Derivatives Markets (Part 3)

The positions taken in Section 8 are directional, meaning a profit/(loss) occurs if the spot price at expiration of the underlying asset has either increased/(decreased) or decreased/(increased). For example, a bull spread is a bet that the underlying asset will increase in value; a profit is obtained if the underlying asset increases in value, and a loss is obtained if the underlying asset decreases in value. On the other hand, a bear spread is a bet that the underlying asset will decrease in value; a profit is obtained if the underlying asset decreases in value, and a loss is obtained if the underlying asset increases in value.

Speculating on Volatility:

The positions in this section are non-directional with respect to the underlying asset. The holder of a non-directional position does not care whether the underlying asset increases or decreases in value; the holder only cares about how much it moves.

A **straddle** is a position achieved by buying purchasing a put and purchasing a call at the same strike price K; i.e. long put(K) + long call(K). A written straddle is a short put(K) + short call(K) position. As an exercise, graph the payoff diagram for a straddle.

A **K_1-K_2 strangle** is a position achieved by buying purchasing a put at strike price, K_1, and purchasing a call at a different strike price, K_2; i.e. long put(K_1) + long call(K_2). The usual strangle has $K_1 < K_2$. A written strangle is a short put(K_1) + short call(K_2) position. As an exercise, graph the payoff diagram for a K_1-K_2 strangle, where $K_1 < K_2$.

A **K_1-K_2-K_3 butterfly spread** ($K_1 < K_2 < K_3$) is position that can be achieved in many ways. One way is a combination of a written straddle using strike price K_2 and a purchased K_1-K_3 strangle. The purchased strangle provides insurance against the written straddle. As an exercise, graph the payoff diagram for a K_1-K_2-K_3 butterfly spread when $K_3 - K_2 = K_2 - K_1$ and when $K_3 - K_2 < K_2 - K_1$.

An **asymmetric K_1-K_2-K_3 butterfly spread** ($K_1 < K_2 < K_3$) is position that is achieved by buying and selling calls with strike prices K_1, K_2, and K_3. In order to construct an asymmetric butterfly spread, first solve the equation $K_2 = \lambda \cdot K_1 + (1-\lambda) \cdot K_3$ for λ. Then, write *n* calls with strike price K_2, purchase $\lambda \cdot n$ calls with strike price K_1, and purchase $(1-\lambda) \cdot n$ calls with strike price K_3.

Example: An asymmetric 35-43-45 butterfly spread is constructed by selling 10 calls. Graph the payoff diagram.

Swaps

A **swap** is an agreement to exchange one set of payments for another set of payments over some period of time. If the future payments are being exchanged for future level payments, then the amount of the level payments is called the swap price. An **interest rate swap** involves exchanging floating rate interest payments for fixed rate payments. The fixed rate is called the **swap rate**. Use forward rates to determine swap rates. We illustrate with an example.