MA473 – Computational Finance Laboratory

Lab – 02

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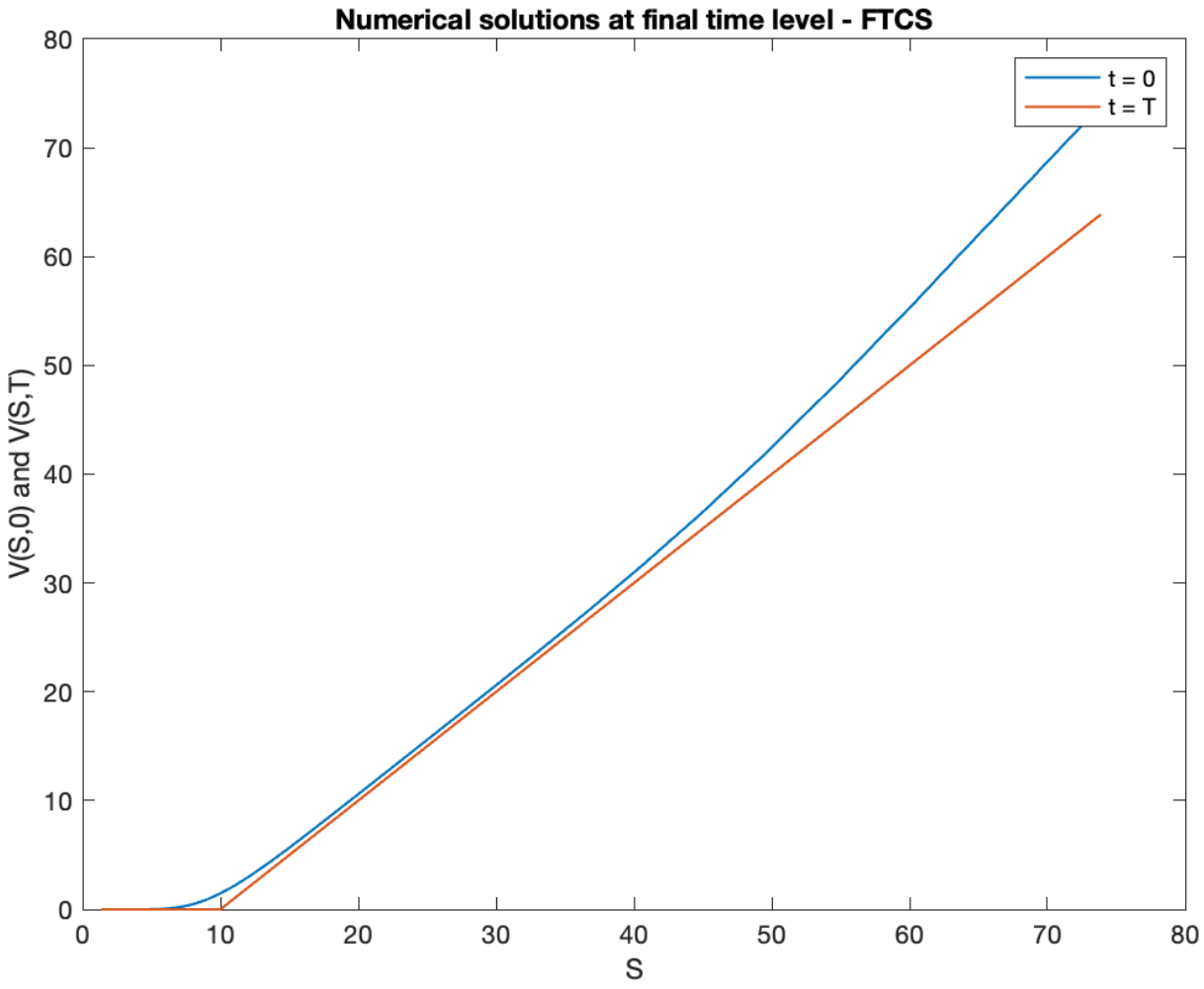
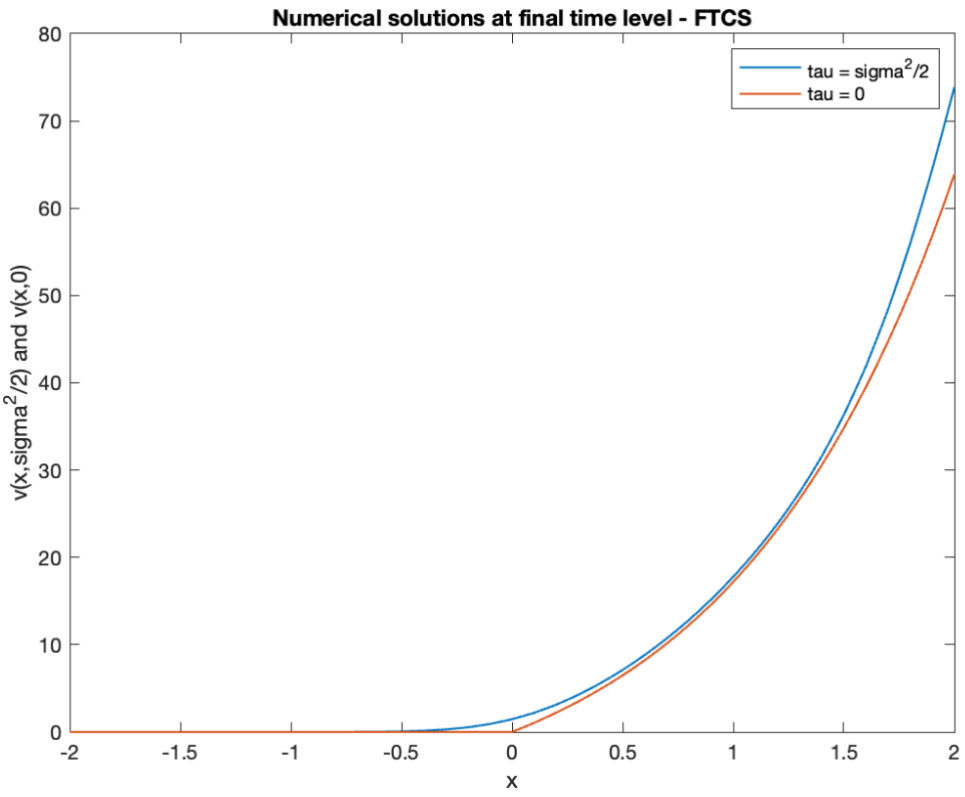
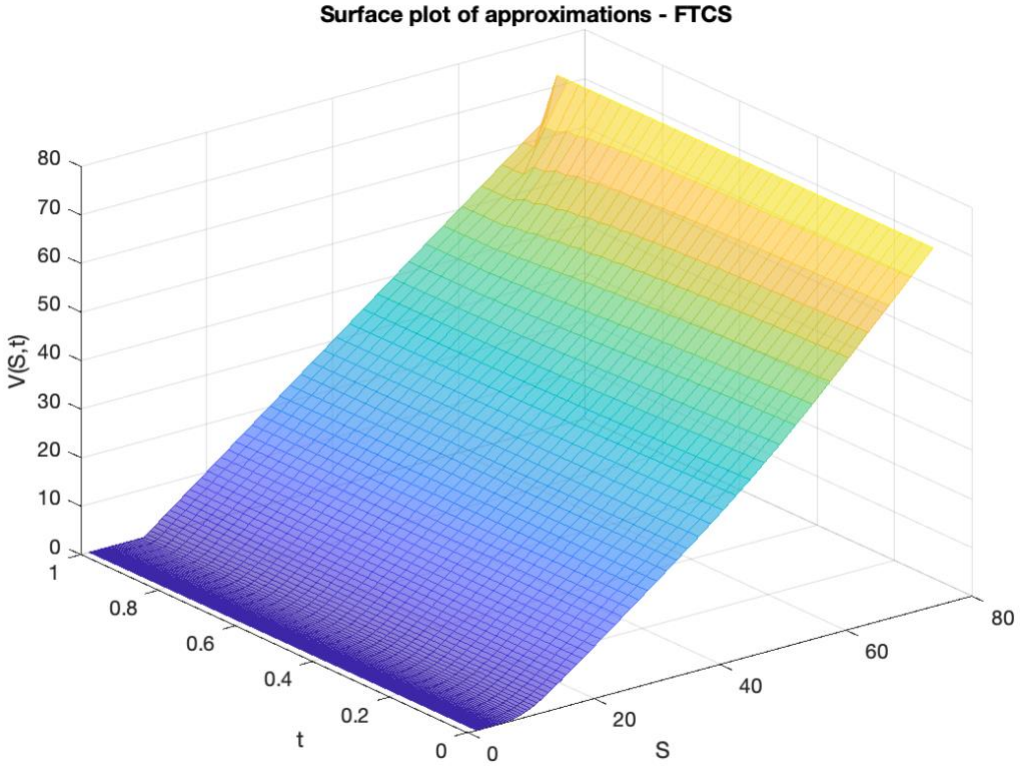
Question – 1

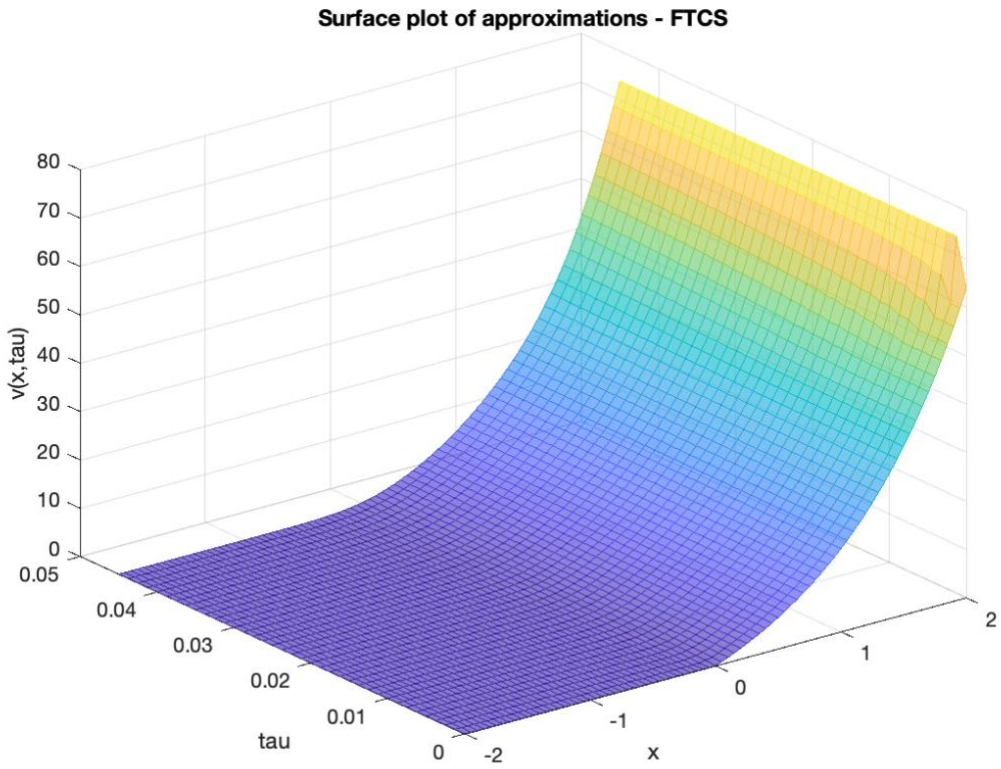
The solution of the given PDE by different approximations are plotted below: -

1. FTCS

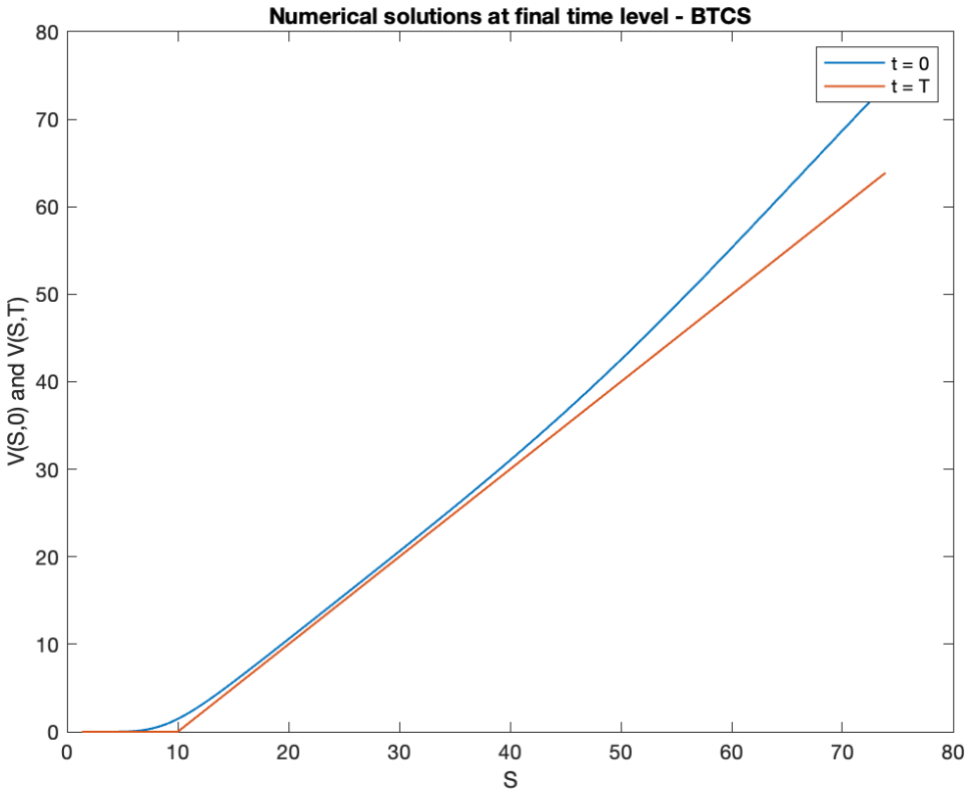


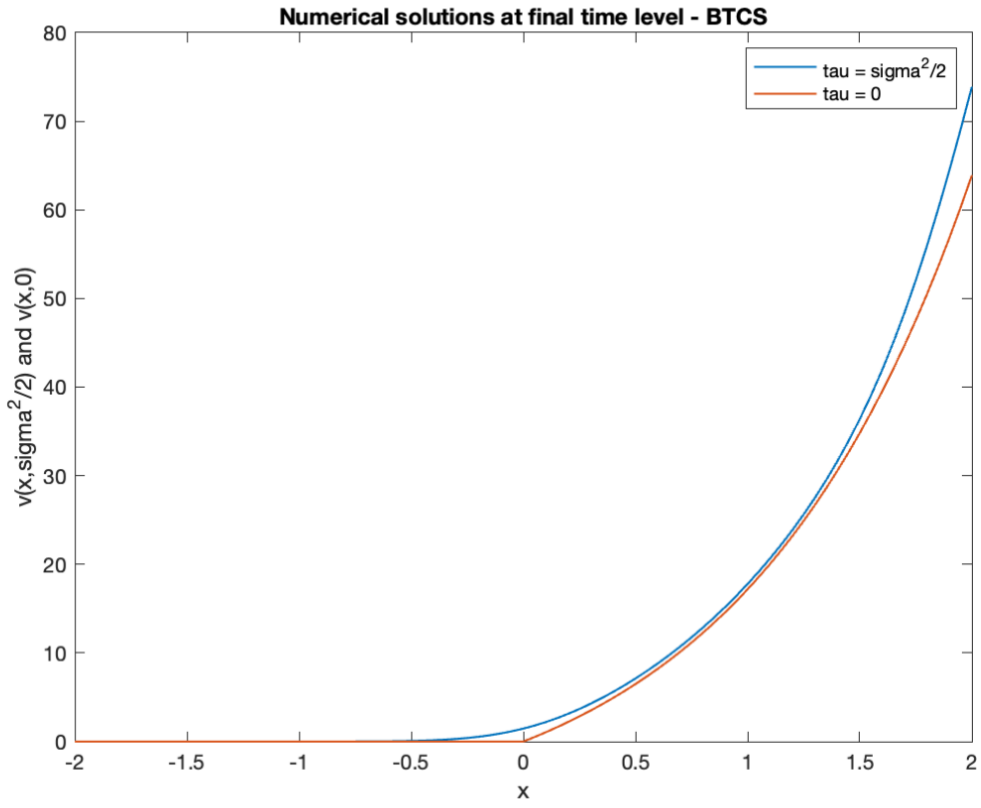

Numerical solutions at final time level - FTCS
tau = sigma^2/2
tau = 0
v(x,sigma^2/2) and v(x,0)
x
80
70
60
50
40
30
20
10
0
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2

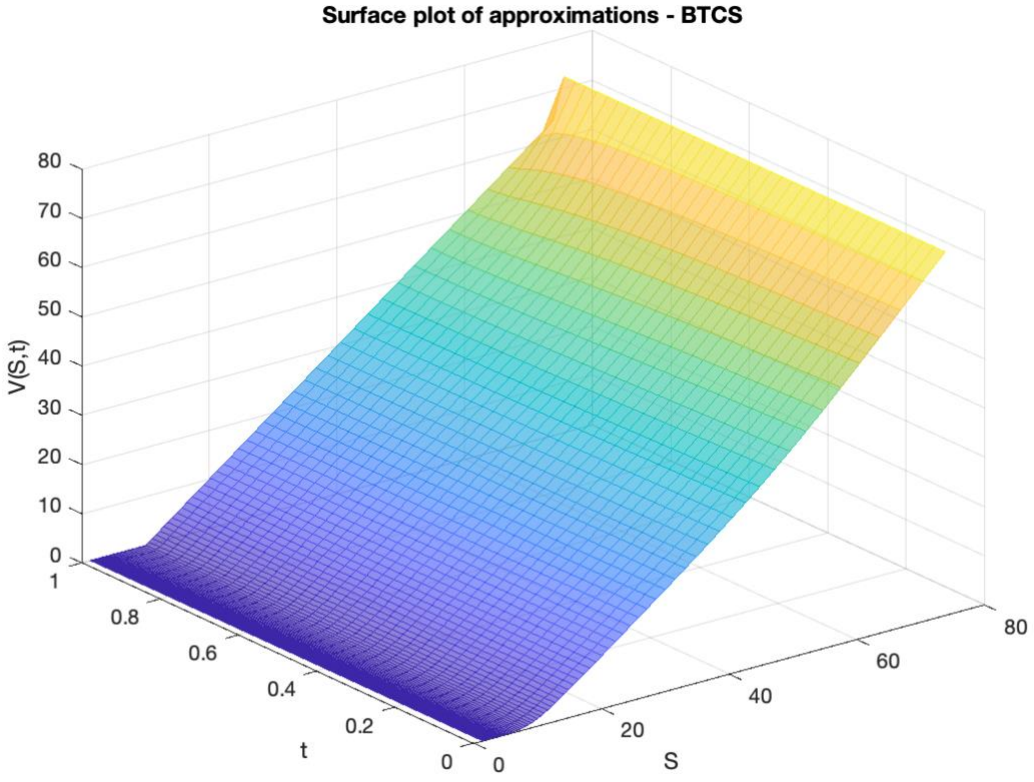

Surface plot of approximations - FTCS
V(S,t)
t
S
80
70
60
50
40
30
20
10
0
1
0.8
0.6
0.4
0.2
0
0
20
40
60
80

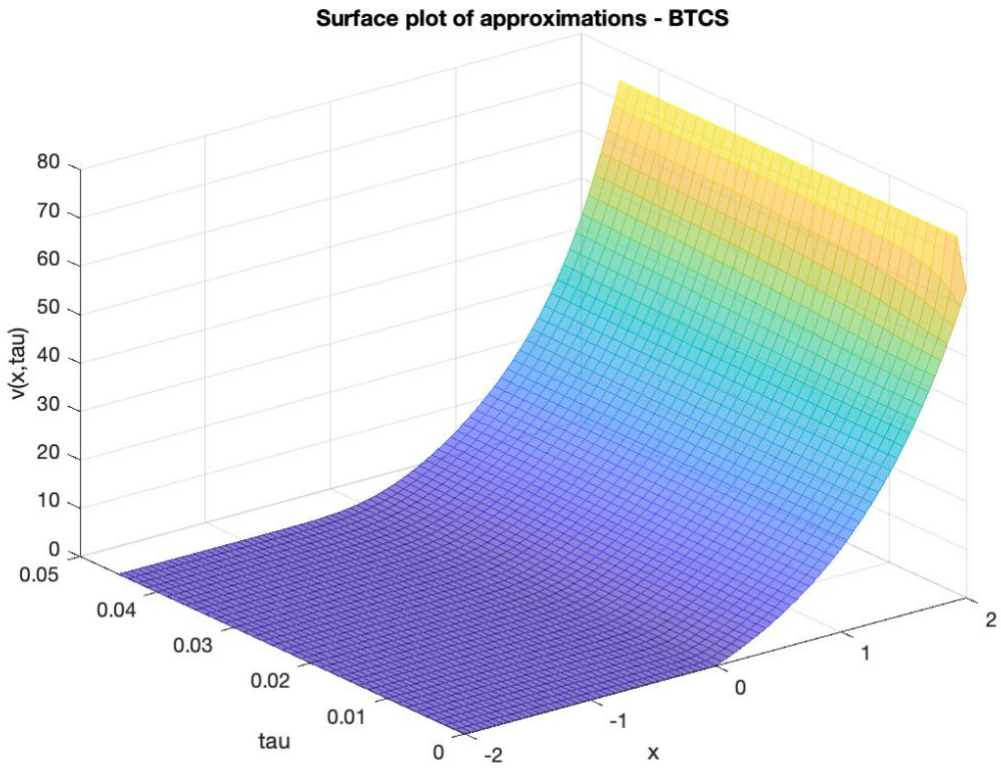

Surface plot of approximations - FTCS
v(x,tau)
80
70
60
50
40
30
20
10
0
0.05
0.04
0.03
0.02
0.01
0
tau
-2
-1
0
1
2
x

2. BTCS

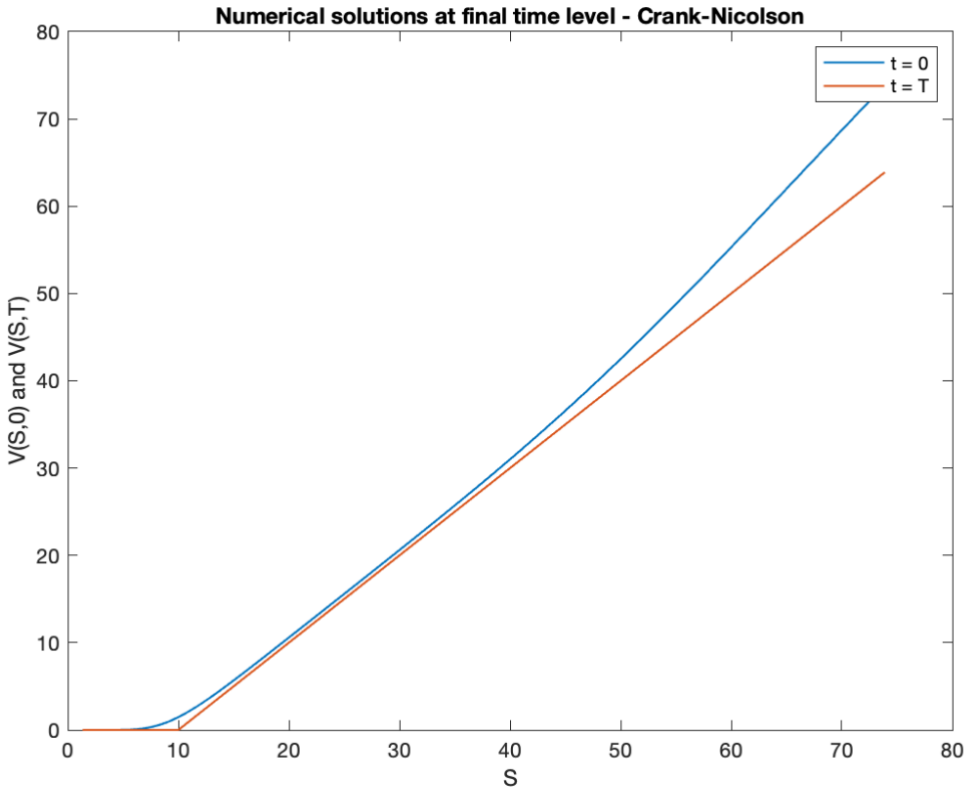

Numerical solutions at final time level - BTCS
V(S,0) and V(S,T)
t = 0
t = T
0
10
20
30
40
50
60
70
80
S

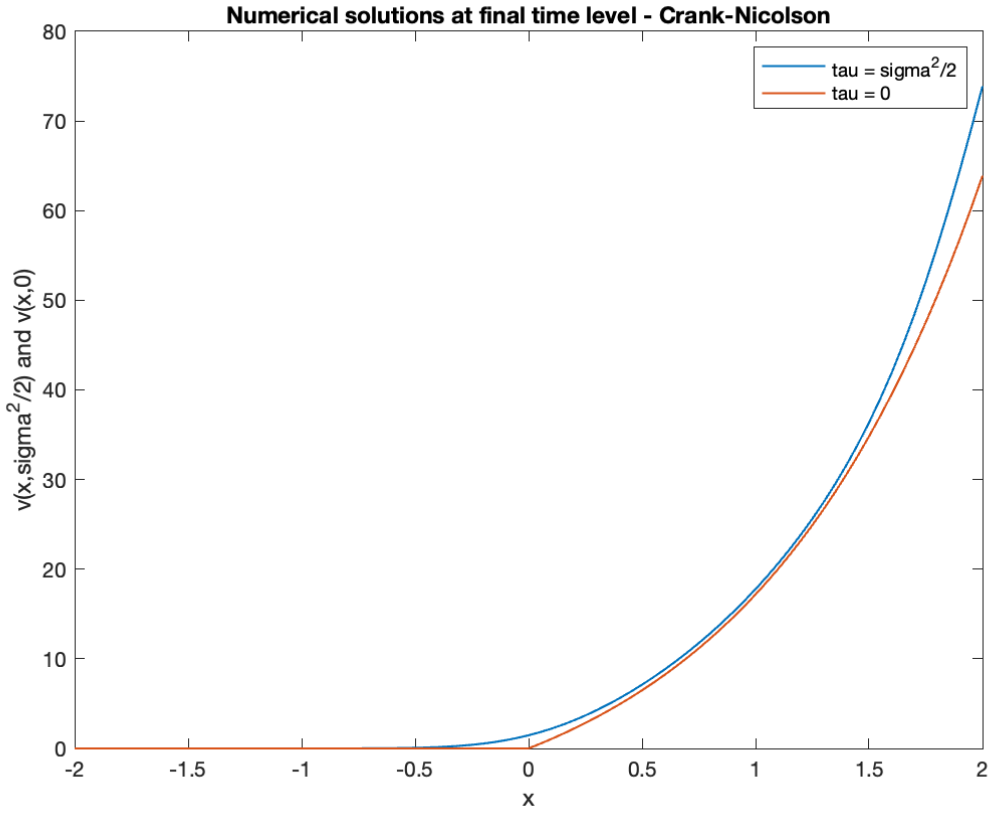

Numerical solutions at final time level - BTCS
tau = sigma^2/2
tau = 0
v(x,sigma^2/2) and v(x,0)
x
80
70
60
50
40
30
20
10
0
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2

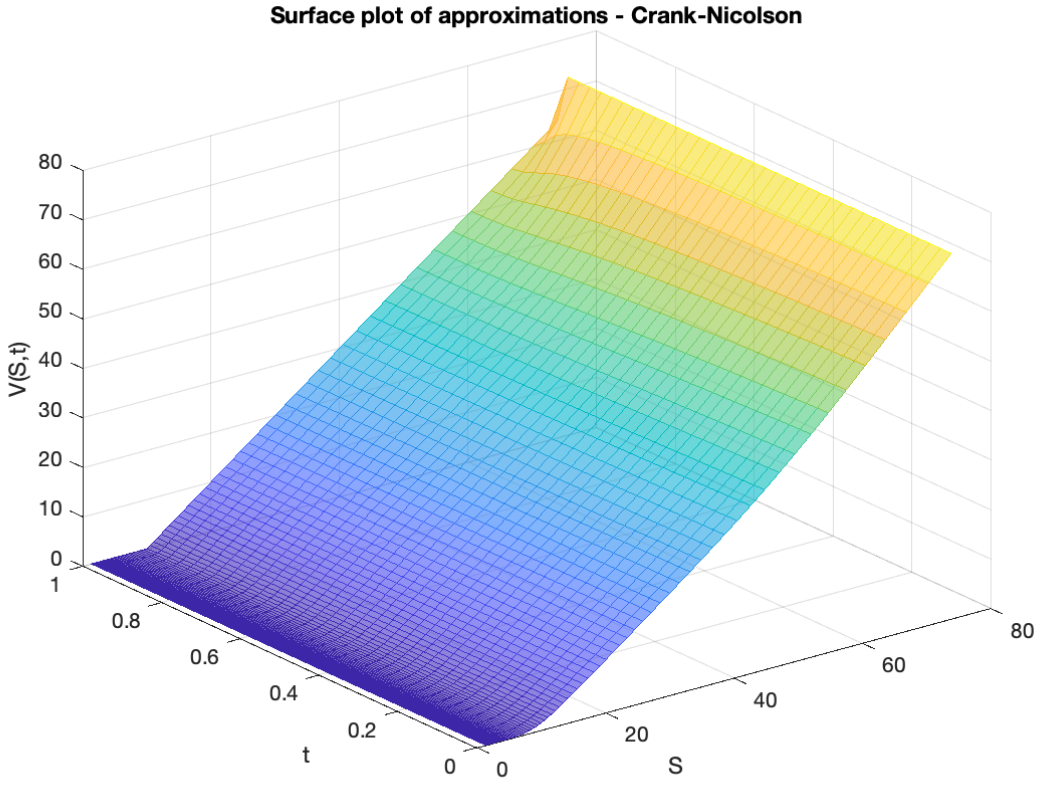

Surface plot of approximations - BTCS
V(S,t)
t
S
80
70
60
50
40
30
20
10
0
1
0.8
0.6
0.4
0.2
0
0
20
40
60
80

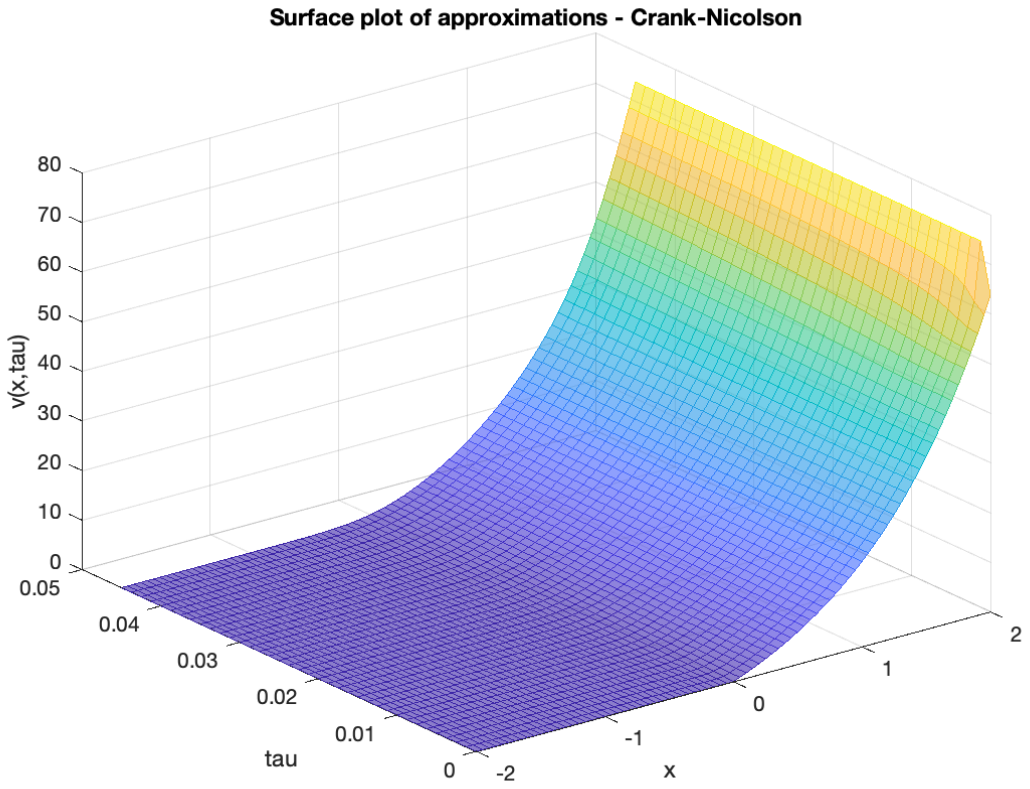


3. Crank-Nicolson




Numerical solutions at final time level - Crank-Nicolson
tau = sigma^2/2
tau = 0
v(x,sigma^2/2) and v(x,0)
x
80
70
60
50
40
30
20
10
0
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2


Surface plot of approximations - Crank-Nicolson
V(S,t)
t
S
80
70
60
50
40
30
20
10
0
1
0.8
0.6
0.4
0.2
0
0
20
40
60
80


Surface plot of approximations - Crank-Nicolson
v(x,tau)
80
70
60
50
40
30
20
10
0
0.05
0.04
0.03
0.02
0.01
0
tau
-2
-1
0
1
2
x