# Selling options: Examining risk

Over the last few weeks we have looked at the concept of selling call options over stock we already own, a strategy known as covered call writing.

We looked at an example where we owned 10,000 shares in XYZ at $18.00 and sold 10 February $19.50 call options at $0.43. As long as the share price was below $19.50 on the day of expiry, then the option premium received would be full profit.

In the world of textbooks, things always seem to work out as planned. In real life however we all know this is not the case.

## Terms

**Mean**: the term used in statistics to describe the arithmetic average. It is the sum of a set of numbers divided by the count.
**Standard deviation**: a measure of volatility of the underlying share. The standard deviation measure the average movement of an individual data point compared to its average. See my website for more info.
**Probability distribution**: A representation of a range of outcomes from a certain event with the corresponding probabilities of those outcomes.
**Bell Curve**: a type of probability distribution.

In the last article, we looked at follow-up action – what to do if the market goes against you. In this article, I'll show you a tool we use in our professional trading that just might stop you from getting into that situation in the first place. It may mean you trade less often, but the odds (as we estimate them) will be more in your favour.

In this article I will show you a tool that will help you pick and choose options for short selling. This not only applies to covered call writing, but any strategy that involves a short option.

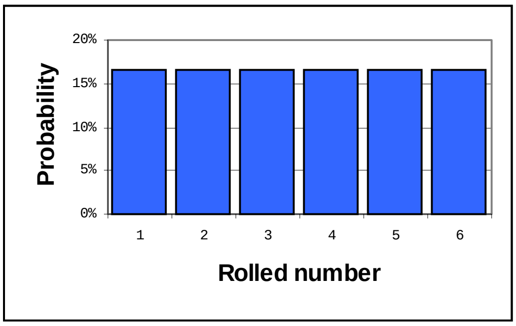
### The Bell Curve

First the ground work. The bell curve is a type of probability distribution. A probability distribution shows the possible outcomes from a certain event, along with the corresponding probability for those outcomes.

Take for instance the roll of a dice. You can spin any number from one to six and (assuming the dice is equally weighted), each number has the same chance of being rolled. A probability distribution shows this in a table or graphically:

| Number | Probability |
|---|---|
| 1 | 1/6 or 16.67% |
| 2 | 1/6 or 16.67% |
| 3 | 1/6 or 16.67% |
| 4 | 1/6 or 16.67% |
| 5 | 1/6 or 16.67% |
| 6 | 1/6 or 16.67% |

***Or graphically…***

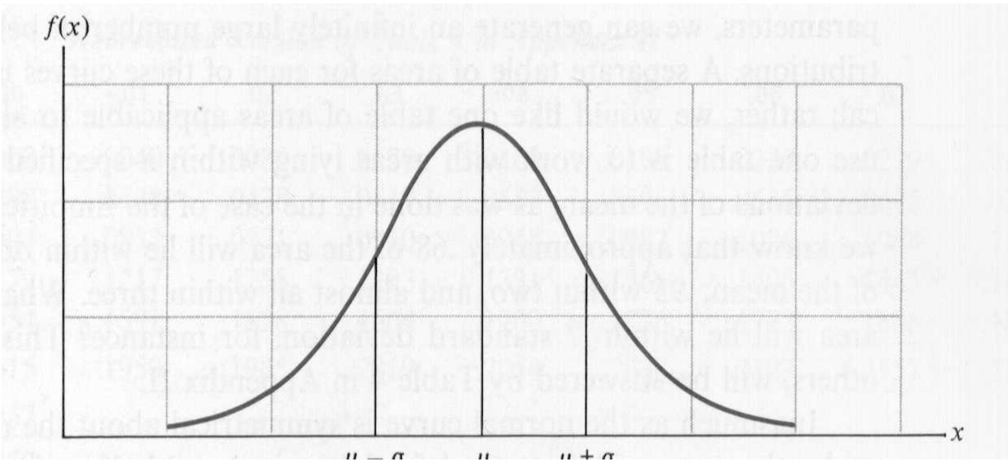


Now that's a nice and simple example in which the probability of each outcome is equal, creating what is called a uniform distribution.

Another type of distribution is the bell curve or normal distribution, as some call it. This distribution shows:

- The *average* outcome of any event has the highest probability;
- The probability of any outcome being near the average is greater than the probability of the outcome being distant from the average; and
- The probabilities of the outcome being greater than the average or less than the average are both exactly 50%.

The normal distribution is represented thus:




Can you see why it's called a bell curve?

Like with the die-rolling example, the x-axis shows the outcome and the y-axis shows the probability of that outcome. The average outcome corresponds with the peak of the curve.

## Let's trade options

So big deal! What we want to know is how to trade options, not how to play with dice or draw nice graphs.

Well, as we all know, any options strategy is based on a view of the market. To be well-educated traders, we would need to know what the market is capable of and in what time frame.

Take the All Ords index for example. Most of us know a daily change of a couple of points is small and happens frequently; and something like 100pts is quite large and does not happen too often. We could say that, based on the past, a move of just a couple of points in any day is highly probable. Likewise, a move of 100pts or more is far less likely.

What about over two days? Or ten days?

If your trading options wouldn't it be great to have a tool that helps you estimate the probability of a certain move over a certain time frame? Of course.

So what we need to work out is how to estimate the possible and probable movement of a share price using what information we have (i.e. price history).

### Back to the Bell curve

Remember a bell curve is an estimate of the probabilities of outcomes from a certain event. Amazingly, statisticians have found that this estimate provides an accurate model for many different applications.

For example, the auditory nerve response rates in cats is thought to be normally distributed. The life span of light globes is thought to be normally distributed. The precise thickness of mortar coated steel water pipes is also thought to be normally distributed. No, I am not making this up…

In markets, it's a little more difficult since the nature of markets appear to be constantly changing. Still if we make the assumption that the average daily change in a share price is normally distributed, then we can use the properties of the bell curve to help us estimate the probability of a certain move in a day, or in a week or any time.

These probability figures can help us determine the level of risk a certain trade holds (selling short a certain strike for example).

### The XYZ Example

The truth be known, our XYZ shares were actually that of News Corporation. Anyone who has traded this stock knows it is rather volatile. So our tests will be quite interesting.

So, what we could use is something that tells us the probability of NCP moving by *x%* in *y*-days. We could be looking at a call that is 10% out-of-the-money with 20 trading day left. Using the bell curve assumption of share price movement, we can estimate the chances of the market reaching the strike.

### Back to the Bell Curve again…

The tools of the Bell Curve are the average and the standard deviation. (There is a simple article on standard deviations in the articles section of my website.) To help you understand the application of concept, here are a couple of rules used for data that is normally distributed:

| **The general rules of thumb for interpreting a standard deviation:** | |
|---|---|
| 67% | of the time the price will deviate within one standard deviation from its average price |
| 95% | of the time the price will deviate within two standard deviations of its average |

So, doing some quick numbers of NCP closing prices from Jan2000 onwards, over any 5 days, the stock has averaged a gain of 0.76%. The standard deviation of this average is 8.71%.

So, in our example, 67% of the time the price will deviate within plus or minus 8.71% from the average gain of 0.76%. That is, 67% of the time the shares will move within the range of -7.95% and +9.47% over any 5-day period.

It seems rather wide, but knowing NCP, it looks reasonable.

Now we want to take this to the next level. We want to use these probability concepts for trading options. What we need is something that tells us the probability of a move of *x*% in *y*-days.

For selling options, I tend to look out as far as 40 days, estimating movement between –10% and +10%. That's a lot of number crunching, but I have built an excel template for doing exactly that. Here's one I prepared earlier:

| **Days** | **30** | **29** | **28** | **27** | **26** | **25** | **24** | **23** | **22** | **21** |
|---|---|---|---|---|---|---|---|---|---|---|
| Mean | 0.7% | 0.8% | 0.9% | 1.0% | 1.1% | 1.1% | 1.2% | 1.3% | 1.4% | 1.5% |
| StdDev | 20.7% | 20.5% | 20.1% | 19.7% | 19.2% | 18.7% | 18.1% | 17.6% | 17.2% | 16.8% |
| Min | -35% | -35% | -35% | -34% | -31% | -30% | -28% | -27% | -26% | -27% |
| Max | 67% | 68% | 68% | 68% | 65% | 68% | 67% | 67% | 63% | 50% |
| Count | 239 | 240 | 241 | 242 | 243 | 244 | 245 | 246 | 247 | 248 |
| **% Movement** | | | | | | | | | | |
| **-10%** | 30.30 | 29.91 | 29.41 | 28.85 | 28.24 | 27.55 | 26.81 | 26.08 | 25.31 | 24.64 |
| **-9%** | 32.01 | 31.62 | 31.14 | 30.61 | 30.02 | 29.37 | 28.66 | 27.96 | 27.20 | 26.55 |
| **-8%** | 33.76 | 33.38 | 32.92 | 32.41 | 31.86 | 31.24 | 30.57 | 29.89 | 29.17 | 28.54 |
| **-7%** | 35.54 | 35.18 | 34.73 | 34.26 | 33.73 | 33.16 | 32.53 | 31.89 | 31.20 | 30.60 |
| **-6%** | 37.35 | 37.00 | 36.59 | 36.14 | 35.65 | 35.13 | 34.54 | 33.94 | 33.29 | 32.72 |
| **-5%** | 39.19 | 38.86 | 38.47 | 38.06 | 37.60 | 37.14 | 36.60 | 36.04 | 35.43 | 34.89 |
| **-4%** | 41.06 | 40.75 | 40.38 | 40.00 | 39.59 | 39.18 | 38.70 | 38.18 | 37.63 | 37.12 |
| **-3%** | 42.94 | 42.65 | 42.31 | 41.98 | 41.61 | 41.25 | 40.82 | 40.36 | 39.86 | 39.39 |
| **-2%** | 44.85 | 44.57 | 44.26 | 43.97 | 43.64 | 43.35 | 42.98 | 42.57 | 42.12 | 41.70 |
| **-1%** | 46.76 | 46.51 | 46.23 | 45.98 | 45.70 | 45.46 | 45.16 | 44.80 | 44.41 | 44.04 |
| **0%** | **48.68** | **48.45** | **48.21** | **47.99** | **47.76** | **47.59** | **47.35** | **47.05** | **46.72** | **46.39** |
| **1%** | 49.39 | 49.60 | 49.81 | 49.98 | 49.83 | 49.73 | 49.55 | 49.31 | 49.04 | 48.76 |
| **2%** | 47.47 | 47.65 | 47.83 | 47.96 | 48.09 | 48.13 | 48.25 | 48.43 | 48.63 | 48.86 |
| **3%** | 45.55 | 45.71 | 45.86 | 45.94 | 46.03 | 46.00 | 46.05 | 46.18 | 46.32 | 46.49 |
| **4%** | 43.64 | 43.78 | 43.89 | 43.93 | 43.97 | 43.88 | 43.87 | 43.93 | 44.01 | 44.13 |
| **5%** | 41.75 | 41.86 | 41.95 | 41.94 | 41.93 | 41.78 | 41.70 | 41.71 | 41.72 | 41.79 |
| **6%** | 39.87 | 39.97 | 40.02 | 39.97 | 39.91 | 39.70 | 39.56 | 39.51 | 39.46 | 39.48 |
| **7%** | 38.02 | 38.09 | 38.11 | 38.02 | 37.92 | 37.65 | 37.45 | 37.35 | 37.24 | 37.21 |
| **8%** | 36.20 | 36.25 | 36.23 | 36.11 | 35.96 | 35.63 | 35.38 | 35.22 | 35.06 | 34.98 |
| **9%** | 34.41 | 34.43 | 34.39 | 34.23 | 34.04 | 33.66 | 33.35 | 33.14 | 32.92 | 32.80 |
| **10%** | 32.65 | 32.65 | 32.58 | 32.38 | 32.15 | 31.72 | 31.36 | 31.11 | 30.84 | 30.68 |

The Table shows the probability of a percentage move over a set number of days in the underlying. The figures assume a static Normal Distribution. The figures are also representative of a bull market as indicated by the positive means.

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Given lack of space, this table shows a cut down version of what I tend to look at what considering selling options. Reading across the top, the table tells me the average move over the specific number of days and the standard deviation of that average. Those figures are used to calculate the probability of a certain move over any time frame up to 40 trading days.

So remember back to our initial example? We sold some $19.50 calls when NCP was trading at $18.00. There were 23 trading days remaining in this option. That means, the shares would have to rally by just more than 8% to reach the strike price in 23 days.

From the table above, we can estimate the probability of somewhere between 33.14% (for a 9% move) and 35.22% (for a 8% move). Lets call it 34%. So there is roughly a one in three chance of getting hit. Seems pretty high when considering all we earned was a lousy $0.43 per share (or 2.39%).

By itself, a rally of over 8% is 23 trading days seems like a big ask, but after estimating the probabilities, the evidence suggests the $19.50 strike is a little too close. Lesson: move you strike further away or shorten your time frame.

Keep in mind also, an unfavourable risk/reward balance like this is one thing when selling covered calls, but is far more significant if you are just selling naked calls.  This is when using a method to estimate probability becomes most important.

## A footnote

This tool should not be the only tool you use for trading in options. The bell curve assumption appears to work a little better in markets that are less volatile than shares such as NCP. In the past, this method has worked well in markets such as Share Price Indices and Bond Futures.

My website www.gtcommodities.com ('articles' section) has an excel file you can use on markets of your choice. The NCP figures are also included in this file.

*Guy Bower is an adviser offering a managed options account. Please call (02) 9386 4561.*