

Reliability Is Harder Than It Looks

The Vortex Indicator

The search for a reliable technical indicator for trading a change in market direction seems to be a never-ending quest. Ideally, such an indicator should be on time; neither lagging the market nor too sensitive. The Vortex Indicator was developed as a new directional movement indicator, drawing inspiration in part from J. Welles Wilder's directional movement indicator. The result is a simple but effective indicator that can be used to develop intriguing trading ideas.



After thoroughly researching technical tools, we concluded that the concept of the directional movement index (DMI) offered the most accurate way to identify trend direction or significant price moves in the market. The concept of DMI was best defined and described by J. Welles Wilder in his classic 1978 book *New Concepts In Technical Trading Systems*. The result of his work is the now-famous and highly effective indicator, which inspired the creation of our Vortex Indicator.

To understand the Vortex Indicator better, we must describe directional movement. The idea is that the individual relationship between price bars provides clues to the direction of the trend or market. Wilder summed it up thus: "Directional movement is the largest part of today's range that is outside yesterday's range."

Positive directional movement is simply the portion of a price bar that is above the high of the previous bar. Negative directional movement is the portion of the price bar that is lower than the previous low. The smaller of these two values is assigned a zero value. The larger number is used to indicate if the market is moving up (positive) or down (negative). In the case of an inside bar (if neither the high nor the low is higher or lower than the previous bar), a zero value is assigned to both positive and negative direction.

The result will be a string of seemingly random

consecutive zeroes or positive numbers placed in two columns assigned for positive and negative directional movement. However, if these two strings of numbers are summed after 14, 21, or 55 periods, the larger value gives an indication of overall trend. If this process is continued, the result can be seen on a chart as two lines representing positive and negative directional movement. These will intersect and cross during a change of trend and diverge wider and wider as the strength of the trend increases. This is the basis of Wilder's DMI.

INSPIRATION FROM NATURE

The Vortex Indicator's inspiration for another view on directional movement comes from an entirely different source. Viktor Schauburger (1885–1958), who is viewed as the father of "implosion technology," was an Austrian forester, experimenter, and inventor. He sought to develop energy-producing machines that, through their shape, form, and motion, were able to mimic the power of nature's processes. The foundation of his work came from studying nature and analyzing the fluidic vortexes of water in rivers and streams, and later in pipes and turbines.

Using these concepts, we developed the idea that the flow and vortex motions of water in a river mimic those of the markets. Over the years, traders have made interesting comparisons and analogies to market movement. The challenge was to translate this idea to the market.

Figure 1 shows a stylistic vortex flow of water. We visualized that similar vortex flows are present

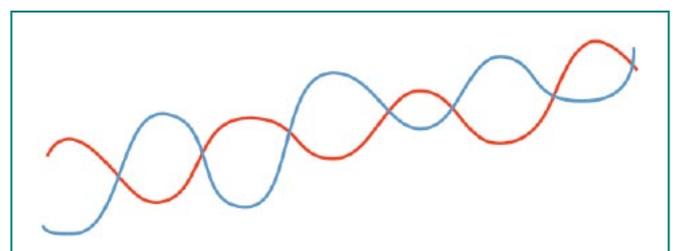


FIGURE 1: A TYPICAL VORTEX FLOW

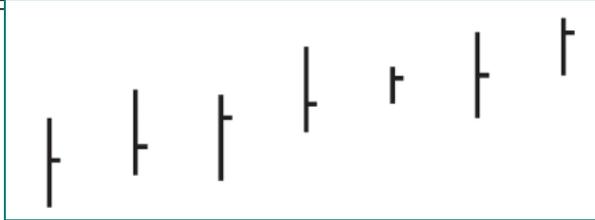


FIGURE 2: VORTEX FLOWS IN THE MARKETS

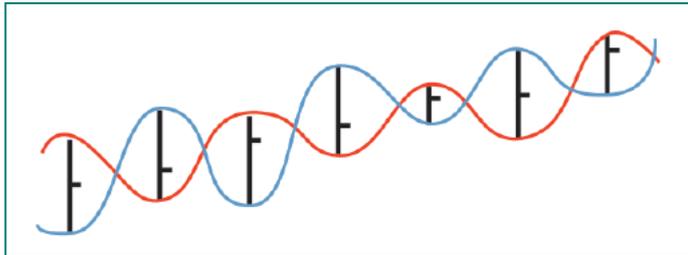


FIGURE 3: VORTEX PATTERN IN THE MARKET. In connecting the lows with consecutive highs and highs with consecutive lows, you can see a vortex pattern in the markets.

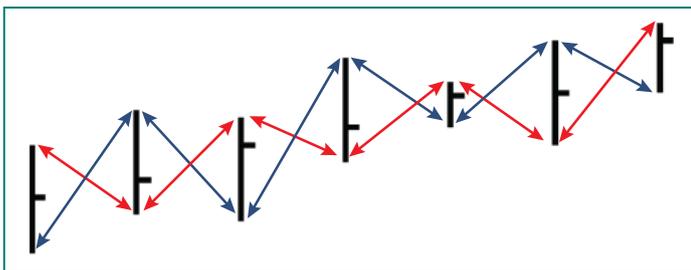


FIGURE 4: THE VORTEX INDICATOR. The greater the distance from yesterday's low to today's high, the stronger the upward (or positive) vortex. Similarly, the greater the distance between yesterday's high and today's low, the stronger the downward (or negative) vortex.

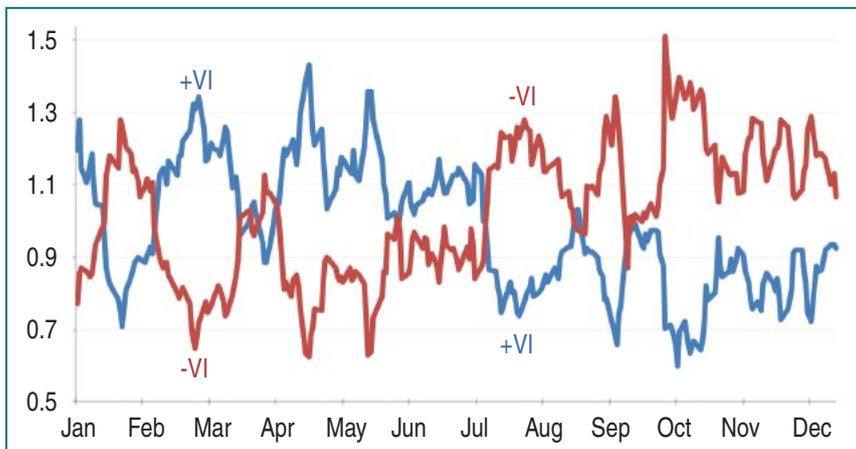


FIGURE 5: 14-PERIOD DAILY VORTEX INDICATOR FOR CRUDE OIL. +VI and -VI converge and diverge in relation to one another and sometimes intersect each other. When +V is greater than -V, the market is trending up. When -V is greater than +V, the market is trending down. The crossing points are the potential trend change points.

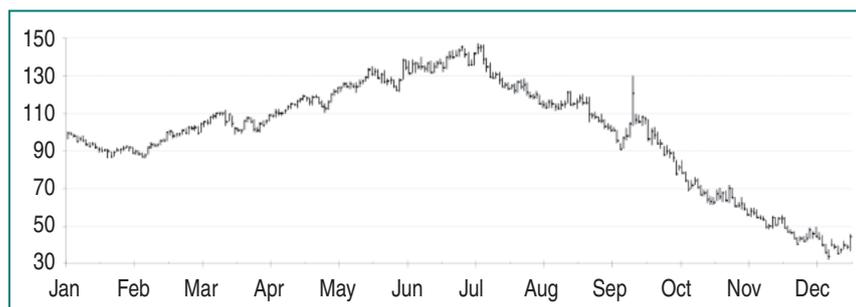


FIGURE 6: CRUDE OIL. As the trend strengthens, note the +VI and -VI lines increasingly diverge. As the trend weakens, the +VI and -VI lines converge.

in the market, influencing the flow of the market (Figure 2). By simply connecting the lows with consecutive highs as well as highs with consecutive lows, we can see a vortex pattern in the market (Figure 3).

This may seem like a tenuous link, yet it served as the spark of innovation for this discovery. Based on the simplicity of calculating the distances between consecutive lows and highs, and highs and lows, the Vortex Indicator was born (Figure 4). The greater the distance from yesterday's low to today's high, the stronger the upward (or positive) vortex. Similarly, the greater the distance between yesterday's high and today's low, the stronger the downward (or negative) vortex movement. As with the DMI, these relationships become more meaningful if a string of upward and downward vortex relationships are summed.

How do we treat an inside bar? Remember, an inside bar is where today's high is lower than yesterday, and the low is higher than yesterday. Wilder believed that such a day represented zero directional movement and assigned a zero value for both upward and downward moves. For the Vortex Indicator, the calculated values for upward and downward movement are included in the calculation.

This is the major difference between the Vortex Indicator and Wilder's DMI: at no stage in the calculation of the indicator are numerical values substituted for zeroes. Please refer to the sidebar on page 25, "The Vortex Indicator With Excel," for a simple explanation of the calculations and construction of the indicator.

INTERPRETING IT

In Figure 5 we have drawn the 14-period daily Vortex Indicator for crude oil. We have chosen the 14-day parameter because Wilder used this same parameter for the DMI in his original book. Note two lines (+VI and -VI) converging and diverging in relation to one another, and at times intersecting and crossing each other. The interpretation is simple: When +VI is bigger and above -VI, the market is trending up. Similarly, if -VI is bigger and above +VI, the market is trending down. The crossing points are the all-important potential trend change points. When compared to the price chart of crude oil in Figure 6, note how the lines increasingly diverge as the trend strengthens and converge as the trend weakens.

All technical tools will indicate a clear trend. In this regard, all technical indicators are always right. The significance and accuracy of any indicator is tested at the point of a change of a trend direction. All technical indicators are bound to have some false signals before the real direction is indicated. The key is to find one that gives the least false signals but at the same time does not lag the market too much.

The Vortex Indicator is effective in identifying the start, existence, or trend continuation in any market. The indicator can be used in

THE VORTEX INDICATOR WITH EXCEL

Traders will recognize that the calculation for the Vortex Indicator is in many ways similar to J. Welles Wilder's DMI. In the Excel spreadsheet (sidebar Figure 1), the first calculation is for the positive trending vortex movement +VM column and starts in cell E3:

$$=ABS(B3-C2)$$

Column F calculates the negative trending vortex movement -VM. The formula for cell F3 is:

$$=ABS(C3-B2)$$

The daily calculations are volatile so the data needs to be smoothed. This is done by deciding on a parameter length for the Vortex Indicator. For this example, we have chosen a 14-period vortex. The formula is simply the sum of the last 14 +VM values in cell G16:

$$=SUM(E3:E16)$$

The same for the -VM values in cell H16:

$$=SUM(F3:F16)$$

Next, we calculate the true range (TR) in cell I3:

$$=MAX(B3-C3,ABS(B3-D2),ABS(C3-D2))$$

Next, we need to get the sum of the last 14 periods' true range. Keep in mind if you want to change the parameter of vortex to 21, 34, or 55, you will also need to use the sum of the last 21, 34, or 55 periods' true range. In this case, we sum the true range in cell J16:

$$=SUM(I3:I16)$$

	A	B	C	D	E	F	G	H	I	J	K	L
1	DATE	HI	LO	CLOSE	VM+	VM-	VM+14	VM-14	TR	TR14	VI14+	VI14-
2	10/1/2007	82.02	79.45	80.24								
3	10/2/2007	80.43	78.87	80.05	0.98	3.15			1.56			
4	10/3/2007	80.88	79.57	79.94	2.01	0.86			1.31			
5	10/4/2007	81.75	78.91	81.44	2.18	1.97			2.84			
6	10/5/2007	81.68	80.51	81.22	2.77	1.24			1.17			
7	10/8/2007	81.11	78.35	79.02	0.6	3.33			2.87			
8	10/9/2007	81.1	78.39	80.26	2.75	2.72			2.71			
9	10/10/2007	81.35	79.72	81.3	2.96	1.38			1.63			
10	10/11/2007	83.67	81.25	83.08	3.95	0.1			2.42			
11	10/12/2007	84.05	82.69	83.69	2.8	0.98			1.36			
12	10/15/2007	86.71	83.5	86.13	4.02	0.55			3.21			
13	10/16/2007	88.2	86.13	87.61	4.7	0.58			2.07			
14	10/17/2007	89	86.91	87.4	2.87	1.29			2.09			
15	10/18/2007	89.78	87.1	89.47	2.87	1.9			2.68			
16	10/19/2007	90.07	87.86	88.6	2.97	1.92	38.43	21.97	2.21	30.13	1.275473	0.729174
17	10/22/2007	88.86	86.17	87.56	1	3.9	38.45	22.72	2.69	31.26	1.230006	0.726807
18	10/23/2007	86.79	84.82	85.27	0.62	4.04	37.06	25.9	2.74	32.69	1.13368	0.792291
19	10/24/2007	87.79	84.68	87.1	2.97	2.11	37.85	26.04	3.11	32.96	1.148362	0.790049
20	10/25/2007	90.6	87.54	90.46	5.92	0.25	41	25.05	3.5	35.29	1.161802	0.709833
21	10/26/2007	92.22	90.2	91.86	4.68	0.4	45.08	22.12	2.02	34.44	1.308943	0.642276
22	10/29/2007	93.8	91.52	93.53	3.6	0.7	45.93	20.1	2.28	34.01	1.350485	0.591003
23	10/30/2007	93.68	89.53	90.38	2.16	4.27	45.13	22.99	4.15	36.53	1.235423	0.629346
24	10/31/2007	95.28	88.92	94.53	5.75	4.76	46.93	27.65	6.36	40.47	1.159624	0.683222
25	11/1/2007	96.24	92.06	93.49	7.32	3.22	51.45	29.89	4.18	43.29	1.188496	0.69046
26	11/2/2007	96.03	93.05	95.93	3.97	3.19	51.4	32.53	2.98	43.06	1.193683	0.755458
27	11/5/2007	96.12	93.72	93.98	3.07	2.31	49.77	34.26	2.4	43.39	1.147038	0.789583
28	11/6/2007	97.1	94.41	96.7	3.38	1.71	50.28	34.68	3.12	44.42	1.131923	0.780729
29	11/7/2007	98.62	94.62	96.37	4.21	2.48	51.62	35.26	4	45.74	1.128553	0.770879
30	11/8/2007	97.7	94.93	95.46	3.08	3.69	51.73	37.03	2.77	46.3	1.117279	0.799784
31	11/9/2007	96.68	94.54	96.32	1.75	3.16	52.48	36.29	2.14	45.75	1.147104	0.793224
32	11/12/2007	96.2	93.54	94.62	1.66	3.14	53.52	35.39	2.78	45.79	1.168814	0.772876
33	11/13/2007	94.7	90.13	91.17	1.16	6.07	51.71	39.35	4.57	47.25	1.094392	0.832804
34	11/14/2007	94.37	91.21	94.09	4.24	3.49	50.03	42.59	3.2	46.95	1.065602	0.907135
35	11/15/2007	94.64	91.86	93.43	3.43	2.51	48.78	44.7	2.78	47.71	1.022427	0.936911
36	11/16/2007	95.73	93.2	95.1	3.87	1.44	49.05	45.44	2.53	47.96	1.022727	0.947456
37	11/19/2007	95.15	93.16	94.64	1.95	2.57	48.84	43.74	1.99	45.8	1.066376	0.955022
38	11/20/2007	98.62	93.99	98.03	5.46	1.16	48.55	40.14	4.63	44.07	1.101656	0.910824
39	11/21/2007	99.29	96.31	97.29	5.3	2.31	46.53	39.23	2.98	42.87	1.085374	0.915092

SIDEBAR FIGURE 1: CALCULATING THE VORTEX INDICATOR USING AN EXCEL SPREADSHEET

Finally, we need to calculate the ratio of +VM14 and -VM14 to the sum of the last 14 days' daily true ranges. We do this in cell K16:

$$=G16/J16$$

Similarly, for cell L16:

$$=H16/J16$$

At this point, these two last columns can be used to draw the graph of the Vortex Indicator. —EB & DS

a number of ways: in combination with other indicators, as a confirmation of a trend change, or as part of a larger system. It can also be used on its own, as suggested by Wilder for the DMI. The key is to focus on the crossing points of +VI and -VI. When the +VI14 crosses above the -VI14, a long position is initiated, and similarly for a short position if -VI14 crosses above +VI14.

The Vortex Indicator can be used for any market, parameter, or time frame. It may be used for time frames as short as 15 minutes or hourly, or for longer time frames such as daily or weekly charts. Most technical indicators, including vortex, work better with longer time frames. Longer time frames such as weeklies or monthlies can be used to establish larger macro trends. In this sense, vortex is the ideal tool for both short-term traders as well as longer-time frame fund managers. Similarly, any parameter may be chosen, be it 13, 21, 34, or 55.

Note that we suggest Fibonacci numbers. There is no magic to these numbers; they simply represent a set of conveniently

spaced numbers that provide a good basis for testing. Again, longer parameters are favored as they are more robust and accurate. However, it is up to the preference of the trader to decide on a time frame and parameter that suits their approach best. If you choose a short time frame (like five minutes), we recommend combining this with a long parameter — for example, 34 or 55. Longer time frames and longer parameters result in fewer false signals, but as with any indicator, the price to be paid is delayed entry.

As with any indicator or system, we recommend that you try not to curve-fit too much; it's more important to stick to one time frame and parameter. Keep in mind that trading system development is all about gaining one benefit for the sacrifice of another.

TRADING IDEA

To increase the accuracy of the crossing points of +VI and -VI, we suggest you experiment with set-up techniques to filter and limit taking false trades. Wilder suggested a trade setup for the

TRADING SYSTEMS

DMI that can effectively be used for vortex.

On the point or day of the crossing, the extreme high or extreme low of the day should become your point of entry, either long or short. You do not take a position at the close; you must leave a “good till canceled” (GTC) entry to go long at the high, or go short at the low of the daily bar that indicated the crossing. If you have an existing long position, and the Vortex Indicator indicates a short, the low becomes your point to exit and go short. If this does not occur, remain long. The indicator may turn back up to long, saving you a false stop and entry. We will explain this in detail in our trading examples.

Even if -VI remains below +VI for a number of trendless bars, your point of going short is still that *first* original bar of the crossing. It may seem puzzling to delay an entry at a more expensive price, either long or short. However, as in the case of other indicators, the vortex is not always accurate, and this method will save you a significant number of false signals. Further, it may happen that you are already holding a long position. It is to your advantage to filter out a false short signal, and vice versa.

In the case of a trendless sideways market, many such crossings may be indicated, but using the same sort of trade setup

will help you filter out these false trades. As a matter of interest, using this technique will improve most systems or approaches despite the cost of delayed entry.



STOP-LOSS AND TAKING PROFITS

Wilder suggests trading the DMI from one crossing to the next, similar to a swing system. This means the new long entry also acts as a stop for a short and vice versa. This may not be the most efficient approach, unless you have a very long-term investment horizon. By not leaving a predetermined stop-

loss with your broker, you may be exposed to high risk in the event of a fast-moving market or an adverse event. Further, we recommend that you use a trailing-stop strategy to enable you to fully let your profits run.

By using a market-derived trailing stop, the size of your profit is determined by the market itself. You may choose to experiment with a trailing stop-loss strategy derived from the true range or average true range or adaptive permutations thereof. Fixed-percentage stops or stops based on an arbitrary dollar figure are not recommended, as each market has different characteristics and volatilities.

TRADING EXAMPLES

We will now show you how to trade the change of trend direction. As an example, we have used the NYMEX crude oil future (light sweet) of 2008. We have constructed a Vortex Indicator using daily bars as our time frame and a 14-period parameter.

Looking at the bar chart for 2008 (Figure 6 on page 24), three obvious opportunities stand out. First, there is a brief opportunity to go short at the beginning of the year, followed by a shallow-angle bull market headed into July. Readers may concur that any shallow-angle market is one of the most difficult and frustrating markets to trade. Finally, there is an extended bear market to the end of the year with a nasty, unexpected spike to \$130 in September. The vortex graph for the same period shows an opportunity for a short whenever the red -VI line is above the blue +VI and vice versa. As with any indicator, some false turning points are indicated, especially during that shallow-angle bull market in the first part of the year.

We will focus on three examples to illustrate different trading situations (Figure 7). In example 1 (Figure 8), on January 15, 2008, the Vortex Indicator turned to indicate a short signal. On the day of the crossing, the low of the session was at 90.98 and the market closed at 91.90. The procedure was to leave an order with your broker to go short at 90.98. This was triggered the next day. By using a trailing-stop strategy, this can be a profitable trade.

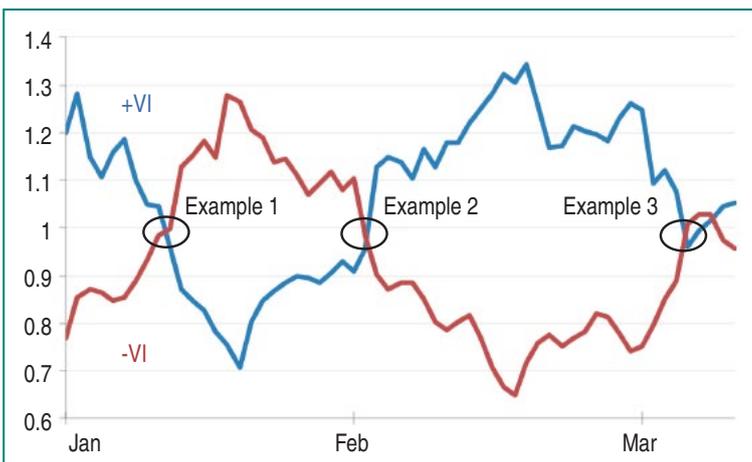


FIGURE 7: THREE EXAMPLES, THREE TRADING SITUATIONS

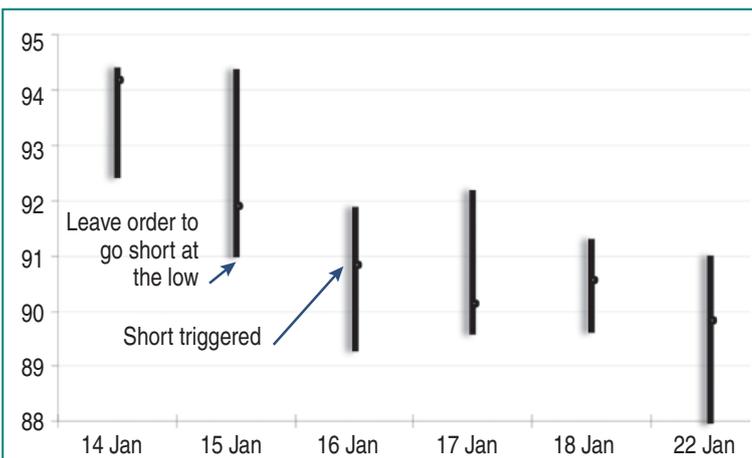


FIGURE 8: EXAMPLE 1. On January 15, 2008, the vortex turned to indicate a short signal. On the day of the crossing, the low of the session was at 90.98 and the market closed at 91.90. You would place an order with a broker to go short at 90.98.

TRADING SYSTEMS

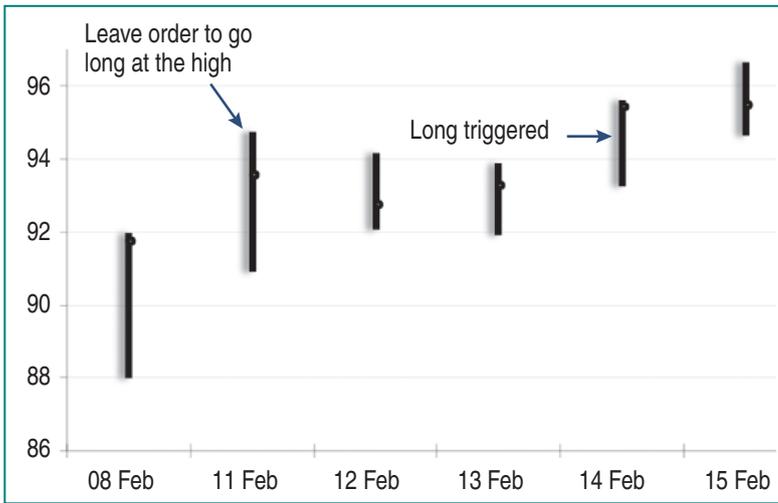


FIGURE 9: EXAMPLE 2. A long signal is given on February 11, 2008. The high was at 94.72. Note that if you had placed a “good till canceled” order to buy at 94.72, your trade would only have been filled three days later.

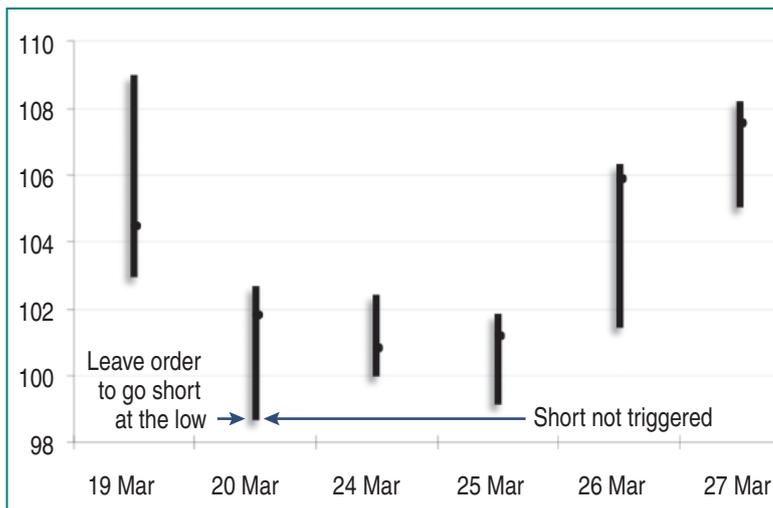


FIGURE 10: EXAMPLE 3. On March 20, 2008, the 14-day vortex shows a turning point for a short signal. The low was at 98.65. However, the short was never triggered since the price did not reach 98.65. So you would cancel the order and continue to remain long.



FIGURE 11: FALSE SIGNALS. Between July 2008 and December 2008, there were two false buy crossings. These signals can be filtered in the same way as in Figure 10.

In example 2 (Figure 9), a long signal was given on February 11, 2008, the high being 94.72. By leaving a GTC order to buy at 94.72, this level was only traded three days later. The market on February 12 and 13 failed

to breach this level. During these days, we learned *not* to adjust or lower the original entry point.

The next turning point, which was displayed in example 3 (Figure 10), was to show how a false signal is filtered. On March 20, 2008, the 14-day vortex showed a turning point for a short signal. The low of the session was 98.65. If you are still long from the previous signal, this point will become a stop and reverse. However, on the following two days, the market lows were only 99.95 and 99.13 before the Vortex Indicator turned back to a long signal again. In this case, your order to go short was never traded. Cancel the order and continue to remain long.

During the long bear market stretching from July 17, 2008 (Figure 11), the two false buy crossings could be filtered in the same way, including that irregular spike to \$130. For this reason we recommend using a type of trailing stop to limit losses or lock in profits, even during this well-defined bear market. Though you may still get stopped out at times during this trend, in most cases it will be with a profit.

If you do get stopped out, you need to experiment with techniques to reenter the same trend, as the Vortex Indicator may still indicate a continuation of the original trend at the end of the session. We suggest using the same method to enter a new trade as described previously. Leave a reentry order at the low or high of the bar you have been stopped out on. Leave this order unchanged until it is traded, or until the Vortex Indicator indicates a swing to the opposite direction. In that case, simply cancel the order and enter a new entry on the opposite high or low.

SPINNING VORTEX

It is up to the creativity of the trader to use the Vortex Indicator as the foundation of new trading ideas. Always remember to backtest your approach before implementing your idea, and always keep your trading recipe as simple as possible.

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SUGGESTED READING

- Evans, Stuart [1999]. “Directional Movement.” *Technical Analysis of STOCKS & COMMODITIES*, Volume 17: February.
- Wilder, J. Welles [1978]. *New Concepts In Technical Trading Systems*, Trend Research.