OPTIONS

Call
Put

OPTION TERMINOLOGY

Exercise (Strike) price
Expiration Date
Option Premium

MECHANICS OF TRADING

Options Exchanges
Options Clearing Corporation (OCC)

PAYOFFS AND PROFITS

\[ S_0 = \text{Value of Underlying Stock} \]
\[ E = \text{Exercise Price (strike price)} \]

In-the-Money Options:
\[ \text{Calls: } S_0 > E \]
\[ \text{Puts: } S_0 < E \]

Out-of-the-Money Options:
\[ \text{Calls: } S_0 < E \]
\[ \text{Puts: } S_0 > E \]

At-the-Money
\[ \text{Calls: } S_0 = E \]
\[ \text{Puts: } S_0 = E \]
OPTION POSITIONS

Sell (Write) Calls
Buy Calls
Sell (Write) Puts
Buy Puts

OPTION VALUATION

Premium = Intrinsic Value + Time Value
Call Option Intrinsic Value = Maximum (S₀ - E), 0
Call Options Selling *In-the-Money* Have Positive Intrinsic Value
Minimum Price of Option = Intrinsic Value
Maximum Price of Option = Underlying Stock Price

BLACK-SCHOLES MODEL

\[ CP = CMP[N(d_1)] - EP/e^{rt}[N(d_2)] \]

- \( CP \) = price of call option
- \( CMP \) = current market price of underlying stock
- \( N(d_1) \) = cumulative density function of \( d_1 \)
- \( EP \) = exercise price of option
- \( e \) = base of natural logarithms
- \( r \) = riskless rate of interest (annual rate)
- \( t \) = time remaining before expiration of option (fraction of year)
- \( N(d_2) \) = cumulative density function of \( d_2 \)

To find \( d_1 \) and \( d_2 \):

\[ d_1 = \frac{\ln(CMP/EP) + (r + .5s^2)t}{s[(t)^2]} \]

\[ d_2 = d_1 - s[(t)^2] \]

\( s = \text{stock volatility} \)
FACTORS AFFECTING OPTION VALUES

1) Price of underlying stock
2) Exercise price of option
3) Time remaining to expiration
4) Interest rate
5) Volatility of underlying stock

Hedge Ratio = N(d₁)

The hedge ratio is the change in option price for $1 change in the stock

Option prices change by less than underlying stock prices in $
Option prices change by more than underlying stock prices in %

Effects of Variables on Options Prices

<table>
<thead>
<tr>
<th>Variable</th>
<th>Calls</th>
<th>Puts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stock Price</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Exercise Price</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Time to Expiration</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Stock Volatility</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Interest Rates</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Cash Dividends</td>
<td>-</td>
<td>+</td>
</tr>
</tbody>
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BASIC OPTIONS STRATEGIES

Hedges - combination of option and stock designed to protect against loss

Covered Calls - Purchase stock/Sell Call - increase income
Protective Put - Purchase stock/Buy Put - insurance against decline in stock price
Sell Stock Short/Buy Call - reduces risk on short position