

TD 3&4 calibration, ESILV

1/ From the dataset provided (stock time series, column B), implement the algorithm of Black & Scholes replicating dynamically the price of a fictitious European call of maturity 31/12/2018, strike 6, and constant volatility of 20%. Has this portfolio always the same value as the option? Why?

2/ We are given another fictitious option of same characteristics (including the volatility parameter), except the strike, equal to 6.5. Replicate the initial option in delta and gamma. What is the design of the algorithm to implement? Has this portfolio always the same value as the option? Why?

From now on, we will not work anymore with prices of the fictitious options calculated in questions 1 and 2. Instead, prices will now be provided, requiring you to calibrate their volatility.

3/ Represent the price of a European call as a function of the volatility parameter and calibrate the implicit volatility using the Newton-Raphson algorithm then the dichotomy algorithm.

4/ Estimate the historical series of implied volatility, for the two options provided in columns C and D.

5/ Determine ex post the best replicating strategy for the first option (in two ways: investing only on the underlying stock or investing also on the second derivative) and propose a replication portfolio at the last date for a one-day horizon. Give your answer here before the evening of **24 November**:

<https://goo.gl/forms/9bobGfSpaU9aRDWF3>

(this will contribute to part of the final grade for this course, so failure to respond will lower that grade).
During the next lecture, the best P&L and corresponding replication strategy, based on the students submissions, will be revealed to you.