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CHICAGO BOARD OPTIONS EXCHANGE

Using Volatility to Choose Trades
&
Setting Stops on Spreads

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The Options Institute at CBOE

Disclaimer

In order to simplify the computations, commissions have not been included in the examples used in these materials. Commission costs will impact the outcome of all stock and options transactions and must be considered prior to entering into any transactions.

Any strategies discussed, including examples using actual securities and price data, are strictly for illustrative and educational purposes only and are not to be construed as an endorsement, recommendation, or solicitation to buy or sell securities.

Options involve risks and are not suitable for everyone. Prior to buying or selling an option, an investor must receive a copy of Characteristics and Risks of Standardized Options. Copies may be obtained from your broker or from The Chicago Board Options Exchange, 400 S. LaSalle, Chicago, IL 60605. Investors considering options should consult their tax advisor as to how taxes may affect the outcome of contemplated options transactions.

Session Outline

- Volatility defined
- The meaning of “X% volatility”
- Using volatility to select strike prices
- Setting stops on vertical spreads

What is Volatility?

- A measure of “movement”
- Options are like insurance policies
- Volatility in options corresponds to risk in insurance
- A “bad” driver pays more for insurance.
- Options on a volatile index cost more.

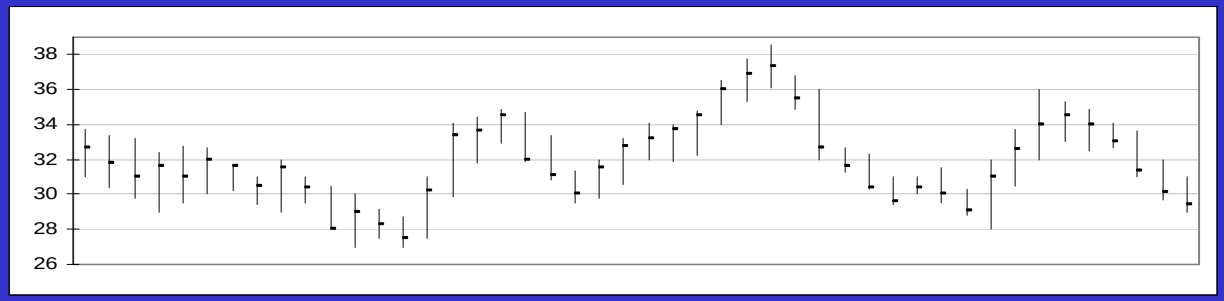
Three Types of Volatility

- Historic
- Realized
- Implied

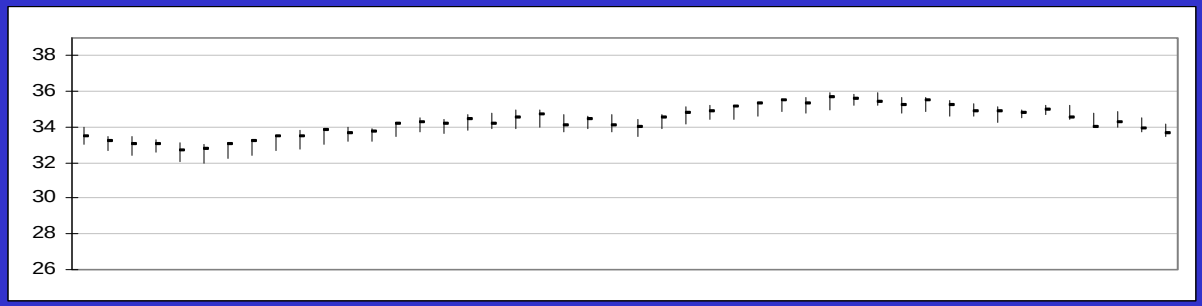
Historic Volatility

- Stock price action in the past

High Volatility



Low Volatility



Realized Volatility

- Stock price action in the future
- Observe stock prices from today until some day in the future and use those prices to calculate historic volatility.
- Also called *future volatility*
- Realized volatility is unknown today.

Implied Volatility

- The volatility percentage that justifies the market price of an option
- The volatility “in an option’s price”

Calculating an Option's Value

XSP Index	75.45
Strike Price	74.00
Days to Exp	31
Interest Rates	2%
Dividends	2%
Volatility	51%

INPUTS

Theoretical Value of 74 Put

3?75

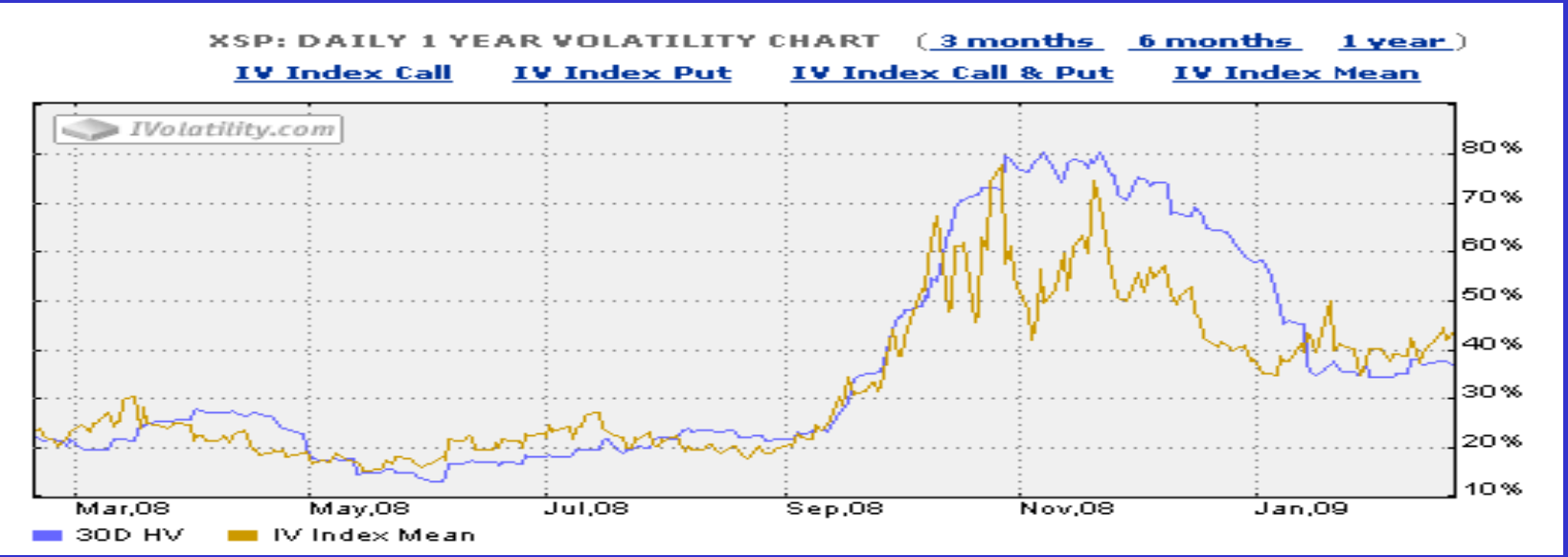
OUTPUT

Calculating the Implied Volatility

Stock Price	75.45	Market Price
Strike Price	74.00	of 74 Put
Days to Exp	31	3.15
Interest Rates	2%	
Dividends	2%	
Volatility	??%	42% ← OUTPUT

INPUTS

Volatility Changes (all of them)



How Traders Use Volatility

- The volatility in an option's market price (implied volatility) can be used to estimate the market's expectation for the range of the underlying price between now and expiration.

30% Volatility – Its Meaning?

- 30% is the 1-year standard deviation
- In one year, an index at 100 today will be:
  - between 70 and 130 68% of the time
  - between 40 and 160 95% of the time
  - between 10 and 190 99% of the time

An index level of $250 in one year is <u>not</u> impossible – just unlikely.

Volatility - Underlying Price Range Expectations

Implied Volatility	Days 30	Days 60	Days 90
15%	4.35%	6.13%	7.50%
20%	5.75%	8.17%	10.00%
25%	7.25%	10.21%	12.50%
30%	8.65%	12.26%	15.00%
35%	10.15%	14.30%	17.50%
40%	11.55%	16.34%	20.00%
45%	13.00%	18.38%	22.50%
50%	14.45%	20.43%	25.00%
55%	15.90%	22.47%	27.50%

Converting the 1-Year Std. Dev.

Formula:

Stock Price × I.V. × sqr root of time in yrs

$$\frac{\text{Stock Price} \times \text{I.V.} \times \sqrt{\text{Days to Exp}}}{\sqrt{\text{Days per year}}}$$

Converting the 1-Year Std. Dev.

XSP Index	75.00
Days to Exp	31
Implied Volatility	51%

$$\frac{\text{Stock Price} \times \text{I.V.} \times \sqrt{\text{Days to Exp}}}{\sqrt{\text{Days per year}}}$$

$$\frac{75.00 \times .51 \times \sqrt{31}}{\sqrt{365}} = \mathbf{11.17}$$

I.V. – What the Market Thinks

- XSP at 75 with 31 days and I.V. at 51%
- The market thinks there is
  a 68% chance that XSP will be between
  86.17 and 63.83 (±1 Std Dev)
  in 31 days .
- and a 95% chance XSP will be between
  97.37 and 52.66 (±2 Std Dev).

Calendar Days or Trading Days?

- The difference is minimal.
- Calendar days are easier to get.
- For less than 7 days, use trading days.
- The standard deviation calculation is only a guide. The market forecast is most important.

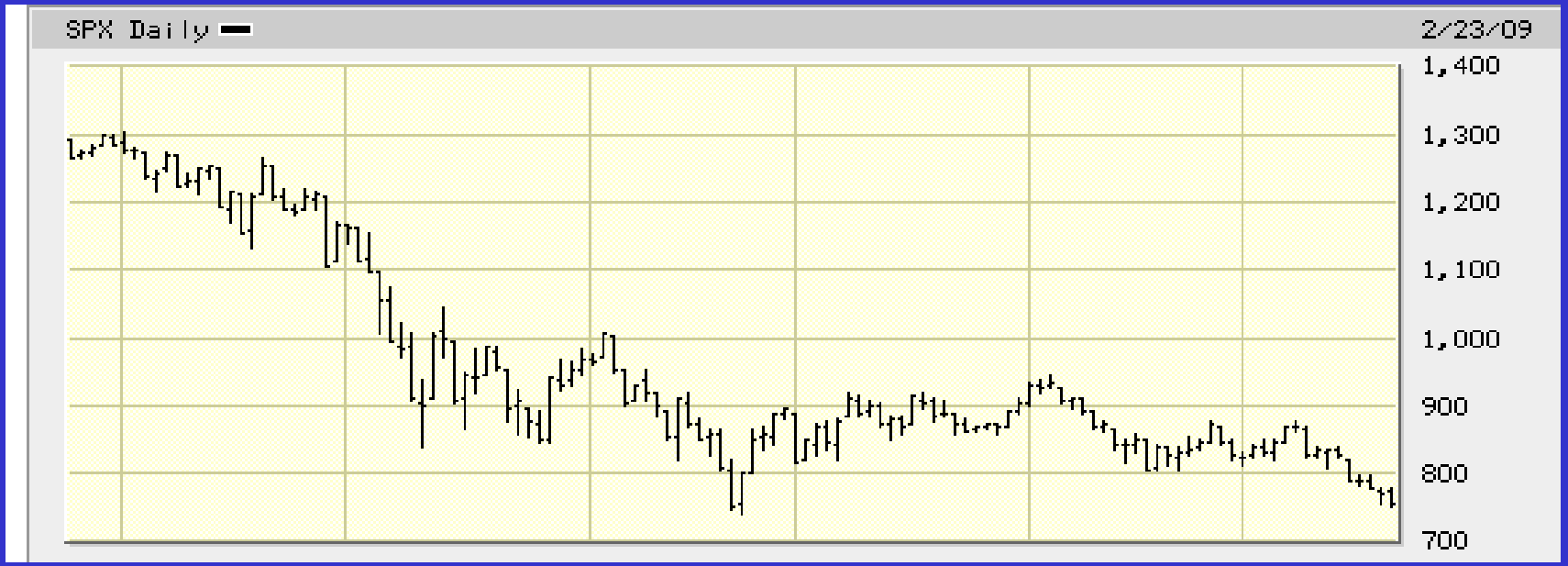
I.V. – One More Statistic

- There is a 50% chance the underlying will touch 1 std dev (up or down) between now and expiration.
- XSP at 75.00 – I.V. at 51% – 31 days
- There is a 50% chance that XSP will touch 86.17 or 63.83 within 28 days

Using I.V. to Choose Strike Price

- Sell options that are 2 Std Dev O-O-M?
- Buy options and have a 1 Std Dev price target for the underlying?
- Choose strategies by combining technical and fundamental analysis with price ranges implied by option imp. vol.

XSP 2/23/09



XSP closing low – 11/20/08 – 752

Intra-day low – 747

Yesterday – 2/23/09 – 750

Case Study 1 – Constant I.V.

XSP at 75.00 31 days to expiration

1 Std. Dev in 31 days is 11.17

You predict at 7-point decline in 10 days.

The Mar 74 Put is: 3.00 bid – 3.15 ask

I.V. 40.5% – 42.0%

Estimated profit if the forecast is right?

Case Study 1 – Constant I.V.

XSP		75.00		68.00	
Days to Exp		31		21	
74 Put	bid	3.00	40.5%	6.70	40.5%
	ask	3.15	42.0%	6.80	42.0%

Estimated profit: **+3.55**

Case Study 1 – Changing I.V.

- XSP at 75.00 31 days to expiration
- You predict at 7-point decline in 10 days.
- The 74 Put is: 3.00 bid – 3.15 ask

I.V. 40.5% – 42.0%

- Profit if volatility drops to 30%?

Case Study 1 – Changing I.V.

XSP		75.00		68.00	
Days to Exp		31		21	
74 Put	bid	3.00	40.5%	**6.25**	30%
	ask	3.15	42.0%	**6.35**	32%

Estimated profit: **+3.10** **vs. +3.55**

Case 1 – Changing I.V. & More Time

- XSP at 74.00 31 days to expiration
- You predict at 7-point decline in 20 days.
- The 74 Put is: 3.00 bid – 3.15 ask

I.V. 40.5% – 42.0%

- Profit if more time & volatility drops?

Case 1 – Changing I.V. & More Time

XSP		75.00		68.00	
Days to Exp		31		11	
74 Put	bid	3.00	40.5%	**6.05**	30%
	ask	3.15	42.0%	**6.15**	32%

Estimated profit: **+2.90** **vs. +3.55**

Case 1 - Observations

Option traders need a 3-part forecast.

- Price of the underlying
- Time period
- Level of implied volatility

Case Study 2 – Debit Put Spread

- XSP at 75.00 31 days to exp
- 74 Put 3.00 – 3.15 40% – 42%

  68 Put 1.45 – 1.55 48% – 50%

What is your bid for the 74-68 Put spread?

The “natural offer” is 1.70

The “natural bid” is 1.45

Bid 1.65

Case Study 2 – Debit Put Spread

XSP	75.00	68.00
Days to Exp	31	21
74-68 Put Spread	1.65	**3.60**

Estimated profit: **+1.95**

Case Study 2 – Debit Put Spread

Implied Volatility drops 10%

XSP	75.00	68.00
Days to Exp	31	21
74-68 Put Spread	1.65	**3.70**
Estimated profit:	**+2.05**	**vs. 1.95**

Case Study 2 – Debit Put Spread

I.V. drops 10% & More Time

XSP	75.00	68.00
Days to Exp	31	11
74-68 Put Spread	1.65	**4.20**
Estimated profit:	**+2.55**	**vs. 1.95**

Case 2 - Observations

- Debit spreads have lower deltas.
- Debit spreads are less sensitive to changes in implied volatility than outright long or short options (lower vega - net).
- More time helps debit spreads.

Part 1Summary – Using Vol. 1

- 3 Types of Volatility

  Historical – Realized – Implied

- Annual std dev can be converted

$$\frac{\text{Stock Price} \times \text{I.V.} \times \sqrt{\text{Days to Exp}}}{\sqrt{\text{Days per year}}}$$

Part 1 Summary – Using Vol. 2

- Implied volatility is an indication of what the market expects the underlying price range to be. **Use to choose strikes**.
- Option traders need a 3-part forecast

  Underlying Price – Time – Imp. Vol.

Part 1 Summary – Using Vol. 3

- Spreads are…

  less sensitive to price (low delta)

  less sensitive to changing I.V.

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Placing Stops on Spreads

(Topic 2)

Three Ways to Place Stop Orders

- Place a stop at a Dollar Level
  - This is most important – **BY FAR!!!**
- Place a stop using delta
  - An option's delta changes over time and as the relationship to the strike price changes
- Place a stop at a time limit

2 Types of Stop Orders

- Stop Market
  - Your order becomes a market order when it is triggered.
- Stop Limit
  - Your order becomes a limit order when it is triggered.

Events that Trigger a Stop Order

- A **trade** at (or through) the stop price
- A **bid** at or above the stop price
- An **offer** at or below the stop price

Placing a Stop at a Dollar Level

- You bought a spread for 3.50 (net)
- How much are you willing to risk?
- Does your broker accept stop orders on spreads?
- Does your broker accept spread orders based on a stock price? (contingency)

Using Delta & Theta – 1

- You bought the Mar 75 Call for 3.35 when XSP was 75.60. (35 days to exp.)
- Delta: 0.55; 7-day theta: 0.44
- If you are willing to risk 1.50, then
  - You have approx. 3 XSP points (gamma)
  - Approx 3 weeks

Using Delta & Theta – 2

- 1 week later: XSP up 2 to 76.60.
- 75 Call: 4.65 (up 1.30)
- Delta: 0.65;   7-day theta: 0.50
- To get back to even:
  - Approx 2.00 index points
  - 2.5 weeks

Don't forget the bid-ask spread!

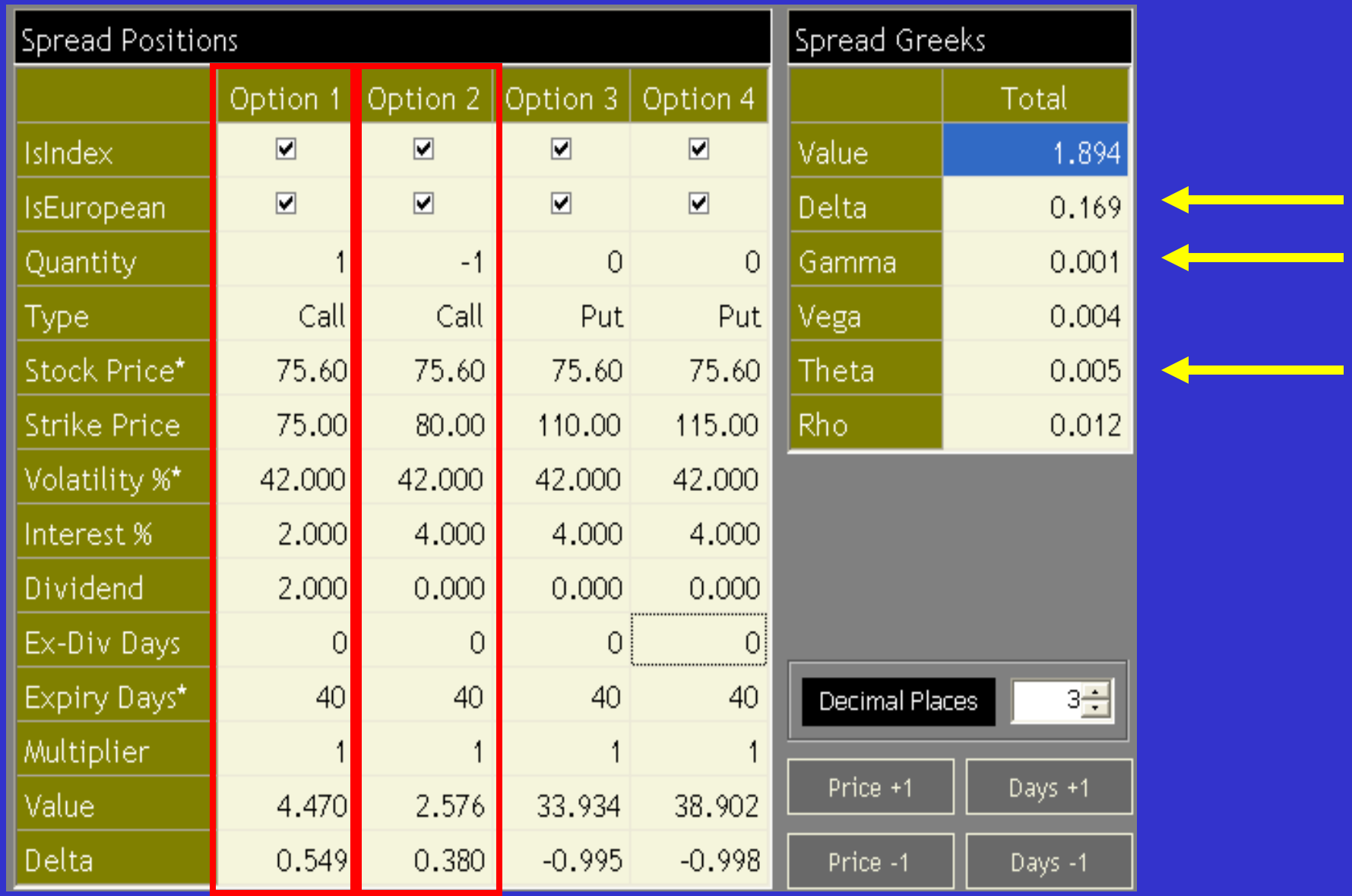
The Greeks and Spreads

	Price	Delta	Gamma	Theta
75 Call	4.45	+0.55	+0.04	–0.38
80 Call	2.55	–0.38	–0.04	+0.38
Spread	1.90	+0.17	0.00	0.00

XSP 75.60 40 days; Vol.; 40%

Spreads have a “pure” delta.

The Greeks Up Close



Spread Positions

	Option 1	Option 2	Option 3	Option 4
IsIndex	☑	☑	☑	☑
IsEuropean	☑	☑	☑	☑
Quantity	1	-1	0	0
Type	Call	Call	Put	Put
Stock Price*	75.60	75.60	75.60	75.60
Strike Price	75.00	80.00	110.00	115.00
Volatility %*	42.000	42.000	42.000	42.000
Interest %	2.000	4.000	4.000	4.000
Dividend	2.000	0.000	0.000	0.000
Ex-Div Days	0	0	0	0
Expiry Days*	40	40	40	40
Multiplier	1	1	1	1
Value	4.470	2.576	33.934	38.902
Delta	0.549	0.380	-0.995	-0.998

Spread Greeks

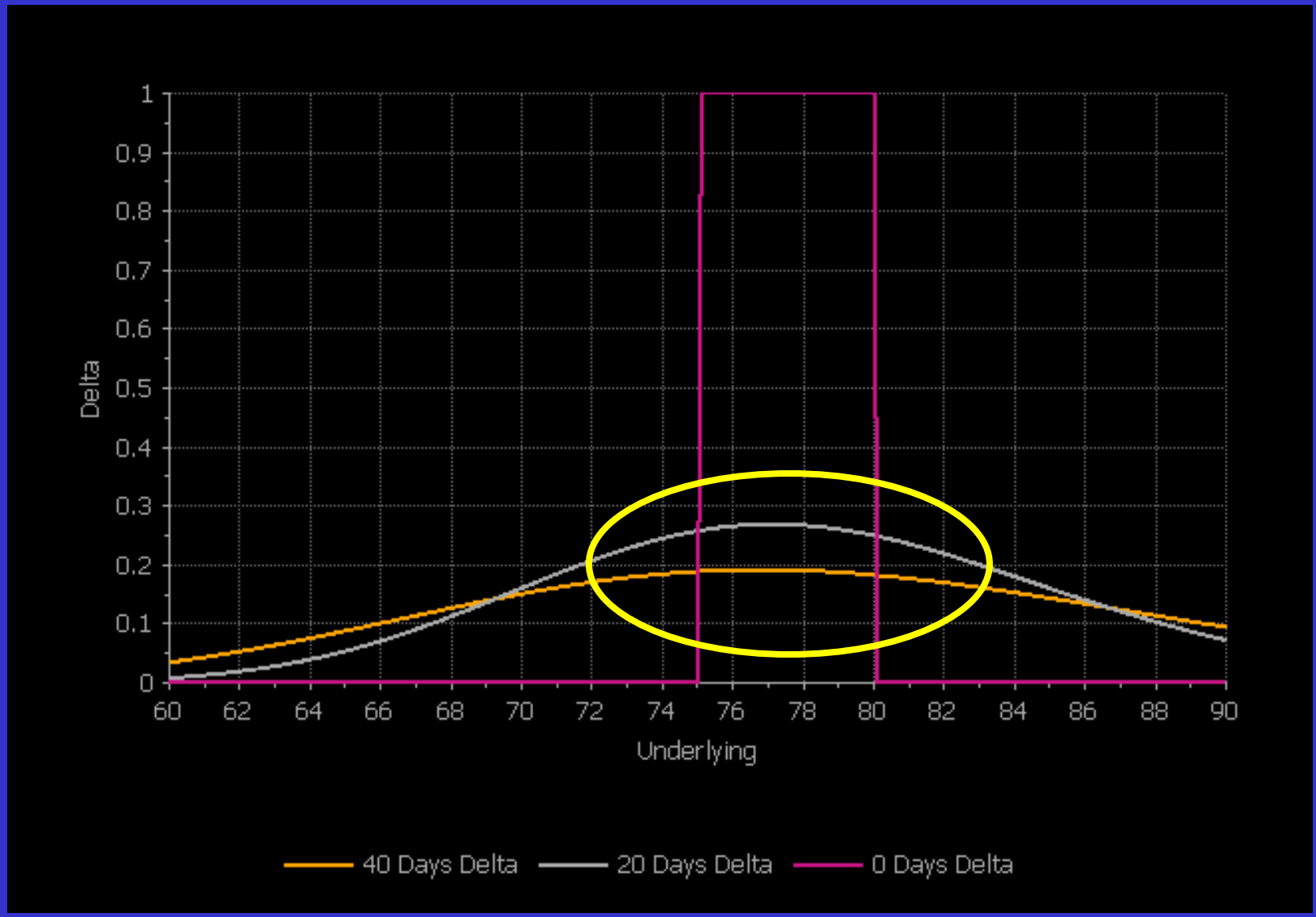
	Total
Value	1.894
Delta	0.169
Gamma	0.001
Vega	0.004
Theta	0.005
Rho	0.012

Decimal Places 3

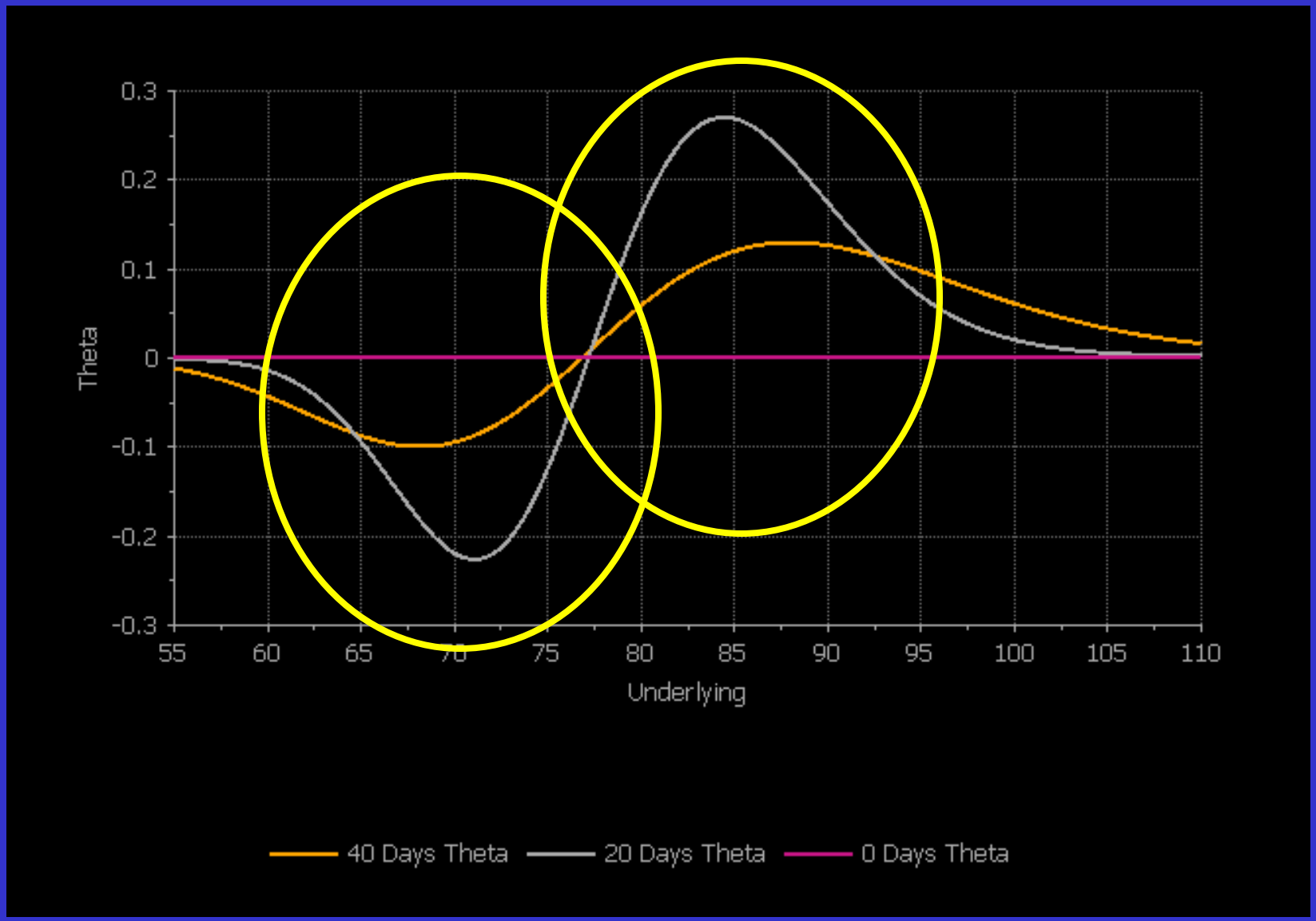
Price +1 | Days +1

Price -1 | Days -1

Spread Delta vs. Underlying Price



Spread Theta vs. Underlying Price



The Greeks in 10 Days

	Orig.	Now	Delta	Theta
75 Call	4.45	5.45	+0.63	–0.35
80 Call	2.55	3.05	–0.43	+0.37
Spread	1.90	2.40	+0.20	+0.02
XSP	75.60	77.60	(+0.17)	(0.00)
Days	40	30		

Back to even is 2 index points

Time erosion more difficult to judge

Summary – Setting Stops

- Dollar risk is the most important
- The Greeks help you estimate where to place a stop (based on a dollar risk)
- Deltas change – gamma
- Spreads have a “pure” delta
- Goal: don’t let winners become losers!

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