Implied Volatility

Implied Volatility is a term used to speculate the market's volatility. Investors use the term to evaluate the future market option contract prices.

Consider the following BSM-Model

$$V(t, S) = BSM(\sigma, r, T, K, S_0)$$

where,
t: Initial time period
S: Stock Price
r: Risk-free rate of interest
S_0: Initial Stock Price
T: Time to maturity
K: Strike Price

Now assume there exists a function:

$$F_\sigma(.) = BSM^{-1}(.)$$

such that

$$\sigma_{implied} = F_\sigma(V_c^{market}, r, K, S_0, T)$$

Calculation of implied volatility

The BSM function does not have a closed-form solution for its inverse. However, we can use root-finding algorithms to minimize the error close to 0, i.e

$$BSM(\sigma_{implied}, r, T, K, S) - V_c^{market} \approx 0$$

We use the Newton-Rhapson method to find the value of implied volatility

$$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$$

References

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