A New Method of Forecasting Trend Change Dates

by S. Kris Kaufman

A new cycle-based timing tool has been developed that accurately forecasts when the price action of any auction market will change behavior. By "behavior" is meant uptrend to downtrend, downtrend to trading range, etc. Six cases are covered by the term "trend change."

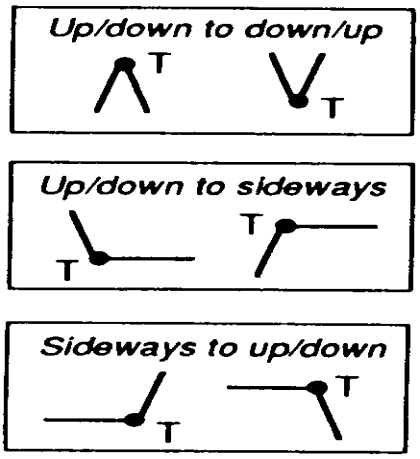
While most cycle techniques attempt to model and forecast the timing of market highs and lows, this new approach focuses on the precise timing and magnitude of any trend change, whether from a high or from a low. By sacrificing direction, this method can take full advantage of the chaotic nature of auction markets to increase timing accuracy. The decision whether a trend change marks a high or low point is left to the trader.

The indicator is constructed by analyzing a 10- to 20-year history of daily price-trend changes to determine weights for the cycle model. These weights are used to forecast one to two years ahead. A trend change is shown on the indicator by a spike - the higher and broader the spike, the more important the trend change.

The results presented here cover several markets during the period of late 1989 and early 1990. The pictures show the timing and magnitude of market turning points as given directly by this indicator.

Introduction

Trend change dates mark transition points between different types of market price behavior, as shown by the six cases below:



Now we need to know when a trend change will occur, what the magnitude of that change will be, and in what direction the market will now move.

Market analysts try to use as many indicators as possible to decide if a significant turn has already occurred. If the market (including individual issues and commodities) were truly random, even detection of a turn after the fact would not be helpful. In fact, many markets tend to exhibit nonrandom behavior, such as trending and cyclic repetition, which some studies have linked to chaos theory.

Chaos theory is the basis for such phenomena as fractals, which the Elliott practitioners were quick to adopt as the key to their theory of market motion. Another effect characteristic of a chaotic system is period doubling. When a system undergoes a transition to chaotic motion, periodic motion is seen at periods that are doubles of each other - such as 20, 40, 80,160, etc. - instead of random fluctuations.

Our method is used to detect and forecast this period-doubling effect. The procedure is to (1) create a trendchange series from historical market records, (2) decompose this new series into harmonics, and (3) project trend changes using the results of this decomposition. The results are evaluated by comparing the date and size of the predicted trend changes with the actual market outcome.

Method

All cycle analysis methods must condition the data before solving for the dominant periods. Our method, however, is only concerned with when the market changed direction and how major a change it was.

Create a Trend Change Series

To emphasize only market trend changes, a time series is constructed that contains only positive-valued spikes located on the days of market highs and lows. The size of each spike is equal to the minimum number of days forward and backward in time until that particular high or low is exceeded by a higher high or lower low. Everywhere else, the series is set to zero. In long-term price extremes, a maximum cutoff number is substituted for the actual day count.

This technique produces a detrended and time-weighted trendchange series that can be used for cycle analysis. The series has positive spikes for both highs and lows, which effectively wipes out all reference to price direction (see Figure 1).

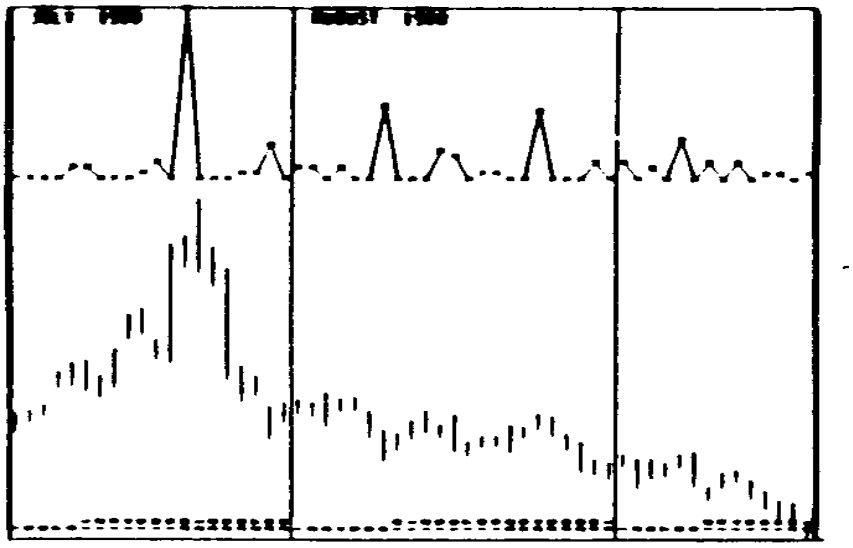


FIG. 1. Price series for silver, plotted in a bar format (below) and in time-weighted format (above).

Price direction is removed because we only wish to detect and model the period-doubling effect characteristic of a chaotic (or nonlinear) system.

Decompose Into Harmonics

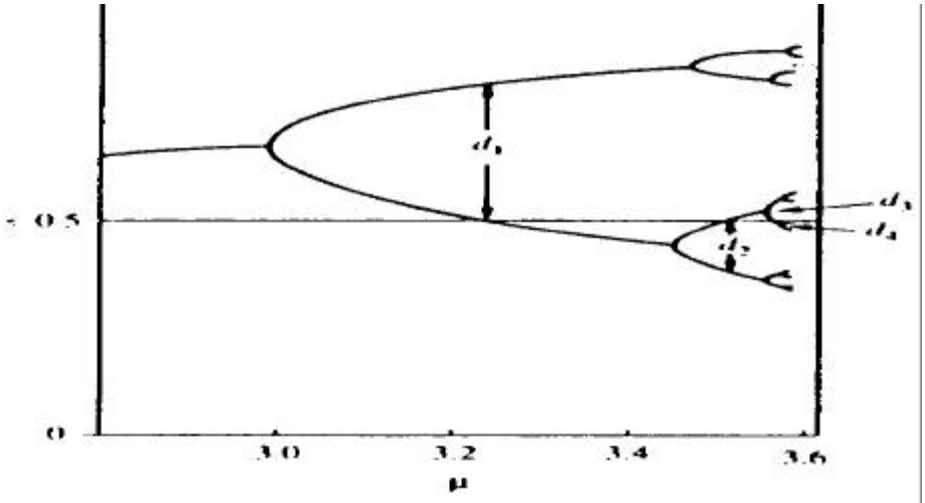


FIG. 2. Transition to chaos reveals periodic behavior.

Both past price and volatility (rate of change in price) contribute to the basis for buy and sell decisions made continuously by market participants. The player's willingness to buy or sell, in turn, affects current price. This recursive relationship is typical of chaotic systems.

Figure 2 shows a system undergoing transition from a smooth and predictable behavior to a chaotic state. As the degree of chaotic behavior increases (left to right), period doubling becomes more and more evident. Periodic behavior is best shown as evenly spaced spectral spikes (Figure 3) in the frequency domain.

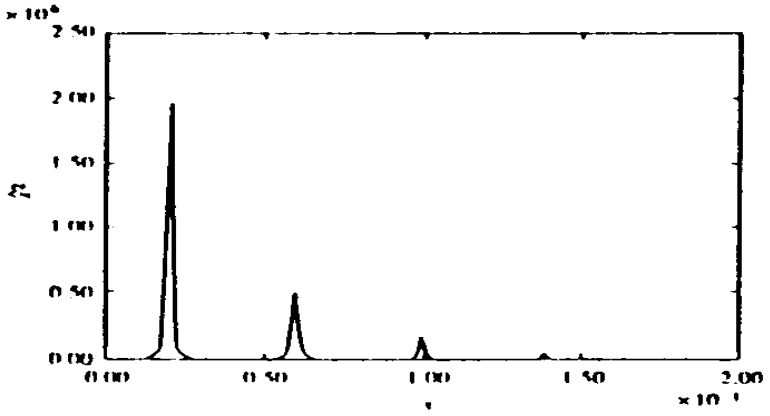


FIG. 3. In the frequency domain, a transition to chaos would reveal periodic behavior by showing distinct evenly spaced spikes.

Figure 4 shows a spectrum of the stock market. A distinct set of somewhat evenly spaced spikes can be seen. Note, for instance, that the spike at 55 days is matched by ones at 113 and 224. Also note the spike at 74 days and its double at 148.

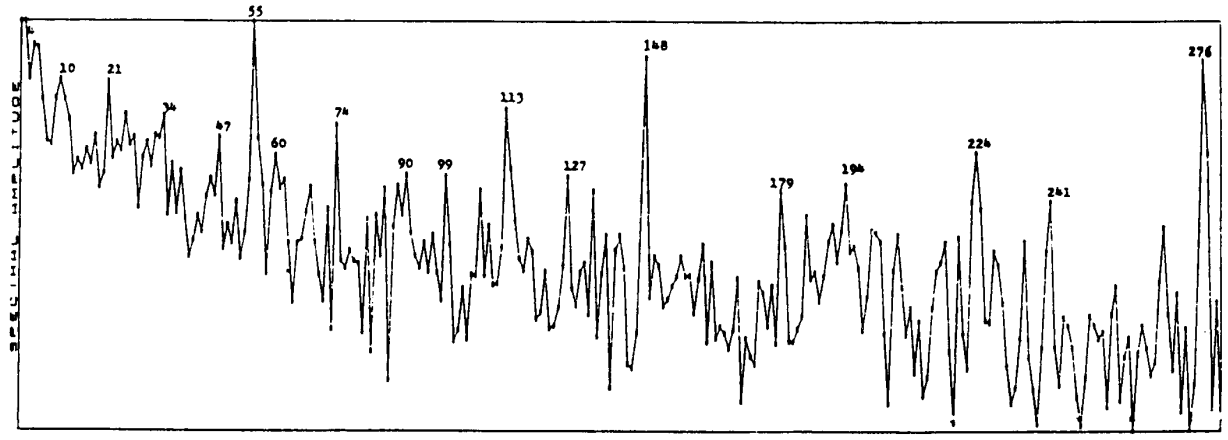


FIG. 4. Spectrum of 100 years of daily DJIA prices.

The second step in our method is to decompose the trend-change series into the dominant cycle components, and weight the contribution of each. Although this process is proprietary, the basic principles are shown in the following example:

Let i = l to m represent days of time-weighted series data, and let j = l to n represent selected harmonic periods. Solve for a set of weights Wj for each harmonic period Lj, such that the error in fitting the time-weighted trend change series Ti is minimized:

Wj { sin Lj Xi +... + sin Ln Xm |

+ cos Lj Xi +...+ sin Ln Xm } = Ti

This is a simple least squares problem that is easily solved, because there will always be far more days of data than harmonics.

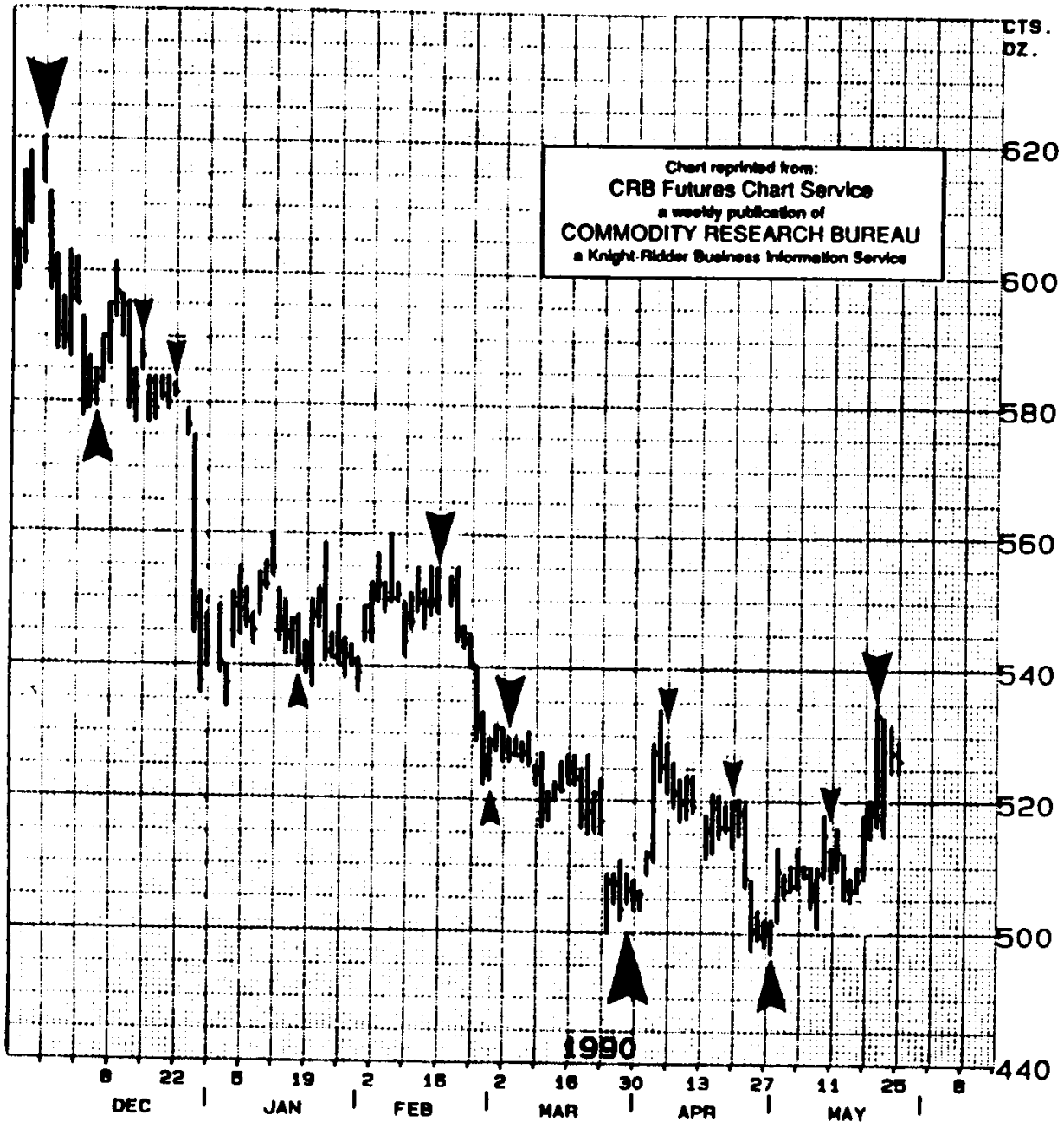


FIG. 5. Comex Silver, July 1990, showing forecast trend change dates.

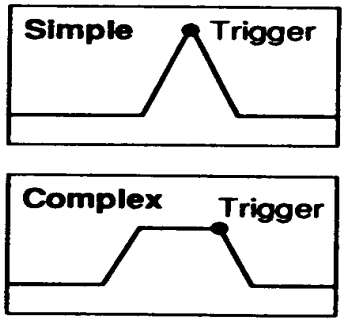
Project Trend Changes

Once decomposition and weighting have been carried out, merely run the calculations into the future to create the forecast. The resulting series should simulate what the real trend change series eventually would look like. In other words, spikes should occur at turning points.

Interpretation of the Indicator

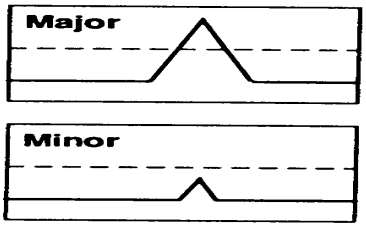
Trend changes in a market are specified by three pieces of information: time, magnitude, and direction. Our indicator delivers time and magnitude. Direction is determined by the use of another indicator, or by examination.

Trend change dates are shown by spikes on the indicator. The actual trigger comes as the indicator drops from its spike high. For complex cases with a broad spike, the last day is used as the trigger point:



The importance of a trend change is proportional to the height and breadth of the spike. Tall spikes usually mean that major market highs or lows are due. Broad spikes indicate the merger of many smaller turns, and so mark times of choppy price action.

For simplicity, we consider spikes that penetrate the center line of the graph to be major, and those that peak below the center line to be minor. In a major trend change, the turn should be noticeable on weekly and possibly monthly charts:



The Results

The method we have described produces a spike series that extends into the future. The spikes on the series signify the projections of past market turns, which have occurred at regular intervals, into the future.

Figure 5 show trend change dates forecast for silver. Figure 6 shows trend changes for the DJIA based on the longer period components only. The indicator correctly detected significant tops in 1987, 1989, and just recently in 1990.

Figure 7 shows the trend changes for crude oil during the critical mid1990 time frame, and, in graphical form, the trend changes for crude oil during the third quarter of 1990. July 6 (the low), and August 2 and 20 are clearly important.

The arrows in these figures point to price bars on the exact date given by the trend change indicator. The size of the arrow indicates trend change magnitude. Remember that the indicator does not give direction. The directions of the arrows are simply meant to clarify the presentation.

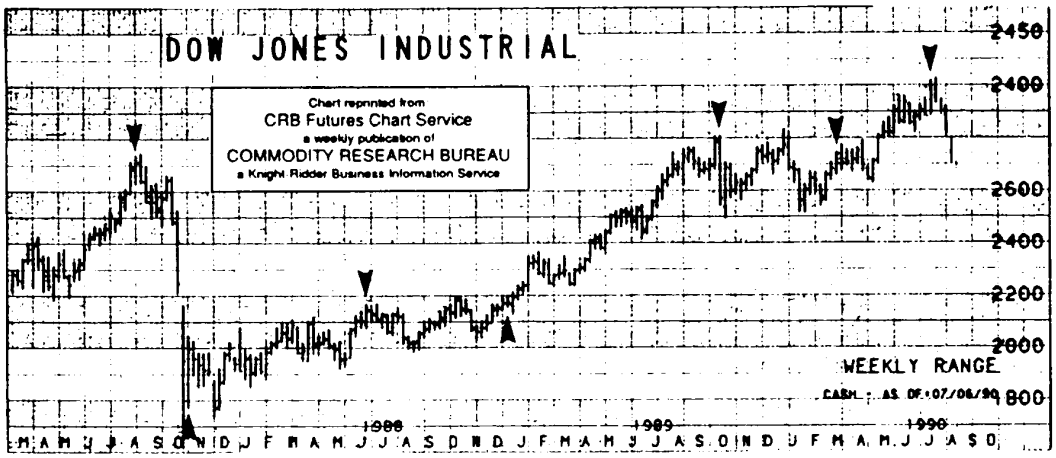


FIG. 6. Trend changes for the DJIA, based on longer period components.

Thc success of the cycle-based method presented here strongly argues in favor of the chaotic nature of auction markets. This means that some level of deterministic behavior is present and can be used to forecast. A random market could not possibly exhibit such behavior.

Our indicator is tuned to each market's rhythm, and continues to forecast the pattern of turning points that will be played out well into the future.

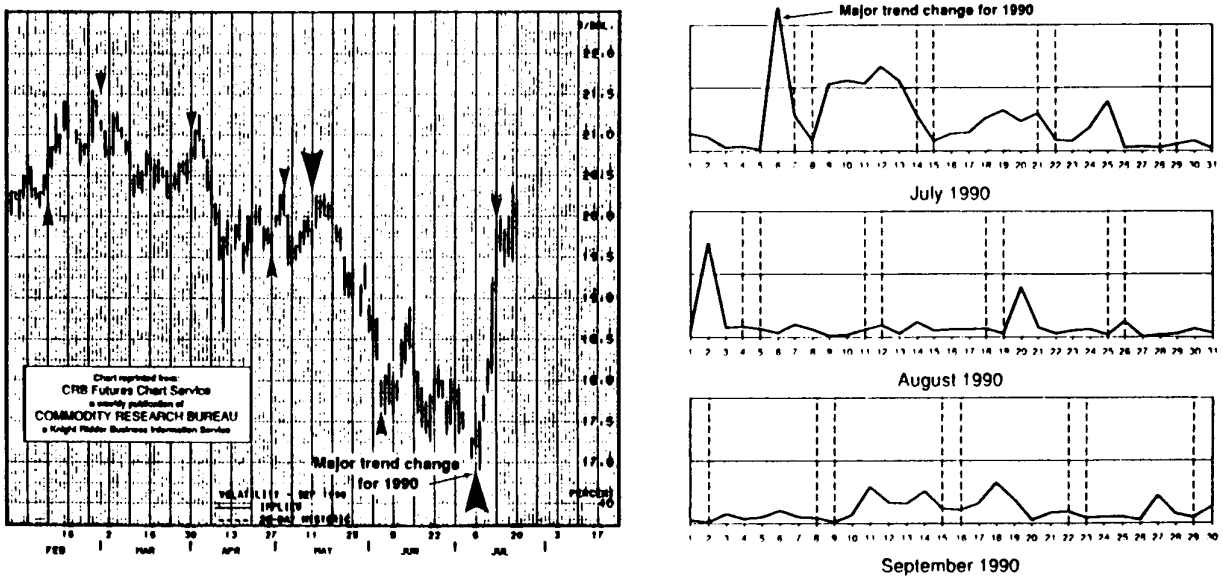


FIG. 7. Trend changes for crude oil during mid-1990 (left) and, in graphical form, during the third quarter of 1990 (right).

S. Kris Kaufman is a senior geophysicist with a leading oil exploration software company, and president of Parallax Financial Research, Redmond, Washington, which publishes the Precision Turn indicator quarterly.

References

Frost, AJ.; Prechter, RR
1978. *Elliot Wave Principle. New Classics Library*

Gleick, J.

1987. *Chaos: Making a New Science. Viking Press*.

Hurst, J.M.
1970. *Thc Profit Magic of Stock Transaction Timing. Prentice-Hall*.

Rasband, S. N.
1990. *Chaotic Dynamics Of Nonlinear Systems.*
John Wiley.

Stewart, I.
1989. *Does God Play Dice? The Mathematics of Chaos. Basil Blackwell.*

Reprinted by Permission

CYCLES September/October 1990