Options Part 4

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Calculating PNL (Part 1 of)

- Suppose you trade an option $\mathcal{O}$ at a price P on trade-date T_1.
- Suppose you hold the option until expiration, which is trade-date T_n.
- The letter i will sever as an index over the trade-dates, so $i = 1, \ldots, n$.

Calculating PNL (Part 2 of)

- Let B_i and A_i be the end-of-day bid/ask prices of the option for trade-date T_i.
- Note that $B_n = A_n =$ option-payoff.
- D_i - daily pnl for the trade as of end-of-day T_i.
- C_i - trade-to-date (cummulative) pnl for the trade as of end-of-day T_i.

Calculating PNL (Part 3 of)

Cummulative as Sum of Daily: **BUY**

$$D_i = \begin{cases} B_i - P & i = 1 \\ B_i - B_{i-1} & i > 1 \end{cases}$$

$$C_i = \sum_{k=1}^{i} D_k$$

Exercise: Show that $C_j = B_j - P$.

Calculating PNL (Part 4 of)

Cummulative as Sum of Daily: **SELL**

$$D_i = \begin{cases} P - A_i & i = 1 \\ A_{i-1} - A_i & i > 1 \end{cases}$$

$$C_i = \sum_{k=1}^{i} D_k$$

Exercise: Show that $C_i = P - A_i$.

Calculating PNL (Part 5 of)

Daily as Change in Cummulative: **BUY**

$$C_i = B_i - P$$

$$D_i = \begin{cases} C_i & i = 1 \\ C_i - C_{i-1} & i > 1 \end{cases}$$

Exercise: Show that both formulations of D_i are equivalent.

Calculating PNL (Part 6 of)

Daily as Change in Cummulative: **SELL**

$$C_i = P - A_i$$

$$D_i = \begin{cases} C_i & i = 1 \\ C_i - C_{i-1} & i > 1 \end{cases}$$

Exercise: Show that both formulations of D_i are equivalent.

Calculating PNL (Part 7 of)

SHOW A SIMPLE data analysis example here.

Black-Scholes-Merton Fuctions

Black-Scholes-Merton Formula (1 of)

$$m = \text{BSM}(\text{p/c}, K, \text{T}, S_t, \sigma, \delta, r)$$

Contract Features

- p/c - put or call
- K - strike price
- T - expiration date (time to expiration)

Market Values

- S_t - current underlying price
- σ - estimate of the standard deviation log-return of the price of underlying between now and expiration
- δ - estimate of dividends paid over the life of the option
- r - risk-free interest rate