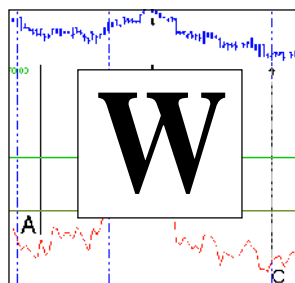


INDICATORS

The Relative Strength Index (RSI)

Here, one of the most popular indicators found in most analytical software packages is explained.

by John Sweeney



When the relative strength index (RSI) became popular in the 1980s, it was touted as the indicator that led every turn in the market. Indeed, for certain futures contracts, financials and currencies, it could be prescient: In those markets, it had the peculiar ability to turn just as the financials would find a level of support or resistance before taking off to another price level.

On other items, say, pork bellies or corn or cocoa, it would ape the price swings precisely. However, on trending prices, it would go up the limits of its excursion and bounce around there for weeks or months until the trend finally reversed. For stocks, its performance could be all over, depending on the trading characteristics of the stock in question.

Clearly, this was an indicator with promise but tricky implementation.

ONE OF A CLASS

J. Welles Wilder's relative strength index is one of a class of indicators known as *oscillators*. These indicators bounce around (or oscillate) between fixed extreme values based on price movement or position of close in range or change in price over time. In the case of RSI, the values can range from zero to 100 but typically fall between 20 and 80.

Like many mainstays, the RSI was introduced in Wilder's *New Concepts in Technical Trading Systems*. There, Wilder outlined its strengths, including three that I think make it the best overall indicator:

- 1 Excursions beyond 70 and 30 are setups for tops and bottoms.
- 2 Chart formations that aren't apparent on the price chart are clear in RSI's line format.
- 3 Divergence between RSI and price is a clear warning of imminent reversal.

For the record, Wilder also felt that support and resistance were more apparent on the RSI line than in price charts and that RSI's failure swings were strong signals of price reversals. I think these two characteristics are included in those above, as we'll see later.

In addition, one characteristic of RSI that Wilder *didn't* mention is its simple direction: If it's going up, so are prices. If it's going down, look south. Therefore, heeding the direction of the RSI should alert you to the trend, depending on the lookback period that you've chosen.

X-RAY

Price charts should cause ideas to percolate in your observant brain. Often, they cause too many ideas or, worse, too many questions. RSI helps with this problem by tossing out all the highs, lows, gaps, excursions to strange price levels and formations to leave you with a single line constrained between two limits.

In fact, in the days when I cut my teeth on my weekly delivery of daily price charts, before the blessing of personal computers, I often covered up the prices just to look at the RSI graph without preconceptions. Thus, the Figure 1 seen here crunches the bars down to innocuous size while emphasizing the movement of RSI.

Working backward by looking at the RSI line first, we can easily see the salient points of action: A, B, C, D and E. In each case, we see in hindsight that RSI turned at or around the top or bottom of the intermediate-term movement (28, 30, 26 and 15 days). Dropping point D, since it never got close to the target level of 30, we see admirable consistency in the length of the bond market swings, half of which is nicely close to the 14 days' length I've used for RSI here. These values haven't changed perceptibly since 1982.

Retreats from RSI extremes match price extremes well. The RSI X-ray gives a nice confirmation or even a clear signal that a change in direction has come.

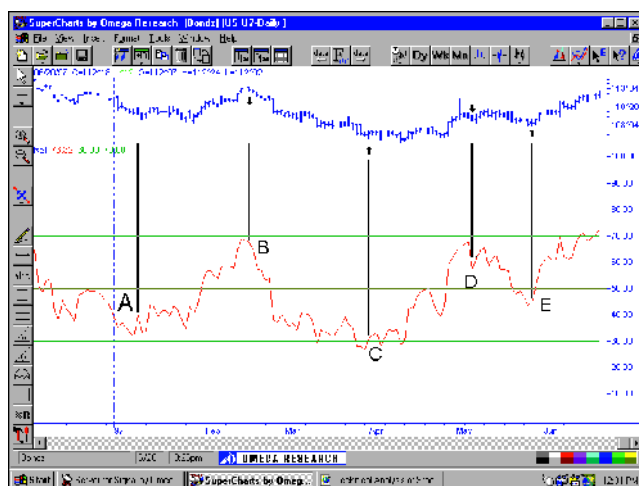


FIGURE 1: BOND ACTION. An RSI set for 14 days ably picks off bond market turnarounds. The actual value chosen for RSI isn't magical — your eye will adjust to how any value distills price charts into definitive pictures.

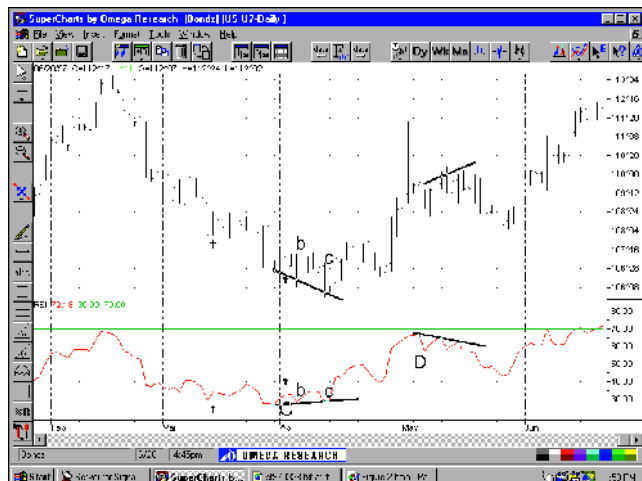


FIGURE 2: SUPPORT AND DIVERGENCE. Zooming in on Figure 1, as bonds hit support above 106, prices press downward as RSI's lows start to rise. As the number of ups and downs starts to equalize during a spell around a given price level, RSI will head back toward a neutral value of 50.

Points C and D illustrate the strength of RSI's divergence feature. Figure 2 inspects this more closely. From point C, points b and c rise on the RSI graph, while the commensurate b and c decline on price. Nevertheless, RSI is correct; we're not continuing downward but have hit support and even move to the upside some days later. Here, RSI is telling you the downward movement has come to an end, not that a reversal is necessarily imminent. The odds have shifted from down to flat or up. Point D portends similar news to the downside in May of the same chart.

Of course, this sort of indication is not infallible. Part of its effectiveness is the instrument selected. In the case of bonds (or interest rates in general), the size of the markets precludes

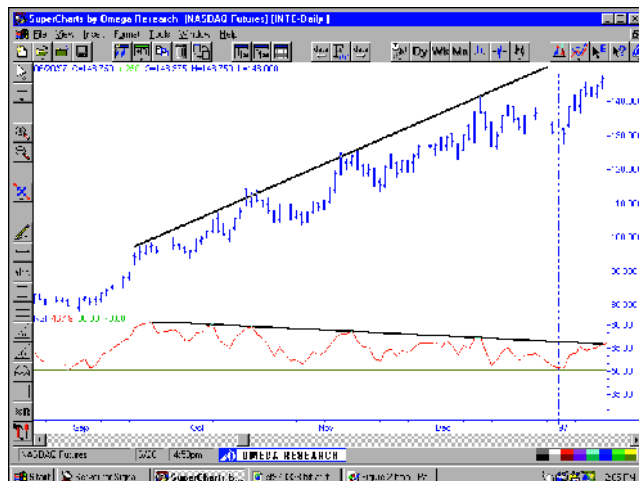


FIGURE 3: INTEL TAKES RSI FOR A RIDE. Intel's September 1996 breakout drives RSI to 82, but the oscillator recedes steadily during INTC's advance, a good example of any oscillator's inability to handle trend well.

instantaneous jumps to other levels. Thus, fluctuations even within major moves fit the design of an indicator created to pick up price oscillations. Inspection of the coincident price and RSI movement over some years is the only way to get a feel for this.

ON THE DOWNSIDE

If RSI is effective in trading swings, it must be ineffective in trends, right? That's true; it's not great at trend-trading. That said, it's not a bad indicator, as it *does* confirm when you're in a trend, valuable knowledge by itself. Some tradables swing well even while trending, but a resolute advance or

CALCULATING RSI

Though the formulation can be made complex, the basic idea of the RSI is straightforward. Considering the last 14 days, let's compare the strength of the upward moves to the downward ones. That should tell us if the price, on average, is stronger in the bull's direction or the bear's. If there are more and bigger upmoves than downmoves, the ratio of the two should increase. If the reverse, it should decrease.

In practice, looking at the past 14 days, you average the day-to-day upward changes (from close to close) and then the day-to-day downward changes. There don't need to be the same number of each. Then you divide the average of the upward changes by the average of the downward changes to get what's called the relative strength, or *RS*.

Since the relative strength ratio could be all over the lot, Wilder arranged to keep it in the corral by using the following formula

$$RSI = 100 - \left[\frac{100}{1 + RS} \right]$$

where RSI is the relative strength index.

The next day, smoothing the result, you multiply the average up close by 13, add today's up change (if any) and divide by 14. For the downs, you multiply yesterday's average down close by 13, add today's downward change (if any), and divide by 14. Then compute relative strength and RSI as before.

Since 1978, many other algebraic formulations have made this simpler; more complex; more flexible; or more convenient, but this formulation is the essential idea. This way, the idea can be maintained by hand (as Wilder originally did) or easily programmed in a worksheet or interpreted computer language.

Wilder is reported to have selected the averaging period of 14 through personal experience. I've found that the period is indeed experience-related: whatever period you pick, you'll soon be experienced with it and interpret its fluctuations appropriately. Theoretically, at least, the period should be the half cycle of the tradable, so truly outlandish numbers should be avoided, but 14 isn't a bad number for most futures and 21 isn't bad for most equities.

decline will find RSI pegged above or below its signal boundaries of 30 and 70. (See sidebar, "Calculating RSI.")

Figure 3 shows such a situation in Intel [INTC]. Here, RSI maxed out in the very first runup, then drifted around the signal boundary with declining highs even as INTC roared up another \$45 per share. RSI's role here was that, in going to 82 in the first place, it portended extraordinary strength, the probable onset of trending. Had you been using RSI as an oscillator here, only your experience-based stop would have protected you from the inevitable loss of going short.

Of course, there were few places to go short, since there are higher highs and higher lows throughout the advance.

SUMMARY

RSI is a great indicator, one of only three I've used religiously

for 15 years (the other two being moving averages and on-balance volume), but its limitations must be understood. Given that, you can reliably use RSI in tradables that swing well, futures contracts being the best bets. Hesitate before invoking RSI on a trending equity, but pay attention to its hitting extreme values: that's usually a clue to trend-sustaining strength.

John Sweeney is Technical Editor for STOCKS & COMMODITIES.

REFERENCE

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

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