ECO 4378
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Call Option

• A call option gives the holder the right to buy the underlying asset at a certain date at a certain price.

• The price in the call option contract is known as the exercise price or the strike price; the date in the contract is known as the expiration date. American style options can be exercised any time before the expiration date, whereas the European style options can be exercised only on the expiration date itself.

Long and Short Positions in a Call Option

• There are two sides to every option contract. On one side is the trader who has taken the long position (i.e., has bought the option). On the other side is the trader that has taken a short position (i.e., has sold or written the option). Accordingly, the party that has taken a long position in a call option is the party that has the right to buy the underlying asset by paying the exercise price (or strike price). If the long party decides to exercise this right, the short call position has to sell the underlying asset at the strike price.

When does the holder of a call option exercise the call?

• Consider a call option on gold with maturity date $T$ and exercise (strike) price $X$. The holder of this call option (i.e., the party who has assumed the long position in that call option) has the right to buy gold at price $X$ at the expiration date $T$. Whether the holder will exercise this right depends on the gold price $S_T$ at the expiration date. In particular

  – If $S_T > X$, we say that the call option is "in the money". The holder exercises the call option, pays $X$ and buys the gold. By doing so, the holder makes a profit $S_T - X$.

  – If $S_T < X$, the holder does not exercise the call option.
What does the short party in a call option contract do?

- The short party has no decision to make. If the long party decides to exercise the call, the short party has to sell the asset at $X$. Accordingly,
  
  - If $S_T > X$, the long party (the holder) exercises the call option, and hence the short party makes a loss of $S_T - X$. If $S_T < X$, the holder does not exercise the call option, so the call option expires without exercise.

Summary of Payoffs in a Call Option Contract:

<table>
<thead>
<tr>
<th>CALL OPTION</th>
<th>Payoff to Long Party</th>
<th>Payoff to Short Party</th>
</tr>
</thead>
<tbody>
<tr>
<td>If $S_T &gt; X$, the long party exercises.</td>
<td>$S_T - X$</td>
<td>$-(S_T - X)$</td>
</tr>
<tr>
<td>If $S_T &lt; X$, no exercise.</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Put Option

- A put option gives the holder the right to sell the underlying asset at a certain date (expiration date) at a certain price (strike price).

Long and Short Positions in a Put Option

- The party that has taken a long position in a put option is the party that has the right to sell the underlying asset at the exercise price (or strike price). If the long party decides to exercise this right, the short put position has to buy the underlying asset at the strike price.

When does the holder of a put option exercise the put?

- Consider a put option on gold with maturity date $T$ and strike price $X$. The holder of this put option (i.e., the party who has assumed the long position in that put option) has the right to sell gold at price $X$ at the expiration date $T$. Whether the holder will exercise this right depends on the gold price $S_T$ at the expiration date.
  
  - If $S_T < X$, we say that the put option is "in the money". The holder exercises the put option and sells gold at $X$. By doing so, the holder makes a profit $X - S_T$. If $S_T > X$, the holder does not exercise the put option.
What does the short party in a put option contract do?

- The short party again has no decision to make. If the long party decides to exercise the put, the short party has to buy the asset at \( X \). Accordingly,

  - If \( S_T < X \), the long party (the holder) exercises the put option, and hence the short party makes a loss of \( X - S_T \). If \( S_T > X \), the holder **does not** exercise the put option, so the put option expires without exercise.

**Summary of Payoffs in a Put Option Contract:**

<table>
<thead>
<tr>
<th>PUT OPTION</th>
<th>Payoff to Long Party</th>
<th>Payoff to Short Party</th>
</tr>
</thead>
<tbody>
<tr>
<td>If ( S_T &lt; X ), the long party exercises.</td>
<td>( X - S_T )</td>
<td>( -(X - S_T) )</td>
</tr>
<tr>
<td>If ( S_T &gt; X ), no exercise.</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Practice Problems

- **Question 1: (Put Option on a Stock)** Suppose that you write a put option contract on 100 IBM shares with a strike price of $120 and an expiration date in three months. The current price of IBM stock is $121. What have you committed yourself to? How much could you gain or lose?

- **Question 2: (Speculating: Call Option versus Stock Itself)** You would like to speculate that the price of a certain stock will increase. The current stock price is $29. A three-month call with a strike of $30 costs $2.90. You have $5,800 to invest. Identify two alternative speculative positions, one involving an investment in the stock and the other involving investment in the option. How far the stock price should go up for the option strategy to be more profitable?

- **Question 3: (A Combination of Put and Call):** A trader buys a call option on a stock with strike price $45 and a put option on the same stock with strike price of $40. Both options have the same maturity. The call costs $3 and the put costs $4. Draw a diagram showing the variation of the trader’s profit as a function of the stock price at the expiration date of the option.

- **Question 4: (Covering Downside with a Put Option)** Suppose that you own 5,000 shares worth $25 each. How can put options be used to provide you with insurance against a decline in the value of your holding over the next four months?

- **Question 5: (Call Option on a Stock)** A trader sells a European call on a share for $4. The stock price is $47 and the strike price is $50. Under what circumstances does the trader make a profit? Under what circumstances will the trader exercise the call option? Draw a diagram showing the variation of the trader’s profit with the stock price at the maturity of the option.