Option Strike Selection

"What do you want from life, an Indian guru to show you the inner light?"… The Tubes

The most difficult questions in any financial planning process are, "What are your objectives," and, "What is your risk tolerance?" Most investors either do not know or lie blatantly. Few ever admit they are in this game to make a quick buck at little or no effort; they know that such an answer would be considered wrong by most social norms. And, startlingly, even fewer would know what to do with a sudden fortune if it fell into their lap; why do you think most lottery stories have unhappy endings?

The question of which strike to employ in an option trading strategy, which arose in a Columnist Conversation exchange last week, is related directly to the level of risk a trader is willing to accept. We can illustrate this by examining which March S&P 500 (SPX) call option to select as part of a replication strategy of the underlying S&P 500 index itself.

The entire topic of strike selection for additional trading purposes, of integration of strikes into strategies and position management is covered in my 1999 book, *The Dynamic Option Selection System*.

On February 13th, the SPX closed at 1287.61, with 63 days remaining to the expiration of March options and the risk-free rate at 4.22%. Key data for the March call options are presented below:

March 2006 S&P 500 Index Options

February 13, 2006

Strike	Premium	Delta	1/Delta	Cost	Gamma	Volatility	Z-Value	Probability SPX > Strk	Expected Return
1260	$44.80	0.653	1.532	$68.65	0.005	13.98%	-0.37	64.55%	-$14.55
1265	$41.10	0.630	1.589	$65.29	0.005	13.67%	-0.31	62.25%	-$16.11
1270	$37.50	0.605	1.653	$61.98	0.005	13.36%	-0.25	59.80%	-$17.84
1275	$34.05	0.579	1.728	$58.82	0.006	13.07%	-0.18	57.19%	-$19.78
1280	$30.80	0.551	1.814	$55.88	0.006	12.81%	-0.11	54.43%	-$22.00
1285	$27.70	0.522	1.915	$53.05	0.006	12.57%	-0.04	51.55%	-$24.44
1290	$24.60	0.492	2.033	$50.01	0.006	12.25%	0.04	48.55%	-$26.96
1295	$21.90	0.461	2.171	$47.54	0.006	12.05%	0.11	45.45%	-$29.96
1300	$19.10	0.428	2.337	$44.64	0.006	11.73%	0.20	42.21%	-$32.96
1315	$12.60	0.330	3.031	$38.19	0.006	11.19%	0.45	32.53%	-$44.24
1320	$10.45	0.294	3.396	$35.49	0.006	10.83%	0.55	29.04%	-$48.17
1325	$9.00	0.265	3.779	$34.01	0.006	10.76%	0.64	26.10%	-$52.77
1330	$7.60	0.235	4.259	$32.37	0.005	10.63%	0.73	23.16%	-$57.44

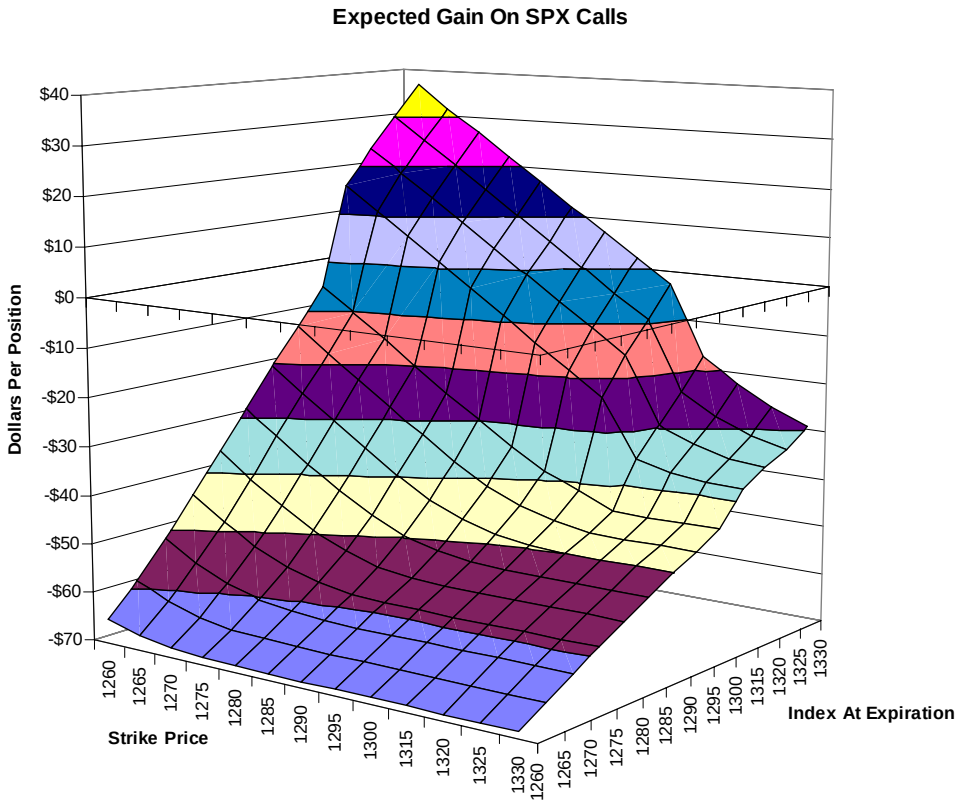
The columns for the strike price and the premium are self-explanatory. Additional columns are included for the option delta, or expected price change for a given change in the index, (1/delta), which determines the number of call options we will need to have full index coverage, and for the cost, which is premium/delta.

The more delta we buy per option, the more each option will move to protect the underlying asset, and the fewer options will be needed. However, we will need to risk more capital due to the greater initial cost of in-the-money (ITM) options, and this starts to defeat the whole concept of using options to create a synthetic index. If we purchase a larger number of out-of-the-money (OTM) options, each option will move far less in response to the underlying asset, and so despite their lower cost, they will be an ineffective index substitute for all except the most extreme price movements.

We also need to consider the probability of the futures price settling at or above the call option's strike price by expiration. We can calculate the number of standard deviations away from the mean each strike price is by using the range formula:

$$Z = \ln(Strike/1287.61)/(\sqrt{63/365} * Volatility)$$

This number of standard deviations, Z, corresponds to a probability of the SPX equaling or exceeding the strike price at expiration. These probabilities then can be used to determine an expected return at that particular strike price at expiration, which is the worst-case scenario for any synthetic option index:



The Tradeoffs

The OTM options, while cheap, have negative expected returns. The ITM options, while expensive, have both positive and negative expected returns by virtue of their intrinsic value and lower time premium costs. An OTM option can provide the "home run" return, but very few traders calculate the probabilities of those higher prices being achieved and even fewer buy (1/delta) calls to replicate the alternative of simply buying the index.

Nothing in options is ever simple, and far more needs to be accounted for in strike selection than simply the expected return at expiration. Three tradeoffs are involved:

1. Maximize gamma, the rate at which delta changes with respect to price, against time decay;
2. Maximize leverage, or the intrinsic value purchased, against net borrowing, or time premium paid; and
3. Maximize position delta against capital outlay

The net result of these tradeoffs is a sliding scale of how far in-the-money we should select our strike. As a rule-of-thumb, the higher the volatility or the greater the time to expiration, the further in-the-money we should go. The low volatility level of the SPX works for a selected strike closer to the at-the-money strike of 1290, but the two months of time remaining push the strike selection back toward in-the-money levels. The relative attractiveness of each strike considered is displayed below. The 1260, one nearly 30 index points in-the-money, is selected.

Call Option Selection