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Volatility

Volatility

- **Volatility is a measure of the range that the underlying stock has fluctuated over a certain period of time**
 - Important component of the pricing model
 - Helps us determine which options to select
- **Historical or Statistical Volatility**
 - The actual measure of how the underlying asset price fluctuates over time
 - Annual standard deviation of the stock price
- **Implied Volatility**
 - How much the marketplace “implies” or expects the underlying stock price to fluctuate
 - Reflected in the actual option price

Volatility - continued

- Volatility is a measure of the risk, uncertainty, or variability of the underlying stock
- It is the most subjective component of the pricing model and often difficult to determine
- The higher the volatility:
 - Greater the expected stock fluctuation – in either direction
 - The higher the price for all options, calls and puts
 - Most noticeable with ATM options



Volatility and the Options Pricing Model

Calculating Option Price with known historical Volatility



Calculating implied Volatility with known Option Price



Example: ABC Jan 11 Calls and Puts

Low Volatility stock, 2 months to expiration



Stock Price: 50.00 Expiration: 2 months

| <u>Strike Price</u> | <u>Call Status</u> | <u>Option Price</u> | <u>Intrinsic Value</u> | <u>Extrinsic value</u> |
|---------------------|--------------------|---------------------|------------------------|------------------------|
| 35 | ITM | 15.10 | 15.00 | 0.10 |
| 40 | ITM | 10.30 | 10.00 | 0.30 |
| 45 | ITM | 5.80 | 5.00 | 0.80 |
| 50 | ATM | 1.60 | 0.00 | 1.60 |
| 55 | OTM | 0.80 | 0.00 | 0.80 |
| 60 | OTM | 0.30 | 0.00 | 0.30 |
| 65 | OTM | 0.10 | 0.00 | 0.10 |

| <u>Strike Price</u> | <u>Put Status</u> | <u>Option Price</u> | <u>Intrinsic Value</u> | <u>Extrinsic value</u> |
|---------------------|-------------------|---------------------|------------------------|------------------------|
| 35 | OTM | 0.10 | 0.00 | 0.10 |
| 40 | OTM | 0.30 | 0.00 | 0.30 |
| 45 | OTM | 0.80 | 0.00 | 0.80 |
| 50 | ATM | 1.60 | 0.00 | 1.60 |
| 55 | ITM | 5.80 | 5.00 | 0.80 |
| 60 | ITM | 10.30 | 10.00 | 0.30 |
| 65 | ITM | 15.10 | 15.00 | 0.10 |

Example: XYZ Jan 11 Calls and Puts

High Volatility stock, 2 months to expiration



Stock Price: 50.00 Expiration: 2 months

| <u>Strike Price</u> | <u>Call Status</u> | <u>Option Price</u> | <u>Intrinsic Value</u> | <u>Extrinsic value</u> |
|---------------------|--------------------|---------------------|------------------------|------------------------|
| 35 | ITM | 15.30 | 15.00 | 0.30 |
| 40 | ITM | 10.90 | 10.00 | 0.90 |
| 45 | ITM | 7.10 | 5.00 | 2.10 |
| 50 | ATM | 4.20 | 0.00 | 4.20 |
| 55 | OTM | 2.10 | 0.00 | 2.10 |
| 60 | OTM | 0.90 | 0.00 | 0.90 |
| 65 | OTM | 0.30 | 0.00 | 0.30 |

| <u>Strike Price</u> | <u>Put Status</u> | <u>Option Price</u> | <u>Intrinsic Value</u> | <u>Extrinsic value</u> |
|---------------------|-------------------|---------------------|------------------------|------------------------|
| 35 | OTM | 0.30 | 0.00 | 0.30 |
| 40 | OTM | 0.90 | 0.00 | 0.90 |
| 45 | OTM | 2.10 | 0.00 | 2.10 |
| 50 | ATM | 4.20 | 0.00 | 4.20 |
| 55 | ITM | 7.10 | 5.00 | 2.10 |
| 60 | ITM | 10.90 | 10.00 | 0.90 |
| 65 | ITM | 15.30 | 15.00 | 0.30 |



WMT Chart (low volatility)





WMT Dec Options (1 month)

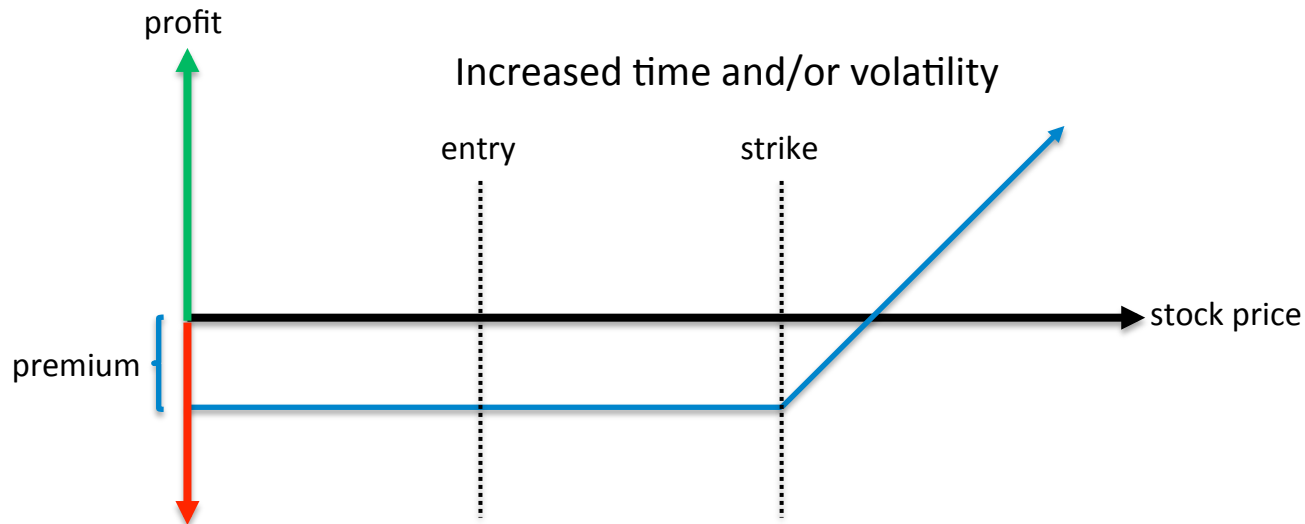
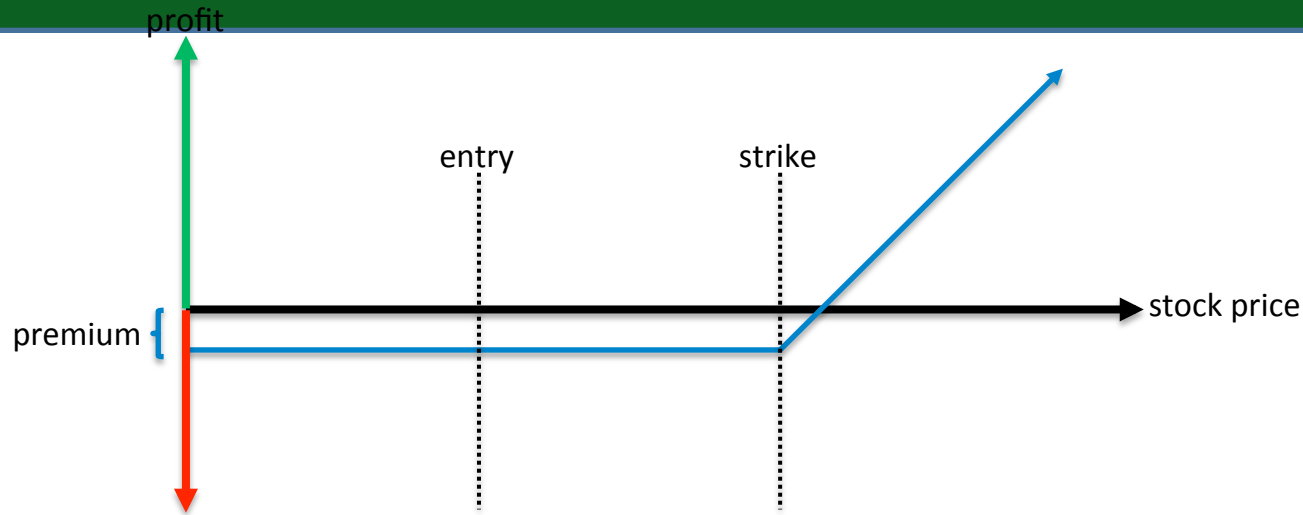
| WMT Wal-Mart Stores, Inc. B: 53.76 A: 53.77 53.76 -02 -1.14% | | | | | | | | | | | | |
|---|----------|---------|---------|---------|-----------|-------------|---------|-------|-------|---------|--|--|
| UNDERLYING | | | | | | | | | | | | |
| Last X | Net Chng | Bid X | Ask X | Size | Volume | Open | High | Low | | | | |
| 53.76 | -.62 | 53.76 N | 53.77 Q | 35 x 34 | 3,253,218 | 54.20 | 54.26 | 53.74 | | | | |
| TRADE GRID Stock price | | | | | | | | | | | | |
| OPTIONS Spread: Single Layout: Theta, Delta Exchange: Composite | | | | | | | | | | | | |
| CALLS | | | | | | Strikes: 16 | PUTS | | | | | |
| Theta | Delta | Bid X | Ask X | Exp | Strike | Bid X | Ask X | Theta | Delta | | | |
| DEC 10 (24) 100 | | | | | | | | | | | | |
| -05 | .90 | 19.40 X | 23.60 X | DEC 10 | 32.5 | 0 X | .01 N | .00 | .00 | 19.82% | | |
| -04 | .90 | 17.00 X | 21.10 X | DEC 10 | 35 | 0 Q | .04 I | .00 | .00 | Imp Vol | | |
| -03 | .91 | 14.35 X | 18.60 X | DEC 10 | 37.5 | .01 C | .03 I | .00 | .00 | -01 | | |
| -03 | .91 | 12.00 X | 16.15 X | DEC 10 | 40 | .01 X | .03 N | .00 | .00 | -01 | | |
| -02 | .93 | 11.20 X | 11.50 I | DEC 10 | 42.5 | .02 I | .04 I | .00 | .00 | -01 | | |
| -01 | .94 | 8.75 I | 8.90 I | DEC 10 | 45 | .03 N | .05 I | -01 | -01 | -02 | | |
| -01 | .94 | 6.25 I | 6.35 I | DEC 10 | 47.5 | .04 I | .06 N | -01 | -01 | -03 | | |
| -01 | .92 | 3.80 I | 3.85 A | DEC 10 | 50 | .10 I | .12 C | -01 | -01 | -08 | | |
| -01 | .73 | 1.53 I | 1.56 Q | DEC 10 | 52.5 ATM | .44 I | .45 I | -02 | -02 | -29 | | |
| -01 | .25 | .28 C | .29 A | DEC 10 | 55 | 1.78 N | 1.80 N | -02 | -02 | -69 | | |
| .00 | .05 | .04 C | .05 I | DEC 10 | 57.5 | 4.05 N | 4.10 X | -02 | -02 | -85 | | |
| .00 | .01 | 0 Q | .02 A | DEC 10 | 60 | 6.50 N | 6.60 I | -02 | -02 | -89 | | |
| .00 | .01 | 0 N | .02 A | DEC 10 | 62.5 | 8.95 N | 9.10 N | -02 | -02 | -91 | | |
| -01 | .02 | 0 Q | .07 I | DEC 10 | 65 | 9.20 X | 13.45 X | -01 | -01 | -99 | | |
| -01 | .02 | 0 X | .07 A | DEC 10 | 70 | 14.20 X | 18.45 X | -01 | -01 | -99 | | |
| .00 | .01 | 0 Q | .05 A | DEC 10 | 75 | 19.20 X | 23.45 N | -01 | -01 | -99 | | |
| JAN 11 (59) 100 21.45% | | | | | | | | | | | | |
| MAR 11 (115) 100 21.89% | | | | | | | | | | | | |
| JUN 11 (206) 100 21.78% | | | | | | | | | | | | |
| JAN 12 (423) 100 22.89% | | | | | | | | | | | | |
| JAN 13 (787) 100 22.33% | | | | | | | | | | | | |



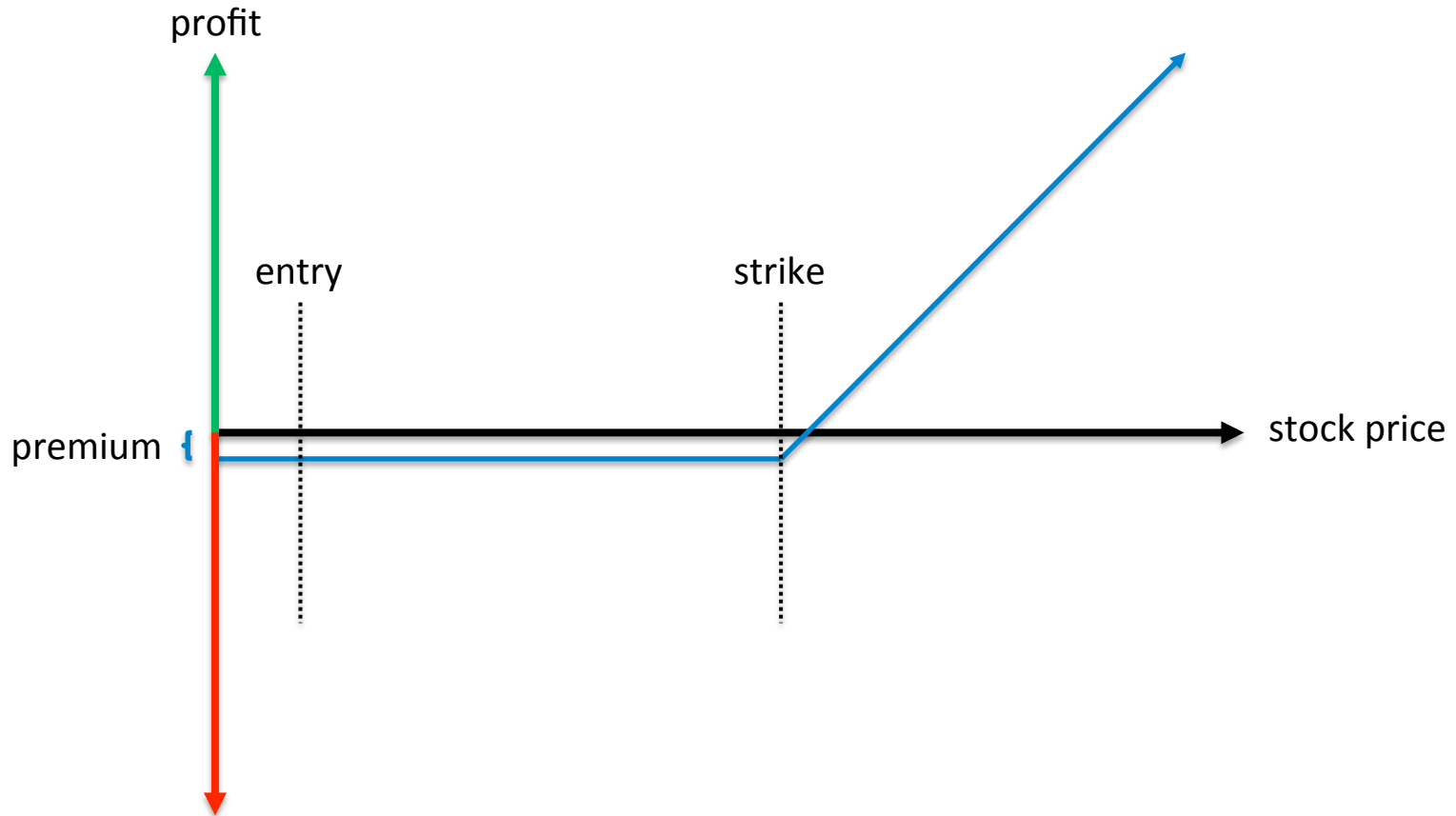
RIMM Chart (higher volatility)



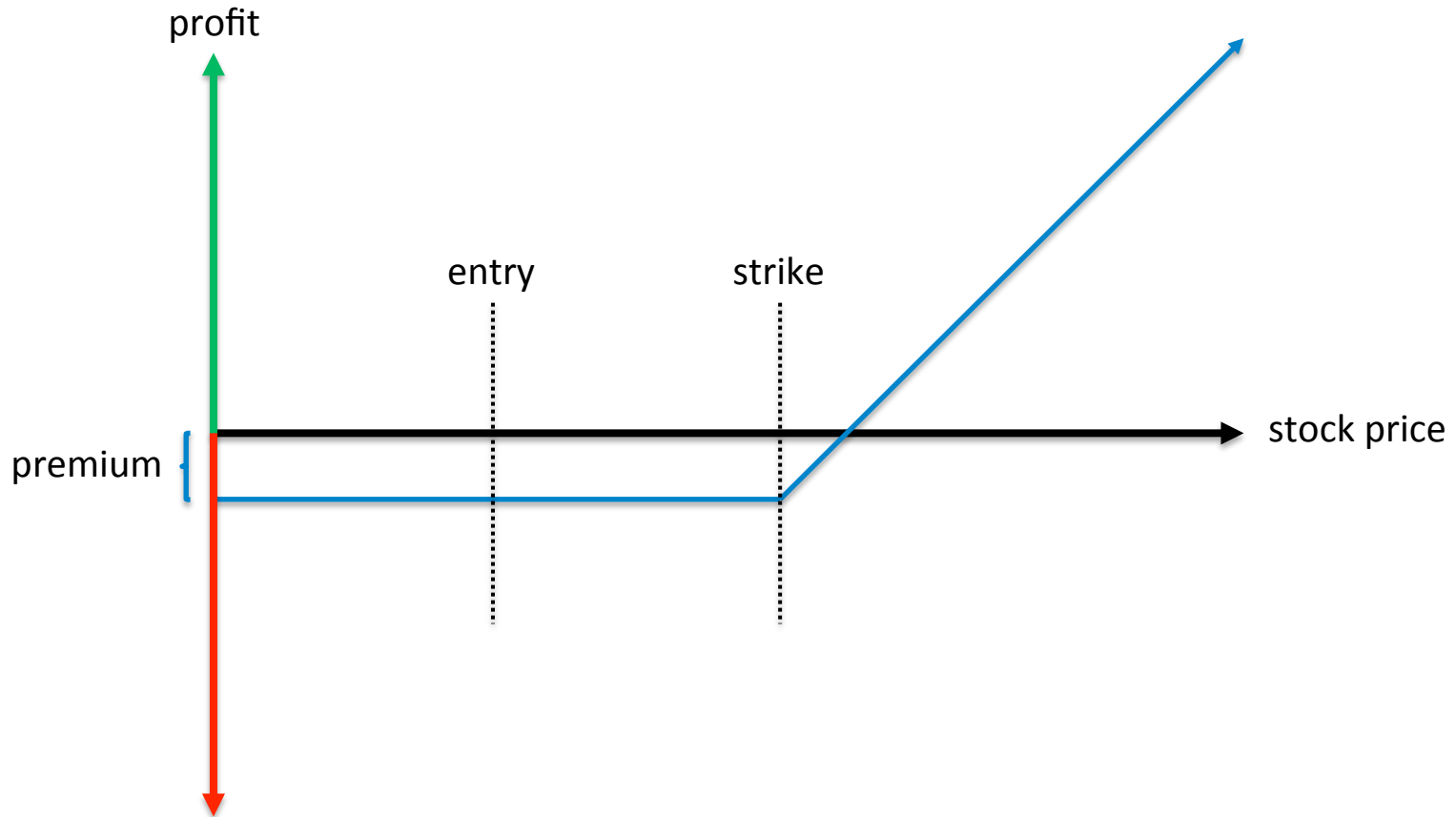
Long Call Parity Graph



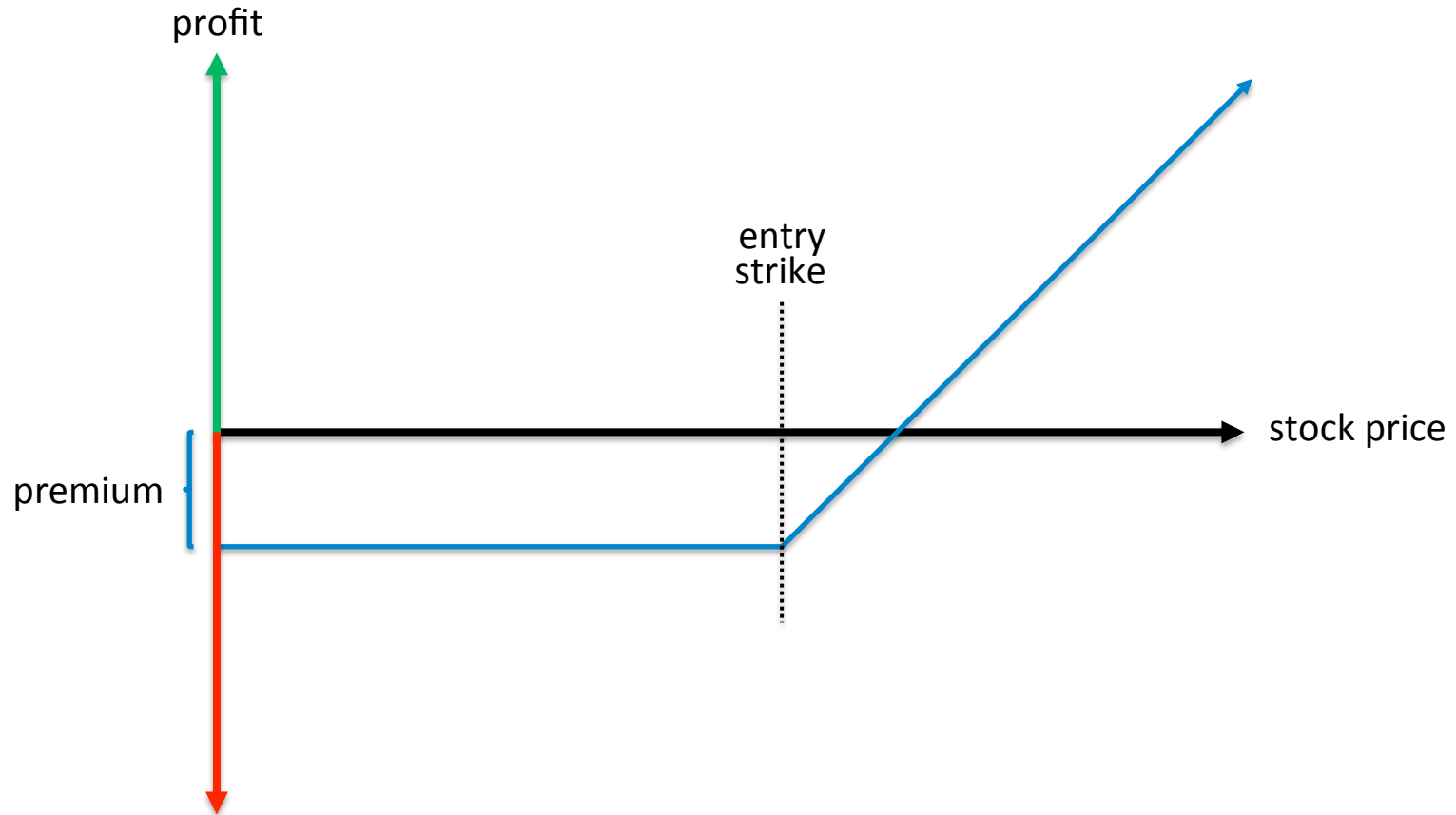
Long Call - Far OTM



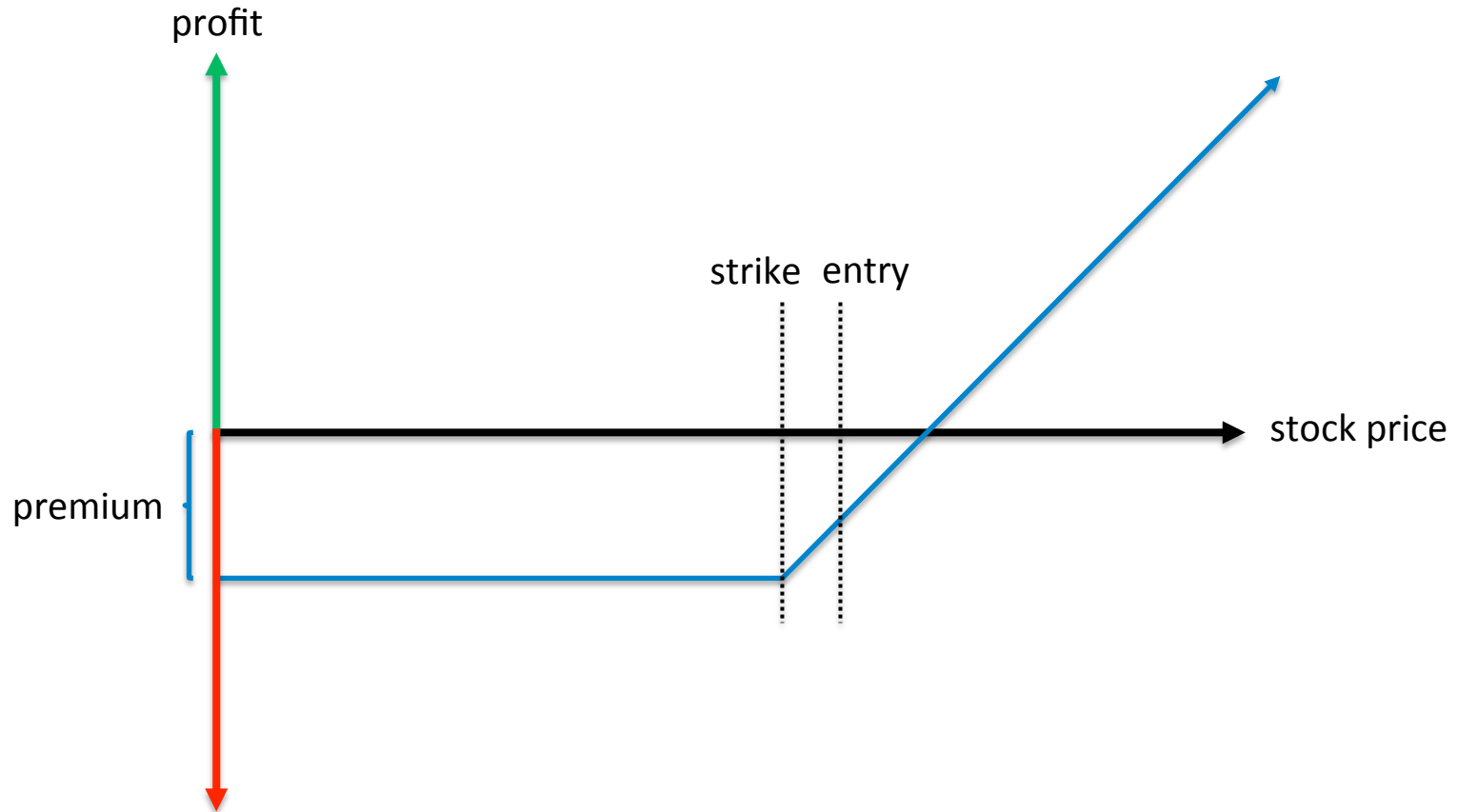
Long Call - OTM



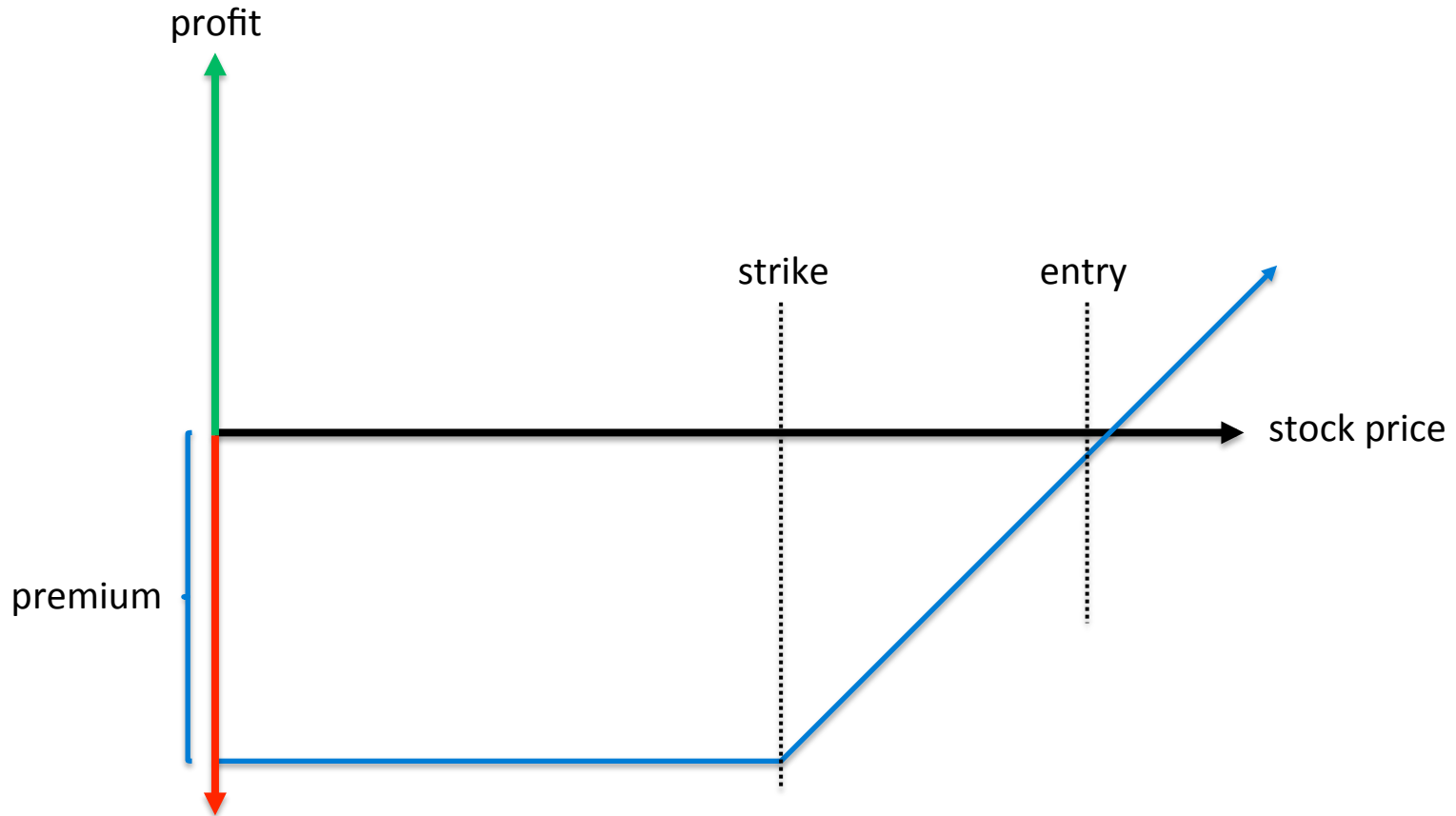
Long Call - ATM



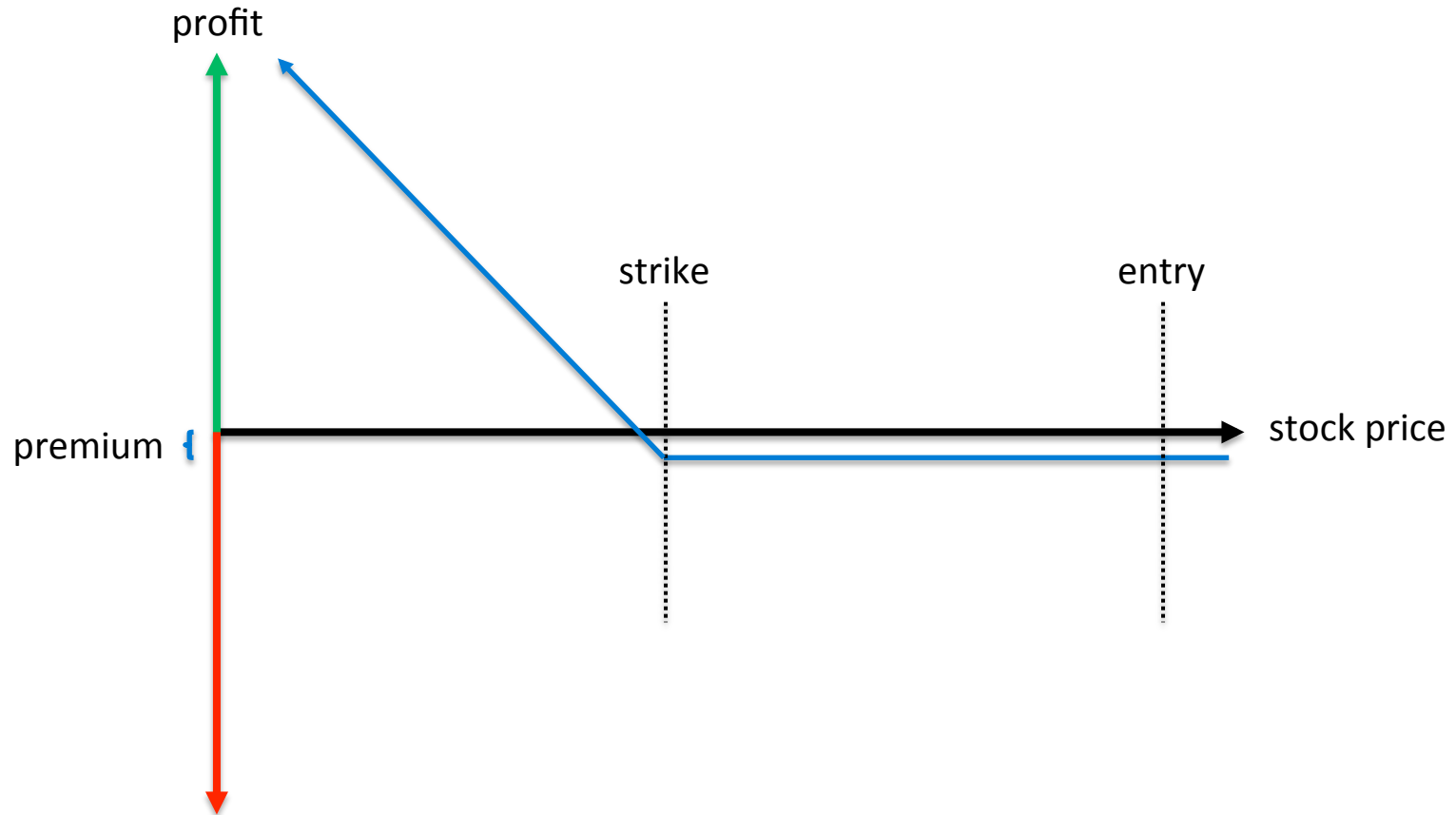
Long Call - ITM



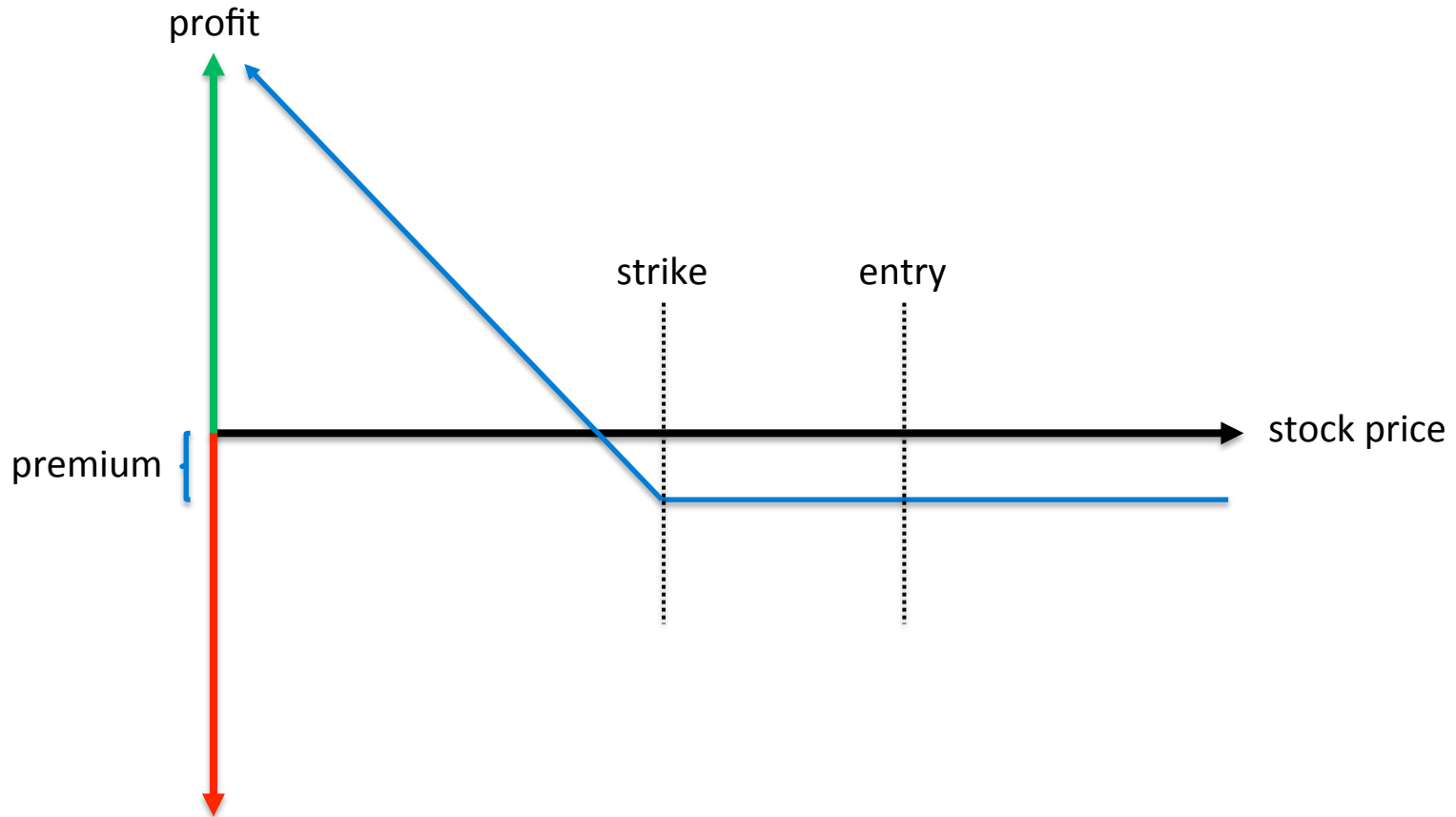
Long Call – Deep ITM



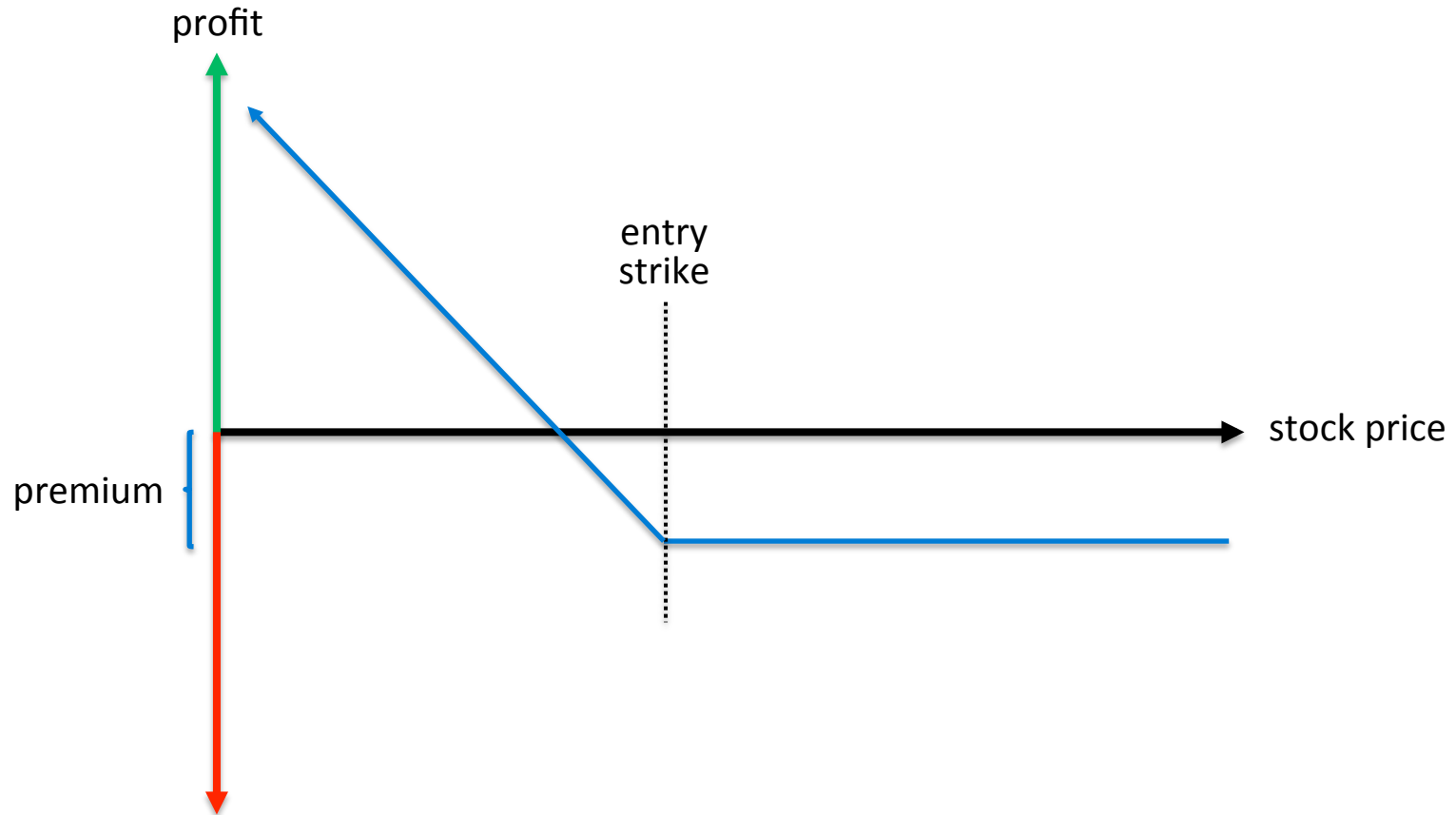
Long Put – Far OTM



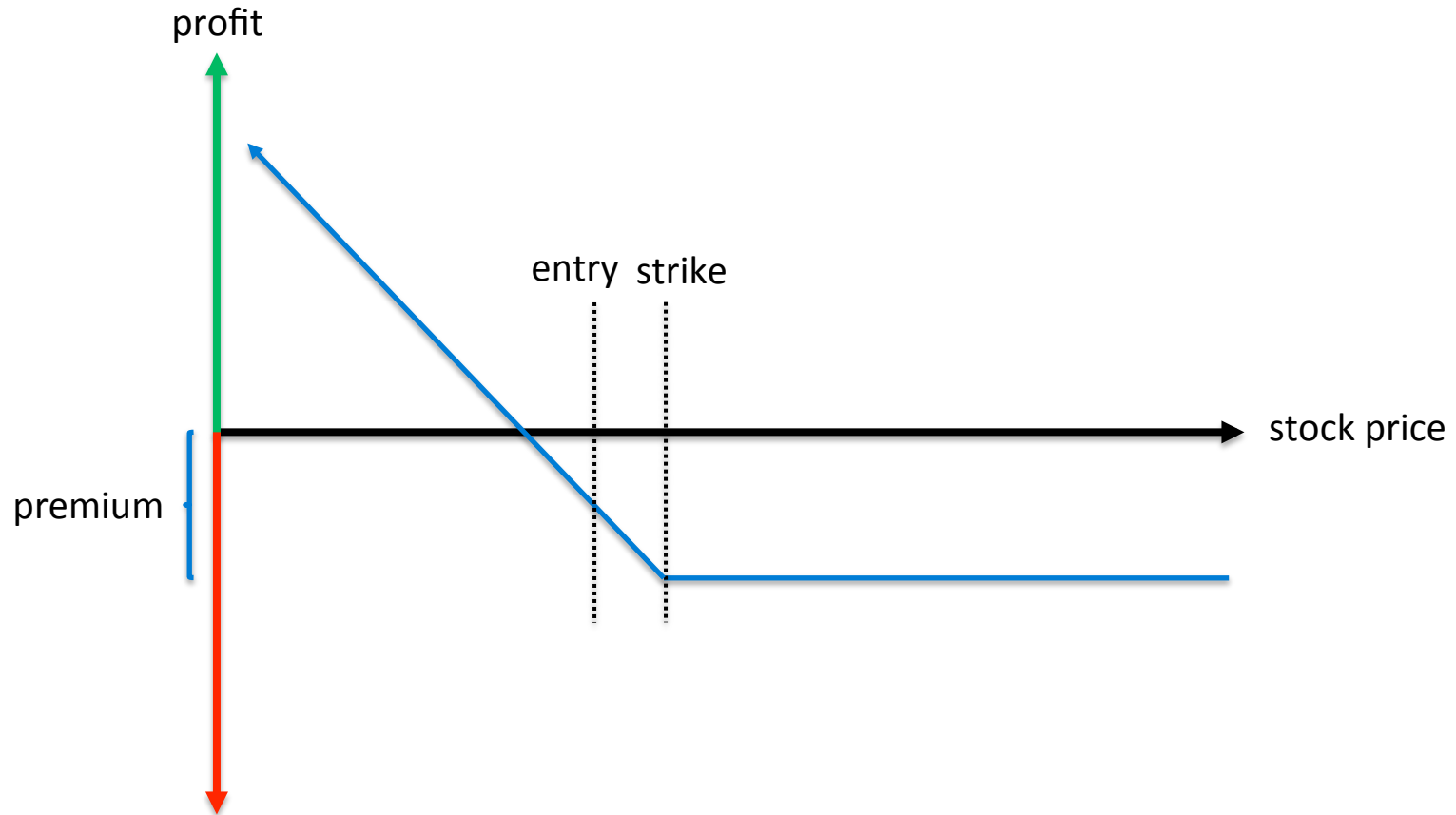
Long Put - OTM



Long Put - ATM



Long Put - ITM



Long Put – Deep ITM

