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Chapter 11 Volatility Spreads

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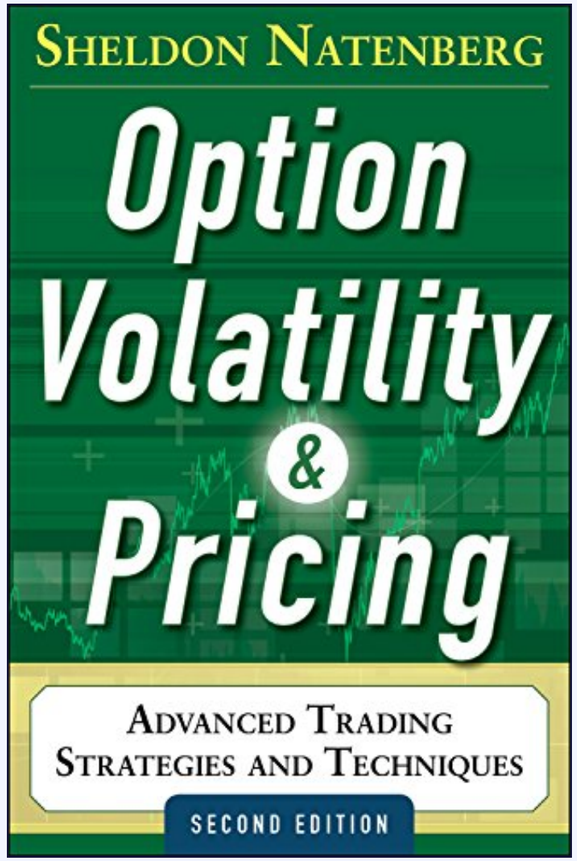
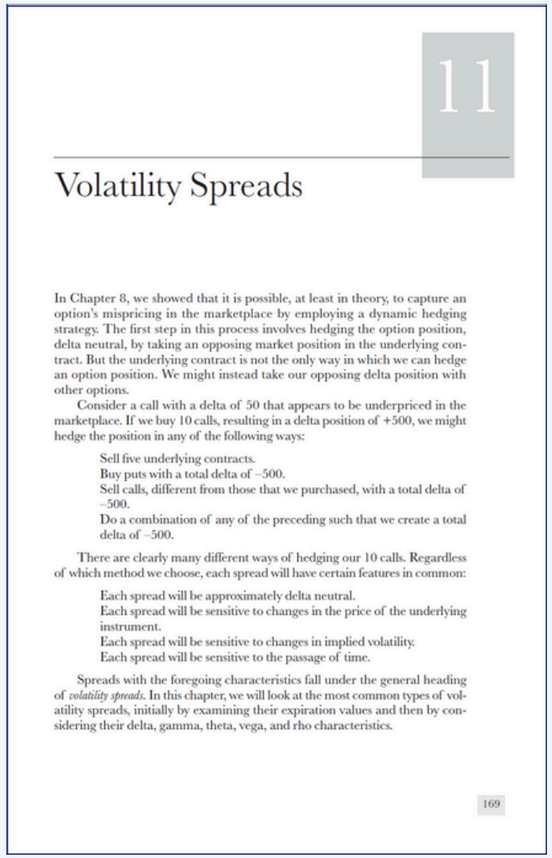
Chapter 11 — Volatility Spreads





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Volatility Spreads

In Chapter 8, we showed that it is possible, at least in theory, to capture an option's mispricing in the marketplace by employing a dynamic hedging strategy. The first step in this process involves hedging the option position, delta neutral, by taking an opposing market position in the underlying contract. But the underlying contract is not the only way in which we can hedge an option position. We might instead take our opposing delta position with other options.

Consider a call with a delta of 50 that appears to be underpriced in the marketplace. If we buy 10 calls, resulting in a delta position of +500, we might hedge the position in any of the following ways:

Sell five underlying contracts.
Buy puts with a total delta of −500.
Sell calls, different from those that we purchased, with a total delta of −500.
Do a combination of any of the preceding such that we create a total delta of −500.

There are clearly many different ways of hedging our 10 calls. Regardless of which method we choose, each spread will have certain features in common:

Each spread will be approximately delta neutral.
Each spread will be sensitive to changes in the price of the underlying instrument.
Each spread will be sensitive to changes in implied volatility.
Each spread will be sensitive to the passage of time.

Spreads with the foregoing characteristics fall under the general heading of *volatility spreads*. In this chapter, we will look at the most common types of volatility spreads, initially by examining their expiration values and then by considering their delta, gamma, theta, vega, and rho characteristics.

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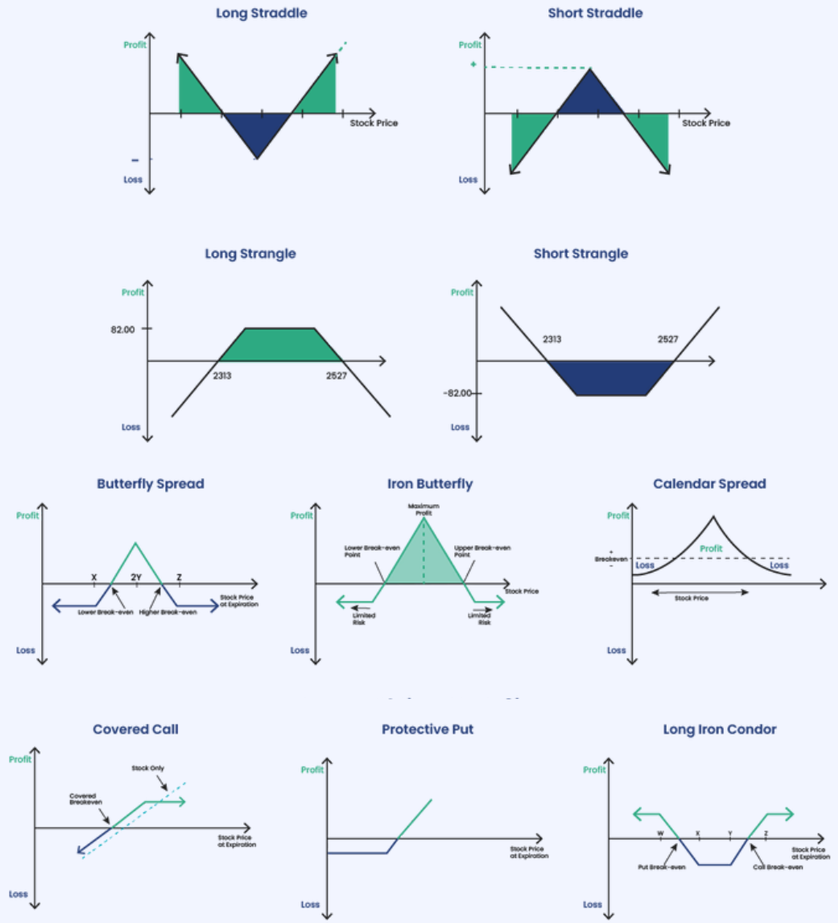
Hedging options with… *options*

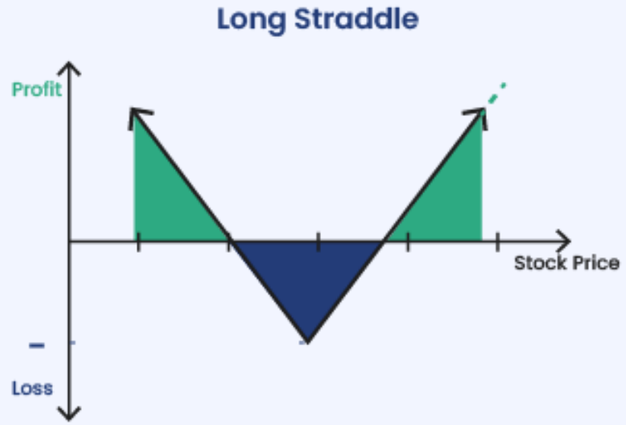
- *We've already covered what it means to delta hedge an option by pairing it with proportional shares of the underlying*
- *Volatility trading ("Vol trading") involves structuring combinations of options to hedge- or "spread"- your risk.*
- *Possible combinations are endless*
- *Hedging can target any of the risk parameters (Greeks)*

Chapter 11 — Volatility Spreads

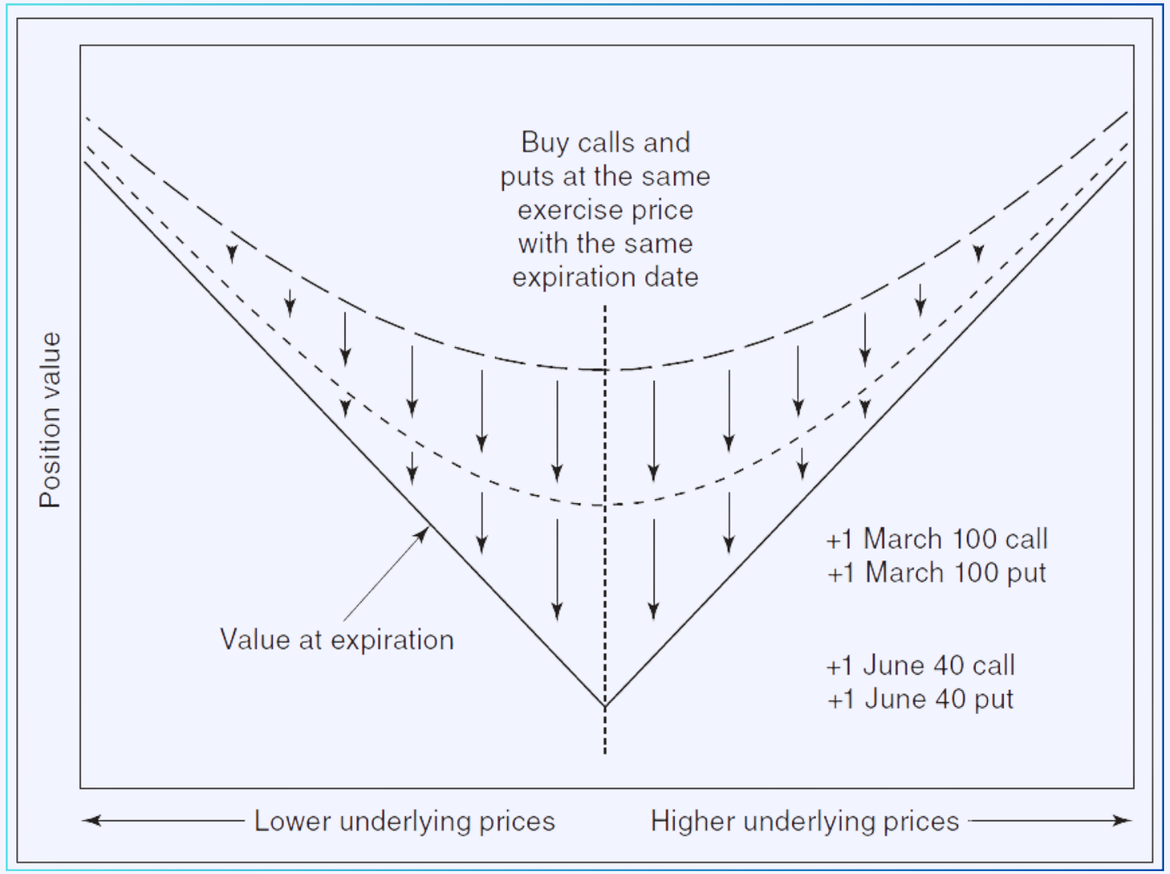
- Straddle
- Strangle
- Butterfly
- Condor
- Ratio Spread
- Christmas Tree
- Calendar Spread
- Changing Interest Rates & Dividends
- Choosing an Appropriate Strategy



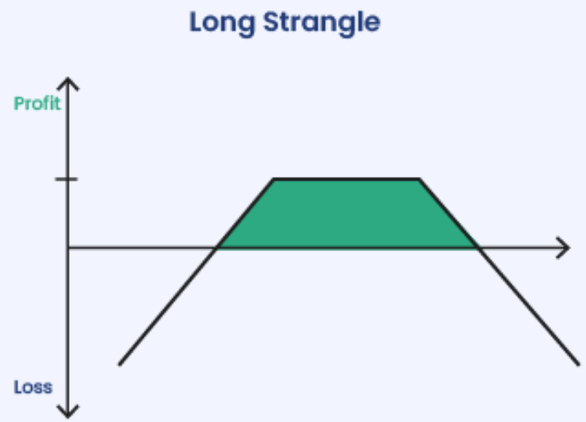
The Straddle

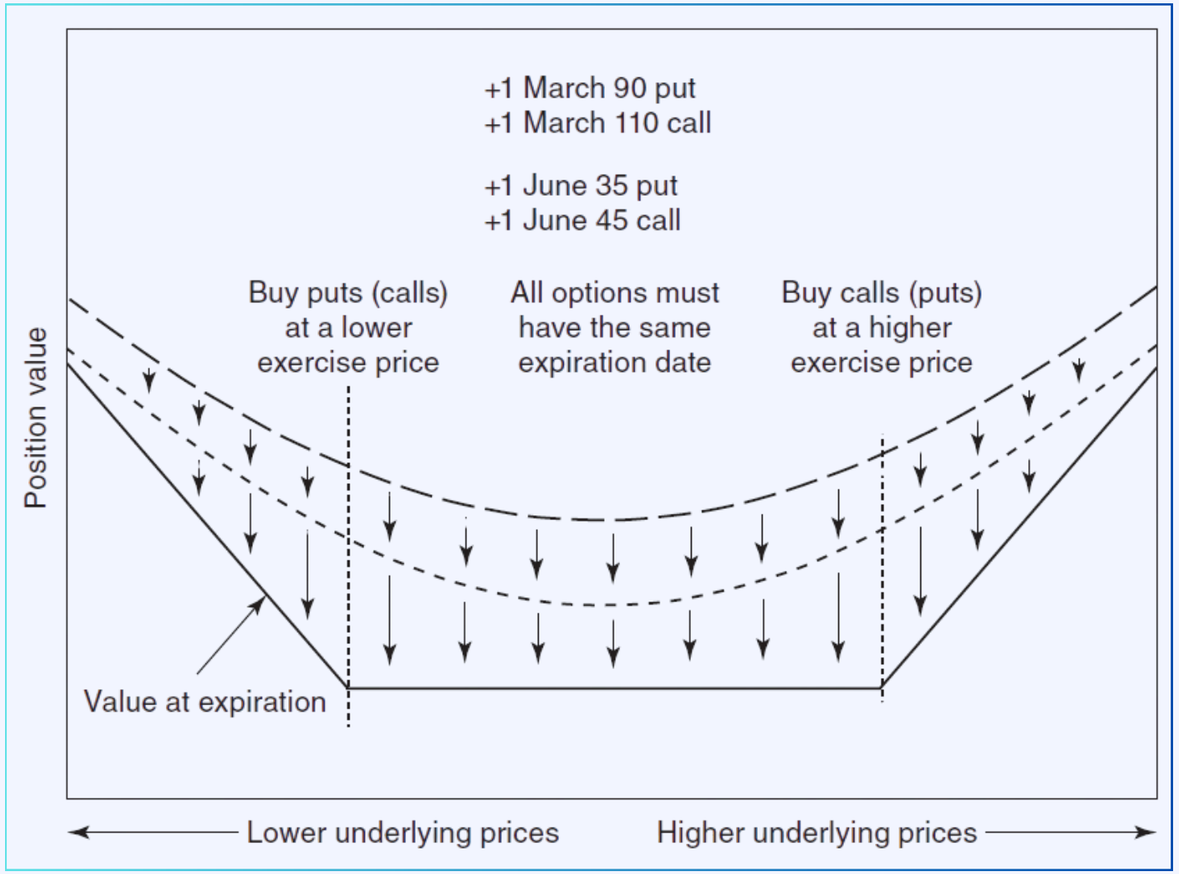


- *A Straddle consists of a Call & Put of the same strike & expiry*
- *Buy both legs = long; Sell both legs = short*
- *A long straddle is +Gamma, +Vega, and –Theta (paying)*
- *A short straddle is –Gamma, –Vega, and +Theta (collecting)*
- *As a rule- flip the signs (+/–) when comparing long & short*



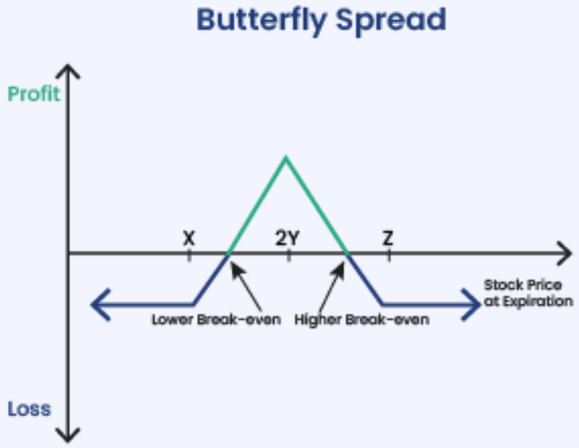
The Strangle



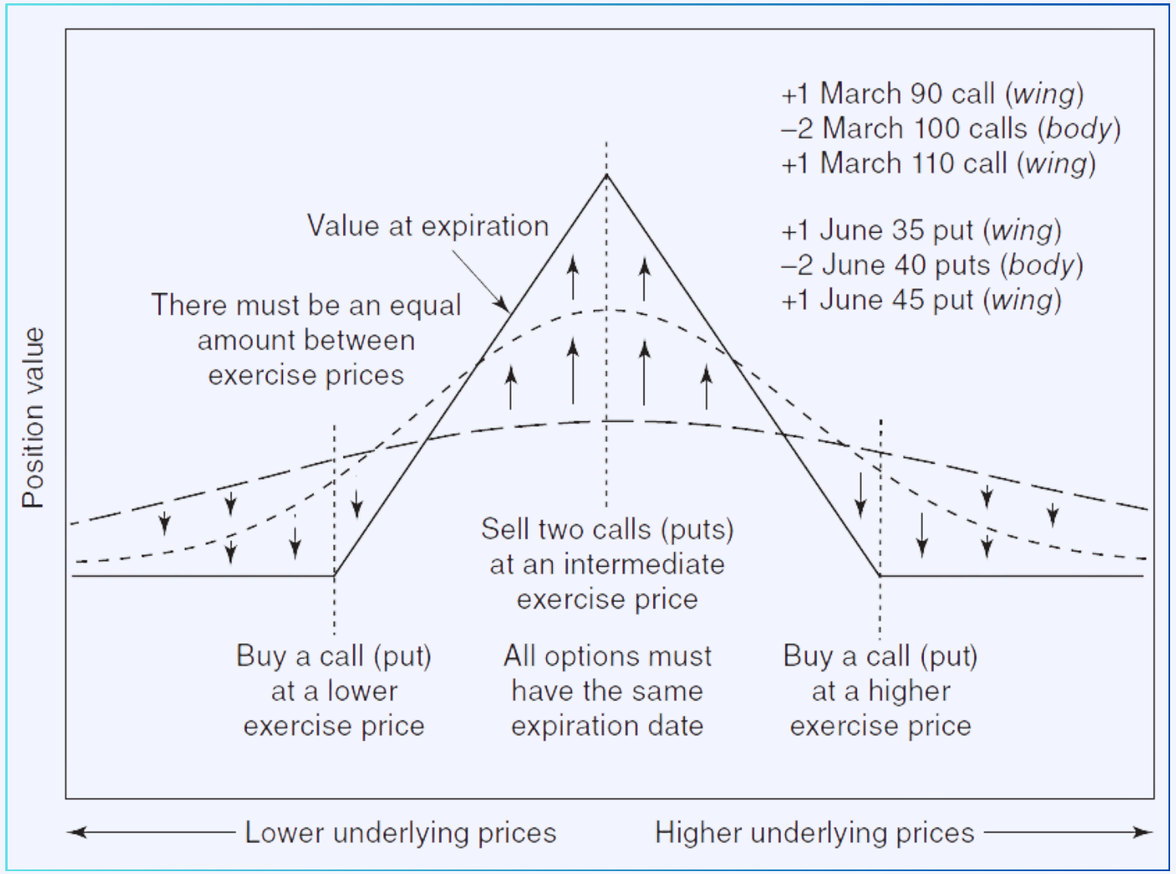


- *A Strangle consists of +C & +P with **different** strikes*
- *Usually set up 1:1 with offsetting deltas on C vs P*
- *Common version is the -20d Put + 20d Call*
- *A long strangle is +Gamma, +Vega, –Theta (paying)*
- *Cheaper to own than the Straddle, with technically unlimited profit potential*

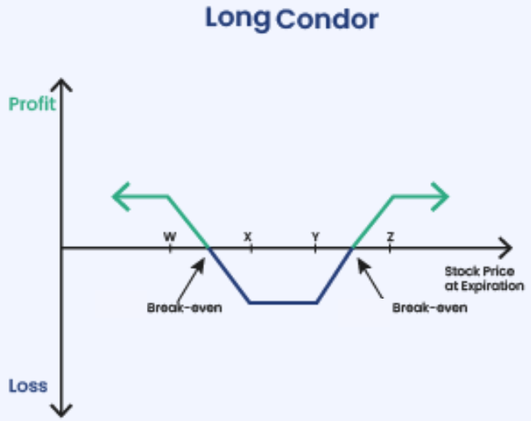
The Butterfly



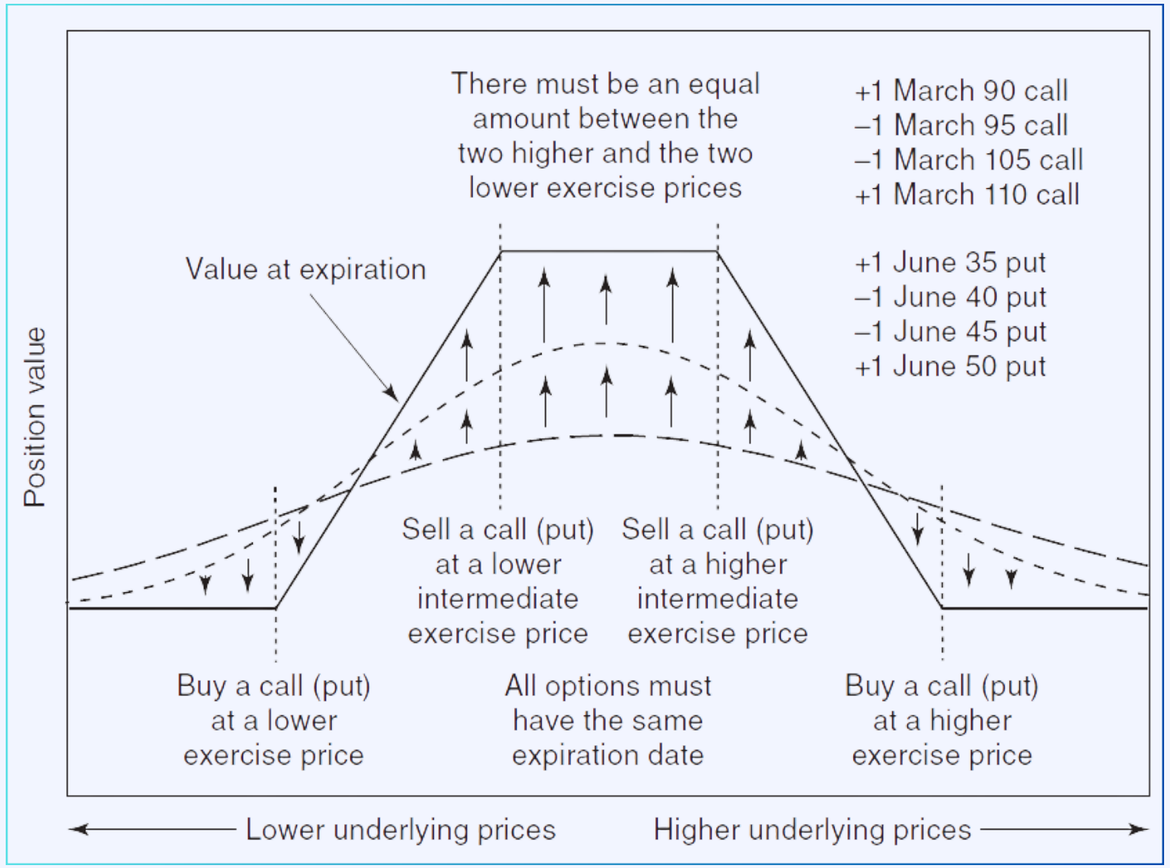
- *A Butterfly ("Call/Put fly") consists of 3 legs +1, -2, +1*
- *Strikes are chosen to be equidistant from the center*
- *Generally a fly involves all Calls (or Puts) of the same expiry*
- *A Butterfly centered ATM will have SHORT STRADDLE Greeks:*
  - *–Gamma, –Vega, +Theta (collecting)*
- *Shift the fly– Greeks will vary!*



The Condor

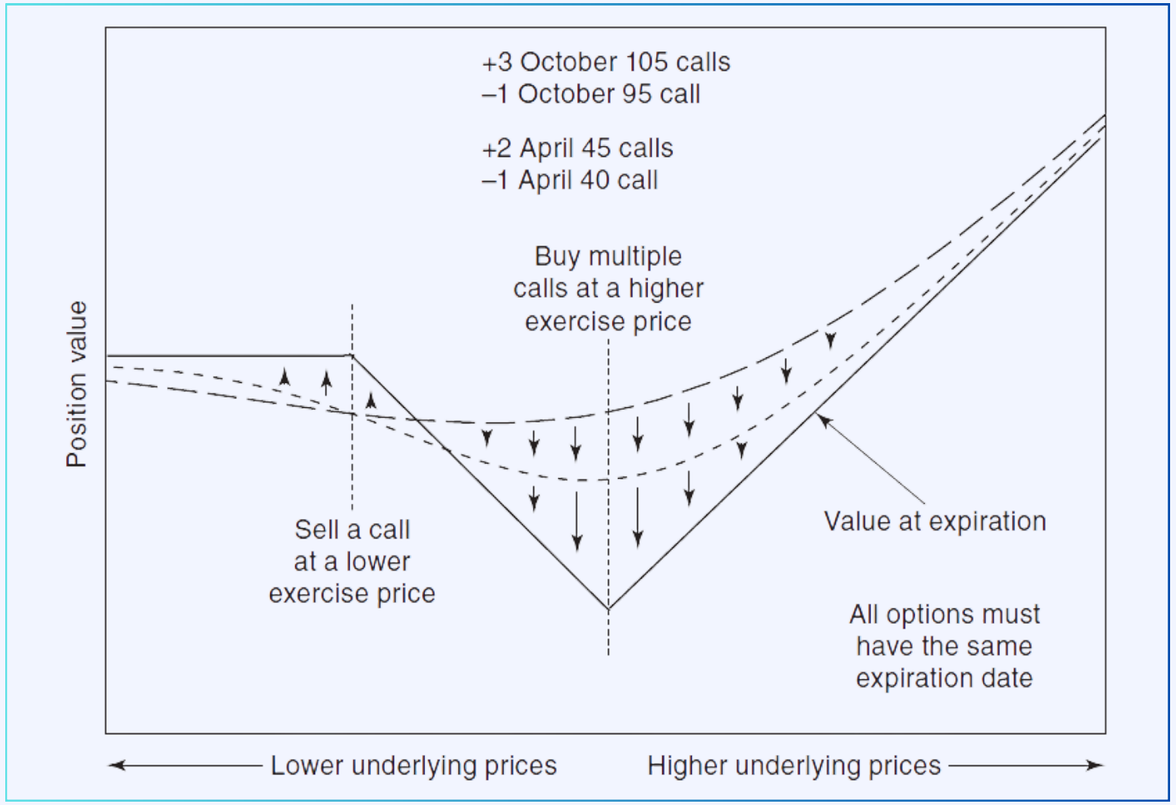


- *A Call/Put Condor consists of long spread vs a short spread*
- *All calls or all puts / same expiration / strikes equidistant*
- *An Iron Condor is a Long (inside) vs. Short (outside) Strangle*
- *A Condor centered ATM will have SHORT STRANGLE Greeks:*
  - *–Gamma, –Vega, +Theta (collecting)*
- *Shift the condor– Greeks will vary!*



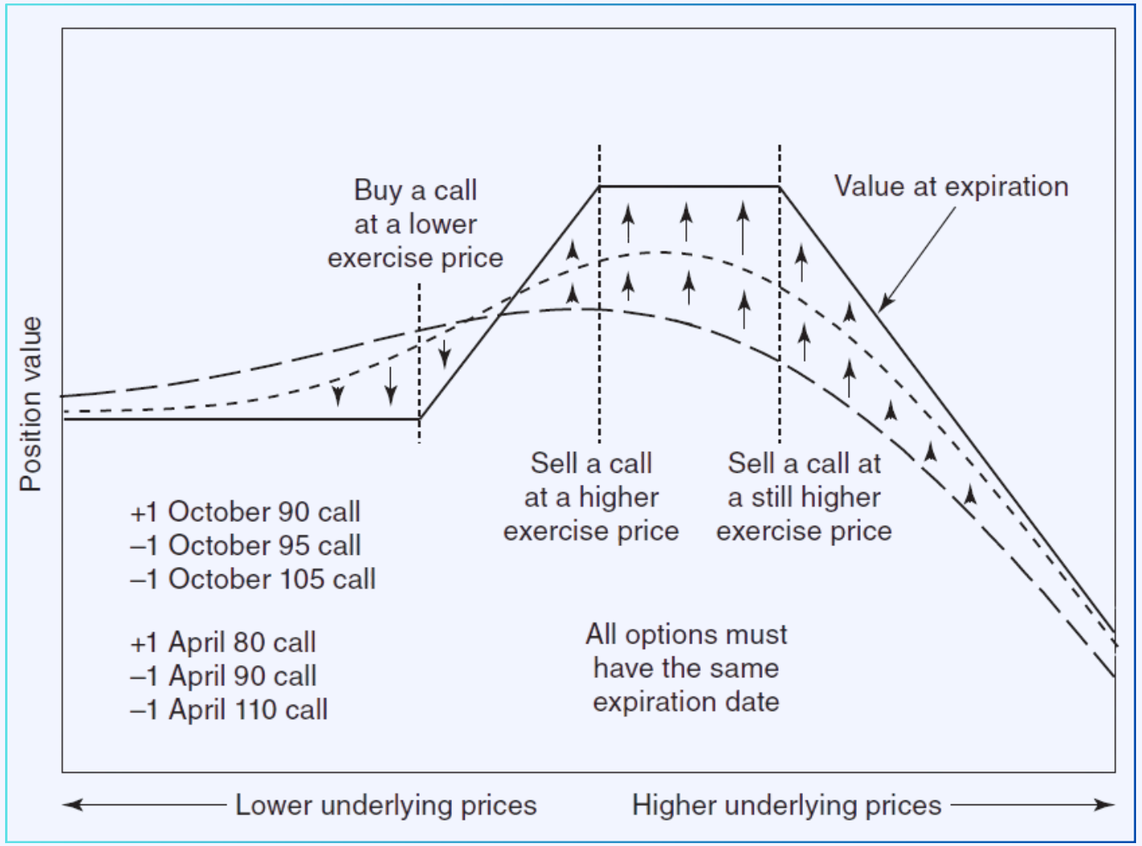
Ratio Spread

- *Ratio spreads involve options of same type (P/C & expiry) but different quantities on the legs*
- *Payoff profile depends on actual structure*
- *Subject to Vanna / Volga dynamics before expiry*
  - *examples*
- *Common phrase = "backspread"*
  - *Convention in quoting is to state "buying/selling the 1"*
- *Do not trade net short options without knowing your risk!*



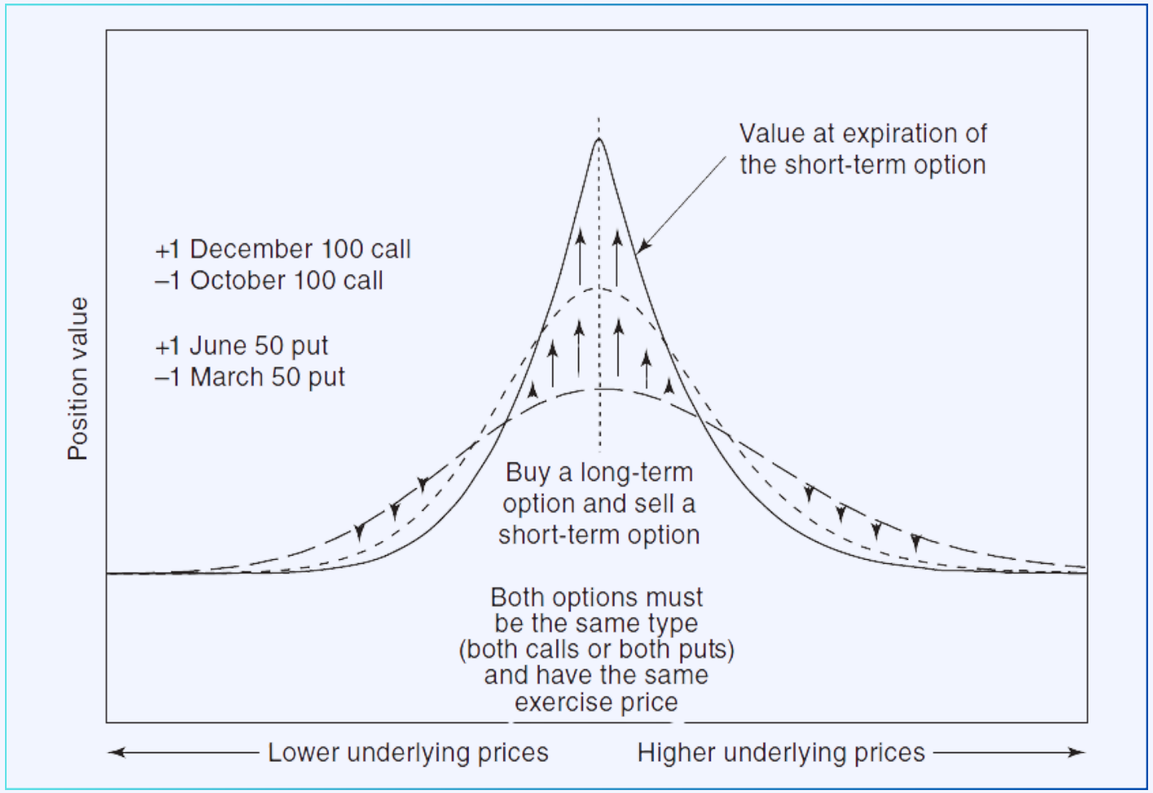
Christmas Tree

- *Consists of a Call or Put Spread with extra short options farther OTM*
- *More commonly called:*
  - *“Call tree” or “Put tree”*
  - *“Call ladder” or “Put ladder”*
- *Similar to a Ratio Spread in terms of payoff profile*
- ***Note… any structure with net short options is going to have unlimited risk in one direction or the other (or both!)***



Calendar Spread

- *Consists of a Call/Put on same strike, long in one expiration vs short in another*
- *aka "timespread" or "horizontal"*
- *Long vs Short convention depends on time exposure*
  - *Long the higher DTE = "long the calendar"*
- *Long Calendar spreads are usually +Vega, –Gamma, +Theta (collecting), but this does when the options in the spread are far OTM.*
- *Payoff profiles looks like that of a long Butterfly!*



What happens when rates or dividends change?

- *Recall the forward equation, including dividends:*

$$F = S_0 e^{(r-d)(t)}$$

- *Interest rates and dividends impact the option's price via changes in the underlying forward values*
- *Options with more time until expiration will be affected to a greater degree (greater rho risk)*
- *In general:*
  - *rates + = + forward / + call $ / – put $*
  - *rates – = – forward / – call $ / + put $*
  - *dividends + = – forward / – call $ / + put $*
  - *dividends – = + forward / + call $ / – put $*

Choose the appropriate strategy. Adjust as needed.

There are virtually endless possibilities. Use this reference to keep it simple—

Spread	Delta*	Gamma	Theta	Vega	Downside Risk/Reward	Upside Risk/Reward
Long straddle	0	+	−	+	Unlimited reward	Unlimited reward
Long strangle	0	+	−	+	Unlimited reward	Unlimited reward
Short butterfly	0	+	−	+	Limited reward	Limited reward
Short condor	0	+	−	+	Limited reward	Limited reward
Call ratio spread (buy more than sell)	0	+	−	+	Limited reward†	Unlimited reward†
Put ratio spread (buy more than sell)	0	+	−	+	Unlimited reward†	Limited reward†
Short straddle	0	−	+	−	Unlimited risk	Unlimited risk
Short strangle	0	−	+	−	Unlimited risk	Unlimited risk
Long butterfly	0	−	+	−	Limited risk	Limited risk
Long condor	0	−	+	−	Limited risk	Limited risk
Call ratio spread (sell more than buy)	0	−	+	−	Limited risk†	Unlimited risk†
Put ratio spread (sell more than buy)	0	−	+	−	Unlimited risk†	Limited risk†
Long calendar spread	0	−	+	+	Limited risk	Limited risk
Short calendar spread	0	+	−	−	Limited reward	Limited reward

*We assume that initially all spreads are approximately delta neutral.
†We refer here to the great majority of delta-neutral ratio spreads, which result in a credit when buying more than selling and which result in a debit when selling more than buying.

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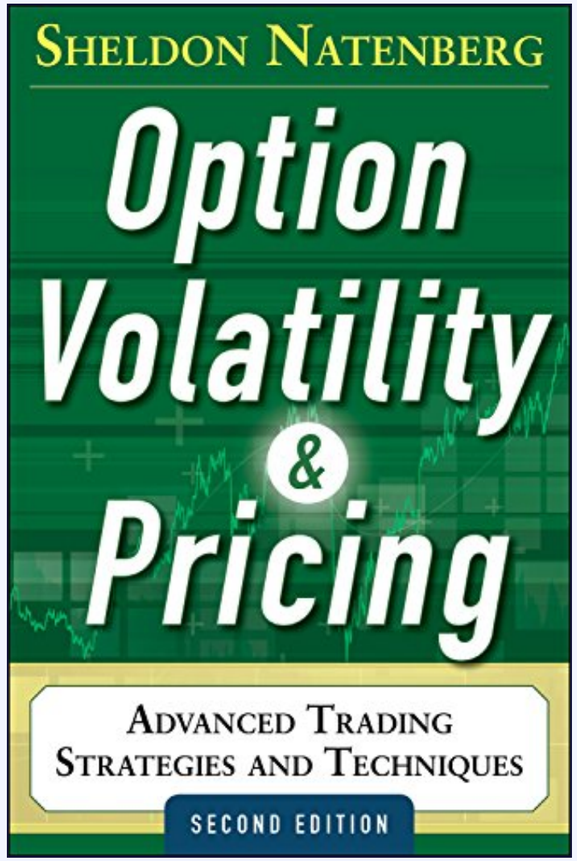
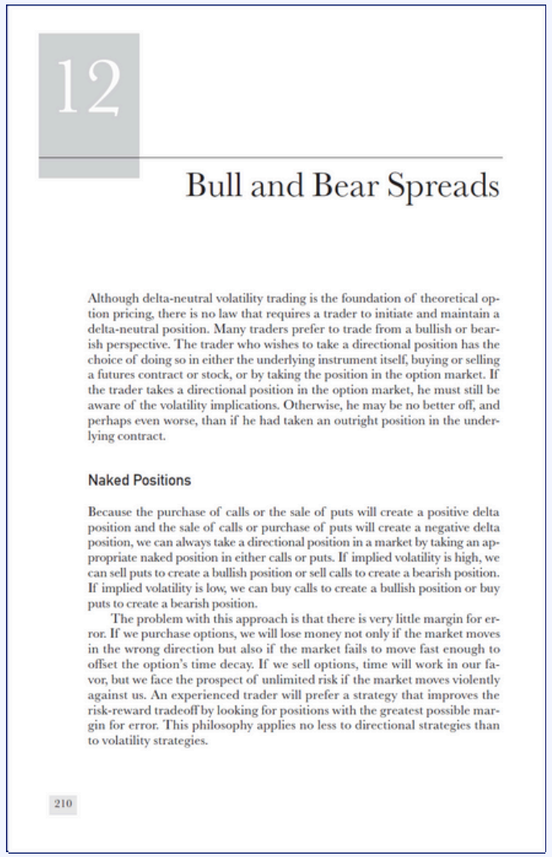
Next up...





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Bull and Bear Spreads

Although delta-neutral volatility trading is the foundation of theoretical option pricing, there is no law that requires a trader to initiate and maintain a delta-neutral position. Many traders prefer to trade from a bullish or bearish perspective. The trader who wishes to take a directional position has the choice of doing so in either the underlying instrument itself, buying or selling a futures contract or stock, or by taking the position in the option market. If the trader takes a directional position in the option market, he must still be aware of the volatility implications. Otherwise, he may be no better off, and perhaps even worse, than if he had taken an outright position in the underlying contract.

Naked Positions

Because the purchase of calls or the sale of puts will create a positive delta position and the sale of calls or purchase of puts will create a negative delta position, we can always take a directional position in a market by taking an appropriate naked position in either calls or puts. If implied volatility is high, we can sell puts to create a bullish position or sell calls to create a bearish position. If implied volatility is low, we can buy calls to create a bullish position or buy puts to create a bearish position.

The problem with this approach is that there is very little margin for error. If we purchase options, we will lose money not only if the market moves in the wrong direction but also if the market fails to move fast enough to offset the option's time decay. If we sell options, time will work in our favor, but we face the prospect of unlimited risk if the market moves violently against us. An experienced trader will prefer a strategy that improves the risk-reward tradeoff by looking for positions with the greatest possible margin for error. This philosophy applies no less to directional strategies than to volatility strategies.

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