Chapter 15  Option Valuation

The Black-Scholes-Merton Option Pricing Formula.

- The formula itself is quite ugly and it's not useful to learn how to implement it by hand.
- Easy to implement on computers and advanced calculators.

The Inputs Are:

\[ S = \text{the current stock price} \]
\[ y = \text{the dividend yield of the stock} \]
\[ K = \text{the strike price} \]
\[ r = \text{risk free interest rate} \]
\[ T = \text{time until the option expires} \]
\[ \sigma = \text{volatility of stock price (a standard deviation type measure)} \]

The book shows a series of plots that demonstrates how the price of an option is affected by these inputs.

See Table 15.3

p 496
<table>
<thead>
<tr>
<th>Input</th>
<th>CALL</th>
<th>PUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>K</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>T</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>σ</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>r</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>y</td>
<td>-</td>
<td>+</td>
</tr>
</tbody>
</table>

**DELTA** - Measure of the impact of a change in the underlying stock price on the value of the stock option, i.e., it's the slope on Fig 15.1.

- It's used to set up hedges between a stock and an option to reduce the risk of option writing. This is called "Delta Hedging."

**Implied Stock Price Volatility.**

- If you solve the BSM model "backward," i.e., put in a call price, you can solve for $S$ which is the implied volatility of a stock.
Hedging with Index Options

- You can use index options to hedge stock portfolios.

Number of Call Options to Write = \( \frac{\text{Portfolio Beta} \times \text{Portfolio Value}}{\text{Option Delta} \times \text{Option Contract Value}} \)

No IQ 12-14, 17-20