JIM FRISINO

Redefining Volatility And Position Risk

STOCKS & COMMODITIES contributor C.A. Kase presents a method on looking at the volatility of intraday price bars using a stop system called the "dev-stop."

by C.A. Kase, C.T.A.

Volatility is the key to understanding market behavior. Volatility is the change in price and thus, by definition, is directly related to price. I normally use true closing range (TCR) as a measure of volatility rather than the annualized price probability that options traders employ. The true closing range is the largest absolute value of three possibilities: (1) high minus low, (2) high minus previous close or (3) low minus previous

close. This is expressed in the same units as the underlying contract or issue we are trading. Specifically, the true closing range tells us the maximum theoretical amount of money we could have made or lost between the close of one bar to the next. Thus, it is easier for a stock or commodity trader to relate to than a percentage measurement.

If the variance around the mean is uneven — more to one side than the other — the distribution is *skewed*. In markets that are very choppy and in which we see much bar-size variation, we are subject to more risk.

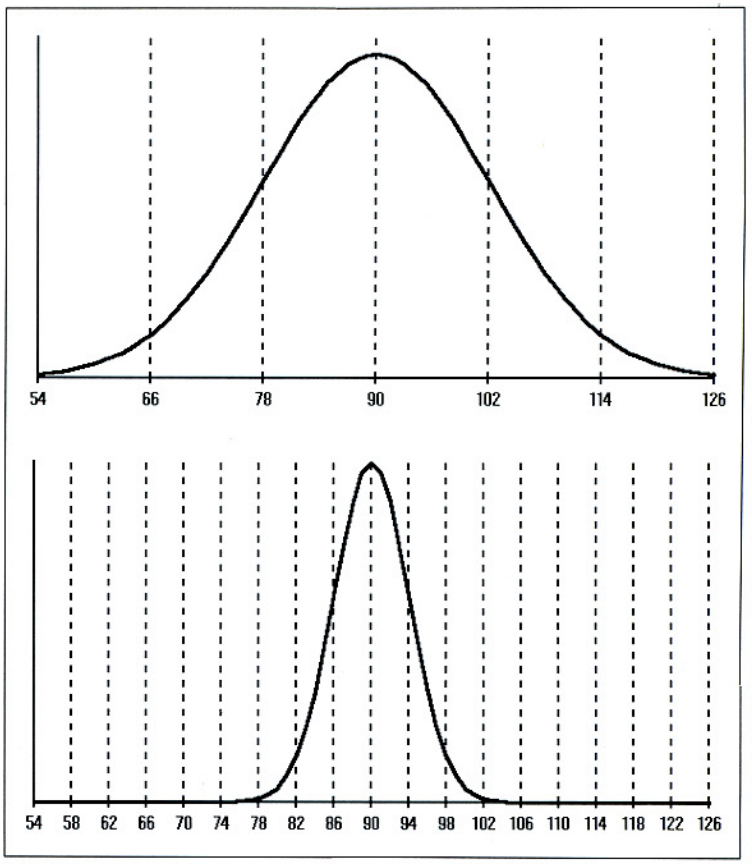


FIGURE 1: SAMPLE MARKETS. *These graphs show a distribution chart of individual bars around the mean. The mean TCR is exactly the same in both cases, 90 points per bar.*

USING VOLATILITY

As traders, our primary interest is volatility itself. If price does not change, you cannot make any money. Of course, without price change you can't lose any money, either. Thus, both reward and risk are directly related to volatility. By defining volatility in terms of range, we can develop rules (algorithms) for stops that may be universal, working in all markets in all timeframes. We can use the volatility of range as a substitute for fixed estimates of stop sizes and thus develop a system that will expand and contract — breathe, if you will — with the market's own activity. For example, one published system that is an improvement over using a fixed value as a stop employs the average true range times a fixed value, say 3. So, as volatility increases and decreases, the stop also expands and contracts.

One problem with this approach: Market conditions may dictate that narrower or wider stops be used depending on the status of the trade. For example, during a surging impulse move, when danger of a reversal is low, a trader may want to use a wide stop. At other times, when danger of a reversal is increased — such as when momentum divergence is present — the trader may wish to use a narrow stop. Problems remain, however, even if we use different factors or multipliers for different conditions.

VARIANCE

Specifically, this method does not account for two very important characteristics of volatility: *variance and skew*. In any market, if we tabulate the true closing ranges of individual bars, we see that they vary from the mean (that is, average). This is *variance*. If the variance around the mean is uneven — more to one side than the other — the distribution is *skewed*. In markets that are very choppy and in which we see much bar-size variation, we are subject to more risk than in more consistent markets.

For example, look at the two sample markets in Figure 1. The graphs show a distribution chart of individual bars around the mean. In both cases, the mean TCR is exactly the same, 90 points per bar. However, in the first example, the greatest bar length is 126 points compared with the maximum of 102 in the second example. Thus, although the average risk in each market is the same, the practical risk in the first example is higher.

Another problem with the old method is that it is not quantifiable. If a trader sets a stop to, say, 2.5 times the mean true closing range from the entry price, the chance of being stopped out, for example, on a two-bar reversal cannot be directly estimated. In place of this, we could use the measured variance of the true closing range and set our stop some number of standard deviations beyond the mean true closing range of our market. Then we can easily estimate the probability of the stop being hit.

CUMULATIVE PROBABILITIES	
STANDARD NORMAL DISTRIBUTION	**STANDARD DEVIATIONS ABOVE THE MEAN**
50	0.000
55	0.126
60	0.257
65	0.385
70	0.526
75	0.675
80	0.848
85	1.033
90	1.282
95	1.645
97.5	1.960
98	2.054
99	2.326
99.5	2.576
99.9	3.090

FIGURE 2: *Use the left column to estimate probabilities.*

Figure 2 shows the cumulative probability and corresponding standard deviations of TCR above the mean. This way of looking at probability differs slightly from the standard method. Usually, probability is measured around the mean.

For example, if we have a market whose average true closing range is 10 with a standard deviation of 3 and if we set the stop 10 points from the lowest low if long and highest high if short, we could expect that the very next bar (or interval) would hit that stop 50% of the time. After all, the average TCR is the amount we expect the next range to be. To avoid being hit by what we expect to happen in the next bar, we need to move the stop farther away. Figure 2 explains that if I wanted a 90% chance of not being hit in the next bar, I'd want the stop to be 1.282 times the standard deviation beyond the average TCR. In this case, that would be 1.282 x 3 = 3.846 points beyond the average TCR, or 10 + 3.846 = 13.846 points. Now, the probability of the stop being hit in the next interval is just 10% (that is, 100% - 90% chance of not being hit).

SKEW IT

Finally, we will consider volatility skew. Figure 3 is a distribution chart of the true closing ranges of wheat.

It is clear that the maximum TCR is higher in magnitude than a normal distribution of TCRs would suggest. I have looked at a number of markets, and actual values range from 45% higher to twice as high as the normal bell curve would predict. Thus, we must correct our stops to account for a normal amount of volatility skew.

Even so, we are left with a dilemma without a solution, as the degree of skew is itself skewed to the right. This tells us that actual risk is always greater than theoretical risk. If we fail to account for volatility skew, we will be stopped out much more often than we expect because the actual bar that constitutes, for example, the 90th percentile will exceed the theoretical value determined by using 1.28 standard deviations above the mean. Thus, we must compromise on a reasonably representative value. Based on our research, corrections for stops placed two standard deviations from the mean should have an additional cushion in the range of 6% to 25% and for the stops, three standard deviations in the range of 20% to 50% are acceptable.

Therefore, we must make a reasonable, average compromise in our correction. In the stop system, which I call the *dev-stop*, we use the average corrections factor determined over a thousand sets of 100 consecutive bars. We do not want to leave ourselves wide open for the times when we might get hit by a large bar. We can think of these bars as stray bullets: We might not get hit by one very often, but when we do, they can be fatal.

It is this understanding of volatility that underlies the

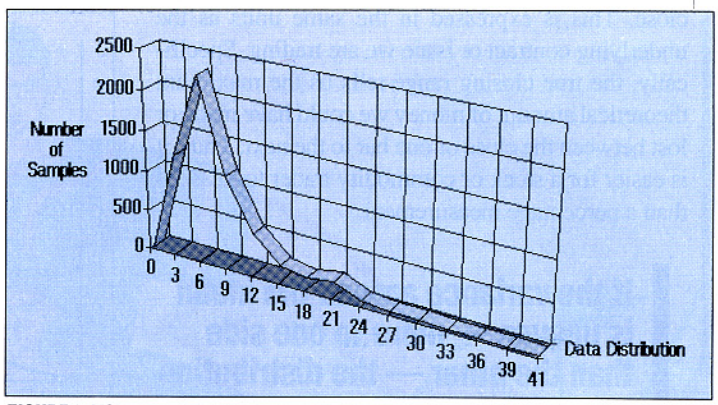


FIGURE 3: VOLATILITY SKEW. *Here is a distribution chart of the TCR of wheat. Maximum TCR is higher in magnitude than a normal distribution of TCRs would suggest.*

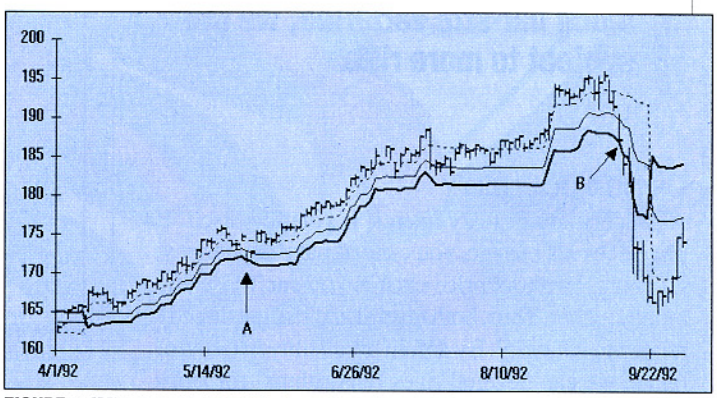


FIGURE 4: IMM BRITISH POUND. *Here, the performance of the IMM British pound is tracked on a daily basis from spring to summer 1992 with the three dev-stop levels.*

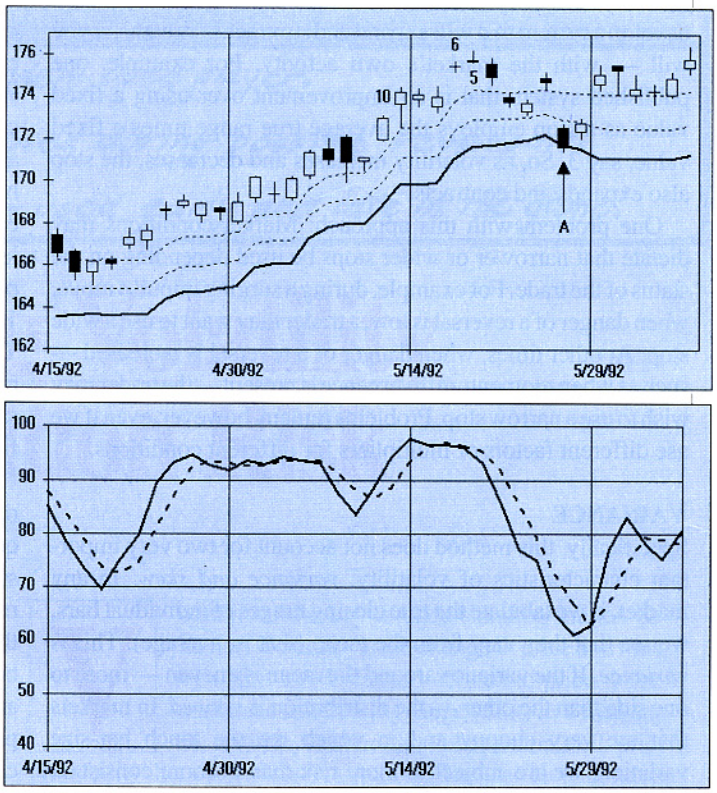


FIGURE 5: TREND REVERSAL. *Look at the situation prior to point A and imagine how two different types of traders might handle a possible reversal.*

design of our stop-loss method, the dev-stop. The reversal value for the dev-stop simply calculates the average true range and standard deviation of the true range of a *double* bar and sets three levels equal to an estimate of 15%, 2% and nil chance of being stopped out during a two-bar reversal, including a correction for volatility skew.

The dev-stop is displayed at three levels:

1. ***Narrow stop:*** Use early in the trade or late in the trade when indications are that a major reversal or end of trend is imminent.
2. ***Medium stop:*** Use as an intermediate stop to lighten up on trade size during possible reversals.
3. ***Wide stop:*** Use most of the time.

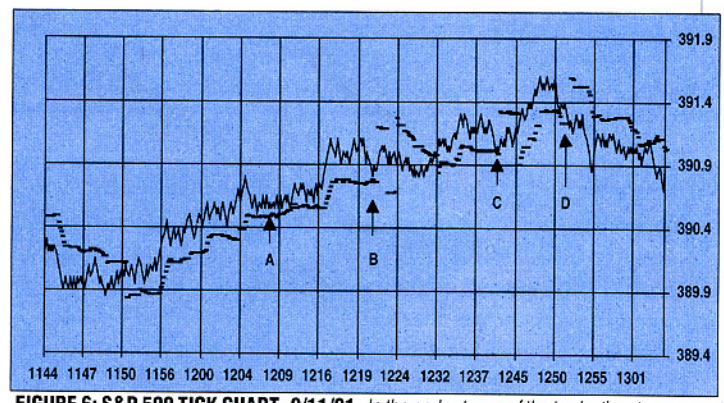


FIGURE 6: S&P 500 TICK CHART, 9/11/91. *In the early stages of the trade, the stop may not be moved above breakeven.*

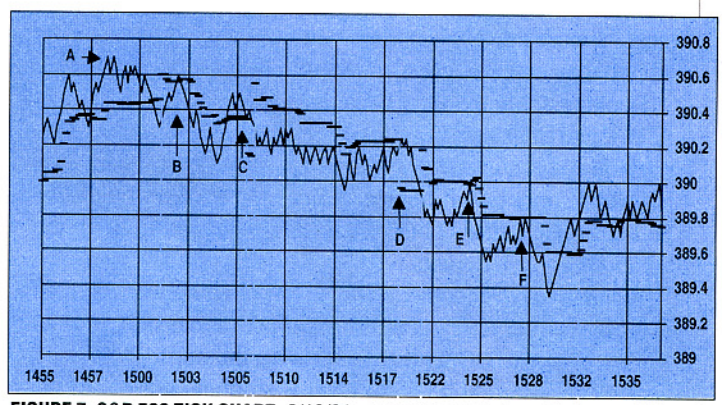


FIGURE 7: S&P 500 TICK CHART, 9/13/91. *Another example shows that we would be using the peak at A as the stop, and add to the position at B.*

USING THE DEV-STOP

Now look at Figure 4, which tracks the performance of the IMM British pound on a daily basis from spring and summer 1992. Normally, all three dev-stop levels are shown as dots, but for the sake of clarity we are displaying the third level as a line. Note how the third-level stop holds for the life of the trend, with the exception of the bar above the A arrow.

Typically, the third level will contain major trends with the exception of either the first or second major corrections, referred to in Elliott wave terminology as wave 2 and wave 4.

In addition, note also how the bar above the arrow labeled B, which would be noted by traditional chartists as a reversal-gap bar or by others as being preceded by a breakaway gap†, extends right to the third-level stop. Those who can trade quickly in and out of the market may wish to operate with levels 2 and 3 (scaling out either 1/3 at 2 and 2/3 at 3 or 50/50, depending on your risk appetite), while larger players or those unavailable during the day might choose to remain with level 3.

WHEN TO USE A NARROW STOP

Generally, we would use a narrow stop when we receive either an exit signal or a warning that the trend might be reversing. Figure 5 is an example of a trend reversal. Look at the situation prior to point A on Figure 5 and imagine how two different types of traders might handle a possible reversal. Bars are numbered according to the numbers of bars back relative to A.

CALCULATING THE DEV-STOP

1. Calculate true range of double bar (use highest of both highs, lowest of both lows). Note that the high-low range may be substituted for short bars.
2. Calculate moving average of true ranges (ATR). Use a 30-bar moving average for intraday charts and a 20-bar moving average for daily charts.
3. Calculate standard deviation of true ranges (SDEV)
4. Dev-stop reversal value (DDEV) = ATR + (f * (SDEV)) where f = 1, 2.06 to 2.25 and 3.20 to 3.50 to correct for skew.
5. Dev-stop long = Trade high -DDEV
   Dev-stop short = Trade low + DDEV

Now evaluate the general situation using techniques widely available in the public domain:

1. At bar 10, we leave a gap in the market that has remained unfilled.
2. At bar 6, we leave another gap, possibly a minor exhaustion gap.
3. The (21-day) slow stochastic at bar 5 has a value around 95. (My view is that we can only identify reversal patterns when momentum is at an extremely high or low level.)
4. Bars 5 and 6 are star candlesticks. In context, these stars are of the abandoned-babies† candlestick formation, constituting a good setup for a modified evening star† formation.
5. At bar 5, dev-stop level 1 is 174.47, while the bottom of the gap prior to 6 is 174.54. (It is common for the dev-stop to fall within a couple of ticks of a natural — that is, support or resistance levels — stop point.)
6. Also at bar 5, dev-stop level 3 falls in the middle of the gap prior to 10. (The bottom of the gap is denoted by blue line.)
7. The 50% retracement level falls just below the gap.

Therefore, we have a higher degree of danger than is usual. We also have good reason to believe that if the first gap does not hold, the market will fall below dev-stop level 3 to fill the earlier gap

†*See Traders' Glossary for definition*

and seek the 50% retracement level. A market timer might decide to exit 50% of his or her trade, should the market close below bar 6 in the gap area and another 50% at level 1. A position holder might decide to take some profit (perhaps on a third of the position) on a close below the gap, and then adjust level 3 to just below the 50% retracement level, and sit through the reversal.

The dev-stop works as described on bar charts from monthly down to intraday bars with a range high enough to overcome normal slippage and commissions. Below this level, the dev-stop can work on tick charts as well. This is one reason for the double-bar analysis of variance.

Tick charts are somewhat more erratic and have a higher degree of skew than normal bars; thus, we are using 4.5 standard deviations as our stop, and only one level. Because it is not feasible to constantly call your broker to keep moving your stops, a more practical approach for tick charts is to move the stop to the next level every time a new high or low is reached.

Looking at Figure 6, we could have added to the position at A, B, C and D. In the early stages of the trade, we might not move our stop above breakeven. Once past A, we would raise the stop to level A, once past B to level B and so forth. We would have gotten stopped after D but would have benefited from all the additions at earlier points.

Figure 7 shows another example. At point B, we would be using the peak at A (or a couple ticks above) as our stop, and add to the position at B. Once past B, we lower the stop to B. At point C, we are operating with the level B stop and add when the calculated level at C is breached, and so forth. In that way we benefit from the first four times we short contracts, even though we might lose a bit on those added at F.

TO CONCLUDE

The dev-stop gives us a universal method that can accurately describe common market behavior and can be used across all markets and in all tradable timeframes. We can know our approximate odds of being stopped out under defined reversal conditions and can use the stop to look for agreement with stop levels determined by other forms of technical analysis to estimate which stop levels are likely to be hit.

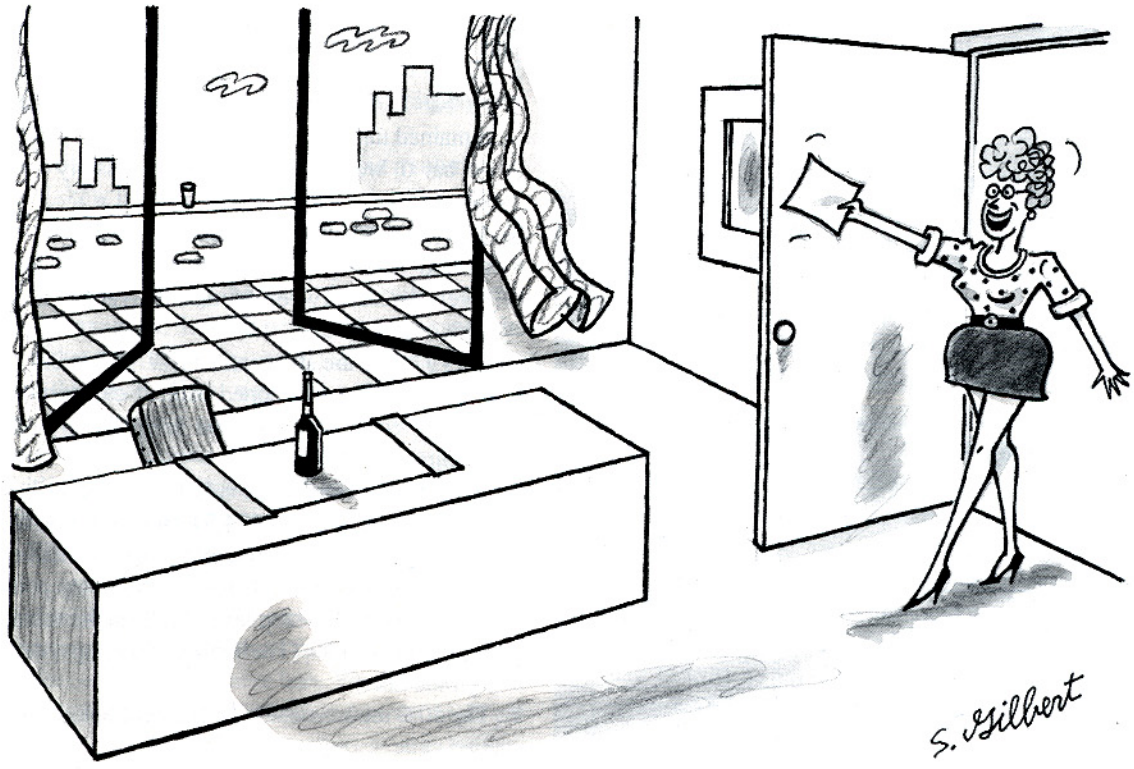
C.A. Kase, CTA, has more than 13 years' experience in physical and futures trading and advises institutions and corporations on trading strategies. Kase can be reached at 718 727-2214 voice, 718 727-2352 fax.

REFERENCES

Bookstaber, Richard [1985]. *The Complete Investment Book*, Scott, Foresman and Co.

Kase, C.A. [1993]. *Getting Started in Low-Risk Trading*, C.A. Kase & Co.

Wilder, J. Welles [1978]. *New Concepts in Technical Trading Systems*, Trend Research.



"Wonderful news, Mr. Leadfoot! The merger succeeded after all! Mr. Leadfoot?"