Scientific Computing - Project 1

USHAKOVA Oxana

June 30, 2016

What is an option ?

An option is a contract that gives the buyer the right, but not the obligation, to buy or sell an underlying asset (a stock, a bond, gold, other option) at a specific price, called Strike price, on or before a certain date, called maturity. An option is a security, just as stocks or bonds, it has its own price called premium.

What are option parameters?

Every option contract has several parameters to be pre-set at $t = T_0$:

- What is the underlying asset ?
- What is the maturity T of the contract ?
- Does the contract give the right to buy (**call option**) or to sell(**put option**) ?
- What is the Strike price K ?
- What is the price of the option itself, i.e. premium?

Options types

What right is proposed ?

- The right to buy – **Call** option
- The right to sell – **Put** option

Who are you in this contract?

- You buy the option – **long** position
- You sell the option – **short** position

Long Call Payoff

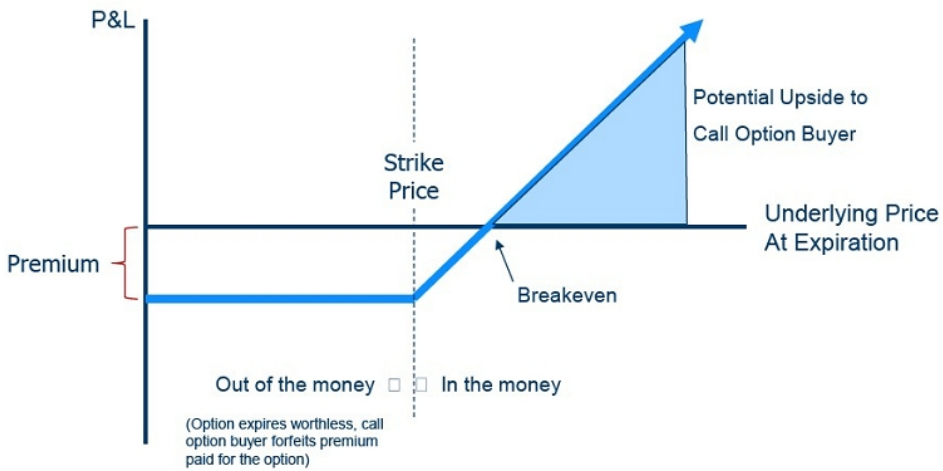

Figure : Long Call Option

As it comes from the figure, Long Call Option brings profit (*in the money*), if S at maturity T is higher than the Breakeven point. So the payoff of this option is: (premium ignored):

$$Payoff = \begin{cases} S - K & \text{if } S(T) > K \\ 0 & \text{if not} \end{cases}$$

Vanilla VS Exotics

Vanilla Option

At time $T0$ you fix the maturity date T and the Strike price K. At time T you decide whenever you want or not execute your option.

Exotic Option

- American option (Bermudian)
- Barrier option (Paris)
- Asian option
- Lookback option (Russian), etc

More closely on Exotics

- **American option** can be executed not only at T,but on any time of life of the option (T_0, T); **Bermudian option** can be executed on a specific period during the life of the option, i.e. every second Monday, June, etc.
- **Barrier option** can be activated for be executed only if the asset price touches (or not) a specific barrier; **Paris barrier option** can be activated for be executed only if the asset price satisfy the barrier condition for a certain period of time (i.e. 15min, 1 day, 30
- **Asian option**, its payoff is determined by the average underlying price over some pre-set period of time.
- **Lookback option**, its payoff depends not at S at final time T, $S(T)$, but on $max(S)$ over the life of the option. **Russian lookback** option is a special case of lookback : it has no pre-set expiration time, it's up to buyer of the option when to execute it. It's also called 'no regret' option.