



THE VALUE LINE

Daily Options Survey

On Line at the Opening Bell, Every Trading Day

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The Weekly Option Strategist

April 19, 2004

Meet *Gamma*, *Vega* and *Rho*

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This week, we add three new risk indicators to our service. These are *Gamma*, which indicates how quickly an options *Delta* will change, *Vega*, which indicates an option's sensitivity to changes in implied volatility, and *Rho*, which indicates an option's sensitivity to interest rate changes.

Along with *Delta* and *Theta* (which we have always listed in our service), these indicators are often called the option "Greeks." (Actually, "*Vega*" is a star, not a Greek letter.) These "Greeks" might seem daunting at first, but in fact they are easily understood based on the fact that options are insurance against uncertainty.

Review: Delta - Based on the Odds

Delta or *Change per Point* is the option's sensitivity to a small change in the stock. It is usually expressed as the percent of the change in the stock that the premium will change. For instance, if an option has a *Delta* of 50, then it is expected to match 50% of a small move in the stock. Thus, if the *Delta* of a call is 50 and the stock price is \$100, then a 1% rise in the stock to \$101 will cause the call premium to rise by \$0.50.

Conceptually, *Delta* is related to the probability that an option will end up in-the-money. In the top two parts of Figure 1 on page 3, we show premiums and the *Deltas* at various stock prices of a call with a \$100 strike price and with three separate maturities: 137 days, 68 days, and five days to go before expiration.

Looking at Figure 1, notice that with only five days to go, if the stock price is \$80, the *Delta* of the \$100 strike call is 0. This is because there is zero probability that the call will end up above \$100 – i.e. in-the-money. If the stock price is \$120, then the *Delta* is equal to 100, since there will be virtually a 100% likelihood that the option will stay in-the-money. Importantly, if the stock price equals \$100 shortly before expiration, then the *Delta* will be close to 50. This is because there is

50% change that the stock will end up in-the-money and a 50% chance that it will end up out-of-the-money.

Now look at the call with 137 days to go. Notice that with the stock at \$100, the odds are still close to 50/50. However, if the stock is equal to \$80, the odds will be greater than zero – in this case 20%. This is because there is a chance that the stock will go above \$100. Alternatively, if the stock is at \$120, the 80 *Delta* is generated by the 80% probability that the stock will end up above \$100.

You can easily translate *Delta* into dollars. Here is an example: if you are long a call on 100 shares of stock priced at \$100 (total value \$10,000) and the *Delta* is 50, then your equivalent position is \$5,000 worth of the stock (or 50 shares).

Gamma: How Quickly the Odds Change

Change in *Delta* is known as *Gamma*. It depends on how quickly the odds that the stock will end up in-the-money are likely to change. When an option is deep in-the-money or far out-of-the-money, a small change in the stock price is not likely to change these odds by very much. However, if the option is for at-the-money options, especially those that are close to expiration, these odds can change very quickly. Thus, at-the-money options tend to have high *Gamma*, while options that are far out-of-the-money or deep in-the-money tend to have lower *Gamma*s.

Looking at the *Gamma* section of Figure 1, notice that the at-the-money \$100 call with five days to expiration has a *Delta* of 51 and a *Gamma* of eight. Thus, if the stock moves up by 1%, the *Delta* can be expected to rise by eight, to 59%. All other things being equal, options with high *Gamma* cost more than op-

tions with low *Gamma*. Basically, you are paying for insurance against the odds changing quickly. Notice that for an at-the-money call with 167 days to go, the *Gamma* is only two. In our service, *Gamma* is reported as the expected change in Delta for a 1% change in the stock.

Theta: Paying for Gamma

This daily cost of holding an option is known as Time Decay or *Theta*. In effect, it is the daily cost of insurance against uncertainty. The quicker the odds change, the greater the uncertainty and the higher the *Gamma* and the *Theta*. Thus, at-the-money options that are close to expiration tend to have the highest *Theta*, while those with maturities tend to have lower *Theta*.

In our service, *Theta* is expressed in dollars of expected one-day time decay on a 100-share option position. Looking at Figure 1, notice that the at-the-money 137-day call has a *Theta* of \$3.74, while the five-day option has a *Theta* of \$19.05. Option buyers should know what it costs per day to hold a position, while option writers should know how

much they can expect to take in per day to assume the risk of their short option position.

Vega: Exposure to Volatility

Vega is the term for an option premium's exposure to a one percentage point change in implied volatility. (Implied volatility is the volatility number needed to generate a particular premium level when all of the other variables, such as stock and strike price, are known.) Notice that the 137-day at-the-money call has a *Vega* of \$24.20. That means that if the implied volatility of the call were to rise from 41% to 42%, the premium on a 100-share option position would rise by \$24.20.

Vega can work very much in your favor if you are long a long-term option and the implied volatility rises. It can work against you heavily, however, if this volatility declines. Therefore, it is very important to know whether an option is underpriced or overpriced and whether the premium is likely to quickly expand or contract, even if nothing else happens.

Rho: Sensitivity to Interest Rates

In our service, we report *Rho* as the sensitivity of an option on 100 shares to a one percentage point rise in interest rates. To understand *Rho*, you need to know that, with an option, the underlying price is really the future delivery price of the stock. This future delivery price is deter-

mined by the stock price, interest and dividend (if any) and the maturity of the contract. Basically, to hedge an option, the market maker must borrow the funds at the going interest rate to buy the stock. This adds to the underlying price. In addition, to be competitive, he or she needs to deduct future dividends. (See "A Primer on Put/Call Parity and How to Use It," Ot020401.Pdf in our *Reports Archive*.) Thus, a rise in the interest rate will make the effective price of the underling higher. This will in turn cause call premiums to rise and put premiums to decline. Notice in Figure 1, that in most cases, *Rho* is higher for the options with the longer maturities.

Where to Find Gamma, Vega and Rho

We now post *Gamma*, *Vega* and *Rho* in columns AX, AY and AZ (respectively) of our daily download files (Calls.Csv, Puts.Csv and Port.Csv). You will find Delta and Theta in columns U and AJ in these files. All these risk indicators can be found in our *Options Screener* under *Risk Management*, except for Delta, which you will find under *Options Information*.

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THE VALUE LINE Daily Options Survey

Volume 36, No. 14 - April 19, 2004

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The Value Line Daily Options Survey (ISSN 1087-3945) is published semi monthly on the second and fourth Mondays of each month by Value Line Publishing Inc., 220 East 42nd Street, New York, NY 10017-5891. Subscription Rate: One year in the U.S. and U.S. possessions: \$399. Foreign rates upon request. Periodicals postage paid at New York, NY and additional mailing offices. POSTMASTER: Send address changes to Value Line Daily Options Survey, 220 East 42nd Street, New York, NY 10017-5891.

Figure 1 - Premium and Indicators at Various Stock Prices and Maturities:
Strike = \$100, Interest = 2%, Dividend = 1%, Implied Volatility = 41%

		Stock Prices										
		\$ 80	\$ 90	\$ 95	\$ 99	\$ 100	\$ 101	\$ 105	\$ 110	\$ 115	\$ 120	\$ 125
Days to Expiration		Call Premium										
	137	\$ 2.35	\$ 5.45	\$ 7.60	\$ 9.60	\$ 10.15	\$ 10.75	\$ 13.15	\$ 16.45	\$ 20.05	\$ 23.95	\$ 28.10
	68	\$ 0.80	\$ 2.90	\$ 4.75	\$ 6.65	\$ 7.15	\$ 7.70	\$ 10.10	\$ 13.60	\$ 17.45	\$ 21.65	\$ 26.10
	5	\$ -	\$ -	\$ 0.35	\$ 1.45	\$ 1.95	\$ 2.50	\$ 5.40	\$ 10.05	\$ 15.00	\$ 20.00	\$ 25.00
		Call Delta										
	137	23	39	47	54	55	57	63	70	75	80	84
	68	12	31	42	52	54	56	64	74	81	87	91
	5	0	2	15	43	51	59	85	98	100	100	100
		Gamma										
	137	1	2	2	2	2	2	1	1	1	1	1
	68	1	2	2	2	2	2	2	2	1	1	1
	5	0	1	5	8	8	8	5	1	0	0	0
		Call Theta x 100										
	137	\$ (2.26)	\$ (3.24)	\$ (3.55)	\$ (3.70)	\$ (3.72)	\$ (3.74)	\$ (3.74)	\$ (3.64)	\$ (3.43)	\$ (3.16)	\$ (2.84)
	68	\$ (2.16)	\$ (4.21)	\$ (4.94)	\$ (5.25)	\$ (5.29)	\$ (5.31)	\$ (5.23)	\$ (4.83)	\$ (4.20)	\$ (3.48)	\$ (2.77)
	5	\$ (0.00)	\$ (1.69)	\$ (10.70)	\$ (18.83)	\$ (19.35)	\$ (19.05)	\$ (11.98)	\$ (3.08)	\$ (0.54)	\$ (0.24)	\$ (0.21)
		Vega x 100										
	137	\$ 14.78	\$ 21.09	\$ 23.09	\$ 23.98	\$ 24.11	\$ 24.20	\$ 24.18	\$ 23.41	\$ 21.99	\$ 20.12	\$ 17.99
	68	\$ 7.05	\$ 13.70	\$ 16.04	\$ 17.00	\$ 17.10	\$ 17.15	\$ 16.83	\$ 15.45	\$ 13.35	\$ 10.95	\$ 8.58
	5	\$ 0.00	\$ 0.41	\$ 2.59	\$ 4.55	\$ 4.67	\$ 4.59	\$ 2.86	\$ 0.69	\$ 0.07	\$ 0.00	\$ 0.00
		Call Rho x 100										
	137	\$ 5.95	\$ 11.12	\$ 14.03	\$ 16.39	\$ 16.98	\$ 17.56	\$ 19.85	\$ 22.54	\$ 25.00	\$ 27.18	\$ 29.07
	68	\$ 1.69	\$ 4.66	\$ 6.62	\$ 8.28	\$ 8.70	\$ 9.11	\$ 10.72	\$ 12.56	\$ 14.12	\$ 15.37	\$ 16.34
	5	\$ 0.00	\$ 0.02	\$ 0.19	\$ 0.56	\$ 0.67	\$ 0.79	\$ 1.15	\$ 1.33	\$ 1.37	\$ 1.37	\$ 1.37

Spring 2004 Options Seminar Schedule

Register by phone 1-800-654-0508 or go to www.valueline.com

We are pleased to announce our Spring 2004 Options Training Seminars. We designed these sessions to teach you how to use options as an investment tool and how to get the most out of *The Value Line Daily Options Survey*.

Morning Session (9:00 a.m. to 12:00 noon)

We start with an introduction to options and an overview of the options market. We then discuss the basic option strategies (Call & Put Buying, Call & Put Writing, Covered Call Writing and Married Put Buying) and we will review the recent performance of our option ranks. We will then show you how to get started with our new, interactive, online service. We will cover such topics as what to look for in an option and how to find options that suit your objectives.

Coffee & Tea Break (10:00 a.m.)

Lunch (12:00 Noon to 1:00 p.m.)

Afternoon Session (1:00 p.m. to 4:00 p.m.)

We will show you how to use our daily download files for advanced option queries. We will walk you through our templates for portfolio tracking, position evaluation and strategy allocations. We will show you how to build a market neutral portfolio, designed to make money in bearish as well as bullish markets. Finally, we will show you how to use option spreads to make optimum use of your capital with limited risk.

There is a registration fee of \$145 for the day, which includes a copy of the presentation. You must make hotel reservations directly with the hotel, phone numbers are provided below. In addition, lunch will be provided. As space is limited, pre-registration is required, and we cannot offer refunds. You may, however, designate someone to attend in your place. You must make hotel reservations directly with the hotel.

Locations:

Las Vegas, NV
*Sunday, April 18, 2004
MGM Grand Hotel & Casino
3799 Las Vegas Blvd. South
Las Vegas, NV 89109
702-891-7777
For hotel reservations, go to
www.mgmgrand.com

White Plains, NY
Saturday, May 15, 2004
Crowne Plaza
66 Hale Avenue
White Plains, NY 10601
914-682-0050
For hotel reservations, go to
www.crowneplaza.com

* The April 18 Seminar in Las Vegas and the May 2 Seminar in London will be given on a Sunday (the day after the Value Line Investment Survey seminars).

Market Review - Week Ending 04/13/04

Market Indexes	Close	% Change	Volatility Indexes*	% Change
Dow Jones Industrial	10,381.28	-1.79%		
Nasdaq 100	1,472.88	-1.39%	22.23	0.00%
S&P 500	1,129.44	-1.63%	17.26	12.66%

Performance Tables

Common Ranks	% Change	Count	Percent
Rank 1	-1.00%	8531	8.40%
Rank 2	-1.14%	19886	19.59%
Rank 3	-1.14%	55540	54.70%
Rank 4	-0.94%	13214	13.02%
Rank 5	-1.90%	4357	4.29%

Call Buyer's Ranks

Rank 1	-3.69%	2874	5.66%
Rank 2	-6.71%	8271	16.28%
Rank 3	-6.34%	39665	78.07%

Call Writer's Ranks

Rank 5	8.35%	4855	14.38%
Rank 4	6.34%	5882	17.43%
Rank 3	5.04%	23018	68.19%

Covered Call Ranks

Rank 1	-1.69%	2174	6.44%
Rank 2	0.11%	6502	19.26%
Rank 3	0.01%	13907	41.20%
Rank 4	-0.10%	6055	17.94%
Rank 5	-0.27%	5117	15.16%

Put Buying Ranks

Rank 1	7.58%	6499	12.76%
Rank 2	5.53%	8428	16.55%
Rank 3	10.76%	35997	70.69%

Put Writer's Ranks

Rank 5	-6.57%	2366	6.60%
Rank 4	-3.00%	6424	17.92%
Rank 3	-3.26%	27054	75.48%

Married Put Ranks

Rank 1	-0.30%	2811	5.52%
Rank 2	-0.32%	8480	16.65%
Rank 3	-0.47%	22833	44.84%
Rank 4	-0.59%	12180	23.92%
Rank 5	-0.73%	4620	9.07%

* - VIX for the S&P 100 and VXN for the Nasdaq 100