
1. A Straddle is established by buying a six-month put option with strike of $50, and buying a six-month call option with a strike price of $50. You also know the following, based on today's information and stock price of $50:

<table>
<thead>
<tr>
<th>Strike price</th>
<th>Call Delta</th>
<th>Call and Put gamma</th>
<th>Call and Put Vega</th>
</tr>
</thead>
<tbody>
<tr>
<td>45</td>
<td>0.75</td>
<td>0.0257</td>
<td>11.26</td>
</tr>
<tr>
<td>50</td>
<td>0.60</td>
<td>0.0313</td>
<td>13.70</td>
</tr>
<tr>
<td>55</td>
<td>0.45</td>
<td>0.0320</td>
<td>14.00</td>
</tr>
</tbody>
</table>

A. What will be the probable gain or loss on the straddle if the stock price increases by $1?

Solution: compute position delta = \( \Delta C + \Delta P = 0.60 + (0.60-1) = 0.6 + (-.4) = 0.20 \)
So that expected gain = $1.00 x 0.20 = $0.20

B. What will be the probable gain or loss on the straddle if the stock price decreases by $1?

Using position delta of 0.20, expected loss will be -$1.00 x 0.20 = -$0.20

C. What will happen to the position delta if the stock price becomes very small?

As stock drops, call is far out-of-the-money, put is far into-the-money, so delta approaches –1.0.
(e.g. position gains almost dollar-for-dollar as stock drops more, since put is far in money.)

D. What will happen to the position delta if the stock price becomes very large?

As stock rises, put is far out-of-the-money, call is far into-the-money, so delta approaches + 1.0.
(e.g. position gains almost dollar-for-dollar as stock rises more, since call is far in money.)

E. What is the position Gamma?

\[
\text{Gamma} = \Gamma_C + \Gamma_P = 0.0313 + 0.0313 = 0.0626
\]

F. What is the position Vega?

\[
\text{Vega} = \text{call vega} + \text{put vega} = 13.70 + 13.70 = 27.40
\]

G. If the expected volatility of the underlying stock increases from .35 to .38, but the stock price remains the same, what is your best estimate of the probable gain or loss on your position?

Vega predicts the amount (in cents per underlying share) that the position will change for a 100 basis point change in volatility. So if volatility rises from 0.35 (35%) to 0.38 (38%), it rose by 300 basis points.
Therefore the predicted change in your position value is:

\[
\text{(change in basis points/100) x net position vega} = 3 \times 27.40 \text{ cents} = 82 \text{ cents} = \$0.82 \text{ (positive change)}
\]