Understanding and Pricing Strangle Options

1 Introduction

A strangle options strategy involves buying a call and a put option on the same underlying asset with the same expiration date but with different strike prices. This strategy benefits from large price movements in the underlying asset.

2 Pricing Strangle Options

To compute the price of a strangle, we sum the prices of a call option with a higher strike price and a put option with a lower strike price. Using the Black-Scholes model, the price for each option is given by:

For a call option:

$$C = S_0 N(d_1) - K_{\text{call}} e^{-rT} N(d_2) \tag{1}$$

For a put option:

$$P = K_{\text{put}} e^{-rT} N(-d_2) - S_0 N(-d_1) \tag{2}$$

where:

$$d_1 = \frac{\ln(S/K) + (r + 0.5\sigma^2)T}{\sigma\sqrt{T}},$$

$$d_2 = d_1 - \sigma\sqrt{T},$$

$N(\cdot)$ = cumulative distribution function of the standard normal distribution,

S_0 = current price of the underlying asset,

K = strike price,

r = risk-free interest rate,

T = time to maturity,

σ = volatility of the asset.

The price of the strangle is simply $C + P$.

3 Numerical Example

Given:

- Current price of the underlying asset, $S = 100$
- Strike price of the call option, $K_{\text{call}} = 110$
- Strike price of the put option, $K_{\text{put}} = 80$
- Time to maturity, $T = 1$ year
- Annual risk-free interest rate, $r = 0.05$ (5%)
- Volatility of the underlying asset, $\sigma = 0.4$ (40%)

The strangle option price can be calculated using the Black-Scholes model, resulting in a price of \$19.13, with an intrinsic value of \$0.00 and a time value of \$19.13.

The following graphs illustrate the payoff and current value of the strangle option:

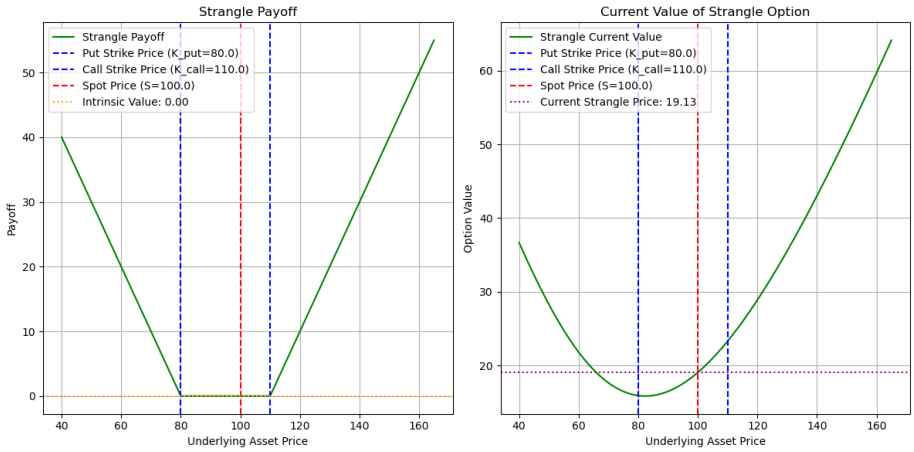

Figure 1: Strangle option example

4 Conclusion

The strangle option strategy is an effective way to capitalize on significant moves in the price of an underlying asset, regardless of the direction. By understanding how to calculate the price of this strategy, investors can make informed decisions to manage risk and potential returns.