

29. A collar is established by buying a share of stock for 50, buying a 6-month put option with exercise price \$45, and writing a 6-month call option with exercise price \$55. On the basis of the volatility of the stock, you calculate that for a strike price of \$45 and expiration of 6 months, $N(d_1)=0.6$ whereas for the exercise price of \$55, $N(d_1)=0.35$.

- What will be the gain or loss on the collar if the stock price increases by \$1?
- What happens to the delta of the portfolio if the stock price becomes very large?
- What happens to the delta of the portfolio if the stock price becomes very small?

Answer

- The delta of the collar is calculated as follows:

Position	Delta
Buy stock	1.0
Buy put, $X = \$45$	$N(d_1) - 1 = -0.40$
Write call, $X = \$55$	$-N(d_1) = -0.35$
Total	0.25

If the stock price increases by \$1, then the value of the collar increases by \$0.25. The stock will be worth \$1 more, the loss on the purchased put will be \$0.40, and the call written represents a *liability* that increases by \$0.35.

- If S becomes very large, then the delta of the collar approaches zero. Both $N(d_1)$ terms approach 1. Intuitively, for very large stock prices, the value of the portfolio is simply the (present value of the) exercise price of the call, and is unaffected by small changes in the stock price.

As S approaches zero, the delta also approaches zero: both $N(d_1)$ terms approach 0. For very small stock prices, the value of the portfolio is simply the (present value of the) exercise price of the put, and is unaffected by small changes in the stock price.