Assignment-2

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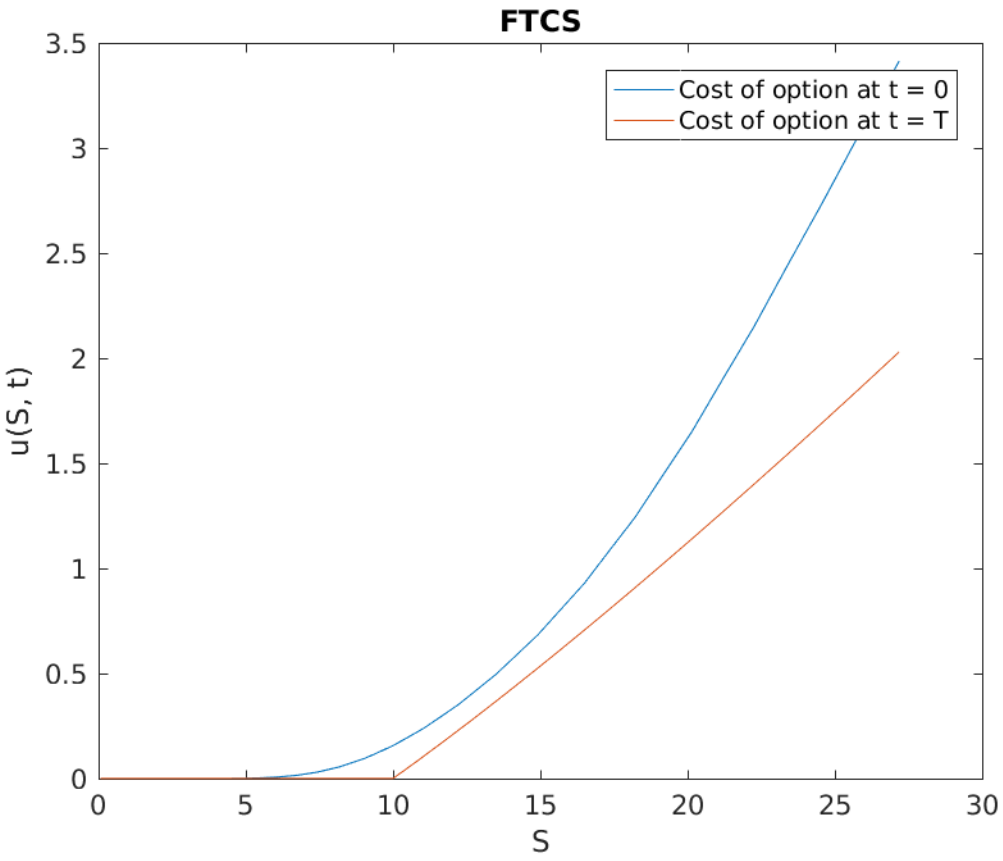
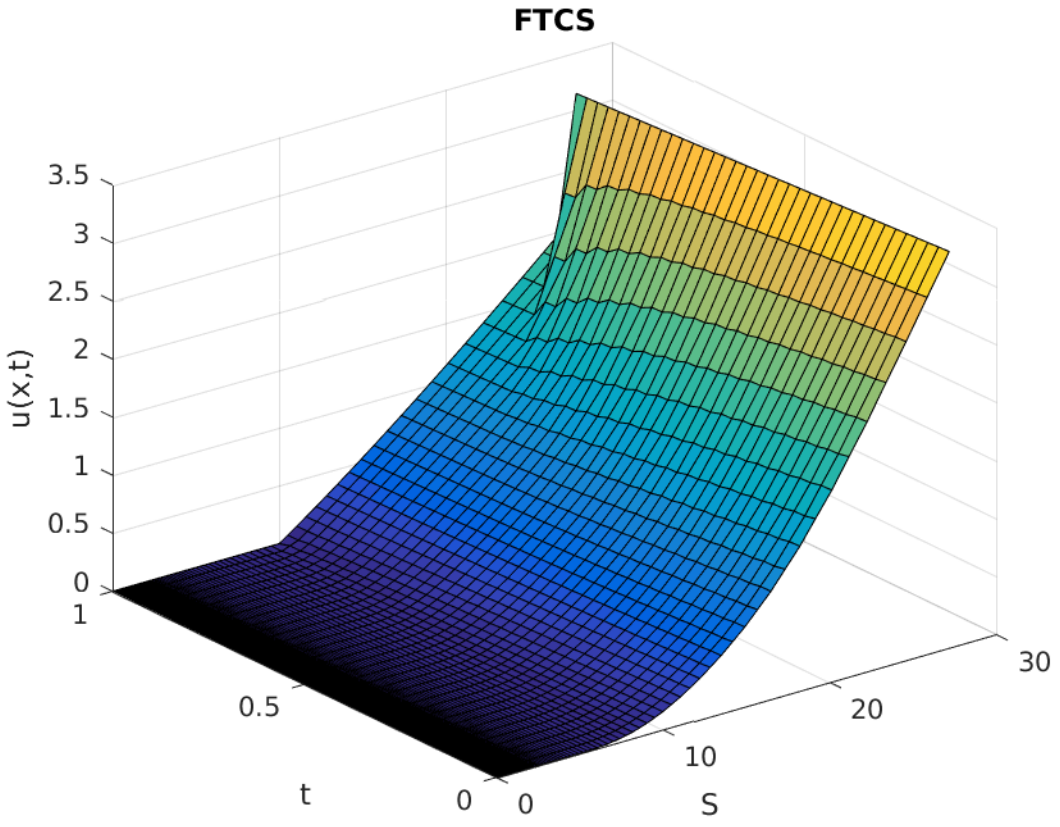
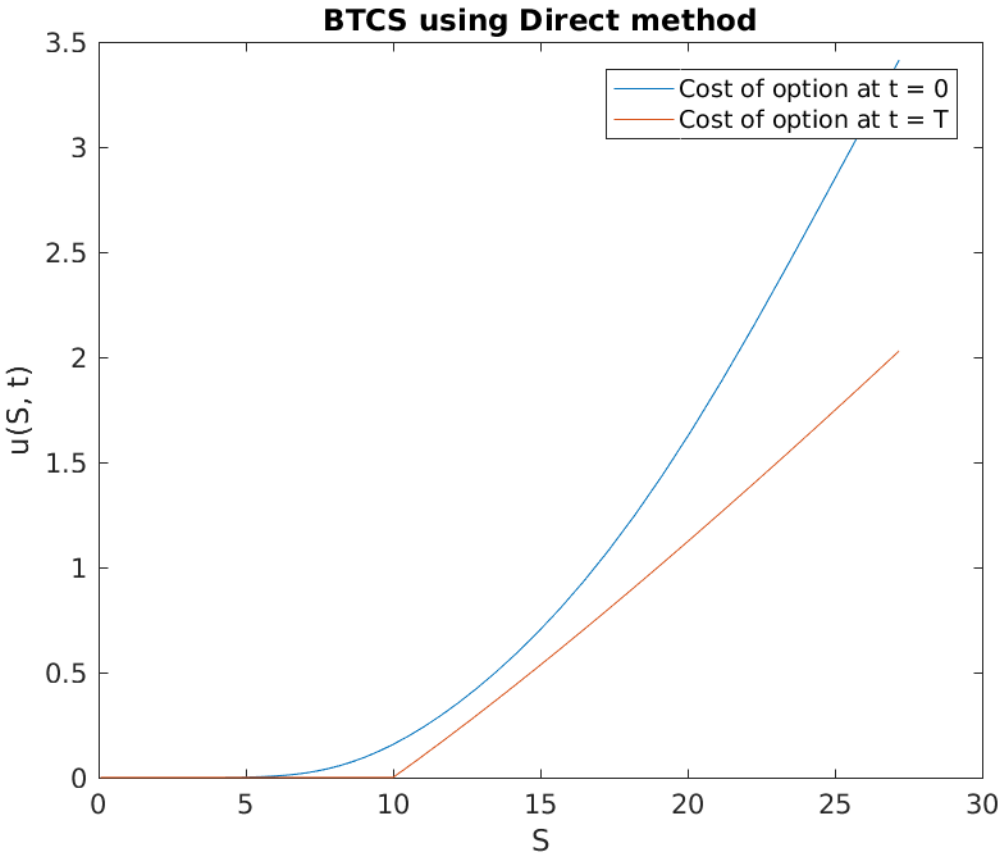
January 19, 2018

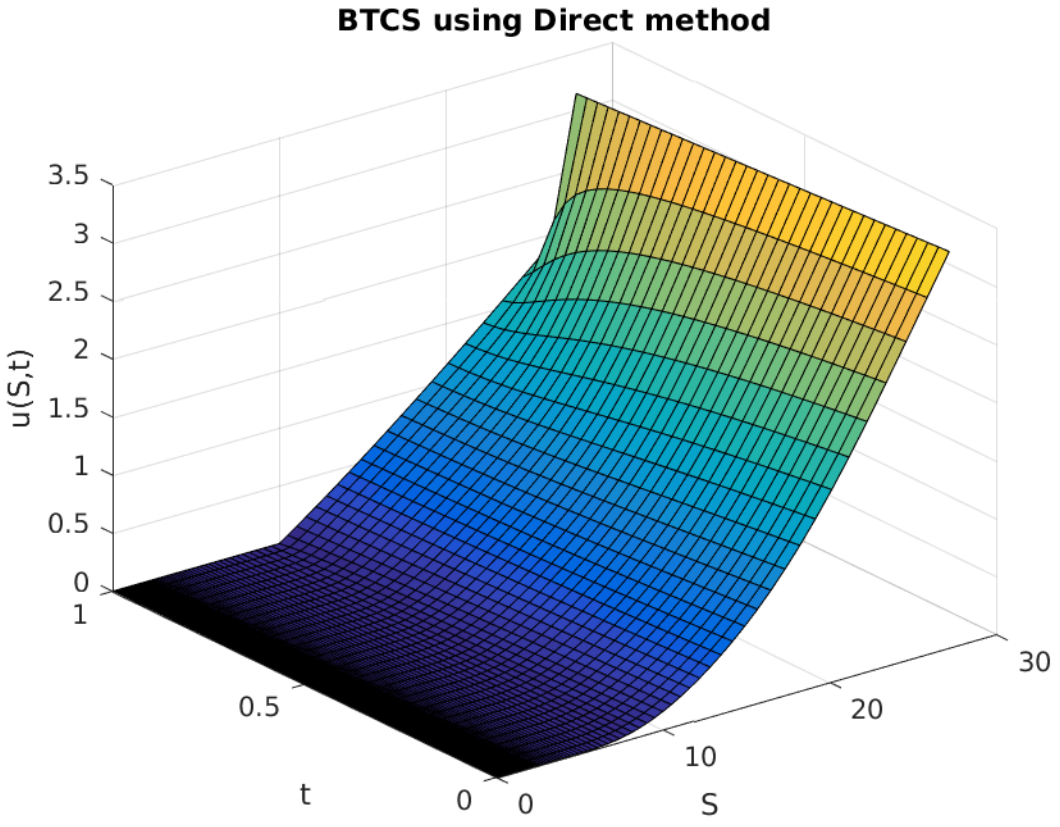
For extreme values of S (or x) the error in the plots is mainly due to the error in computing the boundary condition because we don't have $x = \infty$ and $-\infty$ as required.

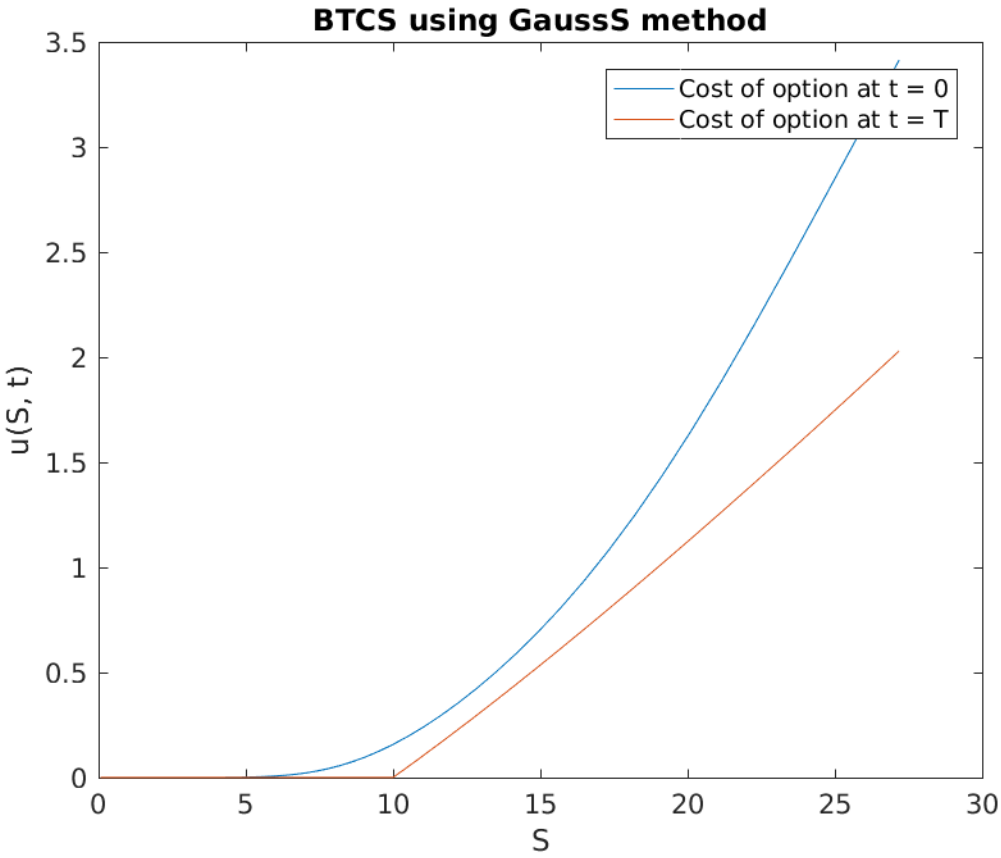
Question 1

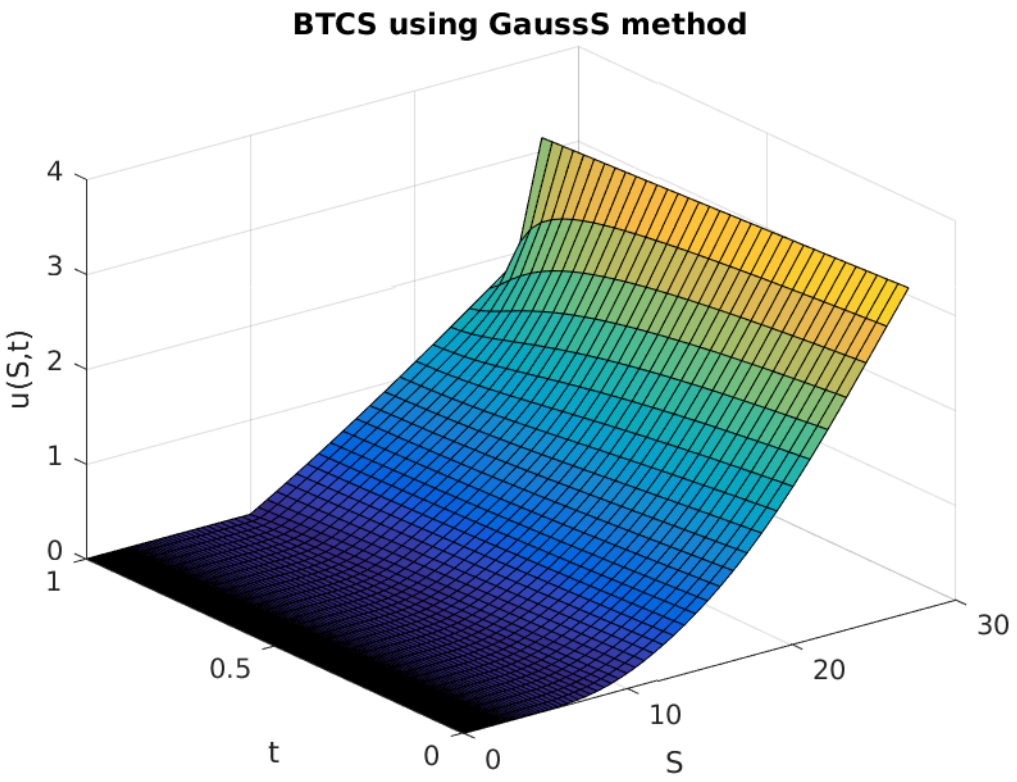


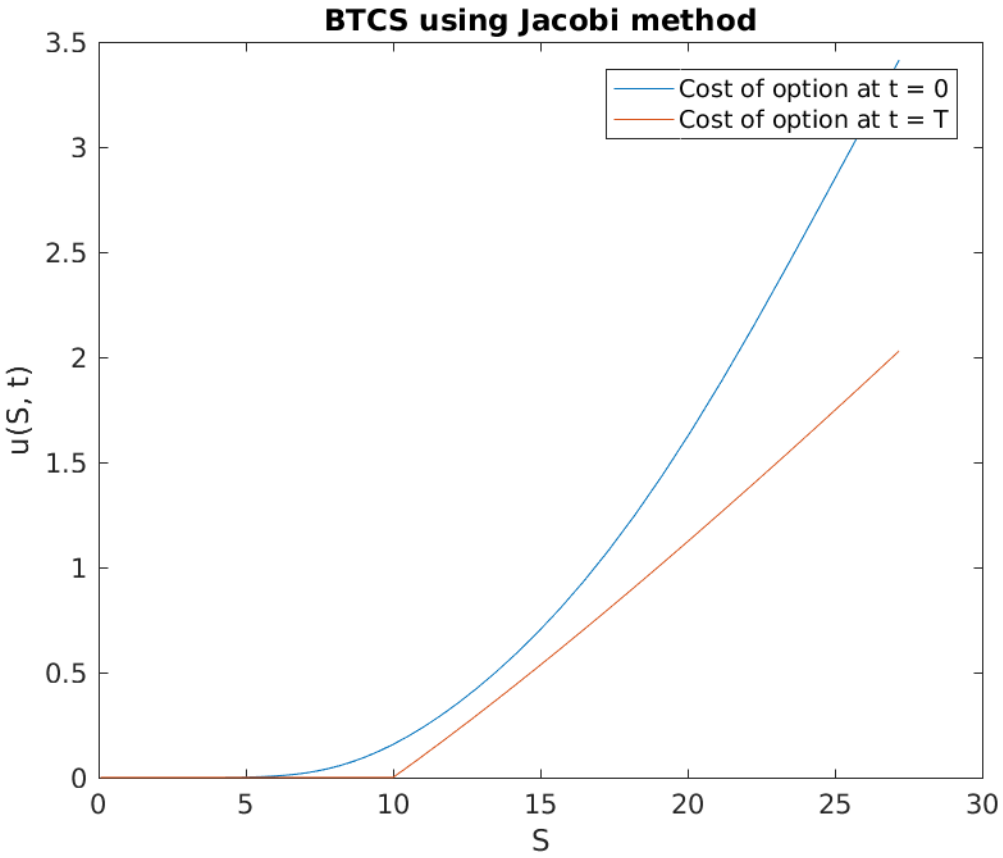

FTCS
u(x,t)
3.5
3
2.5
2
1.5
1
0.5
0
1
0.5
t
0
0
10
20
30
S

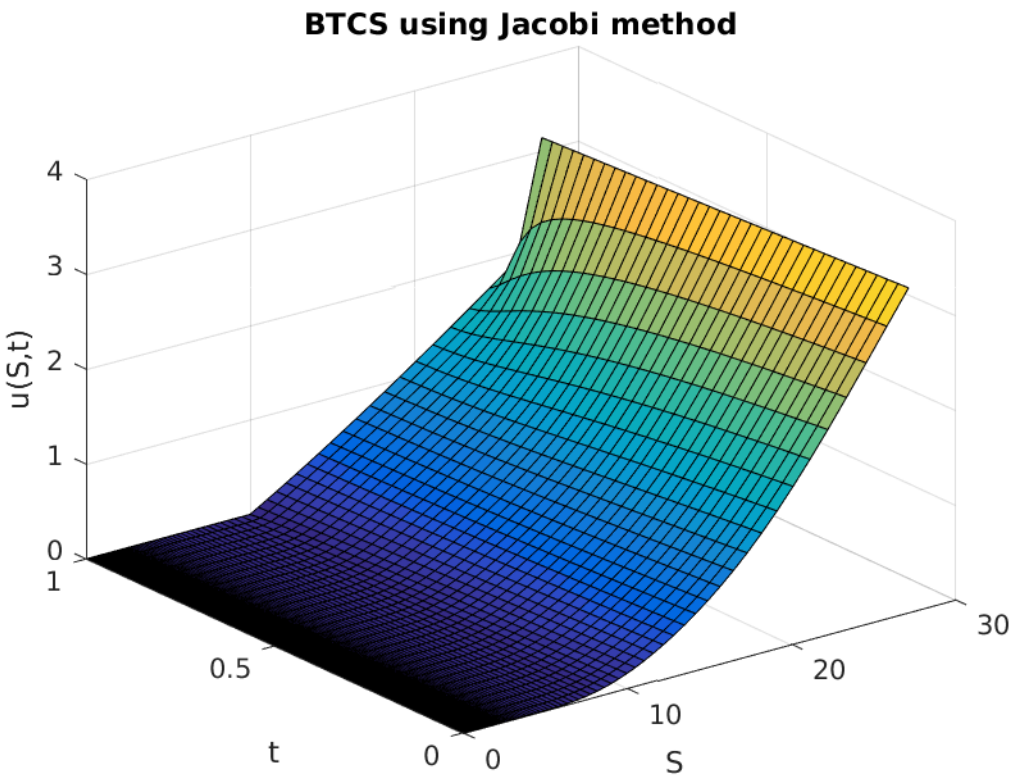

BTCS using Direct method
Cost of option at t = 0
Cost of option at t = T
u(S, t)
S
0
0.5
1
1.5
2
2.5
3
3.5
0
5
10
15
20
25
30

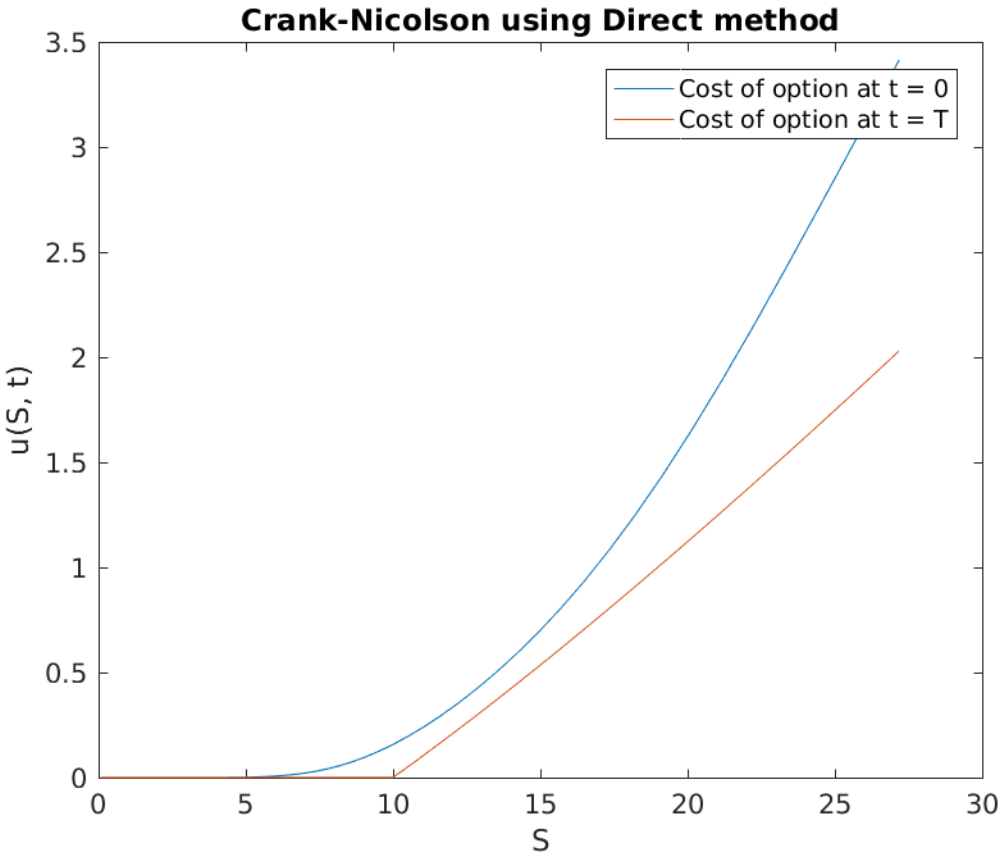

BTCS using Direct method
u(S,t)
3.5
3
2.5
2
1.5
1
0.5
0
1
0.5
t
0
0
10
20
30
S

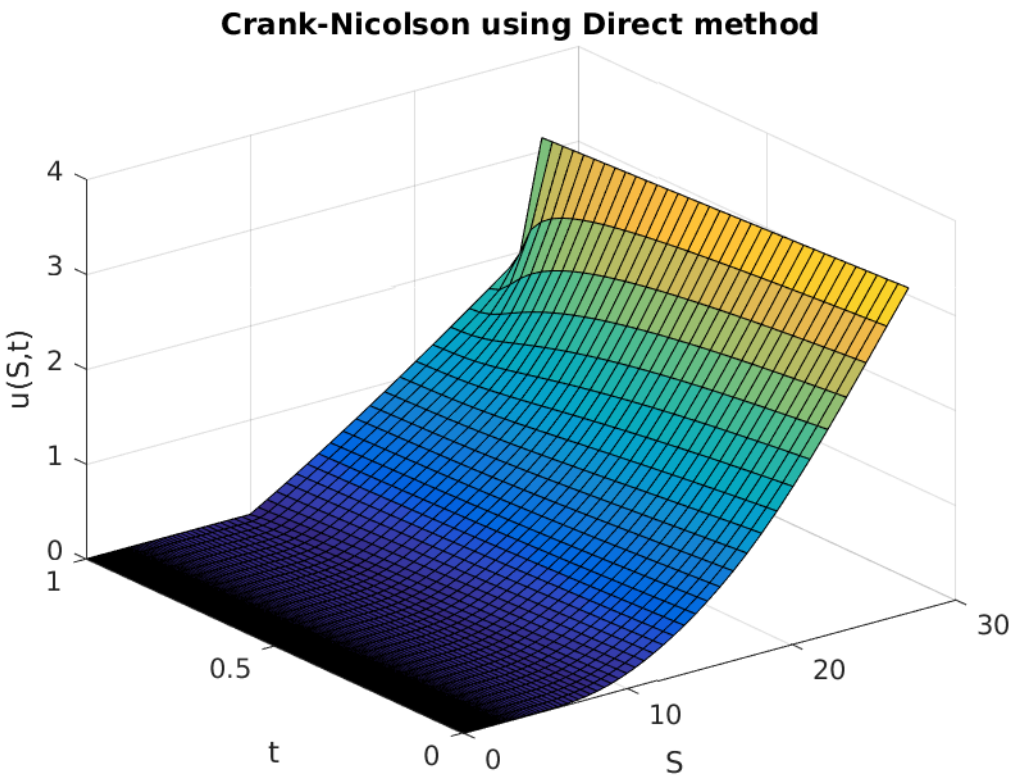

BTCS using GaussS method
Cost of option at t = 0
Cost of option at t = T
u(S, t)
S
0
0.5
1
1.5
2
2.5
3
3.5
0
5
10
15
20
25
30

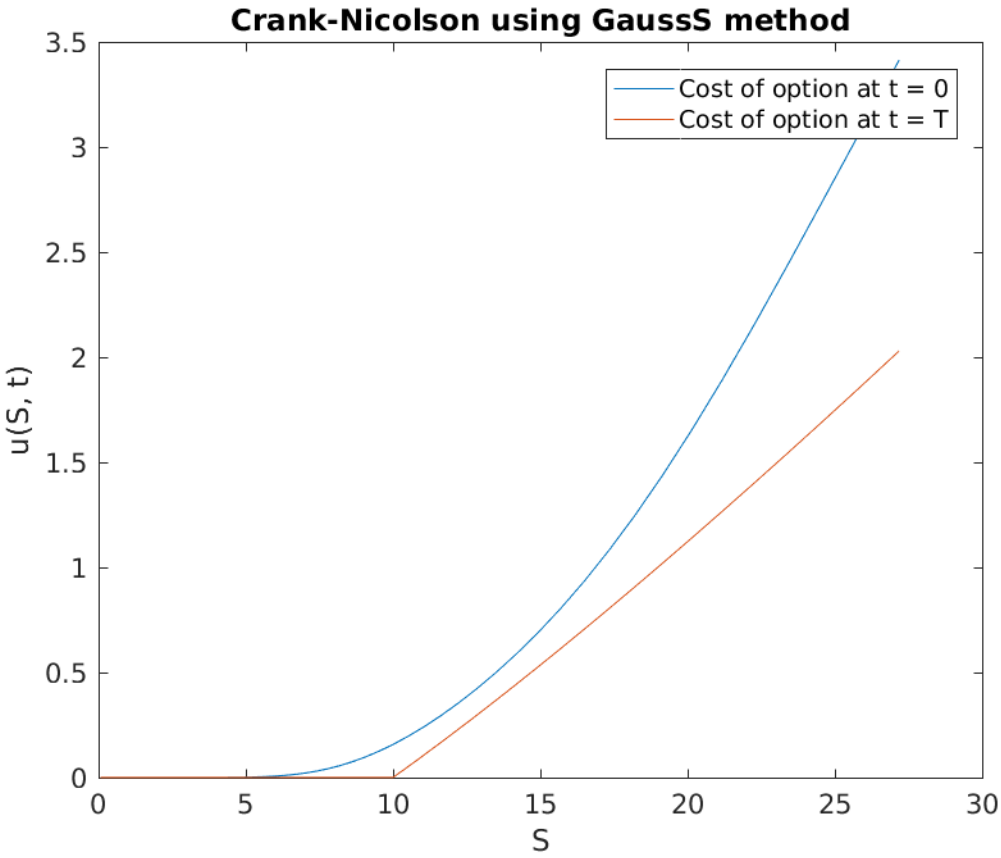

BTCS using GaussS method
u(S,t)
4
3
2
1
0
1
0.5
t
0
0
10
20
30
S

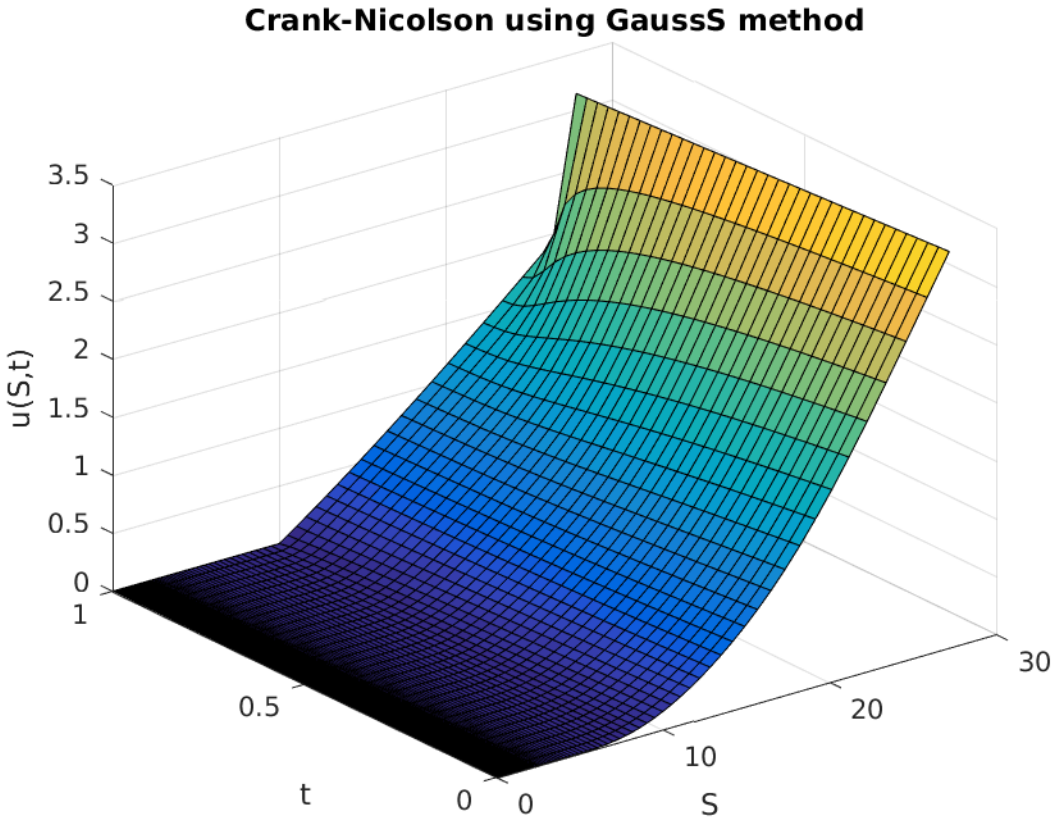

BTCS using Jacobi method
Cost of option at t = 0
Cost of option at t = T
u(S, t)
S
0
0.5
1
1.5
2
2.5
3
3.5
0
5
10
15
20
25
30

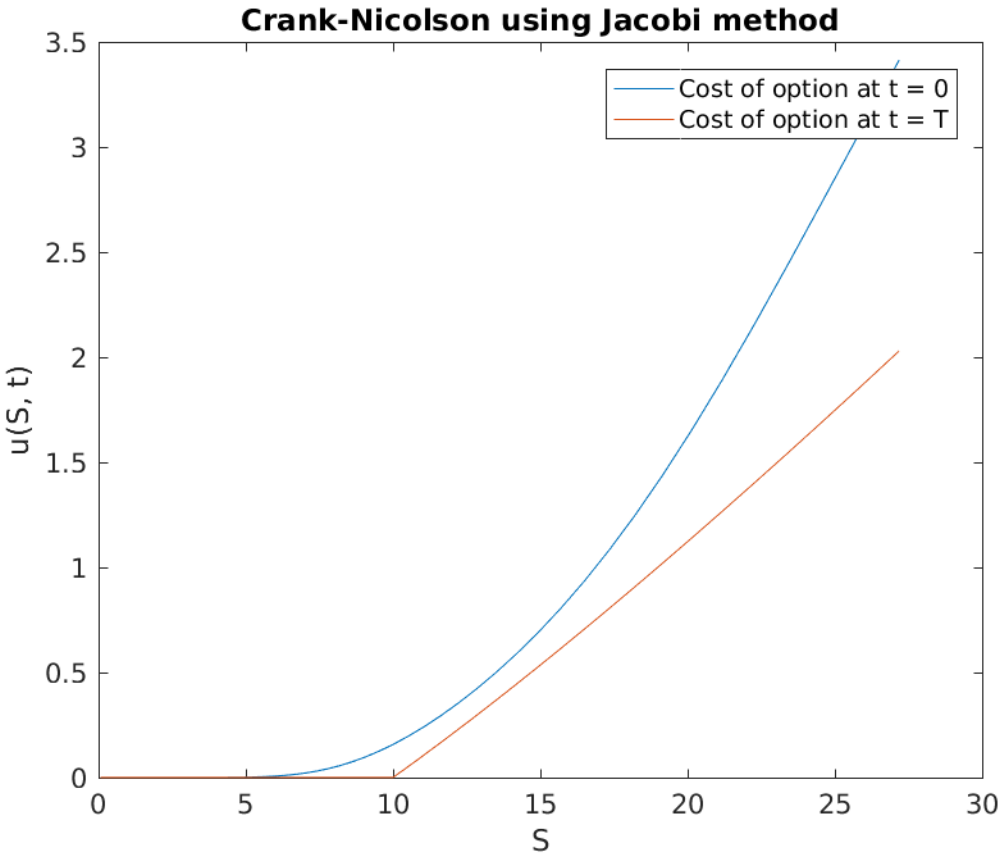

BTCS using Jacobi method
u(S,t)
4
3
2
1
0
1
0.5
t
0
0
10
20
30
S

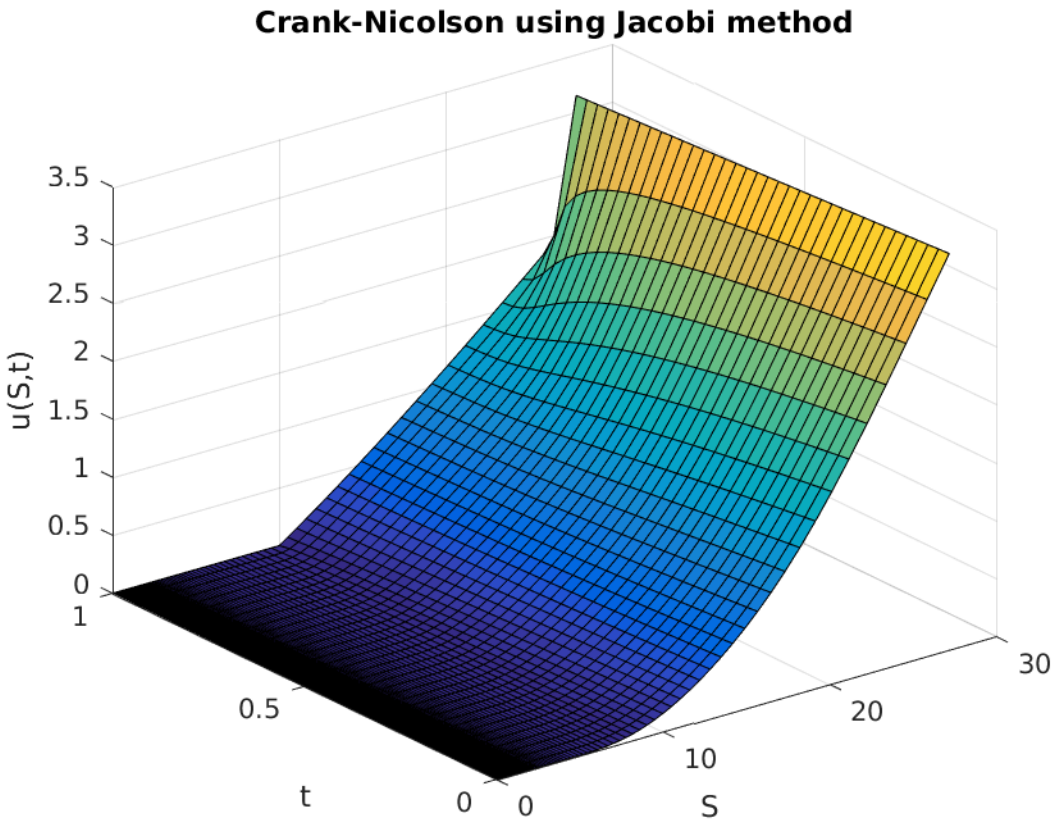

Crank-Nicolson using Direct method
Cost of option at t = 0
Cost of option at t = T
u(S, t)
S
0
0.5
1
1.5
2
2.5
3
3.5
0
5
10
15
20
25
30


Crank-Nicolson using Direct method
u(S,t)
4
3
2
1
0
1
0.5
t
0
0
10
20
30
S

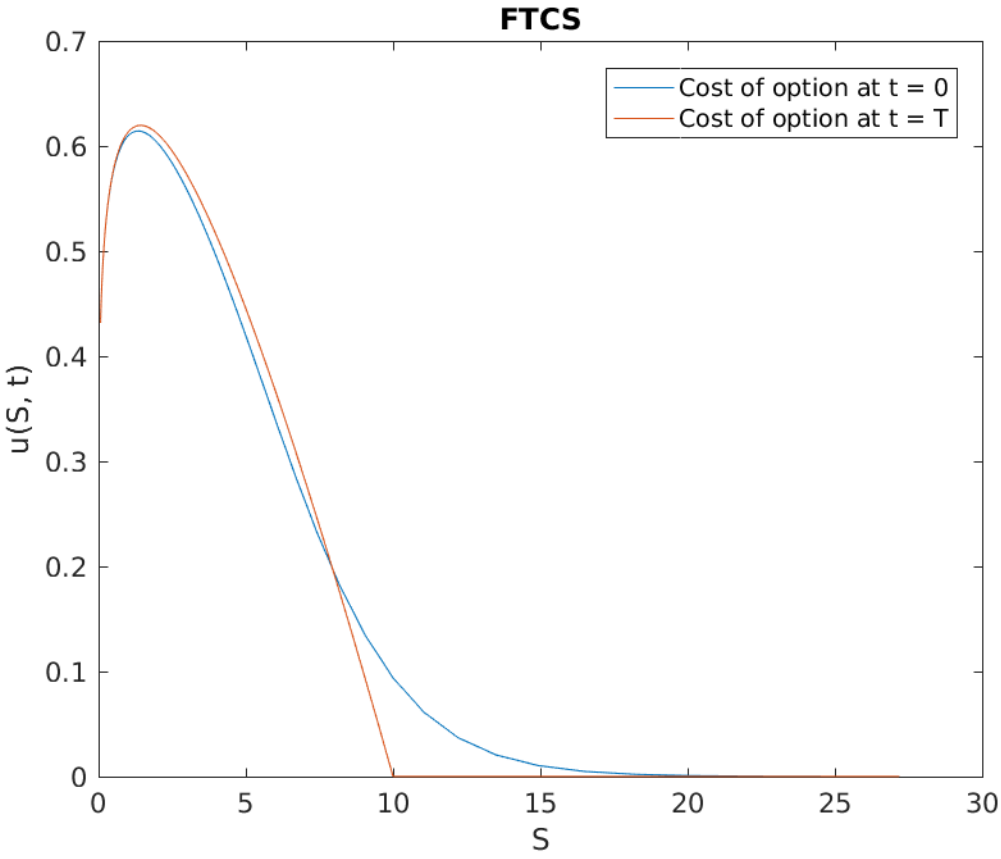

Crank-Nicolson using GaussS method
Cost of option at t = 0
Cost of option at t = T
u(S, t)
S
0
0.5
1
1.5
2
2.5
3
3.5
0
5
10
15
20
25
30

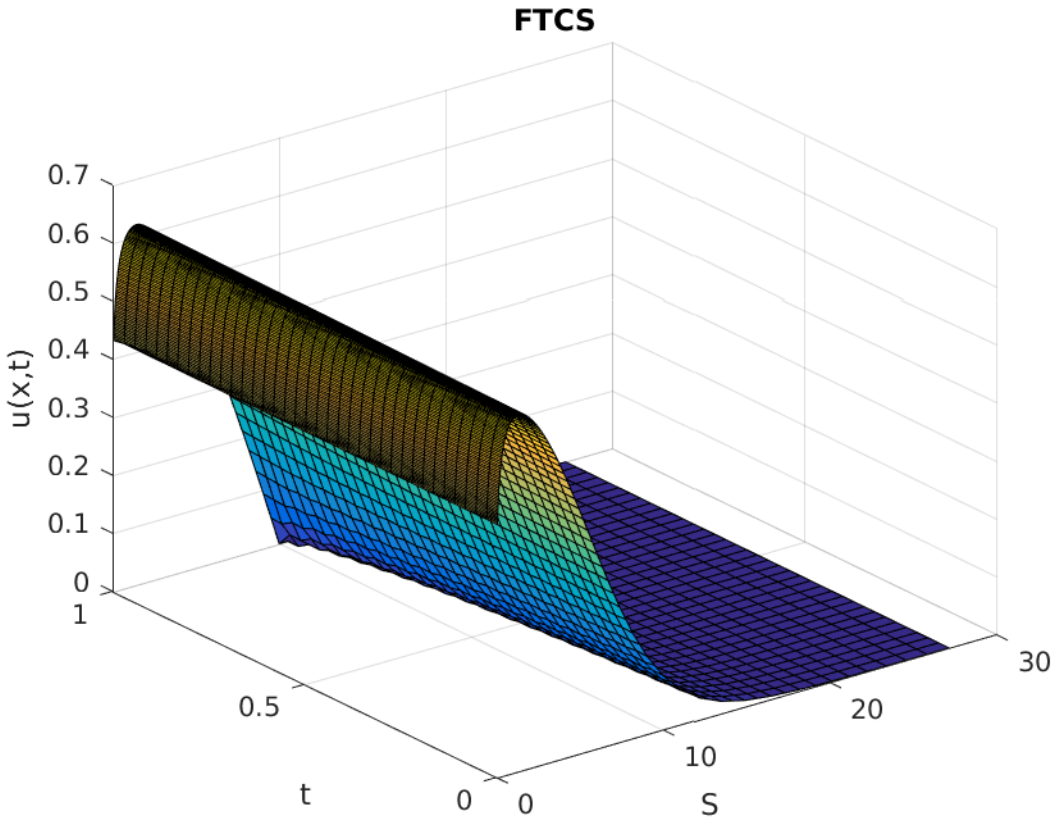

Crank-Nicolson using GaussS method
u(S,t)
3.5
3
2.5
2
1.5
1
0.5
0
1
0.5
t
0
0
10
20
30
S

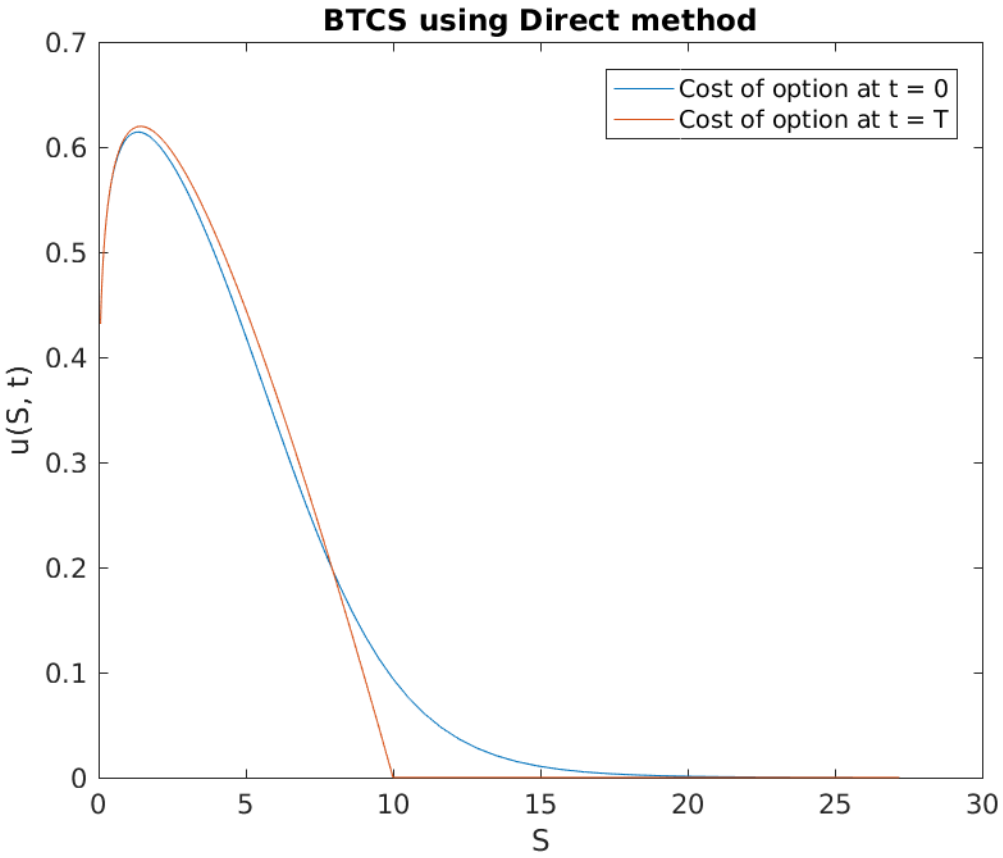

Crank-Nicolson using Jacobi method
Cost of option at t = 0
Cost of option at t = T
u(S, t)
S
0
0.5
1
1.5
2
2.5
3
3.5
0
5
10
15
20
25
30

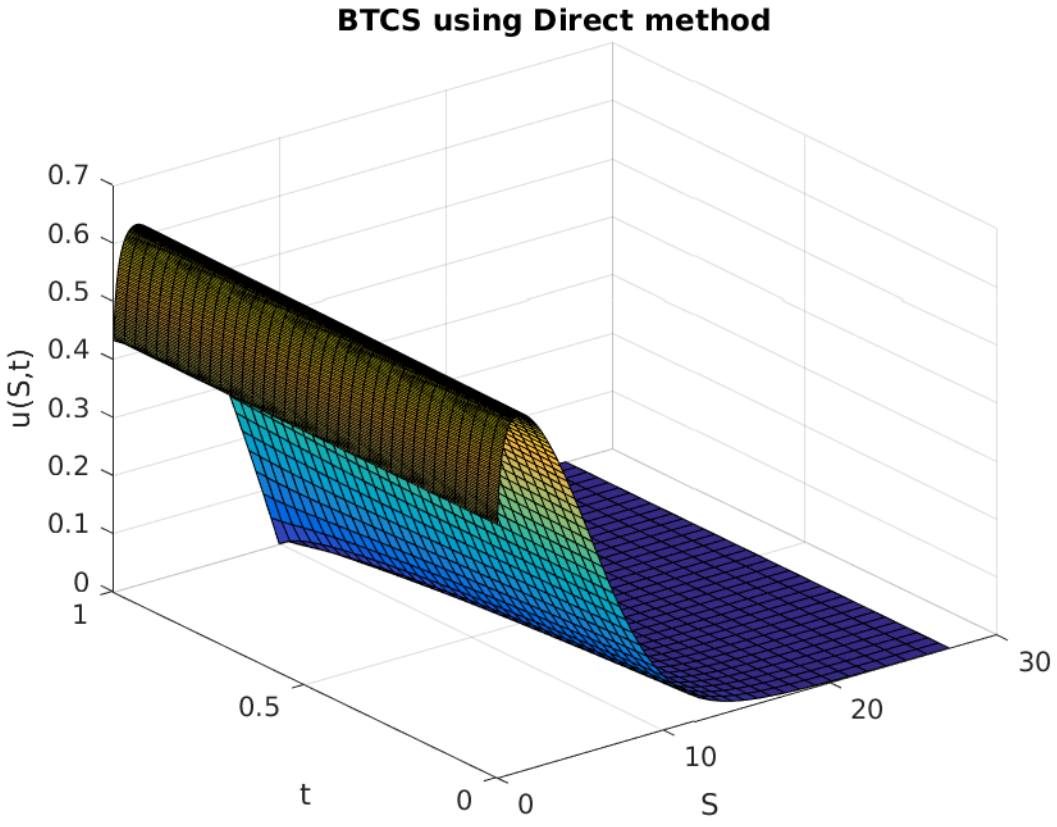

Crank-Nicolson using Jacobi method
u(S,t)
3.5
3
2.5
2
1.5
1
0.5
0
1
0.5
t
0
0
10
20
30
S

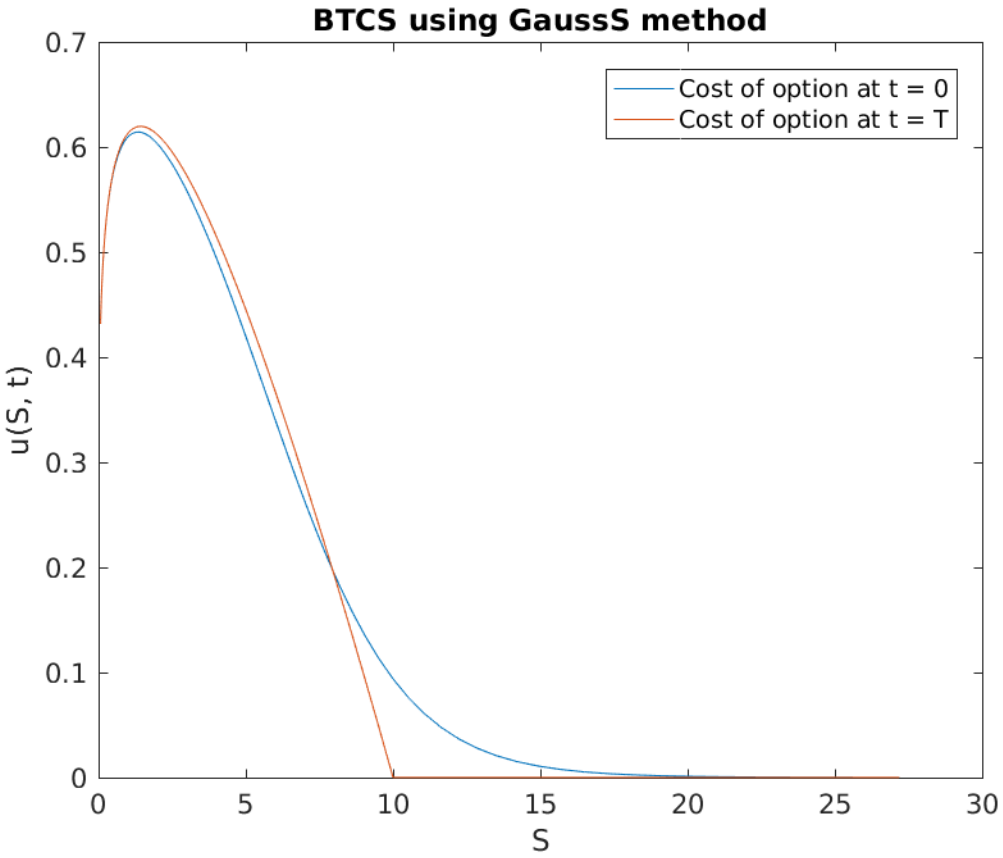
Question 2

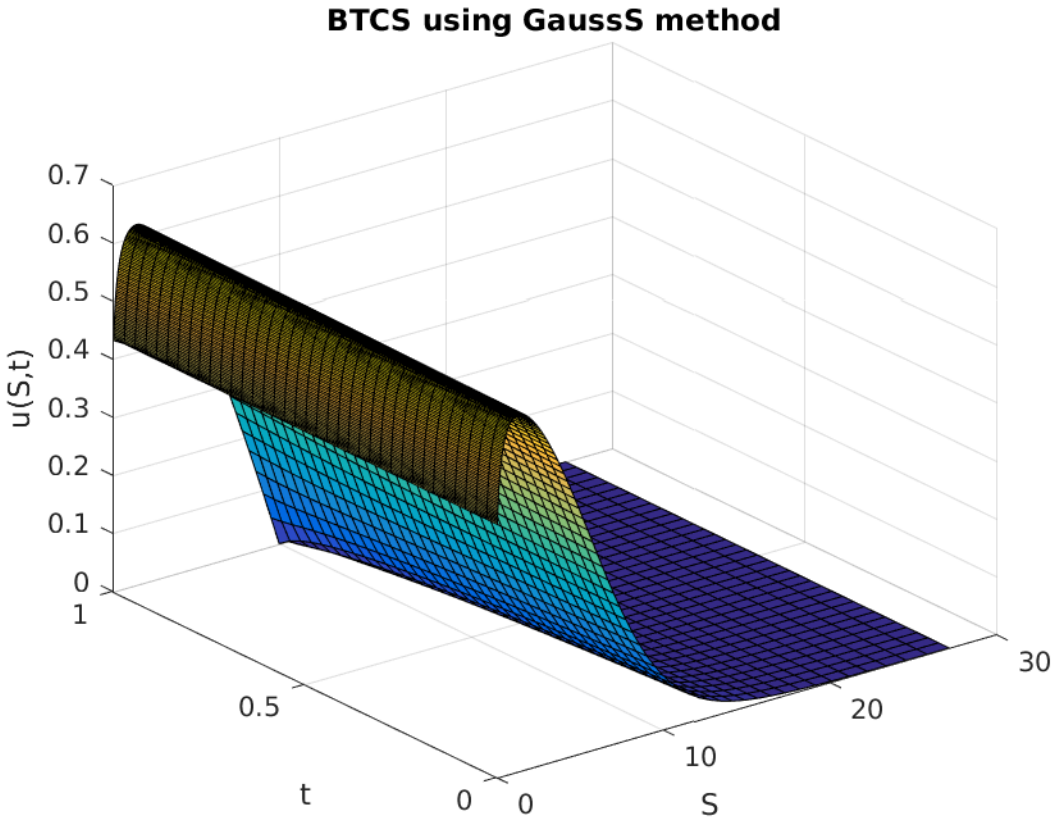

FTCS
Cost of option at t = 0
Cost of option at t = T
u(S, t)
S
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0
5
10
15
20
25
30

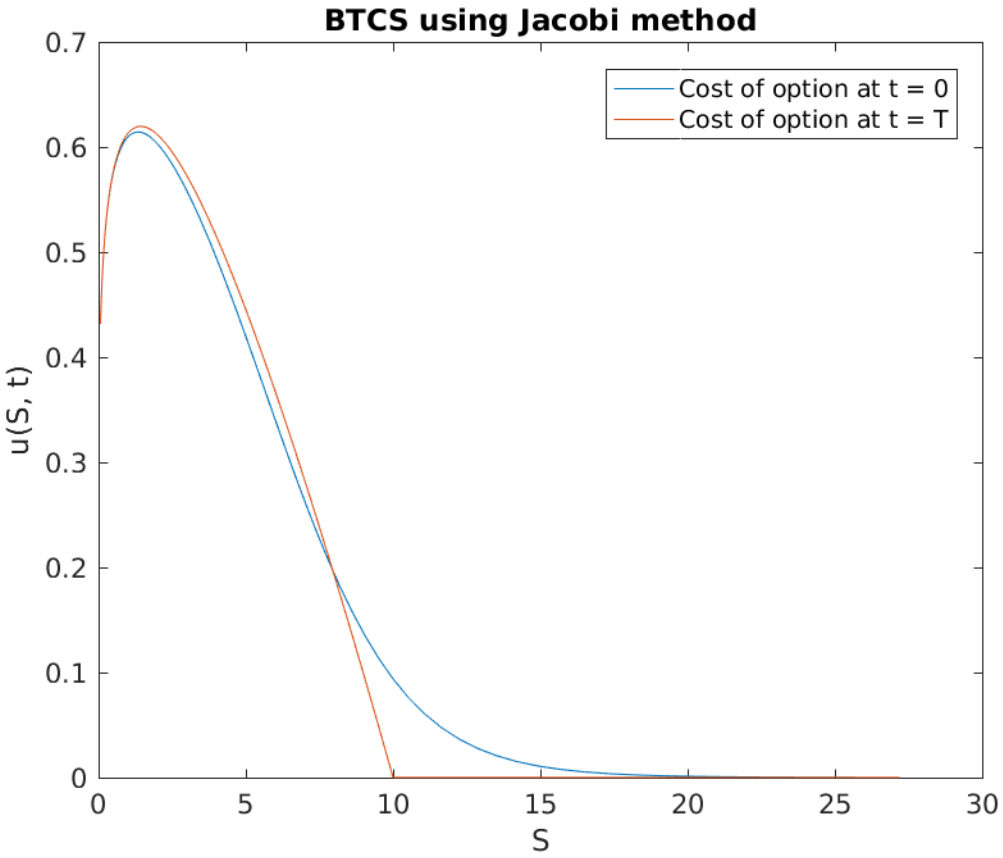

FTCS
u(x,t)
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1
0.5
t
0
0
10
20
30
S

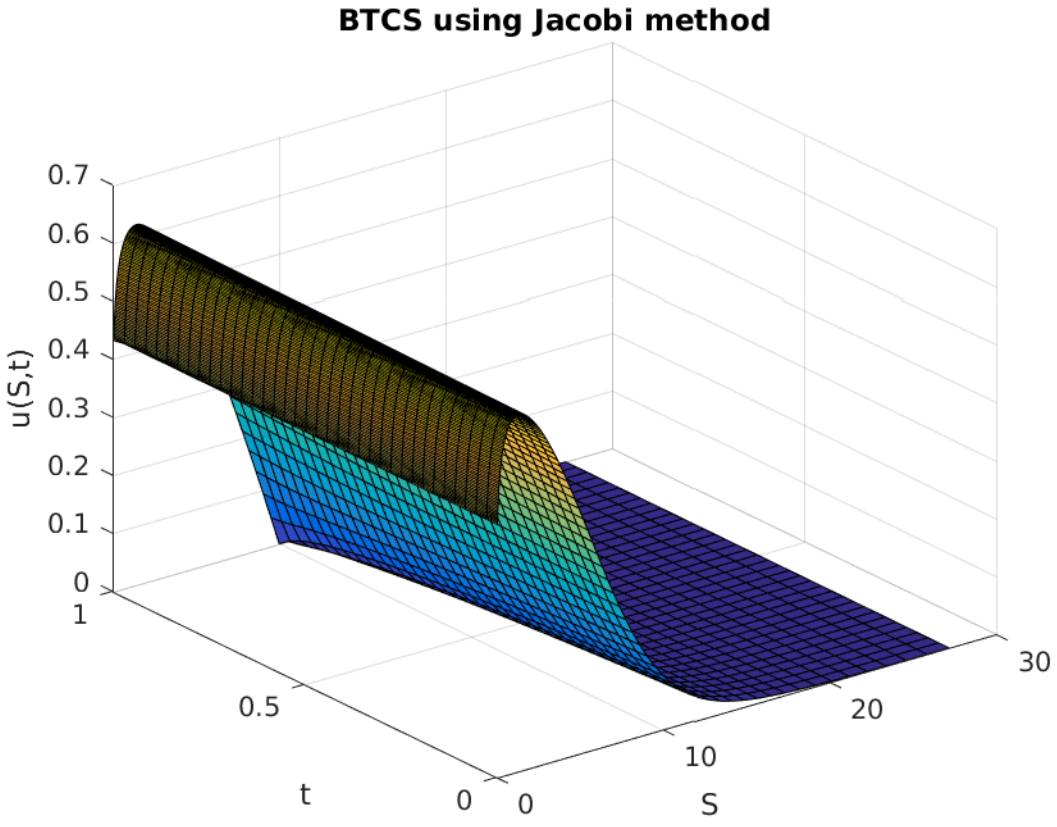

BTCS using Direct method
Cost of option at t = 0
Cost of option at t = T
u(S, t)
S
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
5
10
15
20
25
30

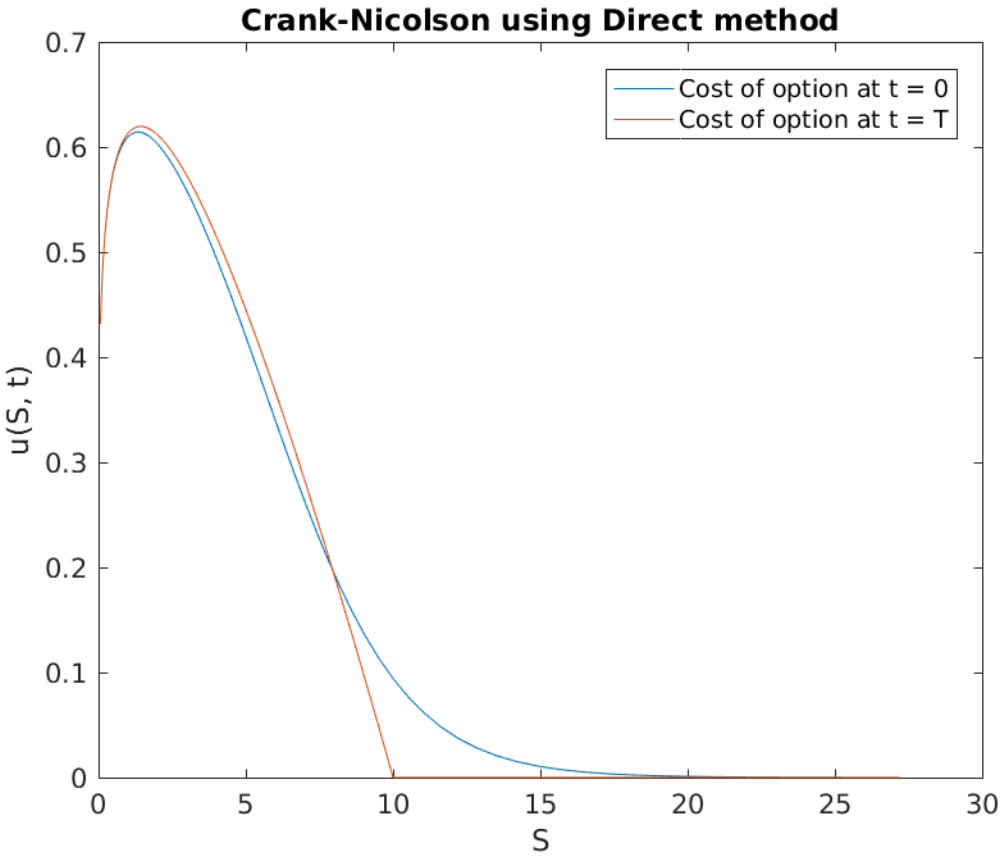

BTCS using Direct method
u(S,t)
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1
0.5
t
0
0
10
20
30
S

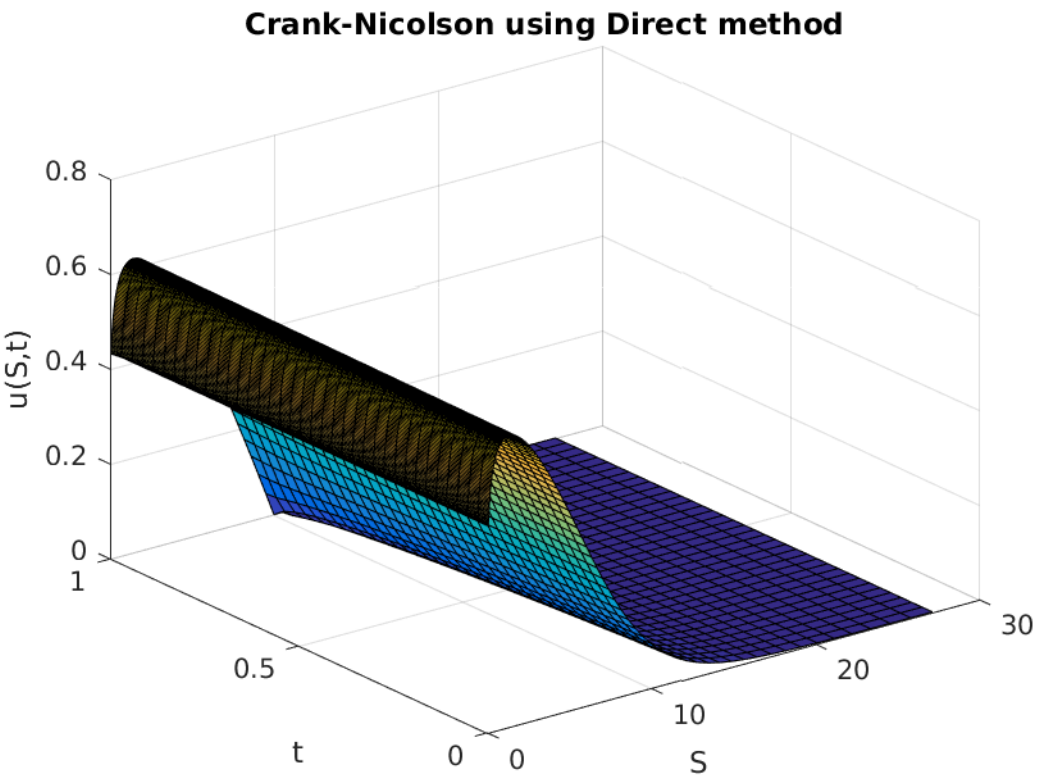

BTCS using GaussS method
Cost of option at t = 0
Cost of option at t = T
u(S, t)
S
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
5
10
15
20
25
30

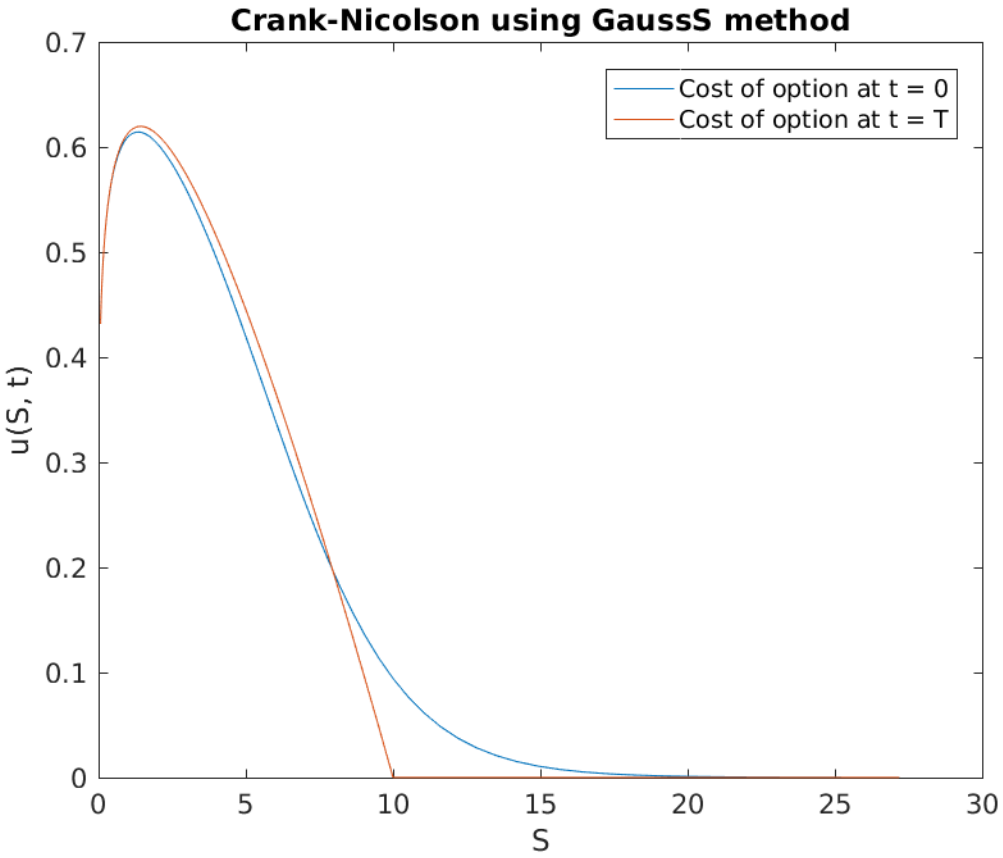

BTCS using GaussS method
u(S,t)
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1
0.5
t
0
0
10
20
30
S

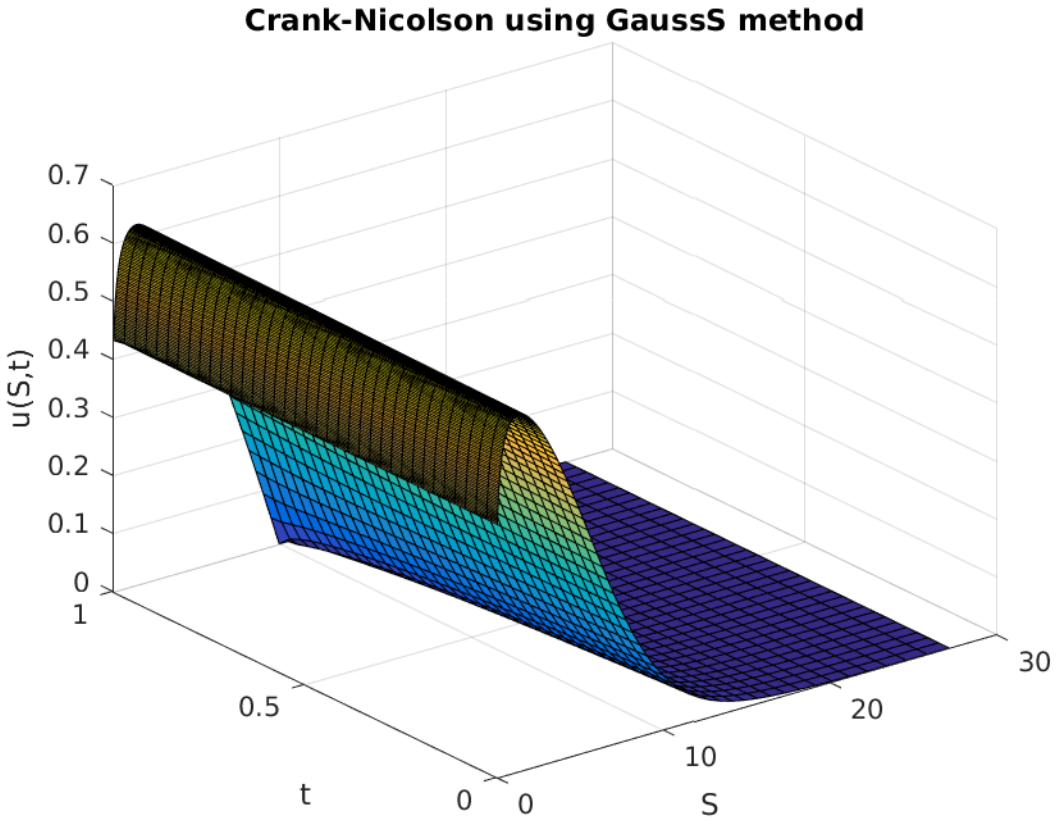

BTCS using Jacobi method
Cost of option at t = 0
Cost of option at t = T
u(S, t)
S
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
5
10
15
20
25
30

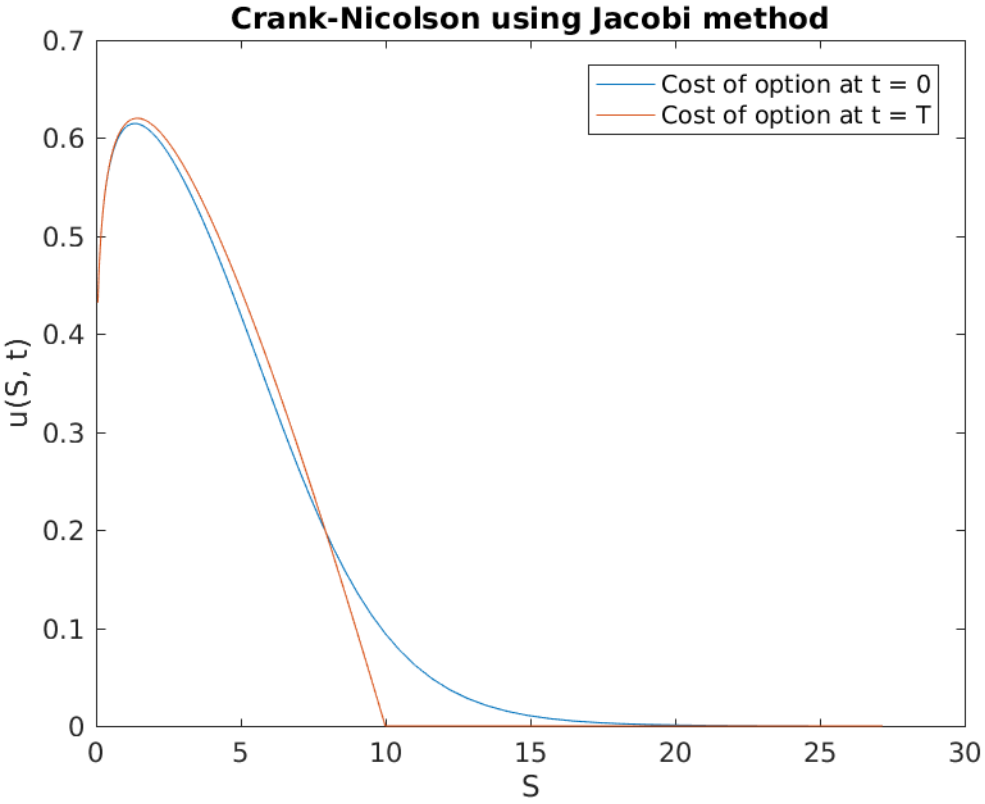

BTCS using Jacobi method
u(S,t)
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1
0.5
t
0
0
10
20
30
S

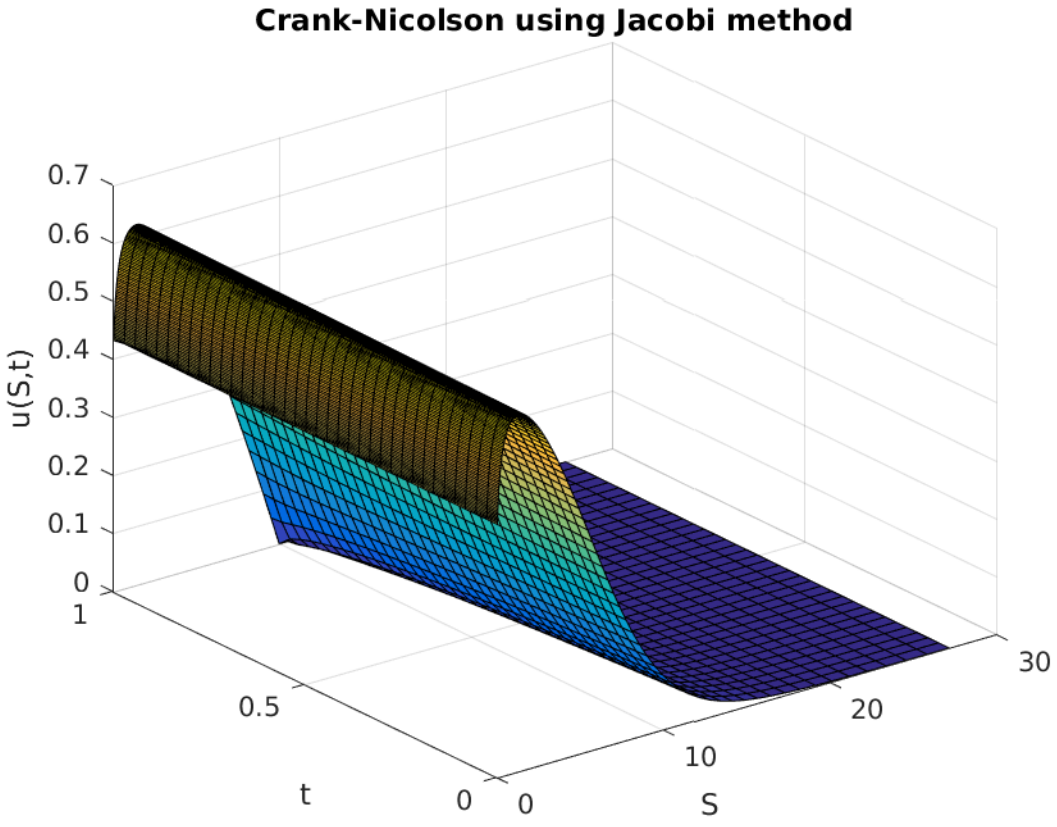

Crank-Nicolson using Direct method
Cost of option at t = 0
Cost of option at t = T
u(S, t)
S
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
5
10
15
20
25
30


Crank-Nicolson using Direct method
u(S,t)
0.8
0.6
0.4
0.2
0
1
0.5
t
0
0
10
20
30
S


Crank-Nicolson using GaussS method
Cost of option at t = 0
Cost of option at t = T
u(S, t)
S
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
5
10
15
20
25
30


Crank-Nicolson using GaussS method
u(S,t)
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1
0.5
0
t
0
10
20
30
S


Crank-Nicolson using Jacobi method
Cost of option at t = 0
Cost of option at t = T
u(S, t)
S
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
5
10
15
20
25
30


Crank-Nicolson using Jacobi method
u(S,t)
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1
0.5
0
t
0
10
20
30
S