OPTIONS PRICING CHEATSHEET

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Types of Options

American Options

Can be exercised any time before the maturity date.

European Options

Can only be exercised at the date of expiration.

Basic Terminology

- **S** Current price of the underlying stock.
- **C** Current value of the associated call option.
- **P** Current value of the associated put option.
- **K (E or X)** Exercise price of the option - the price at which the underlying security can be bought or sold.
- **rf** Risk-free interest rate.
- **T** Time to maturity.
- **σ** Standard deviation of the price of the underlying stock.

Call vs. Put Options

Call Option

Right to buy shares at a fixed price.

Put Option

Right to sell shares at a fixed price.

Payoff vs. Profit

Option Payoff

Gross value of an option at maturity, excluding the initial premium.

Option Profit

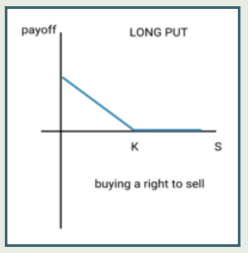
Net gain or loss of a position in options, including costs and gains from the position.

Call vs. Put Options

Long Call

Buying the right to buy.

Long Put

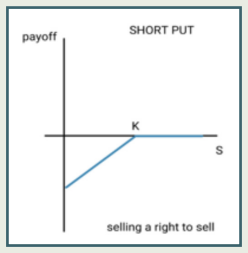


Buying the right to sell.

Short Call

Selling the right to buy.

Short Put



Selling the right to sell.

Key Formulas

$$u = e^{\text{growth rate}} \qquad d = \frac{1}{u}$$

$$P_u = \frac{e^{r_f} - d}{u - d} \qquad P_d = 1 - P_u$$

u = upstep d= downstep r_f= annual risk-free interest rate
P_u= probability of upstep P_d= probability of downstep

$$\text{Annual Discount Factor} = e^{-r_f}$$

Option value = (payoff from upstep * probability of upstep + payoff from downstep * probability of downstep) * annual discount factor

r = annual (nominal) interest rate e = mathematical constant ~ 2.71828

Calculating Option Value

1. Construct Binomial Tree

Calculate stock prices at each node from t=0 to t=T using u and d.

2. Compute Payoffs

Determine option payoffs at expiration (t=T).

3. Calculate Expected Payoff

Use risk-neutral probabilities and discount to present value.

4. Iterate Backwards

Repeat the process for each previous period to find the current option value.