

*Systems And The Universal Cycle Index*

# Cycles In Time And Money

*Wouldn't you like to be able to identify top and bottom extremes and get signals to open new positions or close current ones? This may help.*



When was the last time you thought about using cycles to design a trading system? Many trading systems depend on cycle indicators, and in this article I will focus on systems derived from oscillators. These days, there are literally hundreds of oscillator-based cycle indicators, each scalable by one or more parameters. In addition, most toolbox programs provide a simple formula language, which you can use to derive any number of personal variations.

Markets, groups, and individual securities have characteristic behavior that requires just the right indicator for a given time frame and trading bar interval. It is also evident that markets demonstrate both extended trending and flat or trading type price action, each of which may or may not favor one indicator over the other. But is this level of complexity necessary?

## ***The universal cycle index (UCI)***

The universal cycle index (UCI) is a standard of reference applicable to any security, time frame, and trading bar interval during either oscillating or trending price action. The MetaStock user formulas are shown in the sidebar on the last page, but here, I will:

- Outline a baseline trading system to test the performance of the UCI in example applications.
- Compare the real-time UCI to best-estimate centered versions to determine the effect of increased time lag on performance.
- Show that the UCI, as our standard of reference, is essentially equivalent to any similarly scaled and normalized oscillator.
- Test and compare UCI performance applied to: a volatile common stock with daily price bars; two days of the same stock with five-minute price bars; a less volatile stock with daily bars; and a mutual fund with weekly price bars.

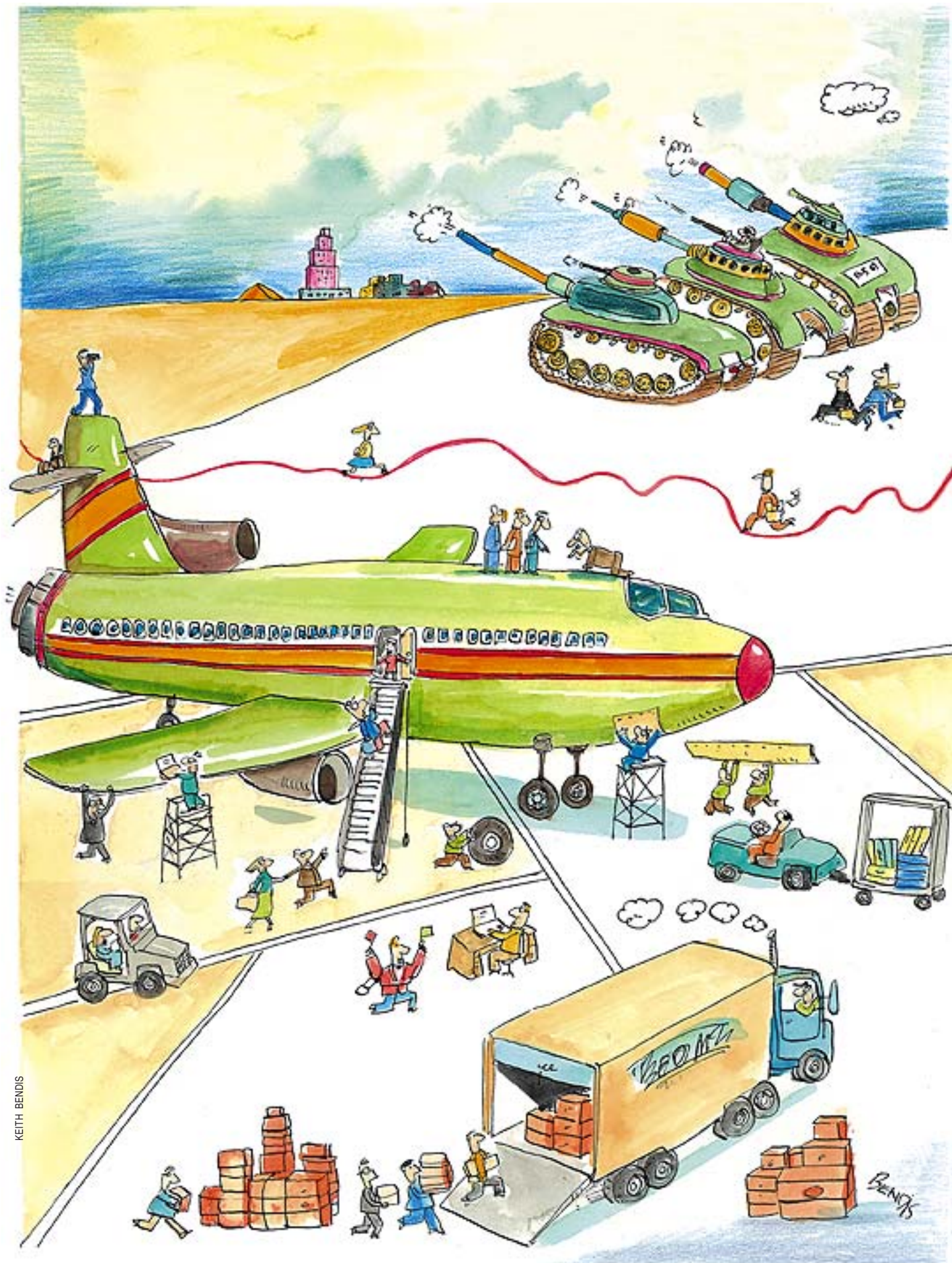
## **MEASURING CYCLES**

The UCI is nothing more than a normalized moving average convergence/divergence (MACD) indicator. I have scaled the index to:

- 1** Fundamental minor cycle period  $T_M = 25$  bars, with minor trend phase interval  $\Delta t = T_M / 2 = 12$  bars
- 2** Secondary cycle period  $T_S = 50$  bars with trend phase interval  $\Delta t = T_S / 2 = 25$  bars
- 3** Intermediate cycle period  $T_I = 100$  bars with trend phase interval  $\Delta t = T_I / 2 = 50$  bars

These may be used on any time interval. All price windows have a semilog scale so that equal percent price or momentum changes are the same everywhere on a particular plot. Normalization involves adjusting an indicator to statistically significant reference limits. In this analysis, the reference is the

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dynamic volatility sigma ( $\sigma_0$ ) calculated as the standard deviation of minor plus subminor price oscillations with respect to a minor-term centered moving average.

The UCI minor cycle limits are  $\pm 50\%$  ( $\sigma_0$ ). A doubling of these levels,  $\pm 100\%$  ( $\sigma_0$ ), corresponds to two-sigma (95%) price action confidence limits. The centered average introduces half-cycle minor-term lag  $\Delta t = T_M/2$  in standard deviation parameter  $\sigma_0$ . This, however, has minimal effect on the utility of the UCI as a slowly changing, real-time measure.

To contrast extended trending and trading range price action, I have included charts of VeriSign (VRSN). In Figure 1, you see an extended upside trend from February 2003 to July 2003. The upside trend is about 100 daily price bars and corresponds to the advance phase of a 200-day primary cycle. In Figure 2, from July through November 2003, VRSN transitions to sideways moving price action with two secondary cycles. Each cycle is approximately 50 bars, and contains advance and decline trend phase intervals of about 25 bars.

**Interestingly, it's all about the continuation signals — in effect, trading tactics and money management.**

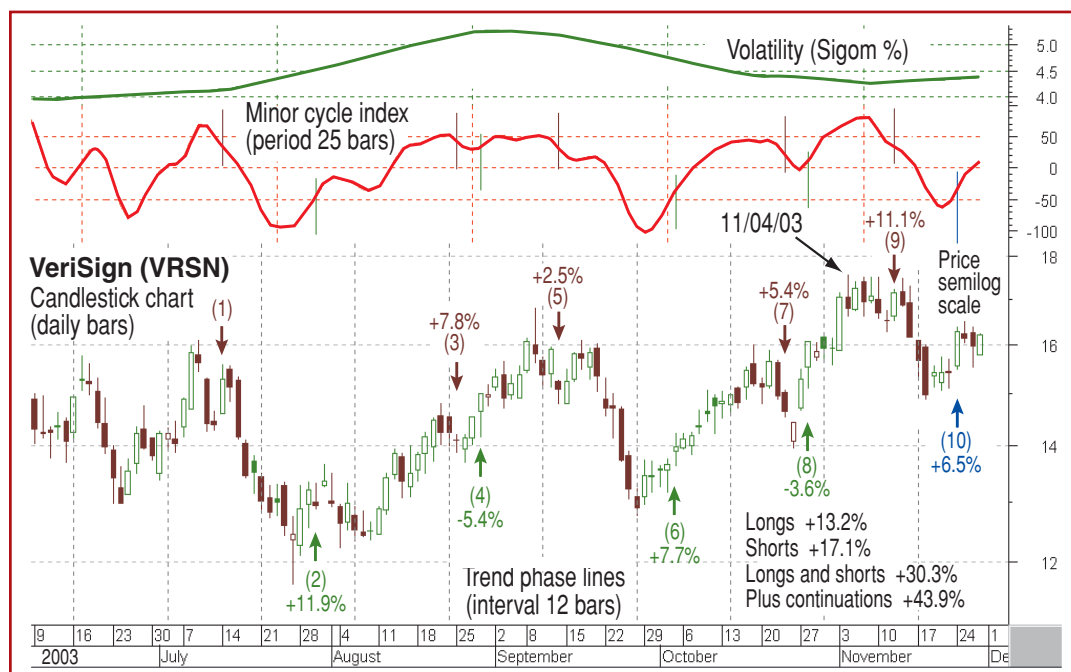


**FIGURE 1: TRENDING PRICE ACTION.** Here you see nine months of a primary trend. As you can see, the trading system performance figures show some very respectable returns.

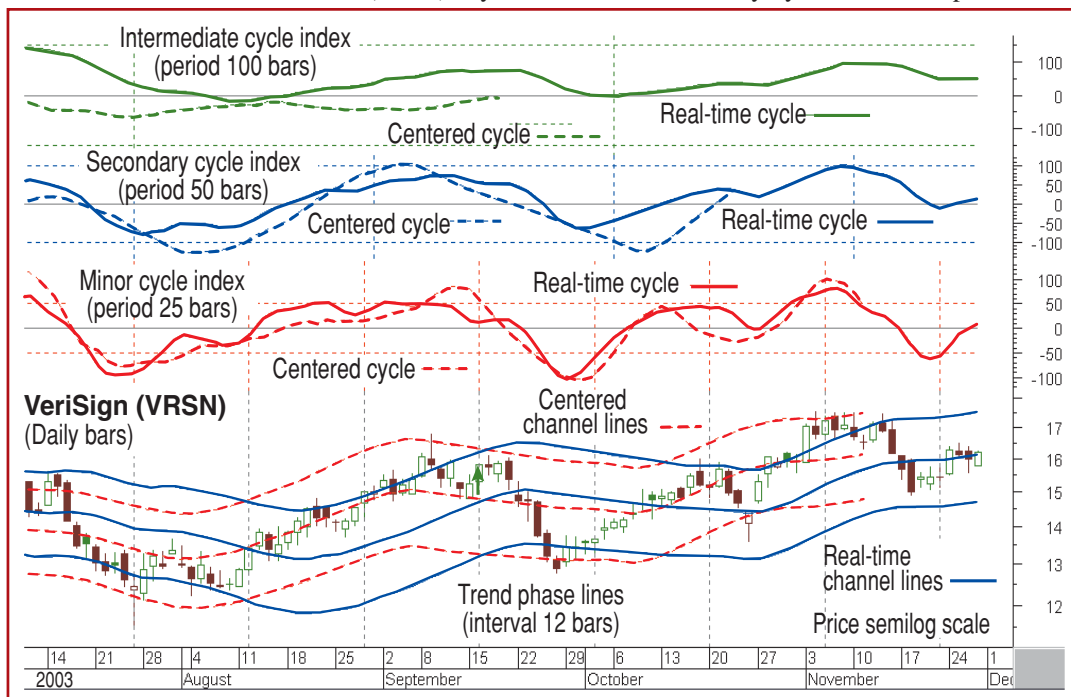
## CYCLES AND TRADING SYSTEMS

To compare and contrast performance, my baseline trading system has the following rules. Note that, here and below, brackets denote a directly [opposite] state or condition:

- 1 When UCI equals or exceeds the designated lower [upper] 50% limit, reverses and crosses this lower [upper] limit upward [downward], place advance [decline] trading arrows below [above] the price action bars as candidate reversal signals.



**FIGURE 2: OSCILLATING PRICE ACTION.** Here, VRSN transitions to a subsequent nine months of neutral oscillations with two secondary cycles.



**FIGURE 3: CENTERED AND REAL-TIME CYCLES.** Comparison of real-time cycle indicators with centered measures illustrates the decrease in accuracy caused by increased lag.

lator, it may or may not help. If you add an accurate momentum indicator or trendline measure, it may help. Any reasonably accurate prediction of longer-term price action by way of technical, financial, or economic analysis will, of course, help.

In any case, Figures 1 and 2, taken as price action examples, are informative. In Figure 1, baseline long signals, used alone, capture only 18.4% of the 118% extended gain. Short signals are a disaster, but combined long and

**2** When a loss in a current long [short] position is on the order of the current one-sigma range displayed in the upper chart window, place down [up] stop-loss signal arrows above [below] the price bar action.

**3** After an initial — and until the final — signal of a particular trading sequence following down [up] stop-loss signals (in the absence of new up [down] reversal signals), interpret continuations as candidate two-way signals indicating new long [short] positions.

These rules support percent gain or loss calculations applicable to four different trading systems: long positions only; short positions only; both long and short positions; or (always-in) long and/or short positions, including continuations. For end-of-day orders, commissions are 0.5% for one-way and 1.0% for two-way trades. For intraday orders, commissions are 0.125% for one-way and 0.25% for two-way trades. Intraday trades assume a fully margined account with positions closed before the end of trading as required to remain flat overnight. The mutual fund example doesn't include commissions. As far as slippage is concerned, we can assume that the execution price is in accord with the price action related to the particular candlestick signal bar.

short trading signals avoid a net loss. If you are clever enough to anticipate the four months of extended trending, long plus long-type continuation signals, without shorts, yield a 53.3% gain or about one-half of the complete extended move.

In the absence of a credible forecast, two-way signals including continuations yield a respectable 35.4% gain, or about one-third of the upside move. Interestingly, it's all about the continuation signals — in effect, trading tactics and money management.

In Figure 2, baseline longs plus shorts produced a 30.3% gain across four months of essentially flat price action. Longs plus shorts alone yield a modest 13% to 17% gain. Combining these with two-way continuation signals raises the net gain to 43.9%. Again, trading tactics and money management appear to be the ticket. Signal criteria based on more complex rules for price action exceeding or crossing zero percent,  $\pm 50\%$ , or  $\pm 100\%$  limit lines in various ways but yield entirely similar results.

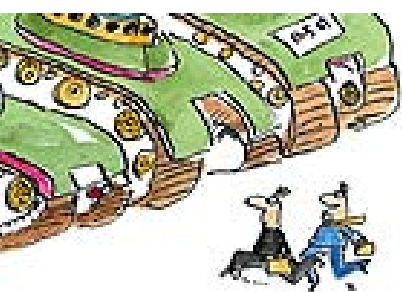
## USING DIFFERENT TIME FRAMES

Figure 3 uses centered oscillators to evaluate the effect of time lag on performance. These centered oscillators, although best estimates of future price action, use one-half cycle of future data and are therefore not available for real-time trading. The calculations, nevertheless, serve as convenient measures of merit for this study.

The top three windows in Figure 3 compare centered UCI estimates with real-time UCI measures scaled to fundamental minor period  $T_M = 25$  bars, secondary cycle period  $T_S = 50$  bars, and intermediate period  $T_I = 100$  bars. The minor-term UCI is similar to its corresponding measure of merit. The secondary UCI, however, tends to miss extremes and crossing points, and the intermediate UCI has very poor fidelity. As might be expected, if you forecast further into the future, it is likely you will experience a proportional loss of accuracy. Rather than applying inaccurate longer-term indicators to fixed trading-bar intervals, it may be

## TRENDS VS. TRADING RANGES

Using only the minor-term UCI and depending exclusively on price action, the baseline system cannot, in and of itself, distinguish between longer-term trending and neutral oscillations. If you add a longer-term oscil-



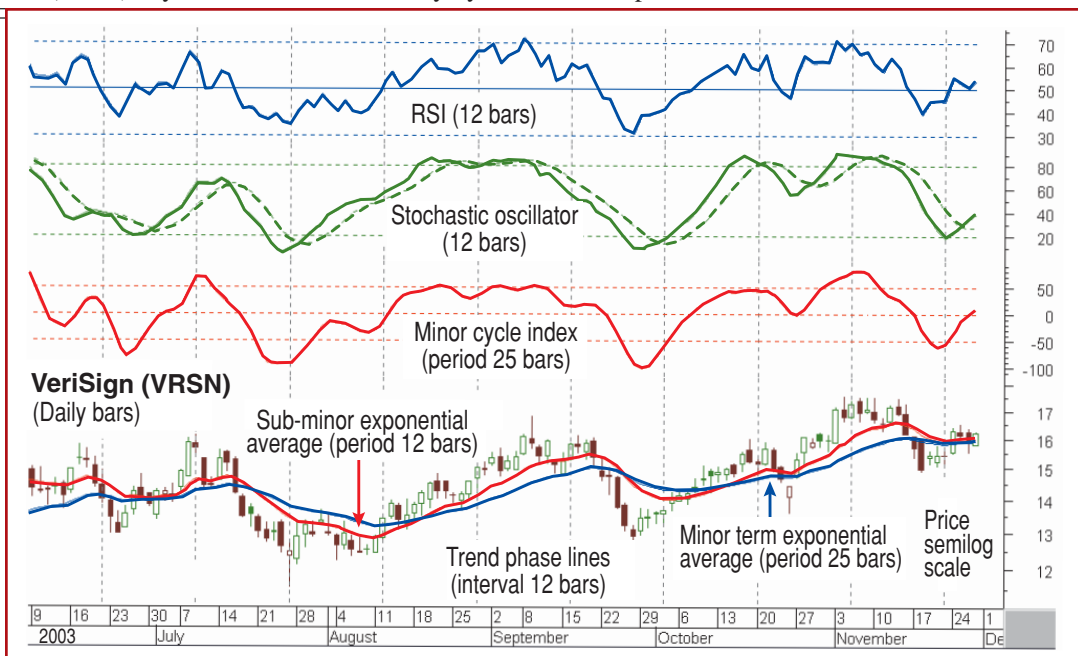
better to apply short-term indicators to longer trading-bar intervals. This is based on the assumption that extended price bars filter out internal action and don't affect performance.

To complete the picture, the bottom window in Figure 3 displays minor-term centered and real-time channel lines spaced according to two-sigma (95%) confidence limits. Note that the centered channels do contain all but about five of 100 price bars. Centered channel lines track trends very closely and would amount to a standalone money machine if available in real time. Real-time channel lines show the unavoidable effects of lag.

### OTHER OSCILLATORS

Figure 4 compares the minor term UCI as a normalized MACD to two classic, similarly scaled oscillator-based indicators: the relative strength index (RSI) and the stochastic oscillator (STO).

The RSI is normalized from zero percent to 100% of the difference between up-bar and down-bar momentum measured as price changes across the scaling interval. The figure includes RSI limit lines at the 30% and 70% levels. The STO is normalized from zero percent to 100% of the



**FIGURE 4: OSCILLATORS.** Classic oscillators such as the relative strength index (RSI) and the stochastic oscillator (STO), when equivalently scaled and normalized, are essentially identical to the UCI.

highest high with respect to the lowest low across the scaling interval. The figure includes STO limit lines at traditional levels of 20% and 80%. Note that with respect to amplitude, phase, and minor details the three oscillators are virtually identical. A bit of algebraic manipulation verifies this similarity of classic oscillators.

The bottom window in Figure 4 includes minor (25-bar) and subminor-term (12-bar) exponential moving averages (EMAs). Note that crossing points and separation extremes are very close to UCI crossing and extreme points. This is because the UCI is derived from the difference of exponential averages. Signals based on moving average crossing action are generally equivalent to oscillator-based signals.



**FIGURE 5: INTRADAY STOCK CHART.** Note that this five-minute chart of VRSN has the same general characteristics as its parent daily chart.

### IS THE UCI UNIVERSAL?

Figure 5 is a five-minute intraday chart of the November 4, 2003, price bar denoted on the VRSN daily chart in Figure 2. With labels and numerals removed, it would be very difficult to distinguish the general characteristics of the five-minute chart from those of the parent daily chart.

Long positions produce a positive gain of +0.88% and short positions, a gain of +2.68% for a combined return of +3.37%. In this example, the inclusion of continuation signals reduces the

composite gain to a very acceptable +2.59%. This is because price action with longs in place happens to trigger three significant stop-loss signals. In addition, the forced close 10 minutes before the close yielded a gain. Other examples show that intraday systems usually do better with always-in two-way trades. As in the case of daily trading, including continuations appears to be a beneficial trading tactic.

In the chart of Boeing (BA) in Figure 6 from July to November 2003, the price chart is similar to that of VRSN over the same period. In this case, long and short positions produce modest gains of +2.8% and +1.8%, respectively, with a combined yield of +4.6% compared to the +25% maximum upside excursion. Including continuations improves the yield to a more generous +14%.

The weekly chart of the Vanguard Star Fund (VGSTX) in Figure 7 has 100 bars of primary-term trending lasting three years with four minor cycles of about 25 bars each. For a mutual fund, you may be limited to long positions with a limit of three or four round-trips per year.

The maximum possible gain is +40%. The price action triggers two longs but is sufficiently oscillatory to close both positions prematurely with a net gain of +20.6%. Including

continuations improves the net gain to +30.7%. The longer-term investor, even when correct about an extended upward trend, does significantly better by incorporating money management.

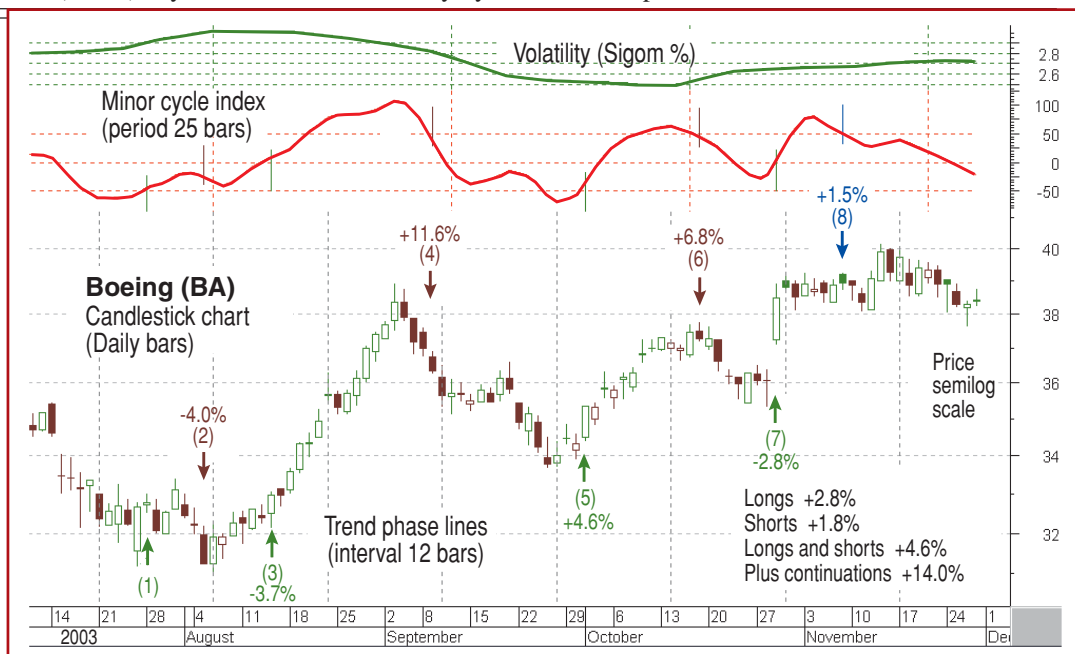
## CONCLUSIONS

There is no need to experiment with a variety of cycle indicators, scale factors, and time intervals. You can use any oscillator-based indicator that you prefer scaled to a personal time frame and normalized by a statistically credible measure of current volatility. It may be better to focus on fewer (more inclusive) price bars as opposed to more (less inclusive) bars across your favored trading intervals.

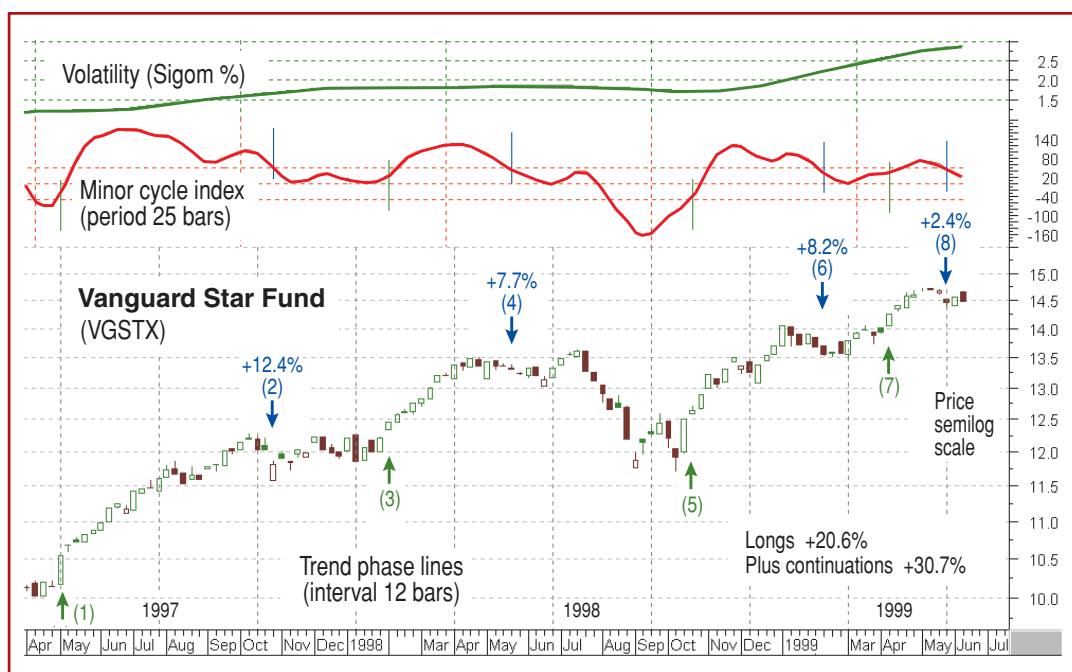
The analysis presented shows that trading systems based entirely on cycle indicators may be profitable, but more as a

matter of trading tactics and money management than choice of signal rules. This is particularly true with respect to the detailed criteria and rules required for a sequence of trades as opposed to simple in-and-out rules, which may serve for individual trades.

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**FIGURE 6: DAILY STOCK CHART.** A template based on this format may be applied to any daily or intraday security with compatible price data.



**FIGURE 7: WEEKLY MUTUAL FUND.** This format also applies to any weekly chart.



**METASTOCK USER FORMULAS FOR UCI****\_sac-sigom**

```
yom:=100*(C-Ref(Mov(C,25,S),12))/
Ref(Mov(C,25,S),12);
avyom:=Sum(yom,50)/50;
varyom:=Sum(yom*yom,50)/50-avyom*avyom;
som:=Ref(Sqrt(varyom),-12);
sigom:=Mov(som,25,S); sigom;
```

**Minor cycle index (period 25 bars)**

```
sigom:=FmlVar("_sac-sigom","sigom");
yme:=100*(Mov(C,6,E)-Mov(C,12,E))/
Mov(C,12,E);
ymes:=TSF(yme,6);
ymesn:= 100*ymes/sigom;
ymesn;-50;+50;0.0;
```

**Centered minor cycle index**

```
sigom:=FmlVar("_sac-sigom","sigom");
ym:=100*(Ref(Mov(C,12,S),6)-Ref(Mov(C,25,S),12))/
Ref(Mov(C,25,S),12);
ymn:=100*ym/sigom; ymn;
```

**Secondary cycle index (period 50 bars)**

```
sigom:=FmlVar("_sac-sigom","sigom");
yse:=100*(Mov(C,12,E)-Mov(C,25,E))/
Mov(C,25,E);
yses:=TSF(yse,6);
ysesn:=100*yses/sigom;
ysesn;-100;+100; 0.0;
```

**Centered secondary cycle index**

```
sigom:=FmlVar("_sac-sigom","sigom");
ys:=100*(Ref(Mov(C,25,S),12)-Ref(Mov(C,50,S),25))/
Ref(Mov(C,50,S),25);
ysn:=100*ys/sigom; ysn;
```

**Intermediate cycle index (period 100 bars)**

```
sigom:=FmlVar("_sac-sigom","sigom");
yie:=100*(Mov(C,25,E)-Mov(C,50,E))/Mov(C,50,E);
yies:=TSF(yie,6);
```

```
yiesn:=100*yies/sigom;
yiesn;-150;+150; 0.0;
```

**Centered intermediate cycle index**

```
sigom:=FmlVar("_sac-sigom","sigom");
yi:=100*(Ref(Mov(C,50,S),25)-Ref(Mov(C,100,S),50))/
Ref(Mov(C,100,S),50);
yin:=100*yi/sigom; yin;
```

**Real-time channel lines**

```
sigom:=FmlVar("_sac-sigom","sigom");
arm:=Mov(C,25,S); arm;
(1+2.0*sigom/100)*arm; (1-2.0*sigom/100)*arm;
```

**Centered channel lines**

```
sigom:=FmlVar("_sac-sigom","sigom");
acm:=Ref(Mov(C,25,S),12); acm;
(1+2.0*sigom/100)*acm; (1-2.0*sigom/100)*acm;
```

**Stochastic oscillator (12 bars)**

```
sto:=Stoch(12,6); sto; Mov(sto,6,S); 80; 20;
```

**RSI (12 Bars)**

```
rs:=RSI(12); rs; 30; 70; 50;
```

**Minor-term exponential moving average**

```
aem:=Mov(C,25,E); aem;
```

**Sub-minor exponential moving average**

```
aen1:=Mov(C,12,E); aen1;
```

**Notes**

The script for **\_sac-sigom** must be included among **User Formulas**.

**Caution:** Do not use the **Centered** parameter estimation **Formulas** as real-time indicators.

—S.B.

**SUGGESTED READING**

Achelis, Steven B. [2000]. *Technical Analysis From A To Z*, McGraw-Hill.

Belknap, Stuart [2003]. "Time And Money Charts," *Technical Analysis of STOCKS & COMMODITIES*, Volume 21: May.

Chande, Tushar S., and Stanley Kroll [1994]. *The New Technical Trader*, John Wiley & Sons.

*MetaStock Professional User Manual*, version 7.0/8.0, Equis International, [www.equis.com](http://www.equis.com).

See our *Traders' Tips* section for program code implementing Stuart Belknap's technique.

†See *Traders' Glossary* for definition

