

OPTIONS

S_0 = today's Stock Price

S_u = Estimated Stock price – upper limit (used in the Binomial Option Pricing Model)

S_d = Estimated Stock price – lower limit (used in the Binomial Option Pricing Model)

X = Exercise Price (Contractual Future Price)

C = Call Premium (C_u and C_d higher and lower payoffs respectively – used in BOPM)

P = Put Premium (P_u and P_d higher and lower payoffs, respectively – used in BOPM)

i = Free interest rate or borrowing rate

t = Time to exercise

σ = Standard Deviation of the Stock

δ = Dividend Yield

Options:

- Call Options: Payoff= $\text{Max}(0, S - X)$, Profit = Payoff, Premium - Bullish View
- Put Option: Payoff= $\text{Max}(0, X - S)$, Profit = Payoff, Premium - Bearish View

Basic Strategies:

- Protective Put: Own the Stock and Buy Put Option – Protective View
- Covered Call: Own the Stock and Sell Call – View of selling the stock
- Straddle: Buy Call and Buy Put – Volatility View
- Collar: Buy Put and Sell Call – Protective View paying \$0 premium

Advanced Strategies:

- **Bull Spreads (Vertical Spread):**
 - Buy Low (Call) Exercise Price (X_1) and Sell High (Call) Exercise Price (X_2) with the same expiration – Bullish - View and paying less premium
 - Sell High (Put) Exercise Price (X_1) in-the-money and Buy Low (Put) Exercise Price (X_2) out-of-the-money with the same expiration – Bullish View
- **Bear Spreads (Vertical Spread):**
 - Buy high (Put) Exercise Price (X_1) in the money and Sell Low (Put) Exercise Price (X_2) out-of-the-money with the same expiration – Bearish View
 - Buy High (Call) Exercise Price (X_1) and Sell Low (Call) Exercise Price (X_2) with the same expiration – Bearish View and paying less premium

- **Butterfly Spreads (Combination of Bull and Bear Spreads) with 3 strike prices:**
 - Buy the Low (Call) Exercise Price (X1), Sell two middle (Call) Exercise Price, Buy the High (Call) Exercise Price (X3) - Stability View and paying less premium

Option Valuation Approaches:

- **Binomial Option Pricing Model – Single Period Approach:**

- **Calculating Call Premiums - Method #1:**

$$C = \left[S_0 - \frac{S_d}{(1+i)^t} \right] \cdot \left(\frac{C_u - C_d}{S_u - S_d} \right), \text{ where}$$

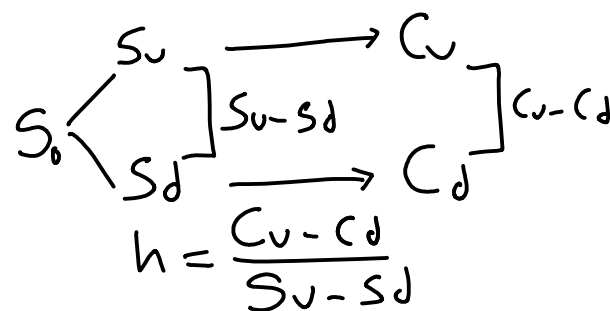
$$C_u = S_u - X \text{ and } C_d = \text{Max}(0, S_d - X)$$

- **Calculating Call Premiums - Method #2:**

$$C = \frac{\rho(C_u) + (1-\rho)(C_d)}{(1+i)}, \text{ where}$$

$$C_u = S_u - X \text{ and } C_d = \text{Max}(0, S_d - X)$$

$$\text{and } \rho = \frac{(1+i)-d}{u-d} \text{ for probability}$$



- **Binomial Option Pricing Model – Two Period Approach:**

- Calculating Call Premiums – using the two-period approach

$$C = \frac{\rho^2(C_{uu}) + 2\rho(1-\rho)(C_{ud}) + (1-\rho)^2(C_{dd})}{(1+i)^2}, \text{ where}$$

$$C_u = S_u - X \text{ and } C_d = \text{Max}(0, S_d - X)$$

- **Black-Sholes Valuation Model:**

- Calculating Call and Put Premium:

$$\blacksquare C = S(e^{-\delta t})N(d_1) - X(e^{-it})N(d_2)$$

$$\blacksquare C = X(e^{-it}) [1 - N(d_2)] - S(e^{-\delta t}) [1 - N(d_1)]$$

$$d_1 = \frac{\ln\left(\frac{S}{X}\right) + \left(i - \delta + \frac{\sigma^2}{2}\right) \cdot t}{\sigma\sqrt{t}} \text{ and } d_2 = d_1 - \sigma\sqrt{t}$$

- **Put Call Parity Method**

$$C - P = S - X(e^{-it}) \text{ then,}$$

$$C = S - X(e^{-it}) + P \text{ and } P = X(e^{-it}) - S + C$$