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Not All Time Spreads Are Created Equally: The Concept of Flattening Implied Volatilities

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Time spreads, Implied Vol, and Time Weighted Implied Vol Spreads

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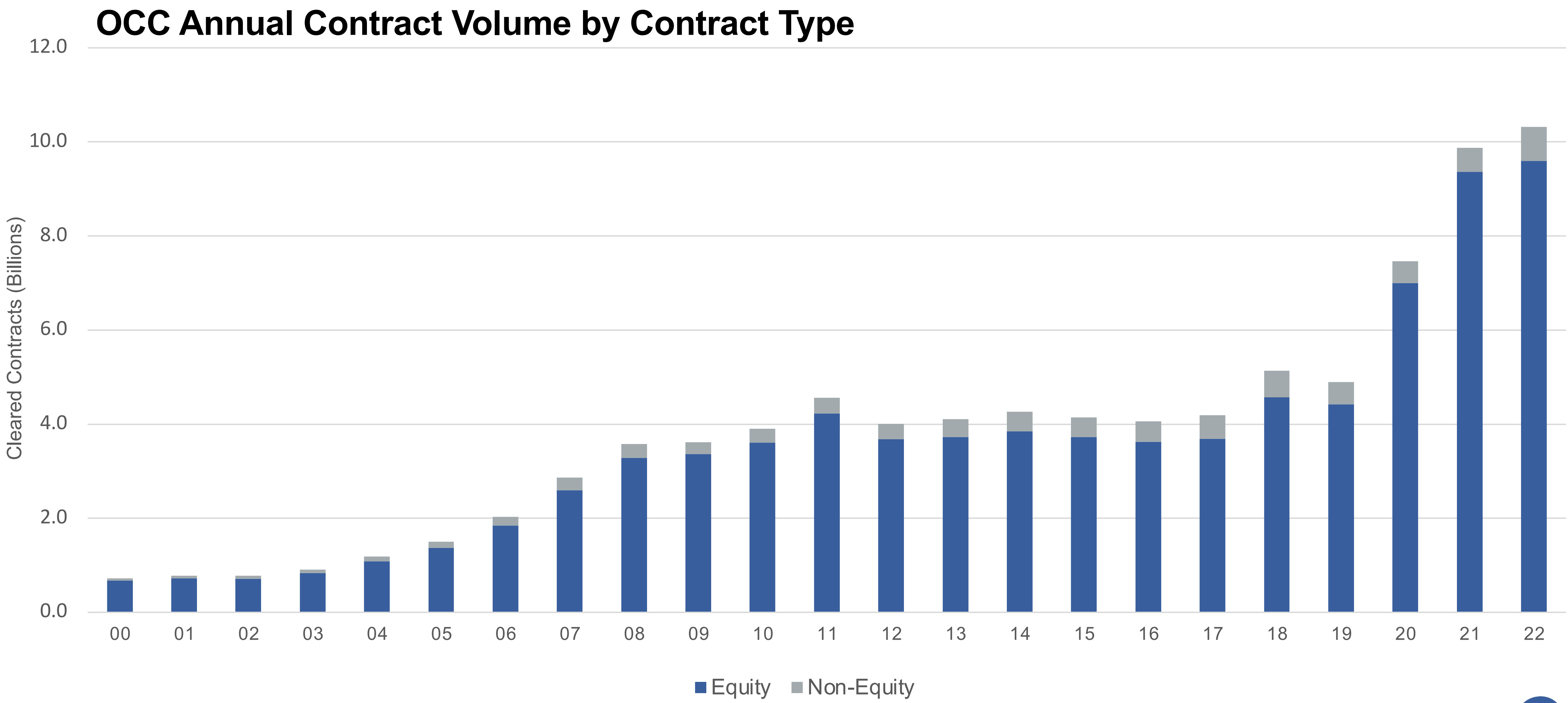
Annual Options Volume 2000-2022



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Presentation Outline

- What is a Time spread
- How time affects Greeks
- Vega and Time
- Assigning a Metric to Time differentials
- What it means in practice
- Points to Remember

What is a Time spread?

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What is a Time Spread?

- Time Spreads
  - Buying an option and selling an option
  - Different expirations (typically far-term and near-term)
  - Usually the same underlying
  - Generally the same strike
  - Same type of options, either calls or puts
- Also known as a Calendar spread
- Calendar spreads can be used in any direction —bullish, bearish, or neutral around the stock

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Effect of Time on the Greeks

How Does Time (DTE) affect the Greeks

- **Delta**
  - As time comes out of options In-the-money options tend toward 100 Delta and Out-of-the-money options tend toward zero Delta.
- **Gamma** (Negative correlation to time)
  - Gamma is highest in short term options and At-the-money options.
  - As time comes out of options their gamma increases.
- **Vega** (Positive Correlation to time)
  - Vega is directly proportional to time and is more concentrated in longer term options.
- **Rho** (Positive Correlation to time)
  - Rho is also proportional to time and is a function of the premium associated with an option – thus its correlation to time and to Vega is positive.

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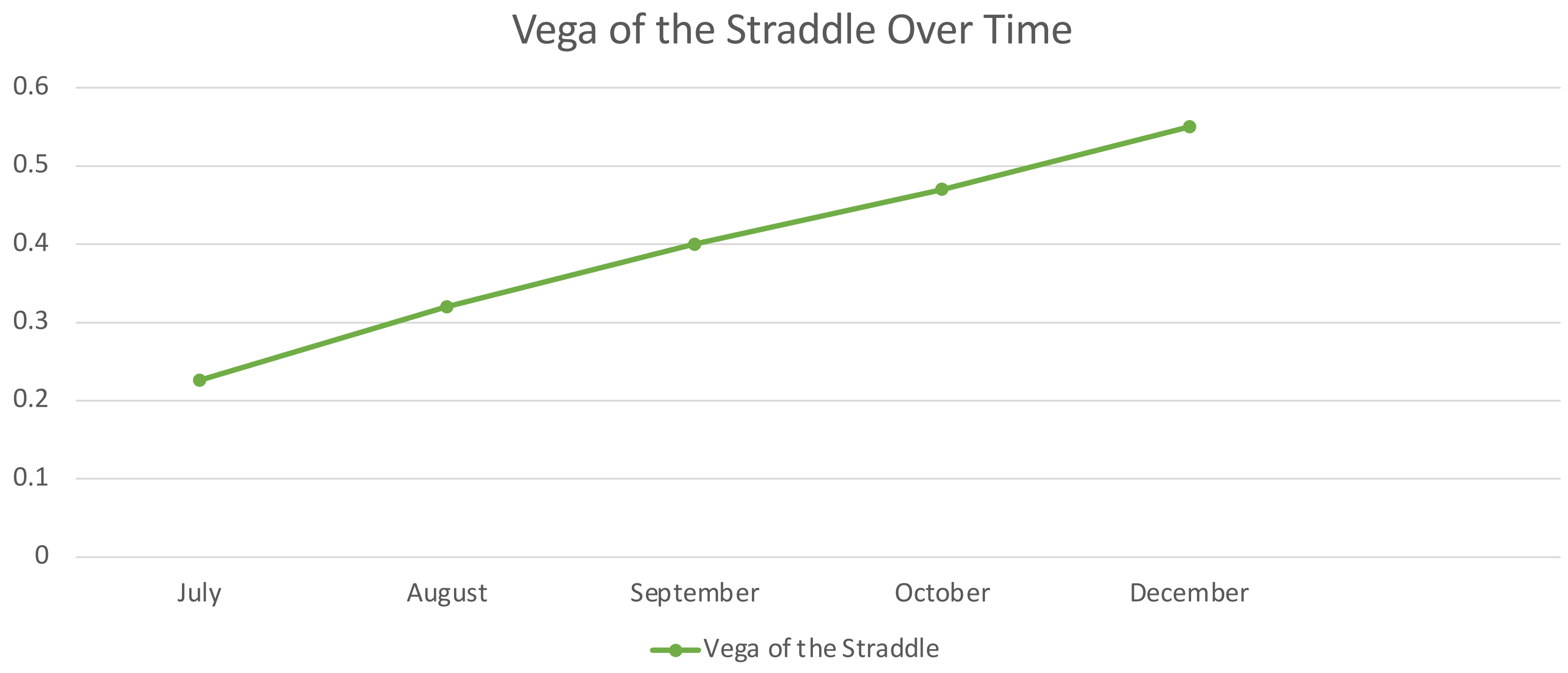
Vega and Time

Vega as a function of Time (Days to Expiration)

	July (30 DTE)	August (60 DTE)	September (90 DTE)	October (120 DTE)	December (180 DTE)
Vega of the Straddle	.226	.32	.40	.46	.55



Assigning a Metric to the Time Differential

Assigning a Metric to the Time Differential

- Traditionally, people express the difference in the two Implied Volatilities as the “Vol spread”
- That very simple equation is:
  - ***Implied Vol #1 – Implied Vol #2 = Implied Vol Spread***
  - But does an Implied Volatility spread of 10 points mean the same thing for two options that are 10 days apart as it does for options that are 60 days apart?
  - How can we account for the time differential of these options?
  - Using the Vega of both option straddles as a measure of their Days to Expiration is one potential way to assign a value to the time Differential between the options.

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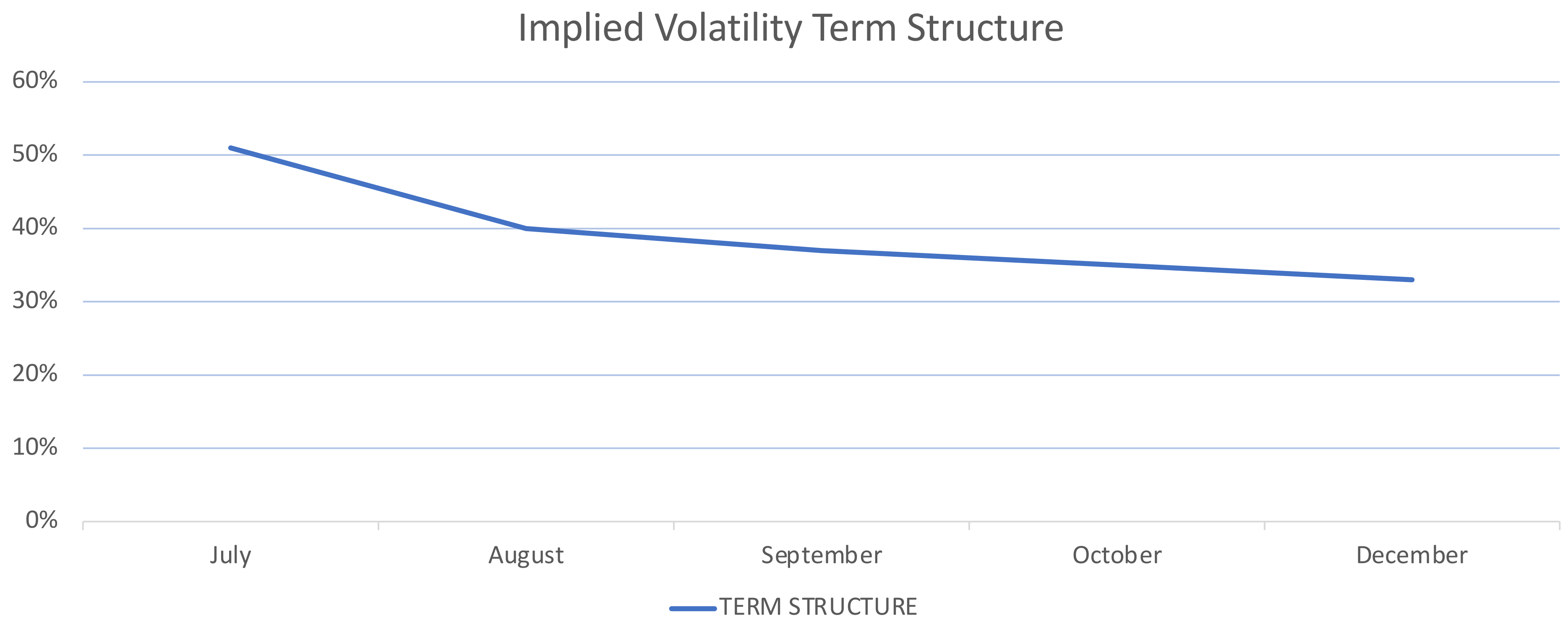
Assigning a Metric to the Time Differential

- Creating a Ratio that takes into account the difference in the Vegas of the two Straddles gives the Implied Vol Spread a frame of reference in terms of Time.

$$\frac{Implied\ Vol\ \#1\ - Implied\ Vol\ \#2}{Straddle\ Vega\ \#1\ - Straddle\ Vega\ \#2} = \text{Time weighted Vol Spread}$$

Potential Implied Volatility Term Structure

	July	August	September	October	December
Implied Volatility	51.00%	40.00%	37.00%	35.00%	33.00%



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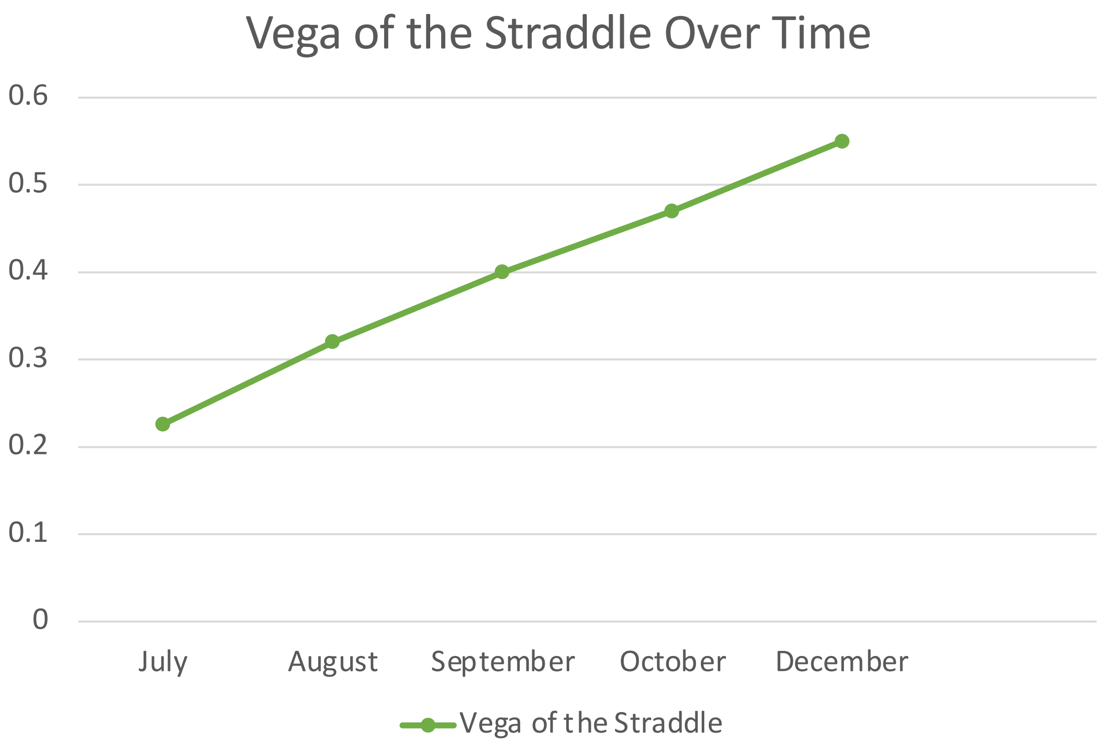
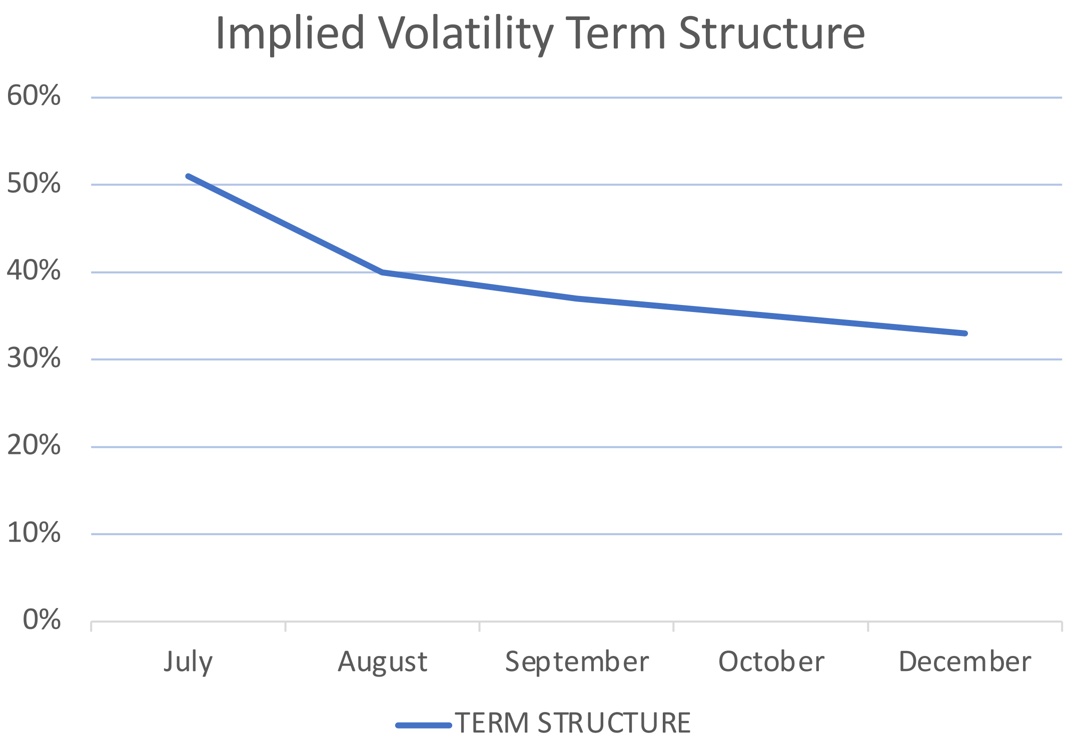
Implied Volatility Term Structure and Vega

	July	August	September	October	December
Implied Volatility	51.00%	40.00%	37.00%	35.00%	33.00%
Vega of the Straddle	.226	.32	.40	.47	.55





What it might mean in practice

How things might line up – Time Spreads

30 Day Straddle

DTE: 30
Underlying $100
Implied Vol: 50%
Price of 100 Straddle: $11.43
Relevant Greeks: **.19** Theta **.056** Gamma

.2281 Vega

−

90 Day Straddle

DTE: 90
Underlying $100
Implied Vol: 37%
Price of 100 Straddle: $15.83
Relevant Greeks: **.084** Theta **.041** Gamma

.3917 Vega

+

If an investor sold the 30-day Straddle and bought the 90-day Straddle, the position would be LONG Vega, SHORT Gamma, collecting Theta, and the investor would be considered LONG the 30-day / 90-day Time spread. Utilizing our Time adjusted Vol spread formula we get the following:

$$\frac{50\% - 37\%}{.3917 - .2281} = \mathbf{79.462}$$

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How things might line up – Time Spreads

30 Day Straddle
DTE: 30
Underlying $100
Implied Vol: 50%
Price of 100 Straddle: $11.43
Relevant Greeks: .19 Theta .056 Gamma
.2281 Straddle Vega

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30 Day Straddle
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90 Day Straddle
DTE: 90
Underlying $100
Implied Vol: 37%
Price of 100 Straddle: $15.83
Relevant Greeks: .084 Theta .041 Gamma
.3917 Straddle Vega

+

60 Day Straddle
DTE: 60
Underlying $100
Implied Vol: 37%
Price of 100 Straddle: $12.10
Relevant Greeks: .10 Theta .50 Gamma
.321 Straddle Vega

(50% - 37%) / (.3917 - .2281) =
79.462
Time weighted vol spread

(50% - 37%) / (.321 - .2281) =
139.93
Time weighted vol spread

Key Points to Remember

- Time Spreads involve more than one expiration, and more than one Implied Volatility
- Therefore, the spread of the two Implied Volatilities needs to have some method of measurement
- Utilizing the Vega of the two straddles for the two respective durations, we can give the Implied Vol spread a new frame of reference and measure it more closely over time

$$\frac{\textit{Implied Vol \#1} - \textit{Implied Vol \#2}}{\textit{Straddle Vega \#1} - \textit{Straddle Vega \#2}} = \textbf{Time weighted Vol Spread}$$

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