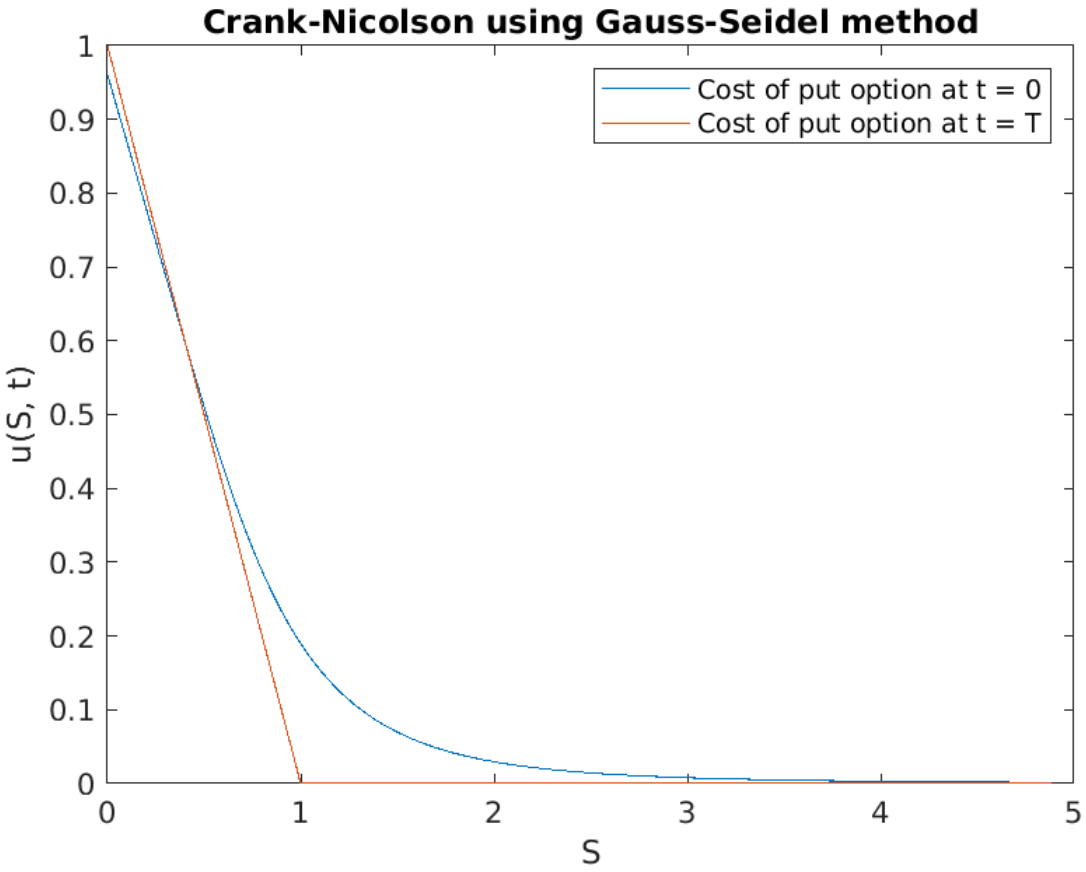
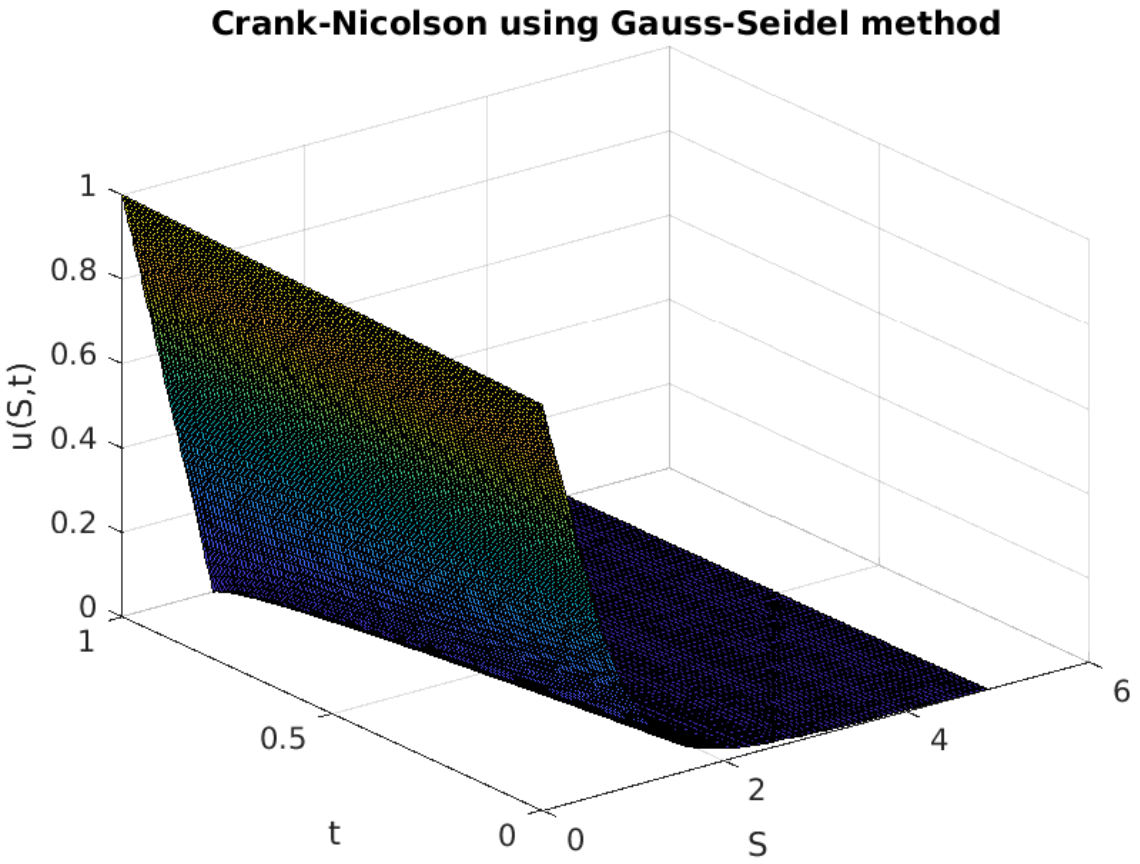
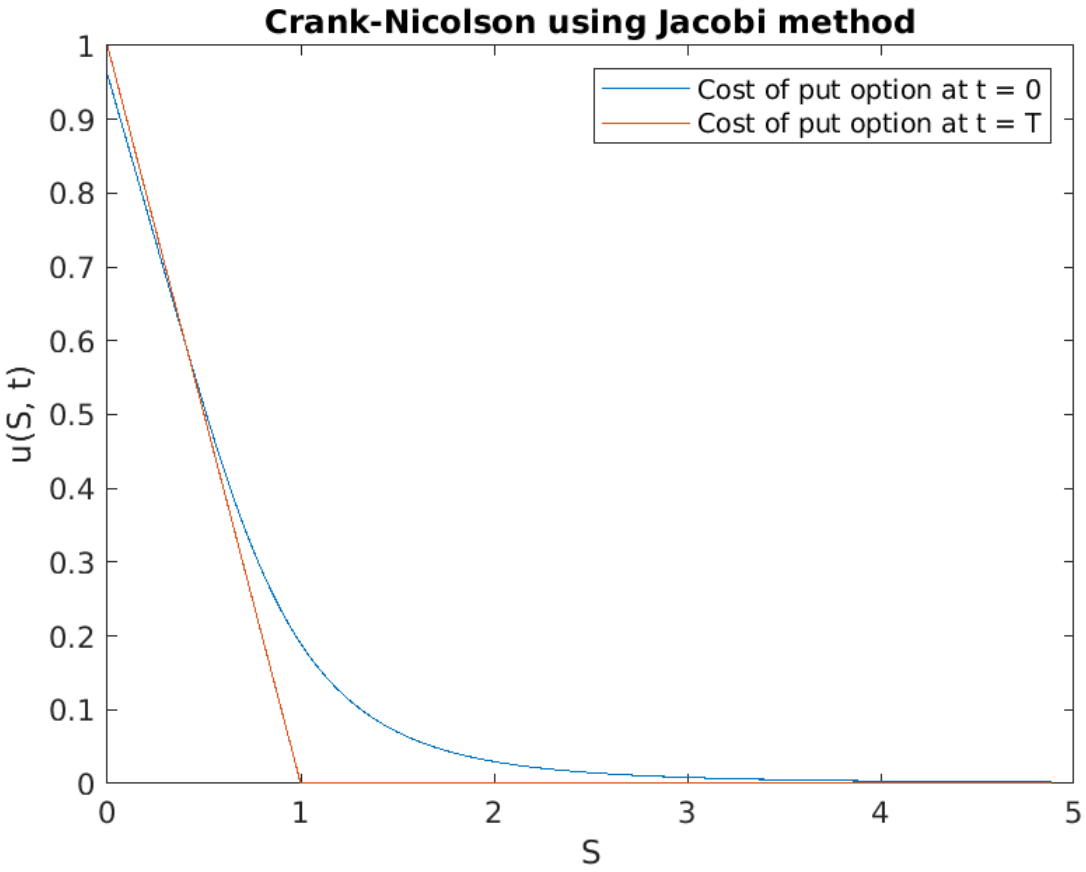
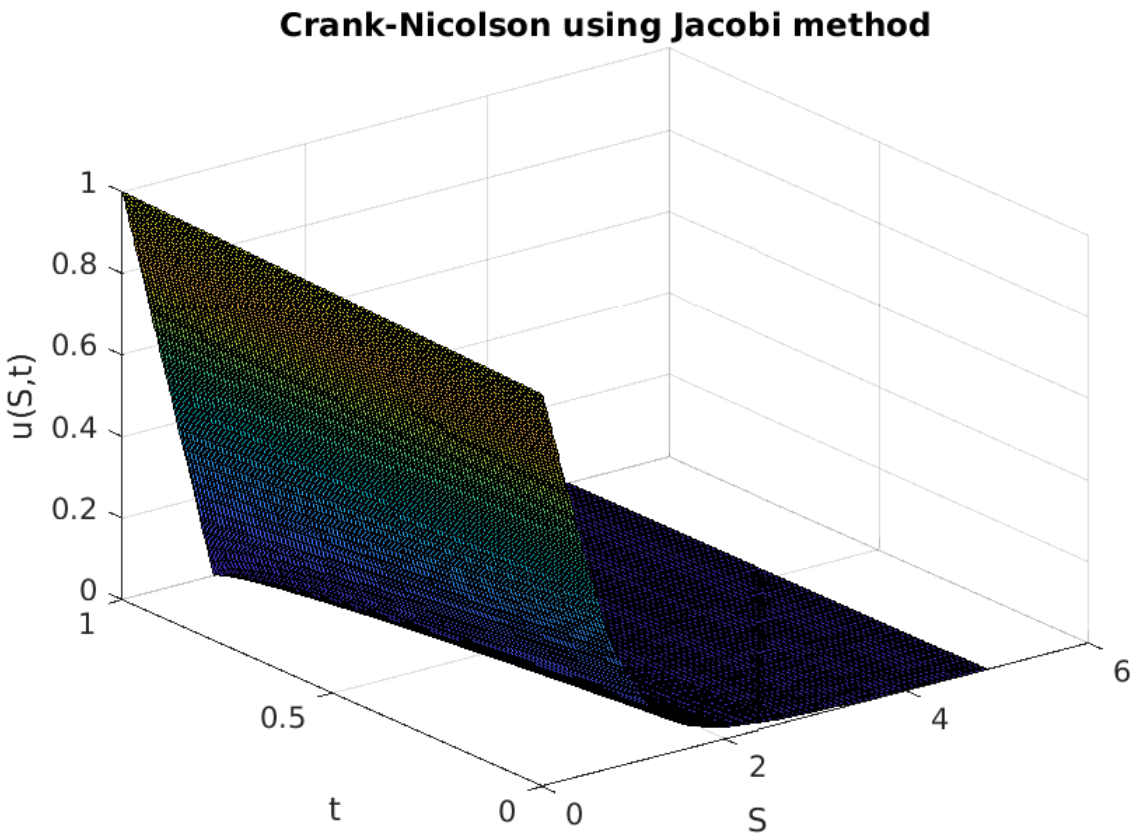
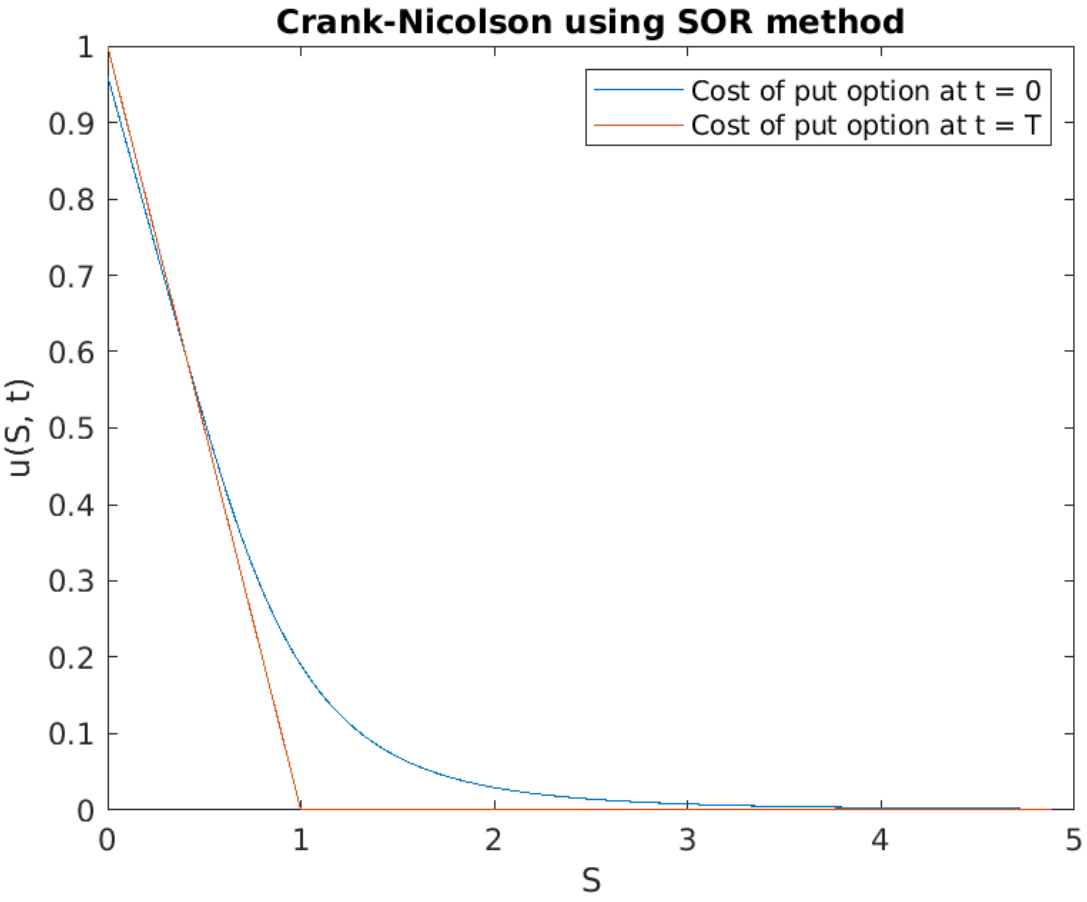
2
4
6
S

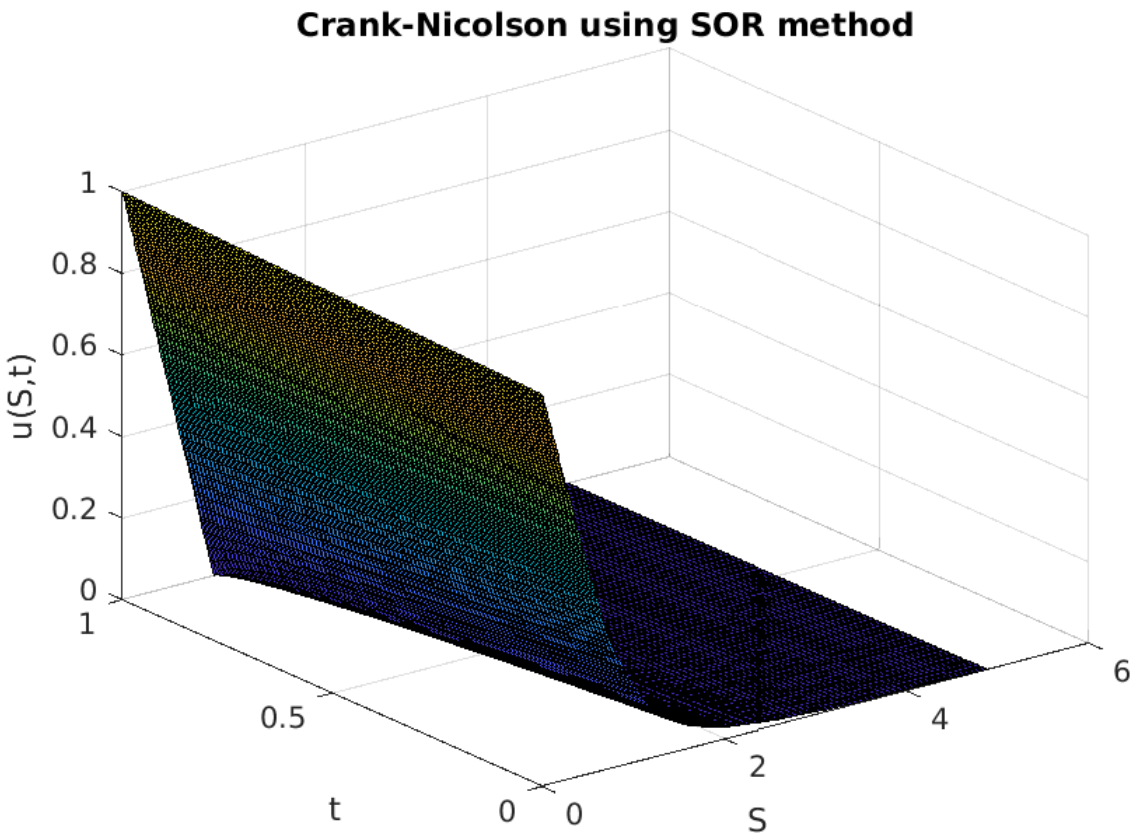

Crank-Nicolson using Gauss-Seidel method
Cost of put option at t = 0
Cost of put option at t = T
u(S, t)
S
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0
1
2
3
4
5

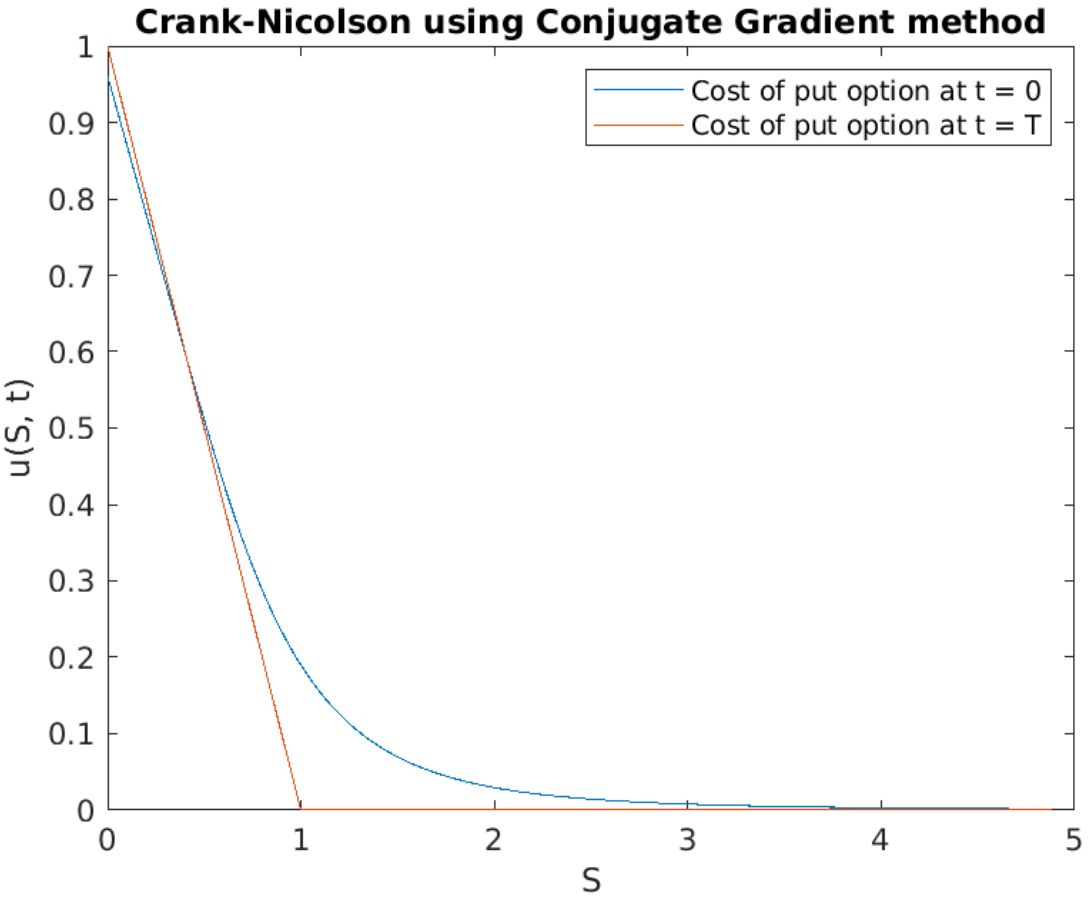

Crank-Nicolson using Gauss-Seidel method
u(S,t)
1
0.8
0.6
0.4
0.2
0
1
0.5
t
0
0
2
4
6
S

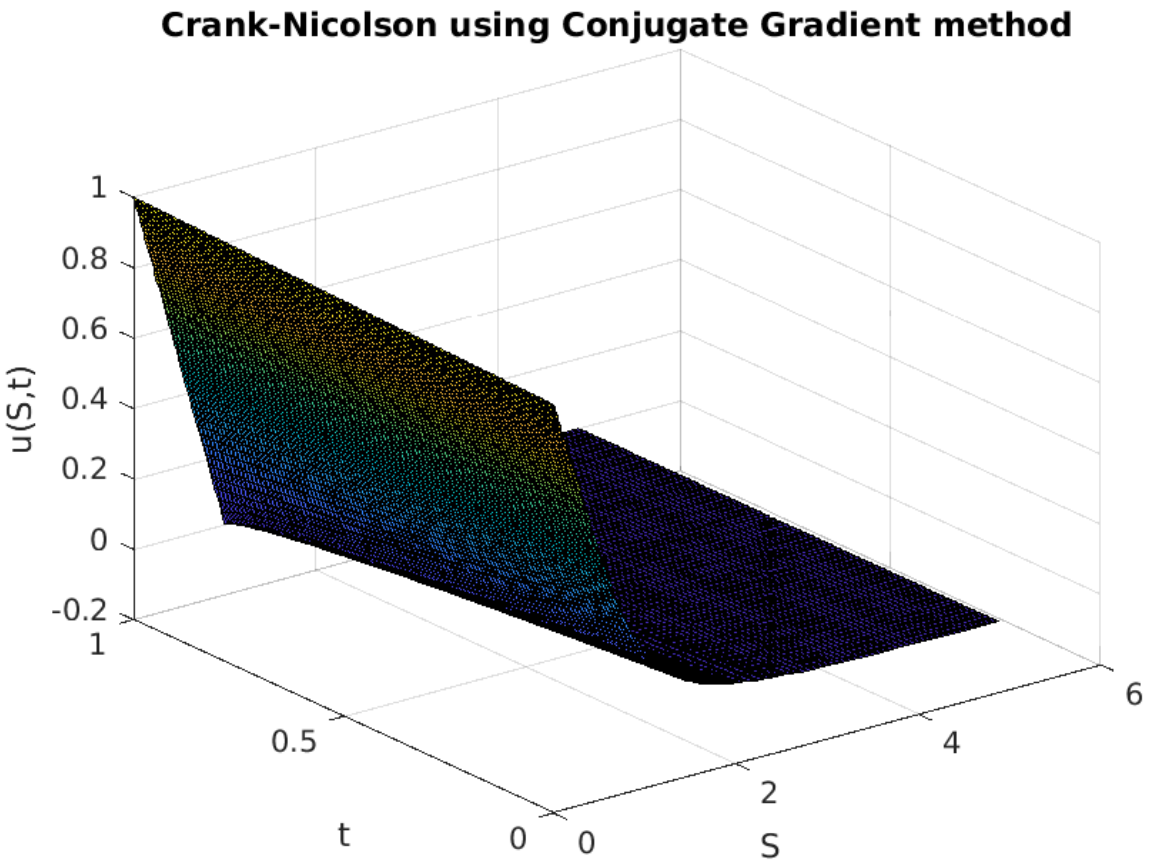

Crank-Nicolson using Jacobi method
Cost of put option at t = 0
Cost of put option at t = T
u(S, t)
S
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0
1
2
3
4
5


Crank-Nicolson using Jacobi method
u(S,t)
1
0.8
0.6
0.4
0.2
0
1
0.5
0
t
0
2
4
6
S


Crank-Nicolson using SOR method
Cost of put option at t = 0
Cost of put option at t = T
u(S, t)
S
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0
1
2
3
4
5


Crank-Nicolson using SOR method
u(S,t)
1
0.8
0.6
0.4
0.2
0
1
0.5
0
t
0
2
4
6
S


Crank-Nicolson using Conjugate Gradient method
Cost of put option at t = 0
Cost of put option at t = T
u(S, t)
S
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0
1
2
3
4
5


Crank-Nicolson using Conjugate Gradient method
u(S,t)
1
0.8
0.6
0.4
0.2
0
-0.2
1
0.5
0
t
0
2
4
6
S