**F. (Finite Difference Method)**

a) The code is slightly modified to have the functionality of calculating exact put and call prices, and to output both prices from the FDM and exact solutions in Excel.

b) 4 tests are carried out for Batches 1 through 4 respectively. The following table shows both J and N for all the tests.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Test 1 | Test 2 | Test 3 | Test 4 |
| Batch 1 | J = 5\*K  N = 103-1 | J = 5\*K  N = 104-1 | J = 5\*K  N = 105-1 | J = 5\*K  N = 106-1 |
| Batch 2 | J = 0.2\*K  N = 104-1 | J = K  N = 104-1 | J = 5\*K  N = 104-1 | J = 10\*K  N = 104-1 |
| Batch 3 | J = K  N = 103-1 | J = K  N = 104-1 | J = K  N = 105-1 | J = K  N = 106-1 |
| Batch 4 | J = 5\*K  N = 105-1 | J = 0.1\*K  N = 5x105-1 | J = 0.1\*K  N = 106-1 | J = 0.1\*K  N = 2x106-1 |

For the explicit method to work, generally, N (the number of mesh point in time) has to be greater than the square of J (the number of mesh point in space); otherwise the method becomes unstable. For example, Test 4 of Batch 2 blows up, as N = 104 and J2 = 106; Test 1 of Batch 4 has the same problem, where N = 105 and J2 = 2.5x105.

Accuracy in C decreases as S increases, while accuracy of P is lower for the middle range of [0, Smax]. For a fixed J value, it seems that neither put nor call price will improve significantly as N increases as shown by the tests of Batches 1 and 3. While for a fixed N value, price and put prices do not improve significantly either as J decreases as shown by the tests of Batch 2.