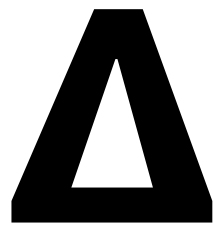


# The Language of Greeks in Options Prices

The story they tell you  
about an option

They are not part of an option price but rather give information about an option such as it's behaviour towards price change, change in volatility or change in interest rate.



# $\Delta$ Delta

- **Delta** is the amount an option price is expected to move based on the next \$1 change in the underlying
- Between 0.00 and 1.00 for Calls and 0.00 and -1.00 for Puts
- Delta of 0 means no sensitivity to the next one dollar change (far OTM)
- Delta of 1 or -1 means 1:1 sensitivity to the next dollar change
- Options that are ATM have generally a Delta of 0.5/-0.5
- Being short Delta means having a Delta with a negative number
- Delta for a given strike changes as the price of the underlying changes
- More ITM, More Delta factor
- Used interchangeably with % Probability ITM

**Quote Panel**  
 Financial Instrument Bid Size Bid 176.62 Ask 176.85 Ask Size 3 Last 176.65 Position

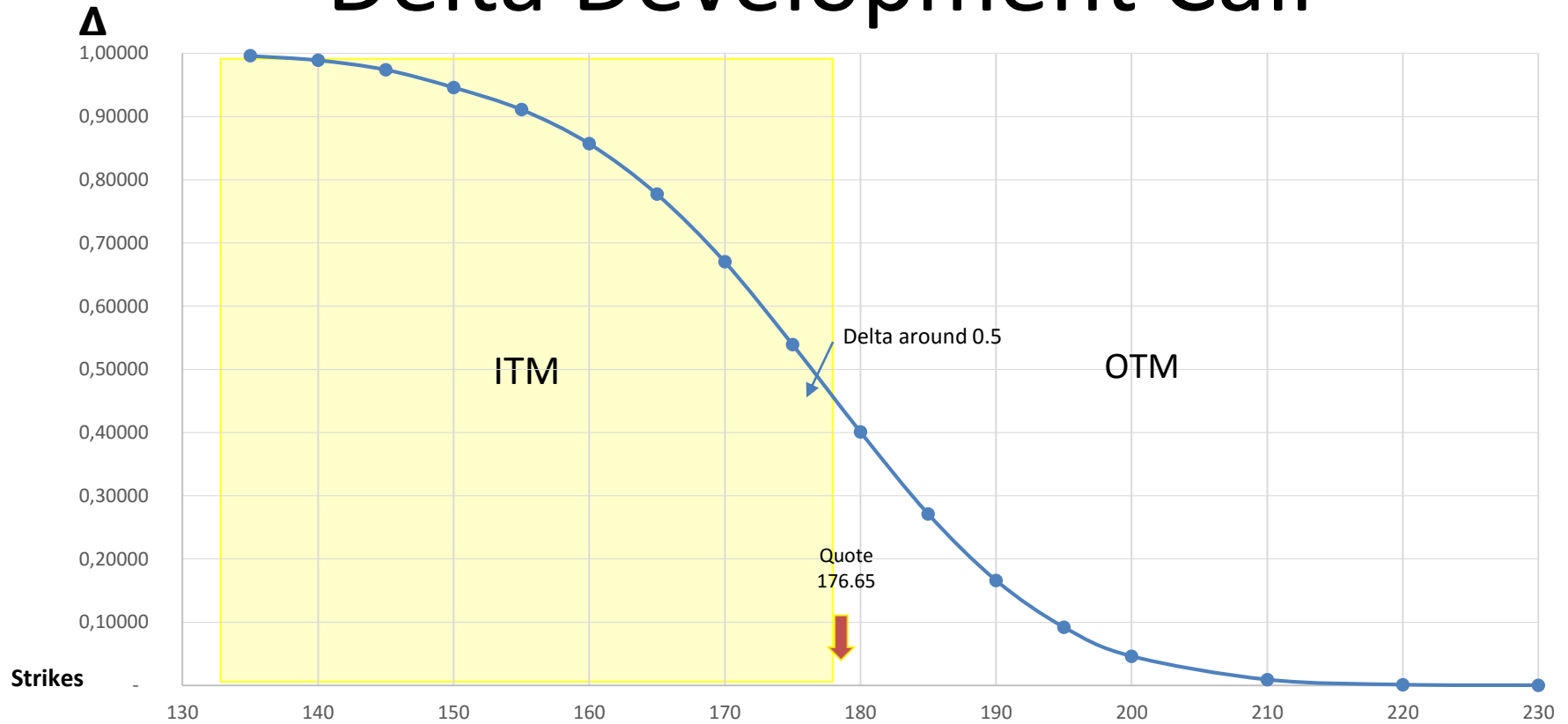
**Trading**  
 Orders Log Trades Portfolio Strategy Builder

B/A: Reverse Add Stock Make Delta Neutral  
 Action Ratio Last Trading Day Strike Type Mltplr  
 Buy 1  
 Use drop-downs or click on option contracts below to build spread.  
 Place order: Add to Quote Panel

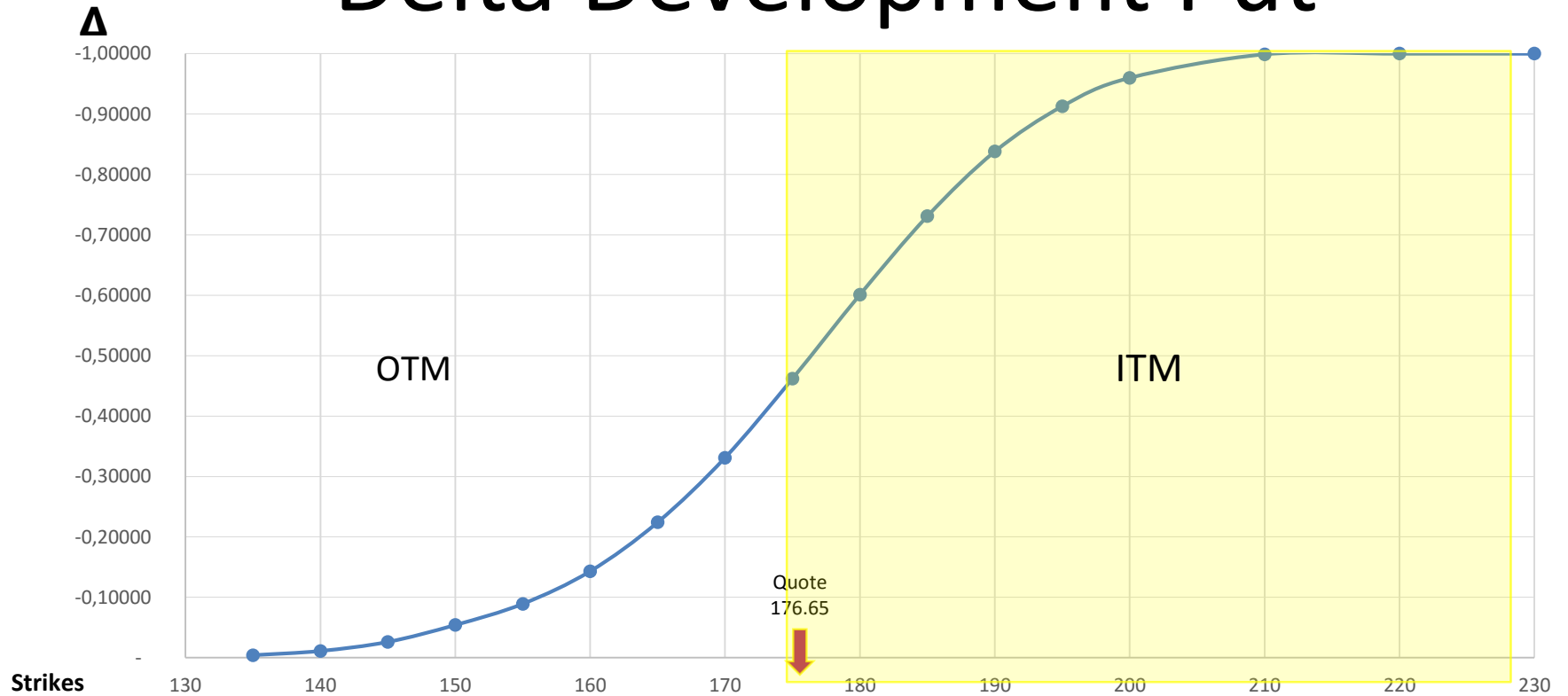
**Option Chains**  
 Collapse All LIST VIEW 2.5 SD 3 MONTHS SMART AYI 100 Load My Chains Clear Chains

CALLS							DESCRIPTION STRIKE	PUTS						
BID x ASK	VOLUME OPTN	DELTA	GAMMA	VEGA	THETA	BID x ASK		VOLUME OPTN	DELTA	GAMMA	VEGA	THETA		
20.20 x 22.80		0.999	0.000	0.000	0.000	155		0.000	0.000	0.000	0.000			
25.20 x 27.80		1.000	0.000	0.000	0.000	150		x 0.30	21	0.000	0.000	0.000	0.000	
							<b>MAY 19 '17 (37 DAYS)</b>	IV: 25.6%						
x 0.30	211	0.000	0.000	0.001	0.000	230	51.80 x 55.10	14	-1.000	0.000	0.000	0.003		
x 0.15	1	72	0.001	0.000	0.004	-0.001	41.50 x 44.90	44	-1.000	0.000	0.000	0.003		
x 0.15	70	0.009	0.002	0.017	-0.005	210	32.30 x 35.00	51	-0.999	0.001	0.005	0.001		
0.15 x 0.50	48	0.046	0.007	0.057	-0.018	200	22.50 x 25.10	167	-0.960	0.008	0.051	-0.013		
0.25 x 0.90	26	0.092	0.012	0.102	-0.031	195	17.80 x 20.50	50	-0.913	0.013	0.098	-0.026		
1.00 x 1.80	123	0.166	0.018	0.143	-0.047	190	13.90 x 16.00	138	-0.838	0.019	0.140	-0.043		
2.10 x 2.80	28	0.271	0.024	0.180	-0.064	185	9.80 x 12.00	73	-0.731	0.024	0.179	-0.059		
4.10 x 4.70	1	79	0.401	0.027	0.216	-0.076	180	7.10 x 7.90	20	31	-0.601	0.028	0.215	-0.072
6.60 x 7.30	35	0.539	0.027	0.220	-0.081	175	4.60 x 5.50	124	-0.462	0.028	0.220	-0.077		
9.50 x 10.50	24	0.670	0.024	0.208	-0.078	170	2.65 x 3.40	1	97	-0.331	0.024	0.208	-0.073	
12.20 x 14.70	2	0.777	0.019	0.167	-0.067	165	1.65 x 2.40	147	-0.224	0.019	0.167	-0.063		
16.30 x 18.70		0.857	0.014	0.134	-0.054	160	0.95 x 1.50	8	104	-0.143	0.014	0.134	-0.050	
20.80 x 23.60	1	0.911	0.009	0.088	-0.041	155	0.40 x 1.05	123	-0.089	0.009	0.088	-0.037		
25.50 x 28.40	2	0.946	0.006	0.065	-0.031	150	0.20 x 0.60	237	-0.054	0.006	0.065	-0.027		
30.30 x 33.50	2	0.974	0.003	0.032	-0.019	145	0.05 x 0.35	20	-0.026	0.003	0.032	-0.015		
35.20 x 38.20		0.989	0.002	0.019	0.000	140	x 0.15	15	-0.011	0.002	0.019	-0.007		
40.60 x 43.60		0.996	0.001	0.008	0.000	135	x 0.15		-0.004	0.001	0.008	-0.003		

# Delta Development Call



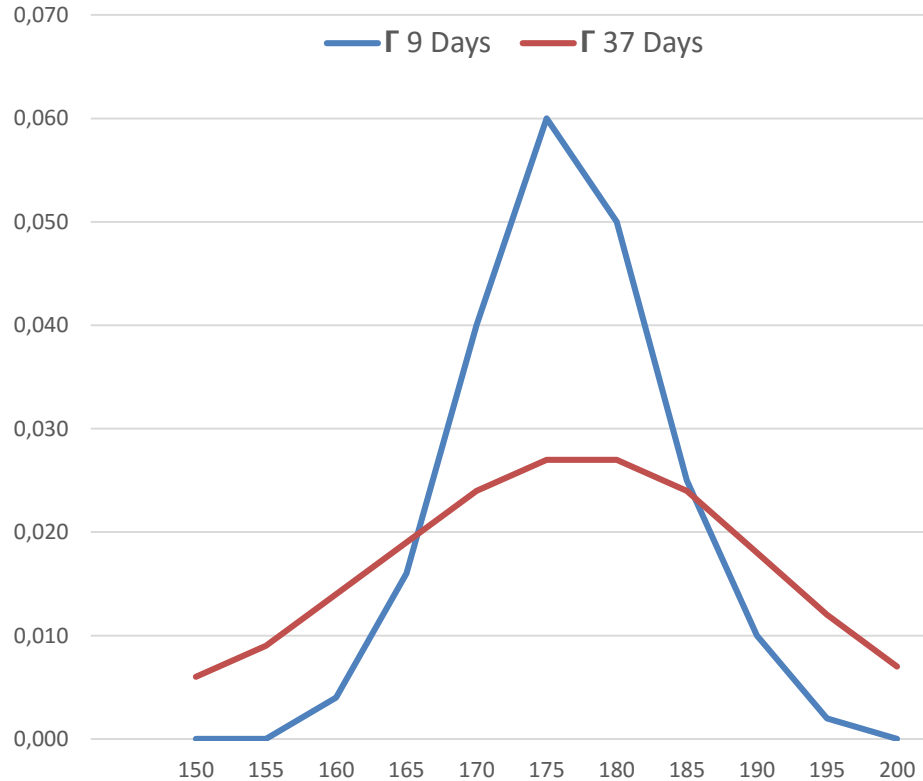
# Delta Development Put







# Gamma Behavior



- Gamma is the rate of change in Delta for the next one dollar move
- Options closer to ATM options have higher Gamma factor
- Increases and concentrates more ATM as it nears expiry

**V**

# v Vega

- Volatility Risk, IV
- Not Historical Volatility
- Shows the sensitivity of an option price to the change in implied volatility
- It is the amount of monetary value an option will change per percentage change in implied Volatility
- Option ATM are most sensitive to change in volatility and thus show the highest Vega
- Vega behaves similarly to Gamma when it comes closer to expiration and if it is close around ATM

Quote Panel

Financial Instrument Bid Size Bid Ask Ask Size Last Position

Trading

Orders Log Trades Portfolio Strategy Builder

B/A: Reverse Add Stock Make Delta Neutral

Action Ratio Buy

Use drop-down

Place order: Add to Quote Panel

Option Chains

Collapse All LIST VIEW 2.5 SD 3 MONTHS SMART AYI 100 Load My Chains Clear Chains

CALLS							DESCRIPTION	PUTS						
BID x ASK	VOLUME	OPTN	DELTA	GAMMA	VEGA	THETA	STRIKE	BID x ASK	VOLUME	OPTN	DELTA	GAMMA	VEGA	THETA
20.20 x 22.80			0.999	0.000	0.000	0.000	155				0.001	0.000	0.001	-0.001
25.20 x 27.80			1.000	0.000	0.000	0.000	150	x 0.30	21		0.000	0.000	0.000	0.000
MAY 19 '17 (37 DAYS) IV: 25.6%														
x 0.30	211		0.000	0.000	0.001	0.000	230	51.80 x 55.10	14		-1.000	0.000	0.000	0.003
x 0.15	1	72	0.001	0.000	0.004	-0.001	220	41.50 x 44.90	44		-1.000	0.000	0.000	0.003
x 0.15		70	0.009	0.002	0.017	-0.005	210	32.30 x 35.00	51		-0.999	0.001	0.005	0.001
0.15 x 0.50		48	0.046	0.007	0.057	-0.018	200	22.50 x 25.10	167		-0.960	0.008	0.051	-0.013
0.25 x 0.90		26	0.092	0.012	0.102	-0.031	195	17.80 x 20.50	50		-0.913	0.013	0.098	-0.026
1.00 x 1.80		123	0.166	0.018	0.143	-0.047	190	13.90 x 16.00	138		-0.838	0.019	0.140	-0.043
2.10 x 2.80		28	0.271	0.024	0.180	-0.064	185	9.80 x 12.00	73		-0.731	0.024	0.179	-0.059
4.10 x 4.70	1	79	0.401	0.027	0.216	-0.076	180	7.10 x 7.90	20	31	-0.601	0.028	0.215	-0.072
6.60 x 7.30		35	0.539	0.027	0.220	-0.081	175	4.60 x 5.50	124		-0.462	0.028	0.220	-0.077
9.50 x 10.50		24	0.670	0.024	0.208	-0.078	170	2.65 x 3.40	1	97	-0.331	0.024	0.208	-0.073
12.20 x 14.70		2	0.777	0.019	0.167	-0.067	165	1.65 x 2.40	147		-0.224	0.019	0.167	-0.063
16.30 x 18.70			0.857	0.014	0.134	-0.054	160	0.95 x 1.50	8	104	-0.143	0.014	0.134	-0.050
20.80 x 23.60		1	0.911	0.009	0.088	-0.041	155	0.40 x 1.05	123		-0.089	0.009	0.088	-0.037
25.50 x 28.40		2	0.946	0.006	0.065	-0.031	150	0.20 x 0.60	237		-0.054	0.006	0.065	-0.027
30.30 x 33.50		2	0.974	0.003	0.032	-0.019	145	0.05 x 0.35	20		-0.026	0.003	0.032	-0.015
35.20 x 38.20			0.989	0.002	0.019	0.000	140	x 0.15	15		-0.011	0.002	0.019	-0.007
40.60 x 43.60			0.996	0.001	0.008	0.000	135	x 0.15			-0.004	0.001	0.008	-0.003

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Gamma and Vega are highest for Options at or near ATM.

Quote Panel  
 Financial Instrument Bid Size 1 Bid 176.65 Ask 176.86 Ask Size 2 Last 176.68 Position

Trading

Orders Log Trades Portfolio Strategy Builder

B/A: Reverse Add Stock Make Delta Neutral

Action Ratio Buy

Gamma and Vega are highest for Options at or near ATM. Note further what happens to Gamma and Vega near expiry.

Use drop

Place order:

Option Chains

Collapse All LIST VIEW 2.5 SD 3 MONTHS SMART AYI 100 Load My Chains Clear Chains

CALLS						DESCRIPTION	PUTS						
BID x ASK	VOLUME	OPTN	DELTA	GAMMA	VEGA	STRIKE	BID x ASK	VOLUME	OPTN	DELTA	GAMMA	VEGA	THETA
						APR 21 '17 (9 DAYS)							IV: 23.5%
x 0.10	110	0.001	0.000	0.001	-0.001	200	22.60 x 24.80	1.66K	-1.000	0.000	0.000	0.003	
x 0.15	12	0.006	0.002	0.005	-0.007	195	17.60 x 19.80	275	-0.997	0.003	0.003	-0.003	
0.05 x 0.15	26	0.031	0.010	0.019	-0.028	190	12.30 x 14.90	449	-0.971	0.010	0.018	-0.023	
0.20 x 0.55	56	0.099	0.025	0.049	-0.066	185	7.90 x 10.50	231	-0.902	0.026	0.049	-0.061	
1.00 x 1.75	169	0.272	0.050	0.089	-0.121	180	4.10 x 5.00	628	-0.729	0.050	0.089	-0.117	
3.30 x 4.20	202	0.556	0.060	0.111	-0.144	175	1.60 x 2.45	613	-0.444	0.060	0.111	-0.139	
6.00 x 8.30	20	0.813	0.040	0.073	-0.102	170	0.50 x 1.00	3.35K	-0.187	0.040	0.073	-0.098	
10.10 x 13.00	6	0.939	0.016	0.035	-0.052	165	0.05 x 0.30	1.04K	-0.061	0.016	0.035	-0.047	
15.30 x 17.80	13	0.989	0.004	0.000	0.000	160	0.05 x 0.15	224	-0.011	0.004	0.008	-0.011	
20.20 x 22.80		0.999	0.000	0.000	0.000	155	x 0.10	63	-0.001	0.000	0.001	-0.001	
25.20 x 27.80		1.000	0.000	0.000	0.000	150	x 0.30	21	0.000	0.000	0.000	0.000	
						MAY 19 '17 (37 DAYS)							IV: 25.6%
x 0.30	211	0.000	0.000	0.001	0.000	230	51.80 x 55.10	14	-1.000	0.000	0.000	0.003	
x 0.15	72	0.001	0.000	0.004	-0.001	220	41.50 x 44.90	44	-1.000	0.000	0.000	0.003	
x 0.15	70	0.010	0.002	0.017	-0.005	210	32.30 x 35.00	51	-0.999	0.001	0.005	0.001	
0.15 x 0.50	48	0.047	0.007	0.057	-0.018	200	22.50 x 25.10	167	-0.959	0.008	0.051	-0.013	
0.25 x 0.90	26	0.093	0.013	0.102	-0.031	195	17.80 x 20.50	50	-0.911	0.013	0.098	-0.026	
1.00 x 1.80	123	0.167	0.019	0.148	-0.047	190	13.90 x 16.00	138	-0.836	0.019	0.145	-0.043	
2.10 x 2.80	28	0.274	0.024	0.180	-0.064	185	9.80 x 12.00	73	-0.729	0.024	0.179	-0.060	
4.10 x 4.70	70	0.403	0.028	0.216	-0.077	180	7.10 x 7.90	21	-0.598	0.028	0.215	-0.077	

0

# $\theta$ Theta

- Time value component of an asset
- Options are expiring assets
- Theta Decay is exponential as it nears expiry
- Being long put or long call decreases the value of the option or the value to be received for the option
- Time decay makes options cheaper over time

Quote Panel

Financial Instrument Bid Size Bid Ask Ask Size Last Position

2 176.62 176.85 3 176.65

Trading

Orders Log Trades Portfolio Strategy Builder

B/A: Reverse Add Stock Make Delta Neutral

Action Ratio Last Trading Day Strike Type Mltplr

Buy 1

Use drop-downs or click on option contracts below to build spread.

Place order: Add to Quote Panel

Theta number on the picture represents amount you lose per day as a buyer of a particular option contract. Sellers earn this.

Option Chains

LIST VIEW 2.5 SD 3 MONTHS SMART AYI 100 Load My Chains Clear Chains

CALLS							DESCRIPTION	PUTS						
BID x ASK	VOLUME	OPTN	DELTA	GAMMA	VEGA	THETA	STRIKE	BID x ASK	VOLUME	OPTN	DELTA	GAMMA	VEGA	THETA
20.20 x 22.80			0.999	0.000	0.000	0.000	155				-0.001	0.000	0.001	-0.001
25.20 x 27.80			1.000	0.000	0.000	0.000	150	x 0.30	21		0.000	0.000	0.000	0.000
MAY 19 '17 (37 DAYS) IV: 25.6%														
x 0.30	211		0.000	0.000	0.001	0.000	230	51.80 x 55.10	14		-1.000	0.000	0.000	0.003
x 0.15	1	72	0.001	0.000	0.004	-0.001	220	41.50 x 44.90	44		-1.000	0.000	0.000	0.003
x 0.15		70	0.009	0.002	0.017	-0.005	210	32.30 x 35.00	51		-0.999	0.001	0.005	0.001
0.15 x 0.50	48		0.046	0.007	0.057	-0.018	200	22.50 x 25.10	167		-0.960	0.008	0.051	-0.013
0.25 x 0.90	26		0.092	0.012	0.102	-0.031	195	17.80 x 20.50	50		-0.913	0.013	0.098	-0.026
1.00 x 1.80	123		0.166	0.018	0.143	-0.047	190	13.90 x 16.00	138		-0.838	0.019	0.140	-0.043
2.10 x 2.80	28		0.271	0.024	0.180	-0.064	185	9.80 x 12.00	73		-0.731	0.024	0.179	-0.059
4.10 x 4.70	1	79	0.401	0.027	0.216	-0.076	180	7.10 x 7.90	20	31	-0.601	0.028	0.215	-0.072
6.60 x 7.30	35		0.539	0.027	0.220	-0.081	175	4.60 x 5.50	124		-0.462	0.028	0.220	-0.077
9.50 x 10.50	24		0.670	0.024	0.208	-0.078	170	2.65 x 3.40	1	97	-0.331	0.024	0.208	-0.073
12.20 x 14.70	2		0.777	0.019	0.167	-0.067	165	1.65 x 2.40	147		-0.224	0.019	0.167	-0.063
16.30 x 18.70			0.857	0.014	0.134	-0.054	160	0.95 x 1.50	8	104	-0.143	0.014	0.134	-0.050
20.80 x 23.60	1		0.911	0.009	0.088	-0.041	155	0.40 x 1.05	123		-0.089	0.009	0.088	-0.037
25.50 x 28.40	2		0.946	0.006	0.065	-0.031	150	0.20 x 0.60	237		-0.054	0.006	0.065	-0.027
30.30 x 33.50	2		0.974	0.003	0.032	-0.019	145	0.05 x 0.35	20		-0.026	0.003	0.032	-0.015
35.20 x 38.20			0.989	0.002	0.019	0.000	140	x 0.15	15		-0.011	0.002	0.019	-0.007
40.60 x 43.60			0.996	0.001	0.008	0.000	135	x 0.15			-0.004	0.001	0.008	-0.003



**p**

# $\rho$ Rho

- Measures an options sensitivity to a change in the risk-free interest rate
- Interest rate affects long term options and is negligible for short term expiry options.
- Relevant for LEAPS (Long Term Equity Anticipation Security) and Long Term Trades.