

Getting a handle on volatility

Many option traders use pricing models to calculate theoretical prices of options. The pricing models usually use the standard deviation to describe the volatility of the underlying asset. The standard deviation is expressed as a percentage of the current stock price, and represents the variability of the stock price over a defined period of time.

There are many ways to measure volatility. To get a handle on volatility, it is useful to work with some simpler measures of volatility. These simpler measures allow you to analyze volatility in a very concrete way. They also can give insights in the search for option bargains.

Consider the following recent stock price data for International Paper and Sprint Corp stocks:

Figure 1 Weekly stock price data for International Paper

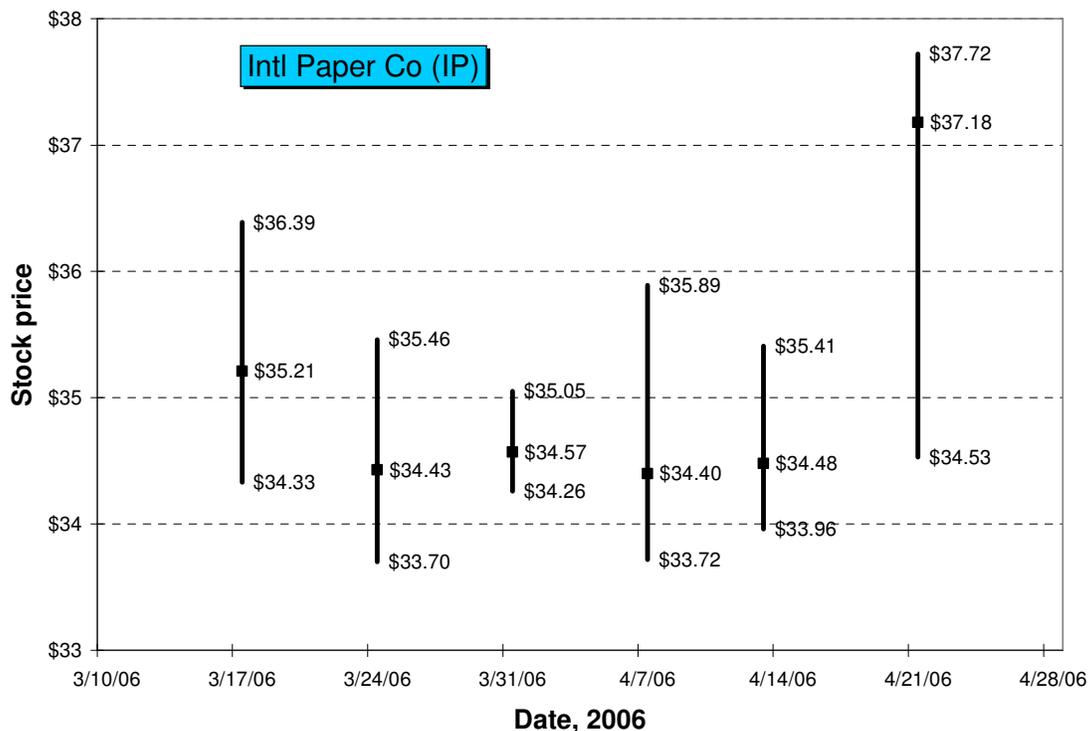
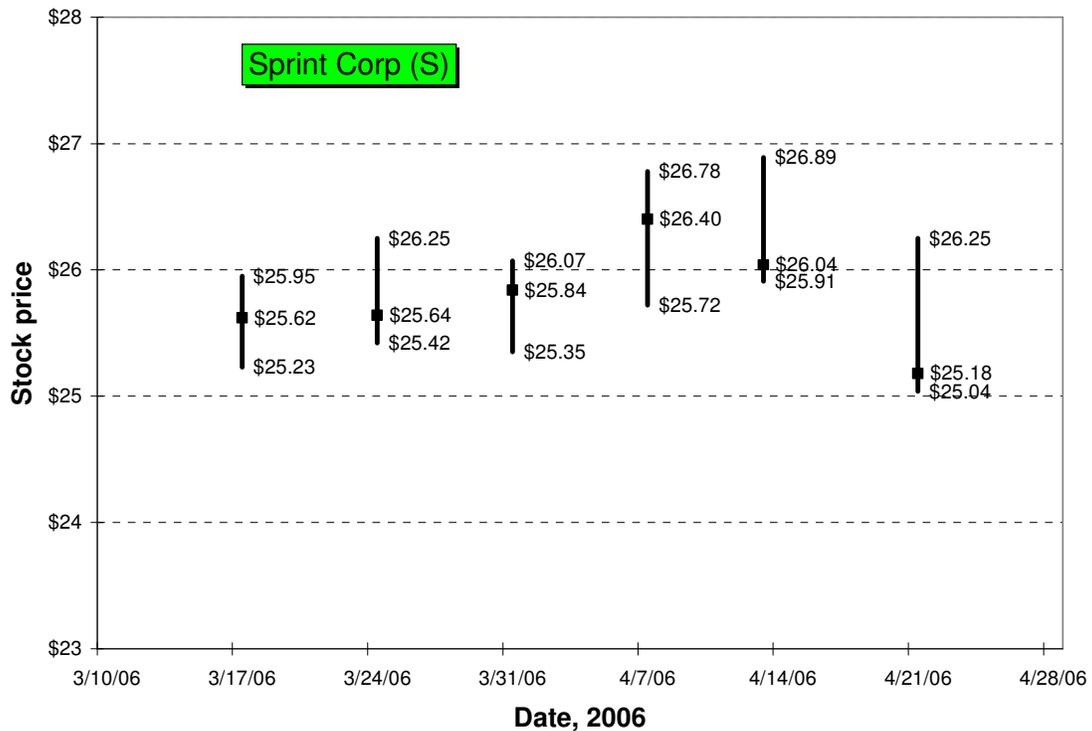


Figure 2 Weekly stock price data for Sprint Corp



Which stock is more volatile?

One simple way to measure volatility is to “eyeball the data”. By glancing at the charts, most people would say IP has been more volatile over the last 6 weeks. This could be called the know-it-when-I-see-it method of measuring volatility.

To be more precise, you could look at weekly ranges.

Weekly range analysis

Last week (April 21, 2006), Sprint stock varied between a low of \$25.04 and a high of \$26.25, for a weekly range of \$1.21. International Paper varied between a low of \$34.53 and a high of \$37.72, for a weekly range of \$3.19. By comparison of last week’s range, International Paper was more volatile than Sprint:

Last week’s range:

- Last week’s range for Sprint = \$1.21.
- Last week’s range for International Paper = \$3.19

Going a step further, you could calculate the weekly range for each of the last six weeks, and then average those six values.

Six-week average weekly range:

- 6-week average weekly range for Sprint = \$0.90
- 6-week average weekly range for International Paper = \$1.90

This method requires a calculator, pencil and paper, or better yet, a computer and a simple spreadsheet. But it is still very easy to do. Weekly stock price data is available free from many websites for example, MSN.com. And the spreadsheet only needs to add, subtract, and average numbers.

Twenty-week average weekly range

With weekly price data and your simple spreadsheet, you can easily calculate average weekly ranges, and moving averages, over any time interval you like. For example, you could calculate a 20-week average range for these 2 stocks:

- 20-week average weekly range for Sprint = \$1.10
- 20-week average weekly range for International Paper = \$1.50

For each of these time intervals, the average weekly range analysis confirms what your eyeballs suggested – International Paper has been more volatile than Sprint in the recent past.

Weekly change analysis

Last week's change

Another way to measure historical volatility is by the weekly *change*, that is, how much a stock moved up or down from last week's close. For last week:

- Sprint went down from \$26.04 to \$25.18 for a weekly change = -\$0.86
- International Paper went up from \$34.48 to \$37.18 for a weekly change = +\$2.70

When using the weekly change as a measure of volatility, you must compare the magnitudes of the numbers and ignore their direction. So International Paper was more volatile last week because it moved by \$2.70 from last week's close, while Sprint moved by only \$0.86.

Average weekly change

With your simple spreadsheet, you could also calculate weekly change for other weeks in the recent past and average them over whatever time intervals you want to see the pattern of volatility.

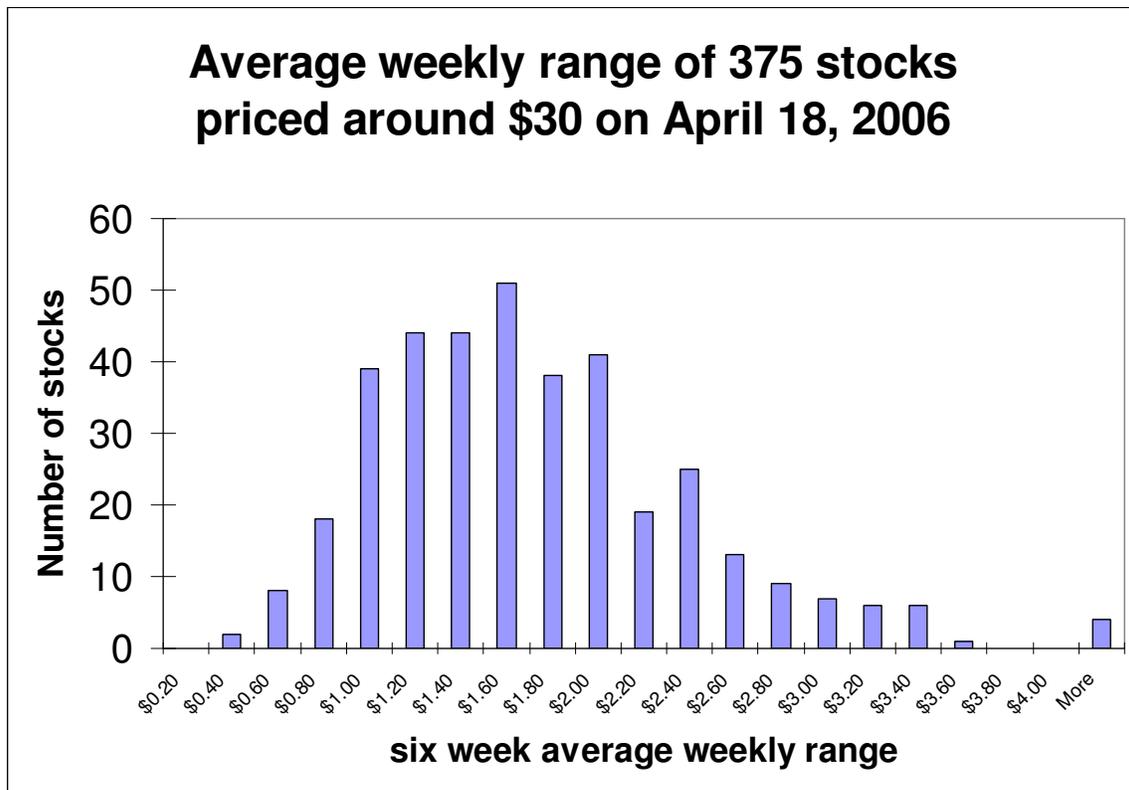
Either of these measures, range or change, is a legitimate measure of volatility in the sense that larger numbers indicate more price action. Unlike the standard deviation, we can easily attach a tangible meaning to each of them.

Because they all are being calculated from historical price data, these are called measures of *historical volatility*. Historical volatilities of stocks vary with time. And, of course, the historical volatility is different for different stocks.

Volatilities of different stocks

Here is a chart of the six-week average weekly range of 375 different stocks that were priced around \$30 per share on April 18. For this chart, the six week average weekly range was measured for each stock. Then the stocks were placed into brackets which are 20 cents apart, based on the weekly range. The y-axis shows the number of stocks falling into each bracket.

Figure 3 Volatility of stocks priced around \$30 based on weekly range



The least volatile of the 375 stocks fell into the 40 cents per week bracket. The most common bracket was the \$1.60 bracket, which contains 51 of the 375 stocks. A few stocks had weekly ranges over \$4 per week.

In doing this bracketing of stocks, Sprint fell in the \$1.00 bracket based on its 6-week average weekly range of \$0.90 (rounding up). International Paper fell in the \$2.00 bracket based on its 6-week average of \$1.90.

If you study data like this, you will find that a stock will bounce around in the distribution as you measure its volatility over different time intervals. Also, the position of a stock in the distribution may be different depending on how you measure the volatility. Some stocks are always more volatile than others, no matter which method you use to measure volatility, and no matter what time interval you use.

These details of historical volatility can give new insights to the option bargain hunter.

Option Price Analysis

All of the 375 stocks represented in Figure 4 have listed options. An option's price reflects the market's expectations about *future* volatility over the life of the contract. All other things equal, a higher option price means the market expects higher volatility from that stock.

When using a pricing model, traders use an option's price to back-calculate an "implied volatility". This represents the market's expectation of future volatility. Usually the implied volatility correlates with historical volatility. Stocks that have consistently shown higher historical volatility will generally have more expensive options.

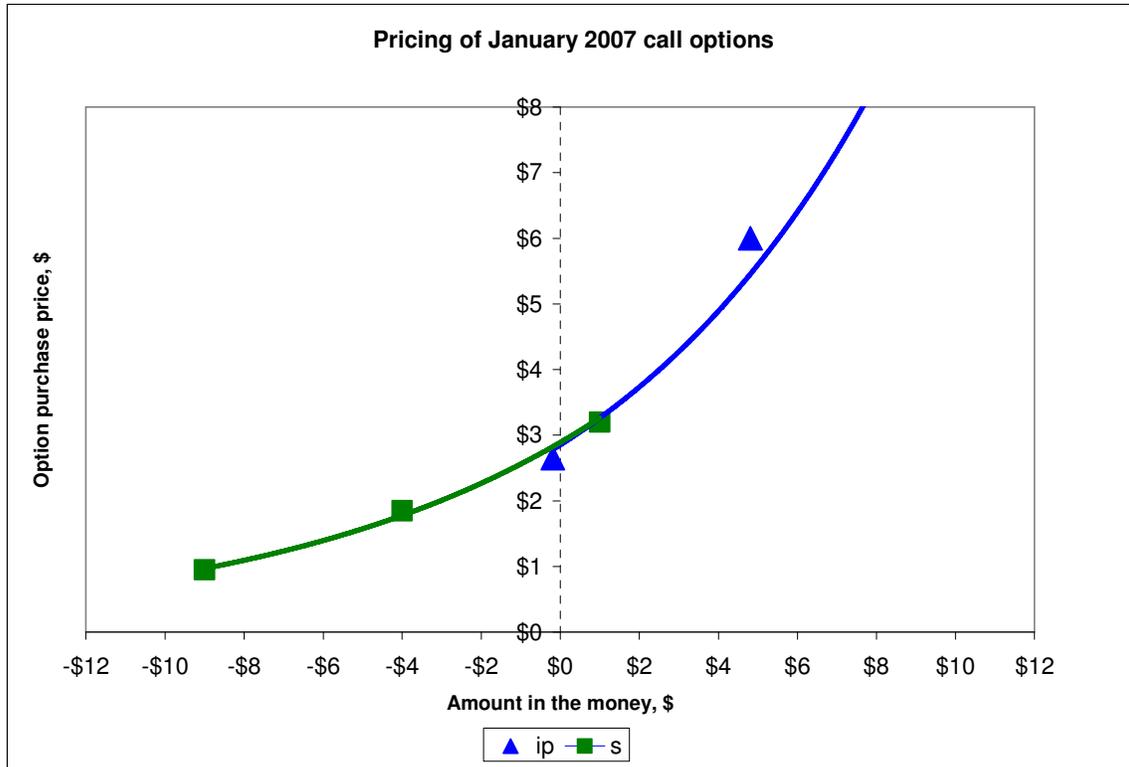
Your job as an option bargain hunter is to find situations where the market's estimate of future volatility is different than your own.

To compare the pricing of options on International Paper and Sprint stocks, make a chart like Figure 4 using price data for January 2007 call options (Table 1)

Table 1 January call option prices on April 18, 2006

	IP	S
stock price	\$34.81	\$26.00
<i>Purchase price of call options</i>		
Jan 25 call	\$10.20	\$3.20
Jan 27.5 call		
Jan 30 call	\$6.00	\$1.85
Jan 32.5 call		
Jan 35 call	\$2.65	\$0.95

Figure 4 Option price chart for International Paper and Sprint stocks, April 18, 2006



The price of each January call option is plotted on the y-axis in relation to the amount it is in the money (x-axis). Smooth curves through the data show that the January calls on International Paper and Sprint are priced the same. An option with the same expiration date (January 2007) and the same intrinsic value (x-axis) can be purchased on either stock for the same price.

The point where the option price curve crosses the y-axis is the *implied price of an at-the-money call option*. This is a good measure of how expensive that stock's January options are. It is a very concrete measure of the "price tag" on an asset's options. Unlike the implied volatility, we can attach a very concrete meaning to it - for \$2.90, you can buy an at-the-money January call option on either stock.

This says the options market is expecting these two stocks to be equally volatile over the rest of 2006.

Table 3 summarizes the analysis of International Paper and Sprint stocks:

	IP	S
6-week average weekly range	\$1.90	\$0.90
Price of at-the-money call	\$2.90	\$2.90

There are many possible reasons why the options of IP and S are priced the same even though their recent volatilities have been different. It may be that the market considers the recently high volatility of International Paper to be a fluke, unlikely to continue through the balance of 2006. Or the relatively low recent volatility of Sprint might be considered abnormal and not expected to continue. It may be that an upcoming earnings announcement is expected to cause unusual volatility in Sprint stock in the near future, increasing the price of its options. Differences in dividends might also play a role.

But it is also possible this represents a true opportunity for the option bargain hunter.

To check these possibilities, it is good to examine the patterns of past volatility in more detail. Notice from Figure 3, there are 40 stocks priced around \$30 per share that have 6-week average weekly ranges of \$2.00 per week, all falling in the same volatility bracket with International Paper. You can look at the price action, and the option prices for the other 39 stocks to see how they compare to International Paper. You can do the same with the stocks having the same weekly average range as Sprint. You can also check differences in dividends, and recent news on the stocks, to see if you can uncover reasons why the IP and S options are showing the same price tag.

By doing such analysis, we concluded that the International Paper January options were a bargain. Accordingly, International Paper January 35 call options were purchased on April 18, 2006 for \$3.40 with the stock at \$36.05.

To learn more about how this kind of analysis can help you uncover option bargains, see previous Active Trader articles, especially “Focusing on Volatility”, and “Bargain Hunting for Options”.

The rest of this article will address some common questions about this approach.

How does this analysis compare to using an option pricing model?

The biggest difference is that this is a *relative* analysis. It does not attempt to calculate the actual price of any option. Instead, it compares relative volatilities and relative option prices for different stocks. Also, the stocks are sorted in a way that causes variables like interest rates and expiration dates to “cancel out” of the analysis. This eliminates the need to quantify the effects of these variables on option prices.

Doesn't relative analysis limit what can be done compared to using a model?

Yes. For example, when using an option pricing model, you are able to directly calculate every single point on the option pricing curve (Figure 4), and you can calculate the theoretical price of any option, for any expiration date. Also, a model gives a basis for comparing the actual value of any particular option to a theoretical value. But doing this relative analysis does not stop you from also using an option pricing model; in fact it is very useful to do both.

Isn't the standard deviation the correct measure of volatility for option valuation?

It is customary to use a standard deviation as the measure of an asset's volatility when calculating option prices. But the standard deviation is not the only useful measure of an asset's volatility, and it is certainly not the only "correct" measure. Doing relative analysis allows use of other simple measures which are less mathematically convenient, but more tangible than standard deviation. Also, these simpler measures can show things that are not reflected by the standard deviation. If you use them in addition to a model, you are giving yourself another lens to look at volatility.

How can someone decide which measure of volatility to use?

This is a good question to consider when formulating a strategy. Different strategies might lend themselves to using different measures of volatility. For example, a stock that has larger weekly ranges, but smaller weekly changes, might be attractive for a strategy that aims for frequent small gains.

Volatility is the key to analysis of option pricing. Most investors have experience analyzing price trends - it takes a shift of mindset to think in terms of volatility.

Working with weekly ranges and changes can help the options trader get a handle on volatility. Standard deviation need not be your only tool.