

MATH40082

Mini Task 1

Version 9910821

A trader has asked you to price the value of the financial contract $\Pi(S, t)$ at time $t = 0$ which has the formula

$$d_1 = \frac{1 - e^{1-S/X} + \sigma e^{(r-q)/\sigma^2} \sqrt{T-t}}{\ln(1 + \sigma \sqrt{T-t})}$$

$$d_2 = \frac{1 - e^{1-S/X} - \sigma e^{(r-q)/\sigma^2} \sqrt{T-t}}{\ln(1 + \sigma \sqrt{T-t})}$$

$$\Pi(S, t) = S e^{1-\sigma^2(T-t)} e^{-r(T-t)} N(d_1) - X e^{q/r} e^{-q(T-t)} N(d_2)$$

where $T = 1$, $X = 4000$, $r = 0.0472$, $q = 0.0269$, $\sigma = 0.2481$. Here $N(x)$ is the standard normal cumulative distribution function.

Tasks

1. Using the formula and the parameters provided write a program to calculate Π and output the results to the screen. You must generate four columns of data:

- the value of S ,
- the value of d_1 ,
- the value of d_2 ,
- and the value of $\Pi(S, t = 0)$.

Output each of the values when the stock price is

$$S \in \{3000, 3200, 3400, 3600, 3800, 4000, 4200, 4400, 4600, 4800, 5000\}.$$

You should use a `for` loop to generate the data.

Instructions

This coursework should not take more than 2 hours or so to complete. You may use any codes that I have provided in Lab Class 1 as part of your solution (any codes/examples will be uploaded to the forum). Please write your own code and final solution, you may work together but **do not** transfer codes or solution files (via email/USB etc.).

Please complete the tasks and hand in your solution on “TurnItIn” (on the Blackboard system) by 5pm Sunday 9th February. If you have any problems with the system at all you can also email your solution directly to `paul.johnson-2@manchester.ac.uk`. If you are DASS registered and are eligible for an extension, please let me know. Solutions handed in AFTER 5pm SUNDAY 9th February will be docked 1 marks plus an additional 1 marks each day thereafter until a mark of zero is reached.

For the solution you should create a document (accepted formats are doc/docx/pdf) containing

- A title with your student id number (9*****) – **do not mention your name**;
- a table of your results - it must be a formatted table within the document, numbered, captioned and labelled correctly as if it were in a technical report (2 marks);
- your full program - it doesn't need annotations but you should add a small number of comments within the code (3 marks);
- **No text or accompanying comment is required.**

This exercise is worth 5% of the total mark for the course.