Jurik Research Add-In Tools

Product Guide

Time is money, and late analysis robs you of the best piece of a trade. Past attempts to speed up slow technical indicators only made them jagged and noisy, but *now* you can have clear, low-lag, military grade indicators from Jurik Research.

Jurik Research software are add-in modules for many commercially available software products, including …

Microsoft Excel®	AmiBroker®	NeuroShell®
TradeStation®	BioComp Profit®	WaveWi$e®
Supercharts®	ESignal®	WealthLab®
	NeoTicker®	

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About Jurik Research

Jurik Research was founded in 1988 in Silicon Valley and develops algorithms that identify and classify complex data. Now that the cold war is over, signal processing skills originally intended for military projects are now successfully applied to the commercial arena, ... and you, the public, stand to benefit. From forecasting the price of aluminum futures to the cost of pumping natural gas across America, from predicting consumer food demand to sports results, Jurik Research innovated ways to "peek" into the future. Today, Jurik Research focusses mainly on the financial market.

Mark Jurik, its founder, specializes in data modeling and time series forecasting methods. For over a decade he has lectured on the theoretical and practical aspects of neural network technology. He created "NeuroTapes", a 12-hour video course on neural network technology that sold worldwide for 11 years. Mark lectured at 28 conferences and seminars and authored articles for Futures magazine and the Journal of Computational Intelligence in Finance. Jurik is a contributing author to the book Virtual Trading, author of his own book **Neural Networks and Financial Forecasting** and editor of **Computerized Trading**, distributed by the New York Institute of Finance.

Customer Comments

Jurik Research has a strong commitment to quality software and customer service. Here are some comments we have received over the years …

- "The right tools for the right job... it's people like Mark that I think are bang spot on, more than we give them credit for -- for providing a proper and diversified toolbox. The rest is up to us." -- Gene Pope [gene@popemusic.com]
- "I appreciate the professionalism of your work. As I mentioned on the phone, I believe some of the work you've done ranks in the brilliant category!" -- Thanks, Dave C. [DCunnin863@aol.com]
- "I have been purchasing your products since 1993. I've been trading for ten years and the only indicators I found that have any value are yours." -- Ted Johnson [mtinvest@charter.net]
- "I use your JMA, VEL, RSX, CFB, WAV and DDR and I find your products to be the best in their class. The implementation is clean and solid and they do what you claim they do." -- Farid Moslehi [fmoslehi@worldnet.att.net]
- "I would give my unqualified recommendation. ... Jurik supports his products well. ... He is a reputable vendor -- one of the few to be found on the internet." -- Rick Heymann
- "Mark Jurik's indicators are on the short list of things I do use. And looking at my screens, they all have Mark's products or derivatives based on them on real-time charts. He's a class guy and his products, in my eyes, are the best." -- Tim Morge [tmorge@interaccess.com]
- "Jurik's JMA is the best answer to the inherent lag problem that I know of....I have never seen a negative post regarding it or any of his other tools. -- Stu Miller [spooz2@bellsouth.net]
- "Mark, you are the recognized authority in the Omega-related community and I hear only excellent comments about your great indicators. I recommend them to a number of my clients. -- Dmitri Bogucharskyy, developer of DynaStore data emulation, [dima@better.net]
- "I find your tools to be superior to any other indicators I've ever used. You did a great job on these." -- Norman Highton [nhighton@MNSi.Net]
- "I am up and running and have already coded up some interesting stuff, made money with Jurik's tools and am happy. ... It's nice to find some quality in this business." -- Bryant Tharp [bulldog5@concentric.net]
- "I have no connection with Mr. Jurik other that as a satisfied user of his products, particularly his RSX. In my twenty years of trading in the markets, I know of comparatively few vendors whose products have performed as represented and actually delivered continuing value to the trader. I have found Mark Jurik to be a straight shooter..." Jim [alvishsd@earthlink.net]
- "I think your products and DynaStore are two of the finest products on the market." -- Bob Claycomb
- "I like Mark Jurik's stuff. No complaints. Does what it's supposed to do." -- J. Werner [cwerner1@maine.rr.com]
- "So far in my experience, Kase and Jurik are in a class by themselves as the only REALLY smart people I've run into in TA (and that includes M. Pring, John Murphy, et al)." -- Ken Berian [kberian@yahoo.com]

Product Overview

DMX (Directional Movement Index)

Superior, low-lag replacement for your classic DMI and ADX indicators. Although DMX is ultra-smooth, it responds immediately to market jolts.

The classic indicator DMI (Direction Movement Index) is so jagged that its smoother version, ADX, is almost always used instead. Unfortunately, the smoothing process adds unwanted lag to the signal, which in turn, delays analysis and induces late trades. Jurik Research's DMX is a superior version of DMI. DMX is ultra-smooth, timely and very responsive to fast market moves. Since there is no need to smooth DMX, both DMI and ADX are now obsolescent.

TECHNICAL NOTES – DMX uses the classic DMI+ and DMI- formulas, with the exception that the exponential moving averages are replaced by JMA. This substitution makes for an incredible improvement. It's smooth, low-lag and agile.

$INDU -- 3 mins.

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DMX(14)

DMX -

DMX +

Directional Movement(14,14)

DMI +

DMI -
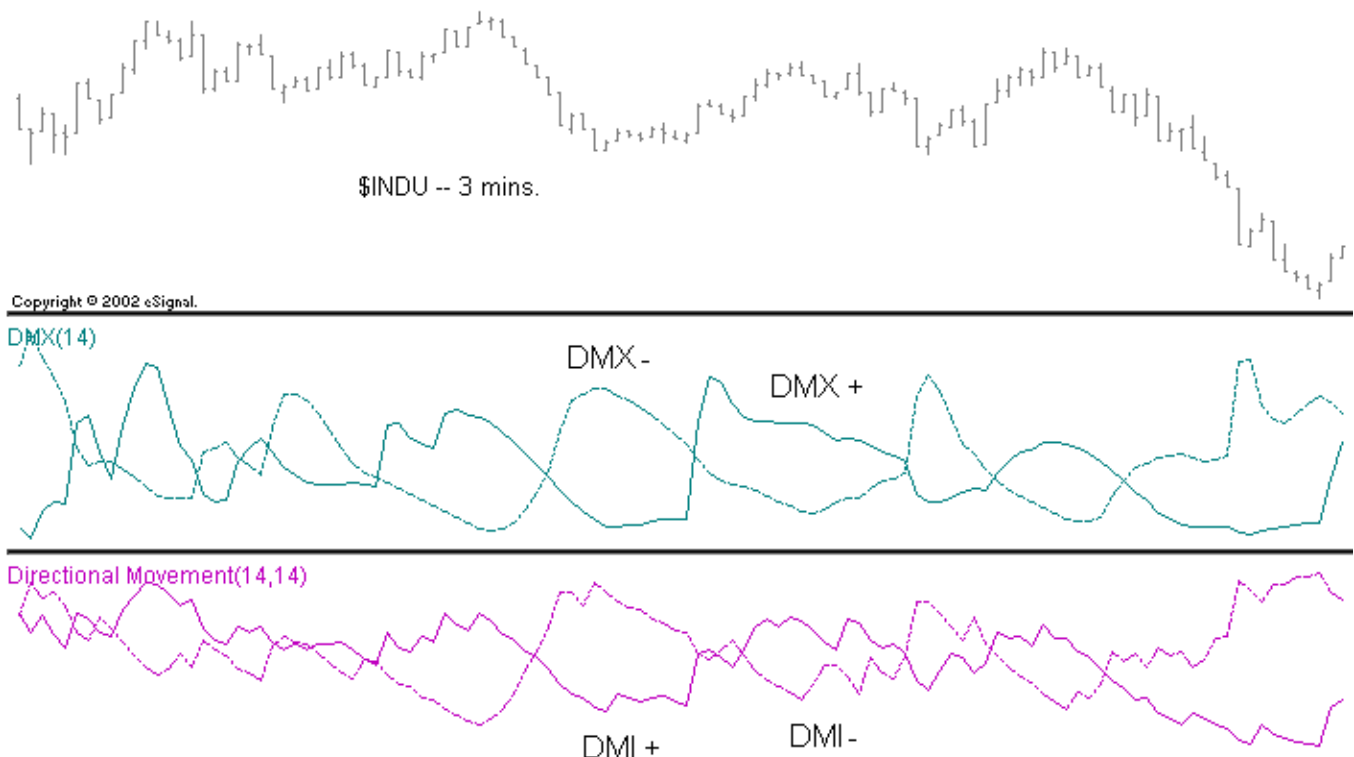
DMX components are significantly smoother than DMI components.

VEL (Signal Velocity)

Superior momentum indicator. Ultra-smooth, accurate measurement of trend direction and speed (velocity). Excellent for instantaneous analysis.

Analysts use momentum indicators to estimate the direction, speed (velocity) and turning points of market movements. These estimates are severely corrupted by the jagged nature of their charts. By rapidly crisscrossing threshold levels, noisy indicators can trigger excessive trade signals. Jagged lines also obscure the true story, delaying analysis until the picture is more certain. Meanwhile, good trading opportunities are sacrificed. Unfortunately, attempts to mitigate these problems by smoothing a momentum chart also make the signal slower, further delaying analyses and trades. … *Now* you can do better!

Imagine that you could remove all the noise from momentum analysis without either distorting the true signal or adding lag. You would now have a crystal clear picture of both direction and speed of market trends. VEL is the superior momentum indicator from Jurik Research. Its accurate and smooth performance virtually eliminates noise-related uncertainty, and its low-lag agility opens up new opportunities for analysis.
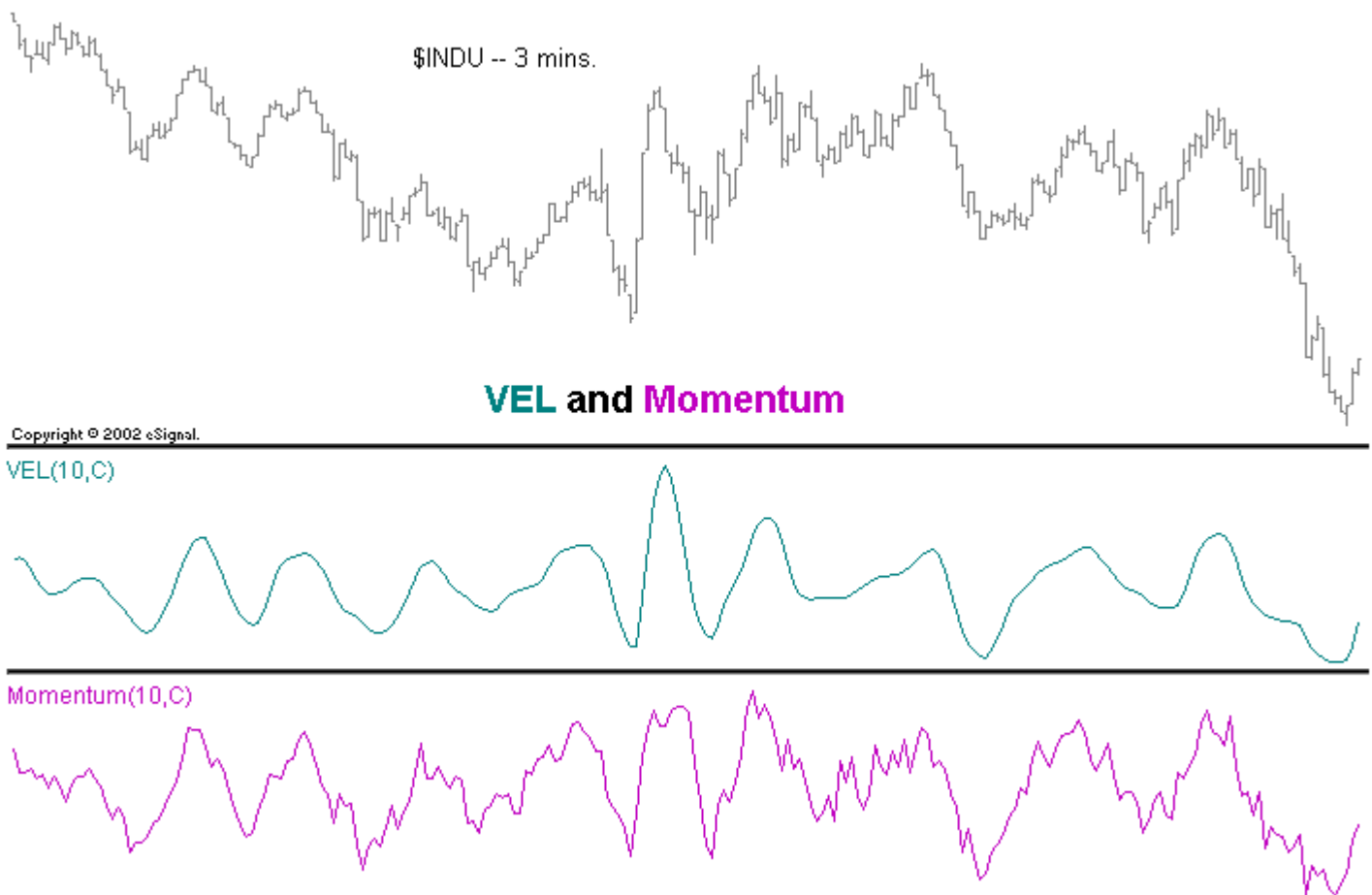

VEL is significantly smoother than standard Momentum

JMA (Jurik Moving Average)

Superior noise elimination filter. Lets you see "true" underlying activity. Has very low lag, is incredibly smooth and extremely responsive to market gaps.

Discover the clean underlying signal that lies within jagged price movements and see what the market is really doing. JMA is a world class moving average that tracks and smoothes price charts or any market-related time series with surprising agility. With significantly less lag than other moving averages, JMA's earlier signals means fewer late trades. In addition, classic moving averages are too slow in adjusting to sudden price gaps, sometimes taking 10-20 bars before you can safely resume your technical analysis. In contrast, JMA recognizes gaps and jumps to new price levels in just a few bars, getting you back in action fast. Using ultra-smooth, low-lag, gap-smart technology, JMA strips away market noise and opens up new vistas of opportunity previously unattained by moving averages.

TECHNICAL NOTES -- Denoising nonstationary time series for real-time application (e.g. financial data streams) requires filtration by *causal* filters, because in such applications, future data at any point in time is not available. In contrast, wavelet filtering of a block of data is *non-causal*, and dominant cycle analysis methods depend on the existence of real cycles. JMA, the Jurik Moving Average is a causal, nonlinear, adaptive filter ideally suited for real-time cleaning of nonstationary time-series data. JMA offers superior noise elimination based on algorithms researched for the military. JMA can clean noise off a square wave without destroying the square wave itself. It has no overshoot or undershoot and very little latency (lag). This is because JMA is based not on frequency analysis, but on distribution analysis, and that makes all the difference.

LESS LAG

FASTER RESPONSE

LESS LAG

JMA and **SMA**
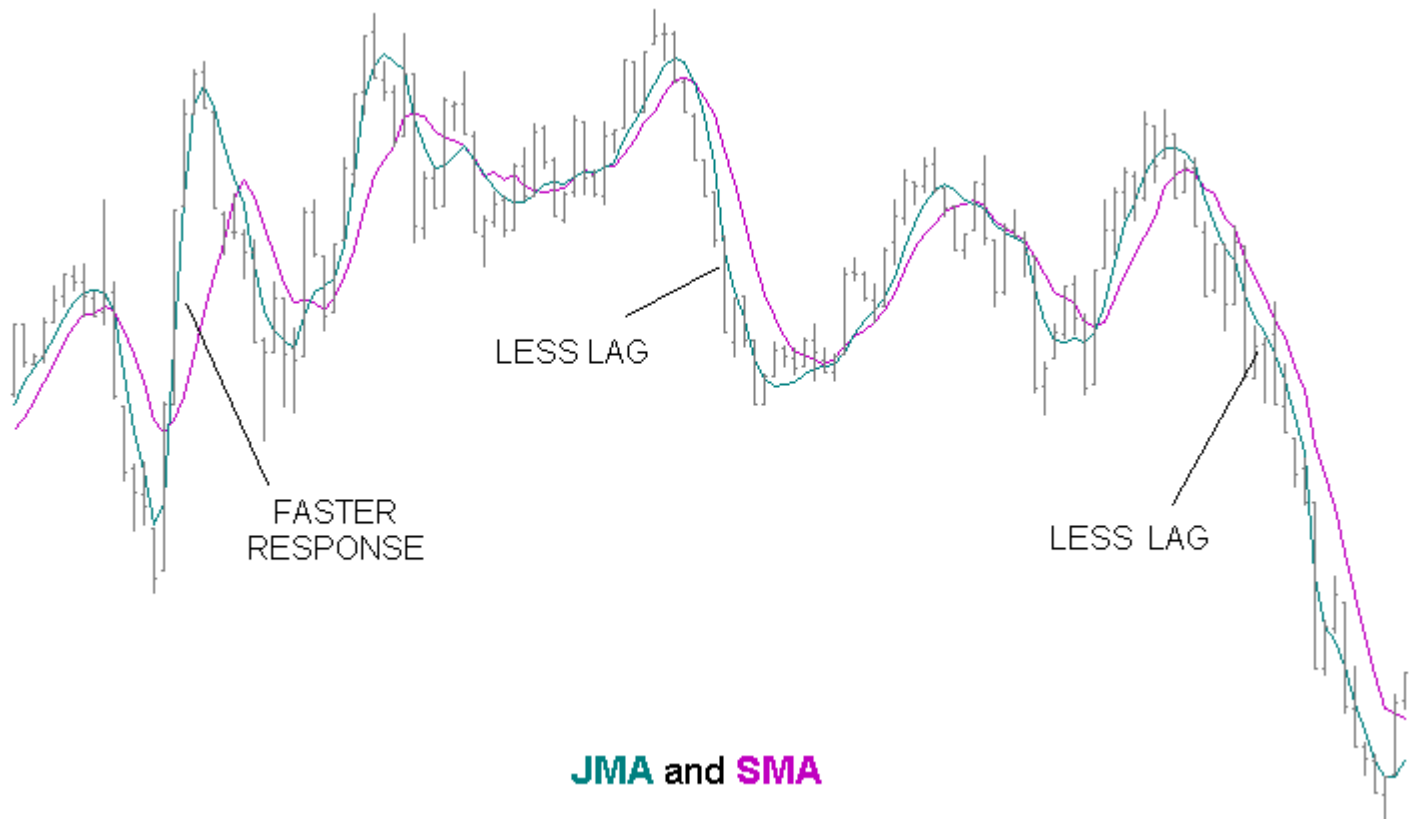
JMA responds rapidly to market jolts, and maintains comparable smoothness with significantly less lag.

RSX (Trend Strength Index)

Superior replacement for RSI. Ultra smooth, accurate, low lag indicator of trend direction and purity. Excellent for deep analysis.

Analysts use Wilder's RSI to estimate the direction, purity and turning points of market trends. These estimates are severely crippled by the jagged nature of their chart lines. By rapidly crisscrossing threshold levels, a noisy RSI can trigger excessive trade signals. In addition, the jagged lines obscure the true story, consequently delaying analysis until the picture is more certain. Meanwhile, good trading opportunities are missed. Unfortunately, attempts to mitigate these problems by smoothing RSI also make the signal slower, further delaying analysis and trades. . . You can do better!

Imagine that you could remove all the noise from the RSI without either distorting the true signal or adding lag. With Jurik Research's RSX you can now have a crystal clear picture of both direction and strength of market trends. Its accurate and smooth performance removes noisy crisscrossing, and its low-lag agility opens up new opportunities for analysis. For example, the speed and direction measurements of RSX are smooth and accurate. Not so with RSI. See the chart below.

TECHNICAL NOTES – Smoothing RSI by running it through a moving average filter degrades signal amplitude and adds considerable lag. Smoothing RSI by extending its range forces the indicator to consider old, irrelevant data. RSX eliminates noise without adding any additional lag, and without including old, irrelevant data. It's the best of both worlds. Once you see RSX charts, you will not want to use the classic RSI ever again.
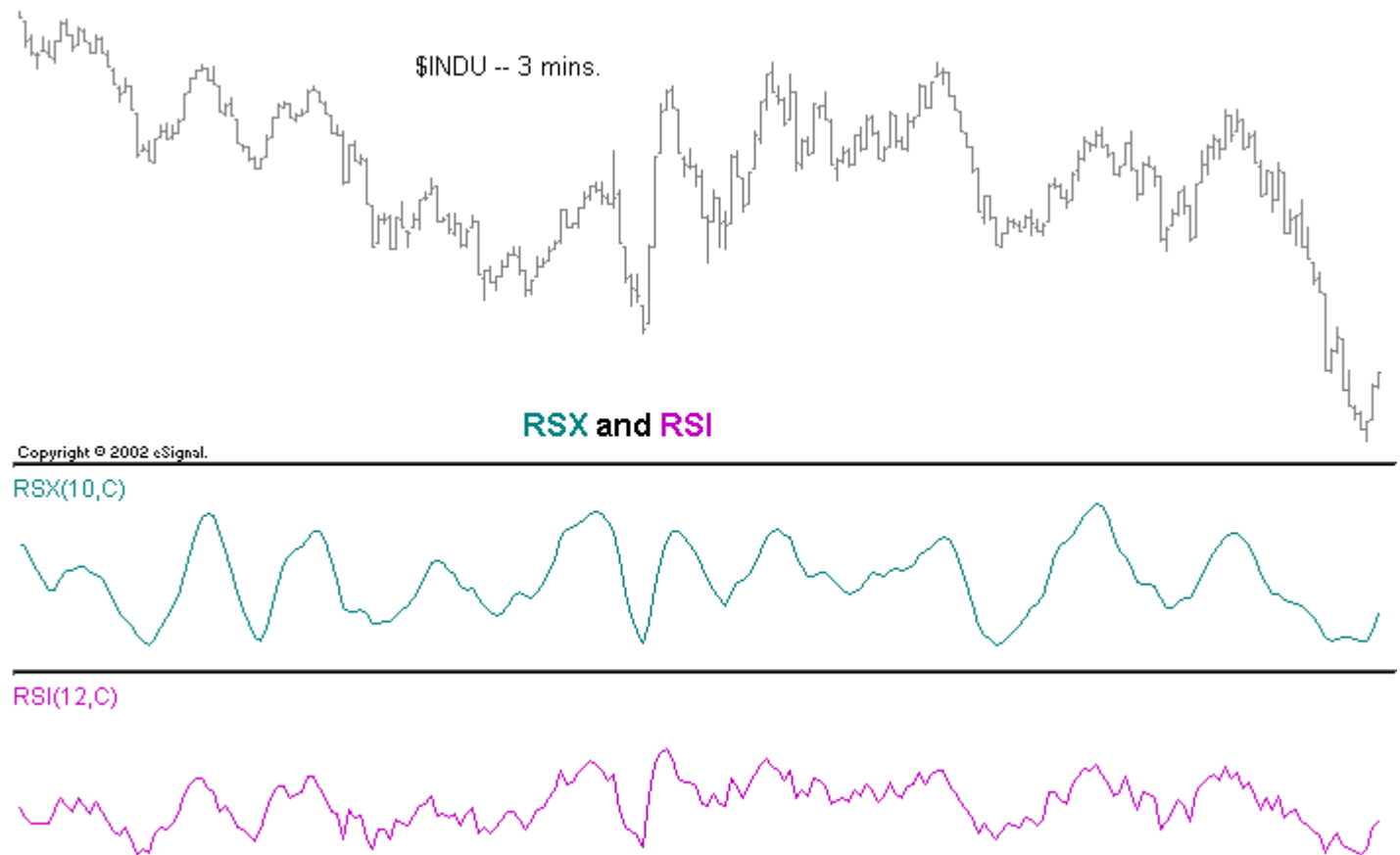
RSX accentuates the basic waveform of the standard RSI while simultaneously lowering noise.

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CFB (Composite Fractal Behavior)

CFB measures the duration and stability of a price trend. Useful for early warning exit signals. Also works well in speeding up other indicators when market trend conditions change.

Many indicators, such as RSI and breakout channels, can have their length adjusted from bar to bar, rather than kept at a fixed value. For example, one might want RSI length increased the longer a market continues to trend, and decreased when trending stops. These dynamically adjusted indicators frequently perform better than their fixed-length counterparts.

Trend duration is a popular measure for modifying other indicators. But how does one measure trend length? CFB, by Jurik Research, measures the duration and stability of a price trend. As a trend steadily grows, the CFB index value increases. When a trend either stops or becomes unsteady, the CFB index value decreases. Trend followers like it as an "Early Warning" signal, letting you know when a trend is breaking up. For the advanced technician, CFB is well suited for providing a measure useful in dynamically adjusting other indicators.

TECHNICAL NOTES – CFB measures trend duration by evaluating the relative fit with various fractal patterns, and then combining the results into a single value: the composite fractal behavior index. This index is especially sensitive to trend instability, enabling it to quickly reset itself to begin measuring the duration of a new trend.
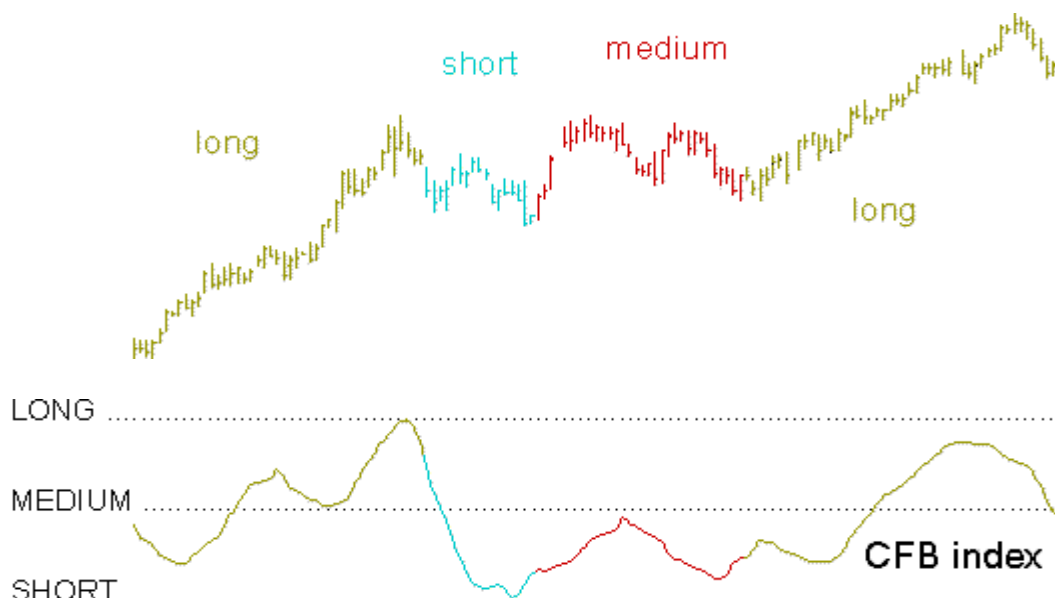
This colorized chart emphasizes the relation between CFB values and trend duration.

CFB is a function that produces numerical values and, per se, does not alter the color of charts.
We applied color to this chart to illustrate the relationship between CFB values and different degrees of price trend.

Notices

IF YOU FIND A BUG . . . YOU WIN

If you discover a legitimate bug in any of our software tools, please let us know! We will try to verify it on the spot. If you are the first to report it to us, you will receive the following two coupons redeemable toward your acquisition of any of our software add-in technical indicators:

- ◆ a $50 discount coupon
- ◆ a free upgrade coupon

You may collect as many coupons as you can. You may apply more than one discount coupon toward the purchase of your next tool.

ABOUT PASSWORDS

And what to do when they become invalid

You may have passwords for up to two machines; additional licenses are extra. If you upgrade to a new computer, replace your BIOS, or replace your motherboard, you will require a replacement password. To obtain a free replacement password, you must fax us a copy of the invoice for your new computer purchase. Also, if you want to run the toolset on additional computers, you will need additional passwords. For new or replacement passwords, call us at 323-258-4860.

INVESTOR LIABILITY

You Assume All Risk

The buy-sell signals shown in some charts were generated by backtesting a trading strategy on historical data. Hypothetical or simulated performance results have certain inherent limitations. Simulated performance is subject to the fact that they are designed with the benefit of hindsight. We must also state here that, due to the frequently unpredictable nature of the marketplace, past performance of any trading system is never a guarantee of future performance.

The example trading strategies described in this manual are for illustration purposes only. Do not trade real money using these demonstration systems. A real trading system should be tested extensively for various kinds of flaws, including hyper-sensitivity to parameter settings. A real trading system also requires not one but several mutually concurring indicators as well as good money management rules for limiting exposure to risk.

All trading strategies have risk and certain markets leverage that risk. It is wise to limit the amount at risk to that which you are willing and can afford to lose.

The user is advised to test all software thoroughly before relying upon it. The user agrees to assume the entire risk of using Jurik Research software. In no event shall Jurik Research be responsible for any special, consequential, actual or other damages, regardless of type, nor shall it be responsible for any trading losses resulting from the use of the software.
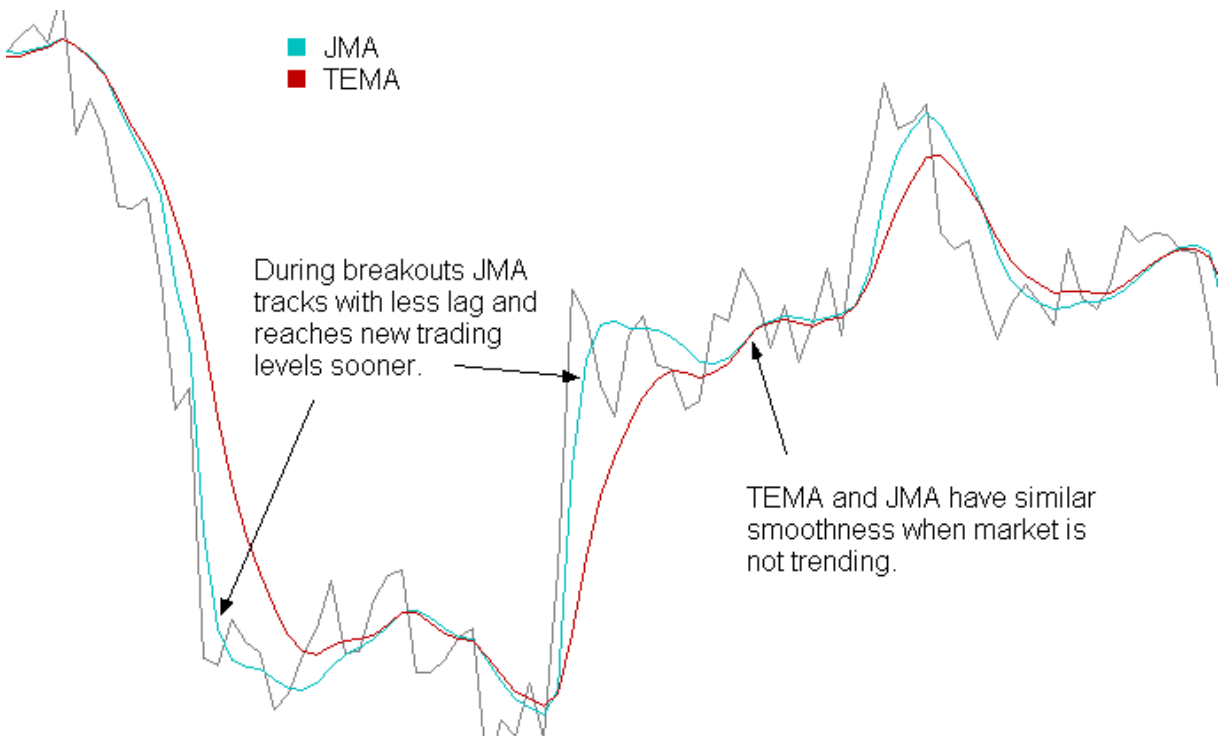
JMA

Theoretical Advantages

Daily prices produce a time series with some amount of random fluctuations. To remove this noise, market technicians typically use moving average (MA) filters. Only JMA excels in all four benchmarks of a truly great filter...

BENCHMARK #1:   ACCURACY

Moving Average (MA) filters have an adjustable parameter that controls their speed. Speed governs two opposing properties of a filter: smoothness (lack of random zig-zagging) and accuracy (closeness to the original data). That is, the smoother a filter becomes, the less it accurately resembles the original time series. This makes sense, since we do not want to accurately track zigzagging noise within our data.

Financial investors try to apply just enough smoothness to filter out noise without removing important structure in price activity. For example, in the chart below, the popular Triple Exponential Moving Average (TEMA) is just as smooth as JMA yet TEMA failed to track some price movement structures. On the other hand, JMA follows the action very well.

During breakouts JMA tracks with less lag and reaches new trading levels sooner.

TEMA and JMA have similar smoothness when market is not trending.

BENCHMARK #2:   TIMELINESS

Most MA filters have another problem: they lag behind the original time series. This is a critical issue because excessive delay and late trades may reduce profits significantly. Ideally, you would like a filtered signal to be both smooth and lag free. For all moving average filters, including the three classics (simple, weighted, and exponential), greater smoothness produces greater lag. Even the more advanced TEMA moving average lags well behind JMA.

Adaptive filters developed by others, such as the Kaufman and Chande AMA, will also lag well behind your time series. Kaufman's Moving Average (KMA), is an exponential moving average whose speed is governed by the "efficiency" of price movement. For example, fast moving price with little retracement (a strong trend) is considered very efficient and the KMA will automatically speed up to prevent excessive lag. This interesting concept sometimes works well, sometimes not. As is shown in the chart, JMA can track fast movement with ease.

The advantage in avoiding lag is readily apparent in the chart to the right. Here we see how JMA enhances the timing of a simple crossover oscillator. The top half of the chart shows crude oil closing prices tracked by two JMA filters of different speed. The bottom half uses two EMA (exponential moving average) filters.

The oscillator becomes positive when the curve of the faster filter crosses over the slower one. This occurrence suggests a "buy" signal.

Note that JMA's crossovers are 15 and 18 days earlier! Can you afford to be 15 days late?
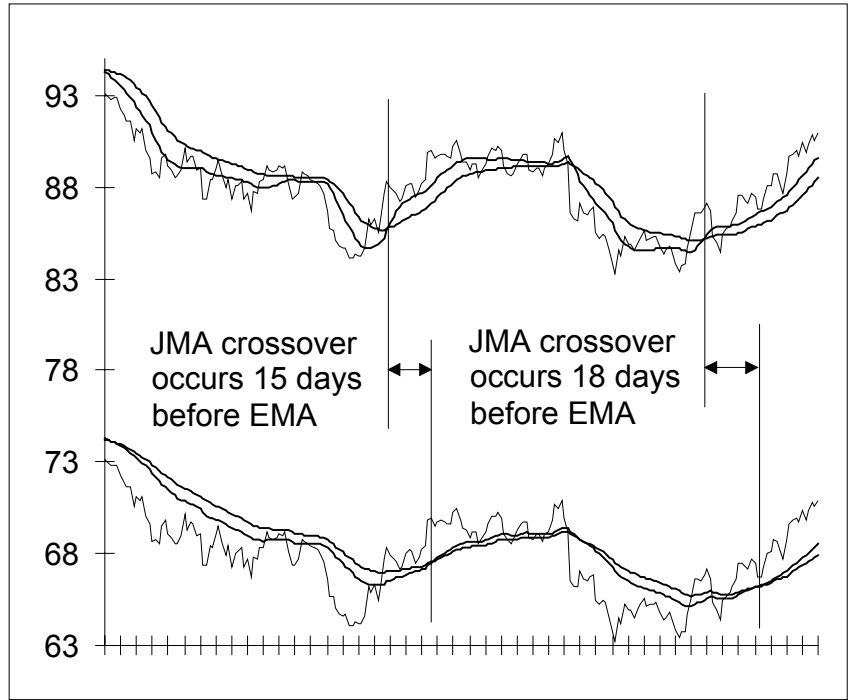
Some moving averages dynamically self-adjust their smoothness in order to minimize lag. For example, Chande's VIDYA (circa 1992) is an exponential moving average whose speed is governed by the ratio between the variance of recent price movement and variance over the long term. Fast moving price (such as a breakout) has large variance and is supposed to cause VIDYA to automatically speed up (in an attempt to prevent excessive lag). This concept sometimes works well, sometimes not.

In the chart below, both JMA and VIDYA perform approximately the same for the first 1/5 of the series, but due to the high volatility during the steep downward trend, VIDYA becomes hyperactive and fast tracks choppy waves during the congestion phase of this time series. However, an ideal filter should smoothly sail through choppy price action in order to avoid triggering trades. Note how JMA cuts right through with a much smoother line. Later on, when it becomes clear the market is trending upward, VIDYA lags behind JMA because the quiet market during the trading range made VIDYA too slow. In contrast, JMA has significantly less lag.
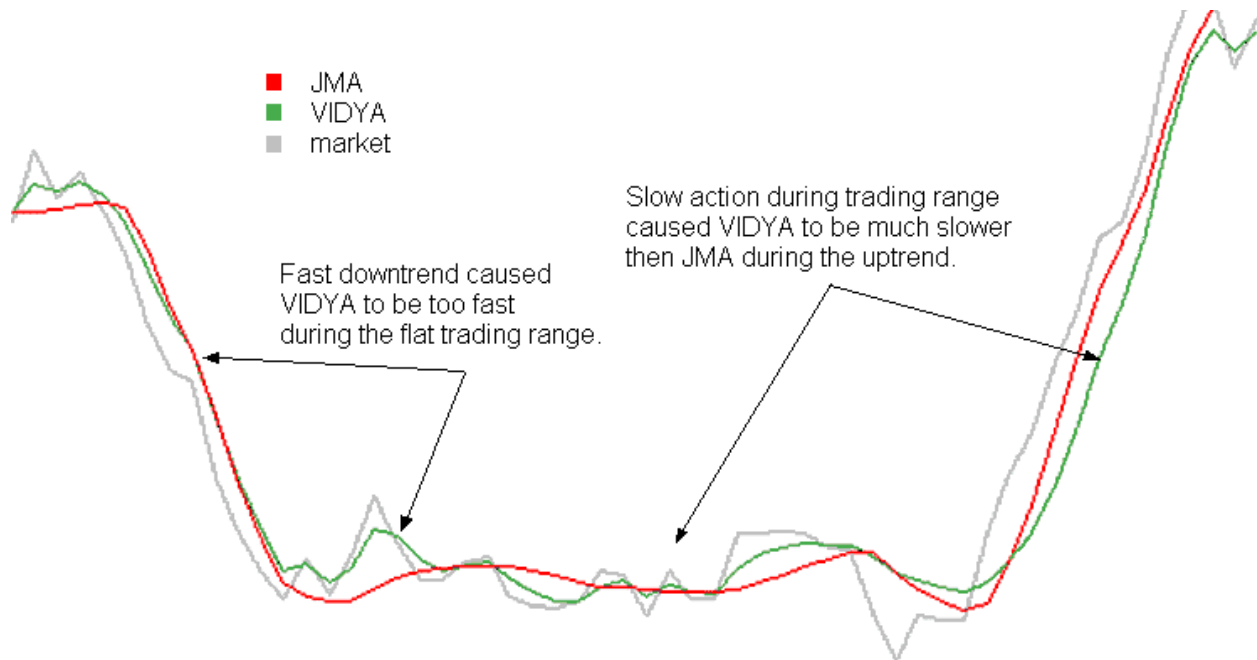
BENCHMARK #3:   OVERSHOOT

Because there is an inherent amount of noise in price action, many trading strategies trigger a trade when a moving average crosses a threshold level.   Moving average lines have less noise and are less likely to produce false alarms. Unfortunately, common moving averages lag too much and many sophisticated designs, like DEMA, Kalman and Butterworth filters, tend to overshoot during price reversals. Overshoots create false impressions of prices having reached levels they never truly did.   The chart below compares JMA with Kalman and Kaufmann adaptive moving averages.

### Comparing JMA to moving averages of similar smoothness
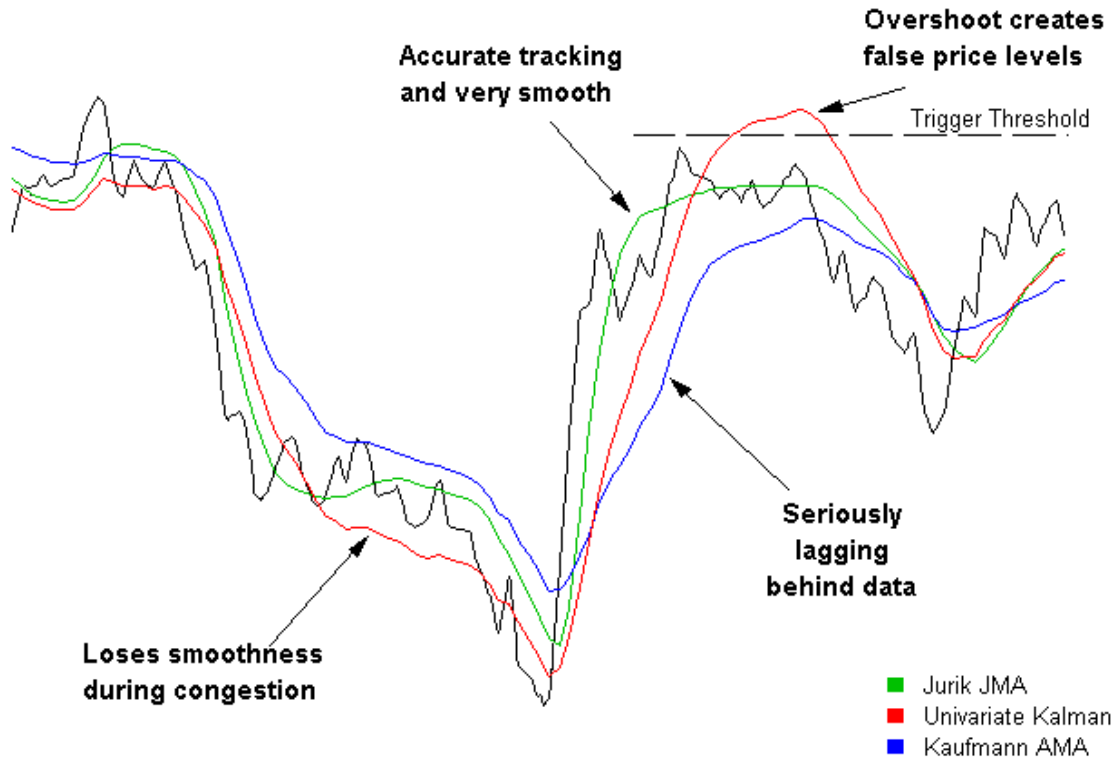
BENCHMARK #4:   SMOOTHNESS

The most important property of a noise reduction filter is how well it removes noise, as measured by its smoothness.

In the chart to the right, EMA and JMA filters are run across closing prices. Note how much the fast EMA alternates upward and downward while JMA glides smoothly through the data. JMA reveals the noise-free underlying price more accurately.

If you try reducing EMA's erratic hopping by making it slower, you will discover its lag will become larger, producing late trade signals.

This is the best of both worlds for technical analysis. JMA resolves the riddle of how to get *both smoothness and accuracy simultaneously*.


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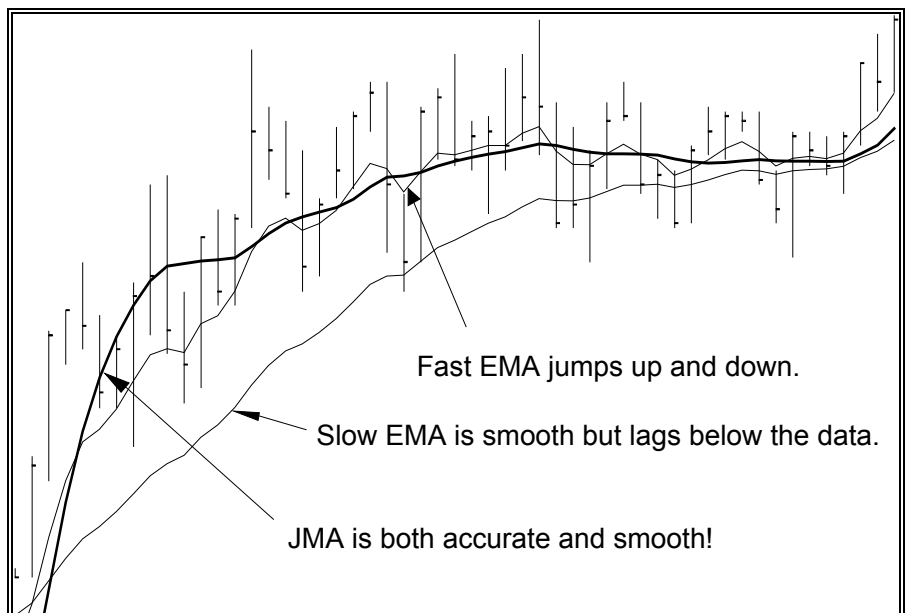
Sample Applications

Noise-free Tracking of The Market

The best way to see how JMA works is to draw comparisons with other moving averages and note JMA's exceptional tracking capability. In the following examples, we will illustrate certain phenomena; the user is invited to select his own data that exhibits similar qualities to that of the examples. To begin, find price data that has at least one large price gap or level change. An example of a price jump is shown below.

Price Jump
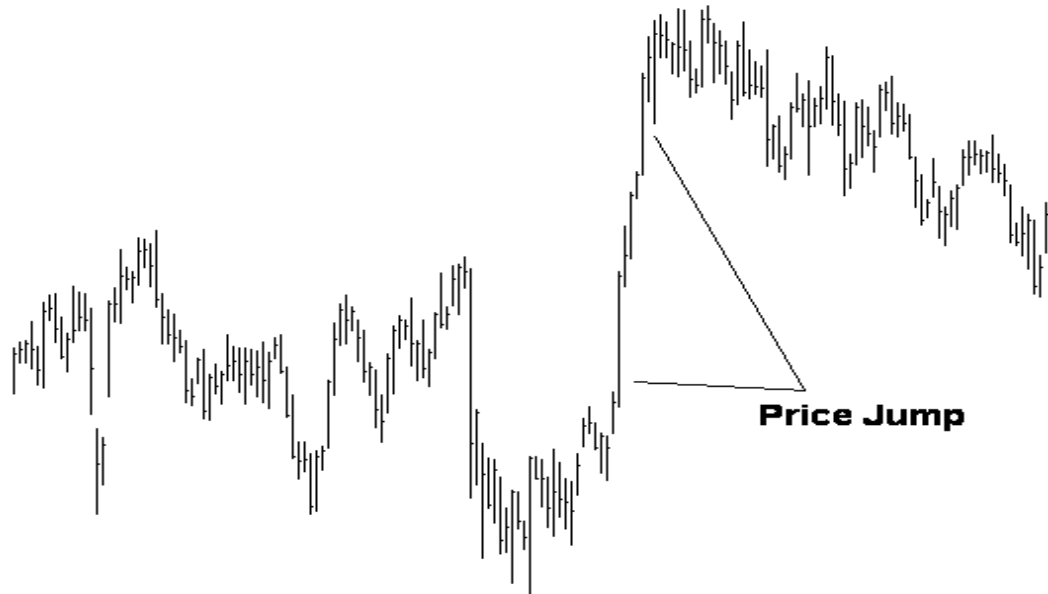
On the closing prices in your chart, plot a simple moving average (SMA) of length 16, an exponential moving average (EMA) of length 16, and the Jurik moving average (JMA) with length 7 and phase 50. For clarity, the chart below shows only SMA and JMA.
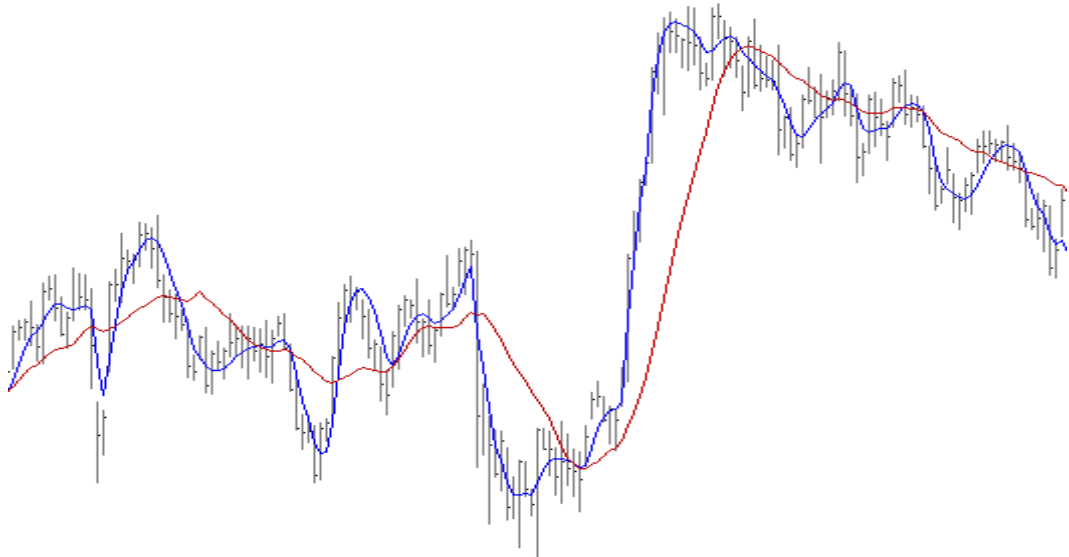
We define smoothness as the lack of bar-to-bar jitter in a moving average. JMA is so smooth that you can afford to make its length as small as 7 and still have less bar-to-bar jitter than the other two moving averages. Consequently, this faster speed gives JMA superior tracking capability, especially during large sudden price jumps. This suggests a unique application for JMA: **price proxy generation**. That is, using JMA as a noise-free replacement (proxy) for market prices. How this vastly improves certain technical analysis methods is discussed in detail in later sections.

Parameter Settings

JMA's **LENGTH** parameter determines the degree of smoothness, and it can be any positive value. Small values make the moving average respond rapidly to price change, and larger values produce smoother, slower moving curves. Typical values for LENGTH range from 3 to 80. You can even use decimal numbers, such as 27.3.

JMA's **PHASE** parameter governs a classic trade-off in filter design, whereby the user can control the balance between two opposing behavioral features of JMA: lag and overshoot.

LAG is the amount by which any moving average trails behind a time series that is either trending upward or downward. When using JMA to track price action, less lag yields better results. JMA phase ranges from -100 (max lag) to +100 (min lag). Its default value is 0.

OVERSHOOT is the amount by which any moving average continues to move in the same direction despite the actual time series having already reversed direction. The more a filter overshoots, the more time it will require to reverse direction and catch up to the time series being tracked. Consequently, when using JMA to track price action, less overshoot is better.

Unfortunately, _no_ moving average filter can deliver both minimum lag and minimum overshoot at the same time. When lag is reduced, overshoot is increased, and vice versa. To see how this tradeoff plays out with JMA, plot two JMA lines, one with phase set to –100 and one with phase set to +100, the minimum and maximum possible extremes. The demonstration chart below shows JMA(close,30,-100) and JMA(close,30,100).
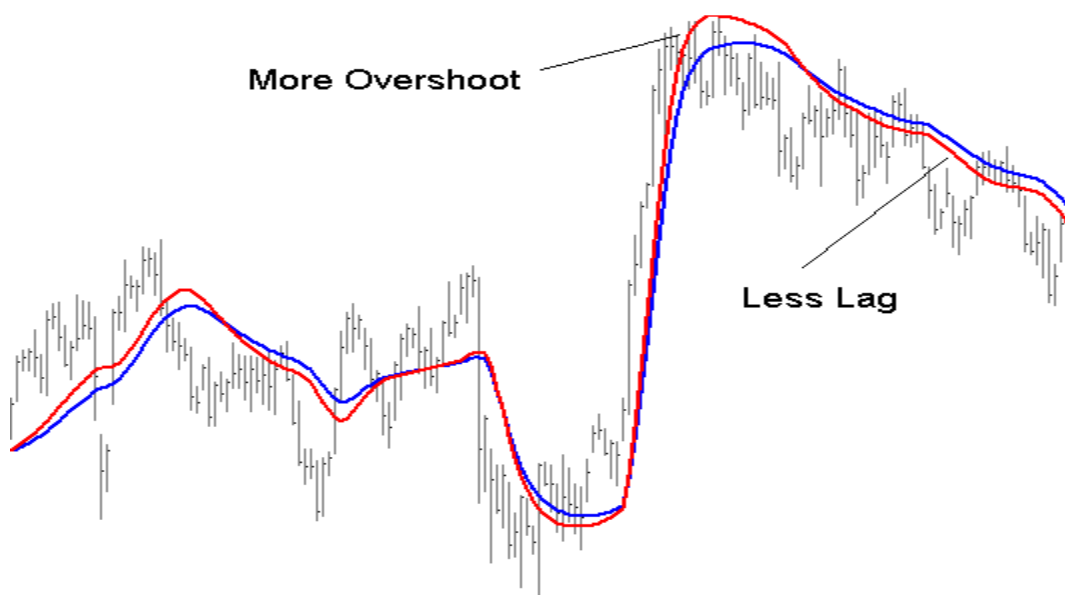
Note how the red line (phase = +100) has less lag than the blue line (phase = -100). It is also more likely to overshoot during large price jumps. If overshoot is not an issue, then consider using positive values of PHASE. If price overshoot is a real concern in your trading system, then consider using negative values of PHASE. If you really don't care one way or the other, then leave PHASE at its default value of 0.

PHASE plays an important role when trading strategies employ moving average crossovers. Since such crossovers are the essence of MACD, indicators, the effect of phase on MACD indicator design is examined below.

Trending Markets

John Murphy, in his book, *Technical Analysis of the Futures Markets*, discusses the MACD indicator (by Gerald Appel). Typically, the classic MACD is simply the difference between the lines of two exponential moving average filters with different length settings. Over time, the EMA lines are either converging (coming together) or diverging. Thus its name: Moving Average Convergence Divergence, or MACD.

With the MACD, a typical buy signal occurs when a faster moving average line crosses above a slower one and a sell signal occurs when the crossover is in the opposite direction.

Classical MACD indicators are great during trending price activity, riding the wave, so to speak. However, they are disastrous during choppy sideways activity, creating excessive, unprofitable trades.

This phenomenon occurs because moving averages lag behind the price signal and this lag causes a delay in trading signals. During rapid price oscillations, this delay could be long enough to cause a sell trade to occur when the downward moving price has already hit bottom of a cycle or a buy trade to occur when the price has already reached the top of its cycle. Either way, the trader would experience a loss using classical MACD.

This chart below shows how using JMA in a MACD system can improve the odds. JMA succeeds because you can use significantly faster speeds, thereby decreasing lag, and still maintain required smoothness for clear, unambiguous crossover signals.

On our demonstration chart below, there are two indicators:

    (red)   JMA(close,40,0)   slow line, medium overshoot
    (blue)   JMA(close,7,-100)   fast line, absolutely no overshoot

The strategy illustrated below is to buy when the fast line crosses above the slow line and to sell when the fast line crosses below the slow one. . .
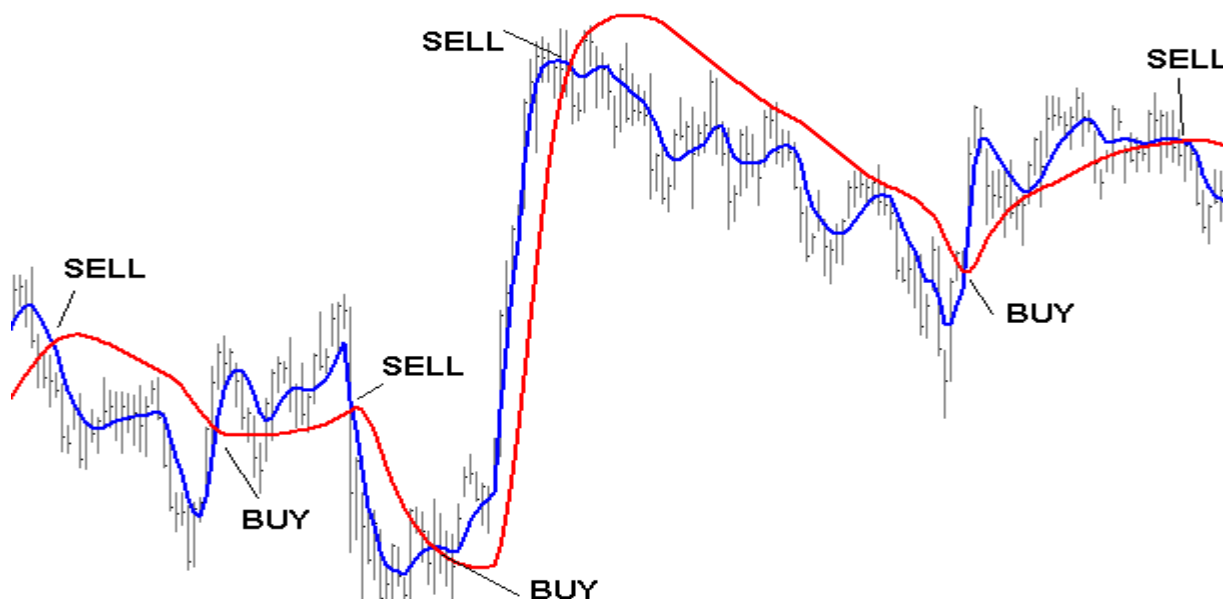

This strategy is only for demonstration purposes. The exact parameters used for JMA may not work on other markets. Do not trade real money using this system, it does not have all the necessary safety features for limiting exposure to risk. You should thoroughly test any trading strategy.

Reversal Markets

The classic crossover strategy does not work well in markets that, instead of trending, tends to frequently reverse within a trading range. The inevitable lag between the actual time the market has reversed direction and when a trade is signaled by the crossover can be so large that by the time the trade is realized, the favorable trend is already over and the market is about to reverse against your position. In this environment, a more appropriate trading strategy is suggested.

The idea is to create a "channel" based on approximations of support and resistance. When the market breaks out of the channel, and fails to maintain momentum, odds are price will fall back toward the center of the channel. This tendency can be exploited in the following manner…
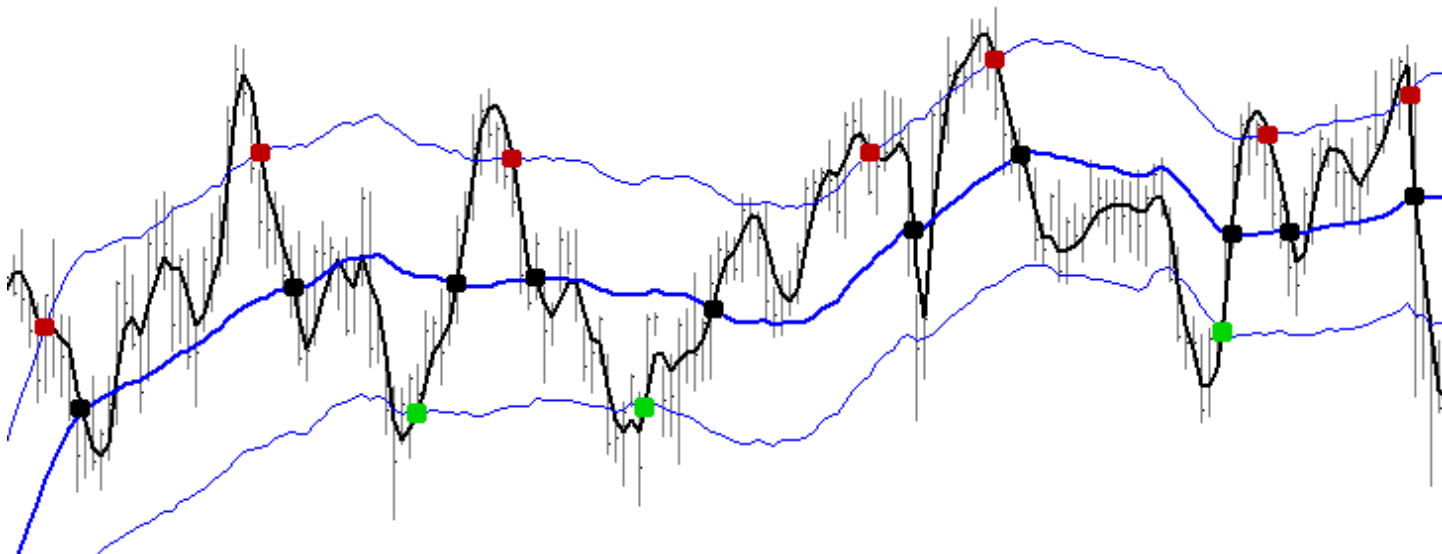
In the chart above, The blue lines are part of a Keltner Band (similar to a Bollinger Band). The middle blue line is a slow running JMA of the closing prices, with Length = 30 and phase = 0. The upper blue band is constructed by adding 1.5 times the 30-bar ATR (average true range[1]) to the blue JMA line and the lower blue band by deducting the same amount. The black curve running through the data is a fast running JMA with length = 5 and phase = 100.

The red dots indicate when the market is retracting from a failed upward breakout, and the green dots mark when price is retracting from a failed downward breakout. These are places where one might want to enter the trade. The black dots indicate where price crosses the center of the channel, a reasonable place to exit the trade.

This method fails whenever price retraces slightly back into the channel, but reverses again and continues on its original trend. To prevent loss whenever a real trend occurs, it is best to add rules for exiting the market when this situation occurs. A simple approach might be to exit the market whenever JMA exits the Keltner channel in the direction contrary to the trade.

This strategy is only for demonstration purposes. The exact parameters used for JMA may not work on other markets. Do not trade real money using this system, it does not have all the necessary safety features for limiting exposure to risk. You should thoroughly test any trading strategy.

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[1] True Range is the maximum of three possible values: the current bar's high minus the low, the current high minus the prior bar's close, or the prior bar's close minus the current bar's low.

De-noising Classic Indicators

There may be occasions when you really like the behavior of a particular indicator, but you want to remove some of its noisy (jagged) motion. You discover that common filtering distorts the indicator's shape or adds unacceptable lag, thereby delaying decision making.

JMA is ideal for "cleaning up" common technical indicators. The chart below illustrates the difficulty determining when Fast %K (magenta line) truly crosses over Slow %D. In contrast, JMA (green line) makes crossover determination very easy. The green line was produced by running Fast %K through JMA.

Parameter settings for this chart …

Fast %K   length = 14

JMA   length = 6 ,   phase = 100

Slow %D   length = 20
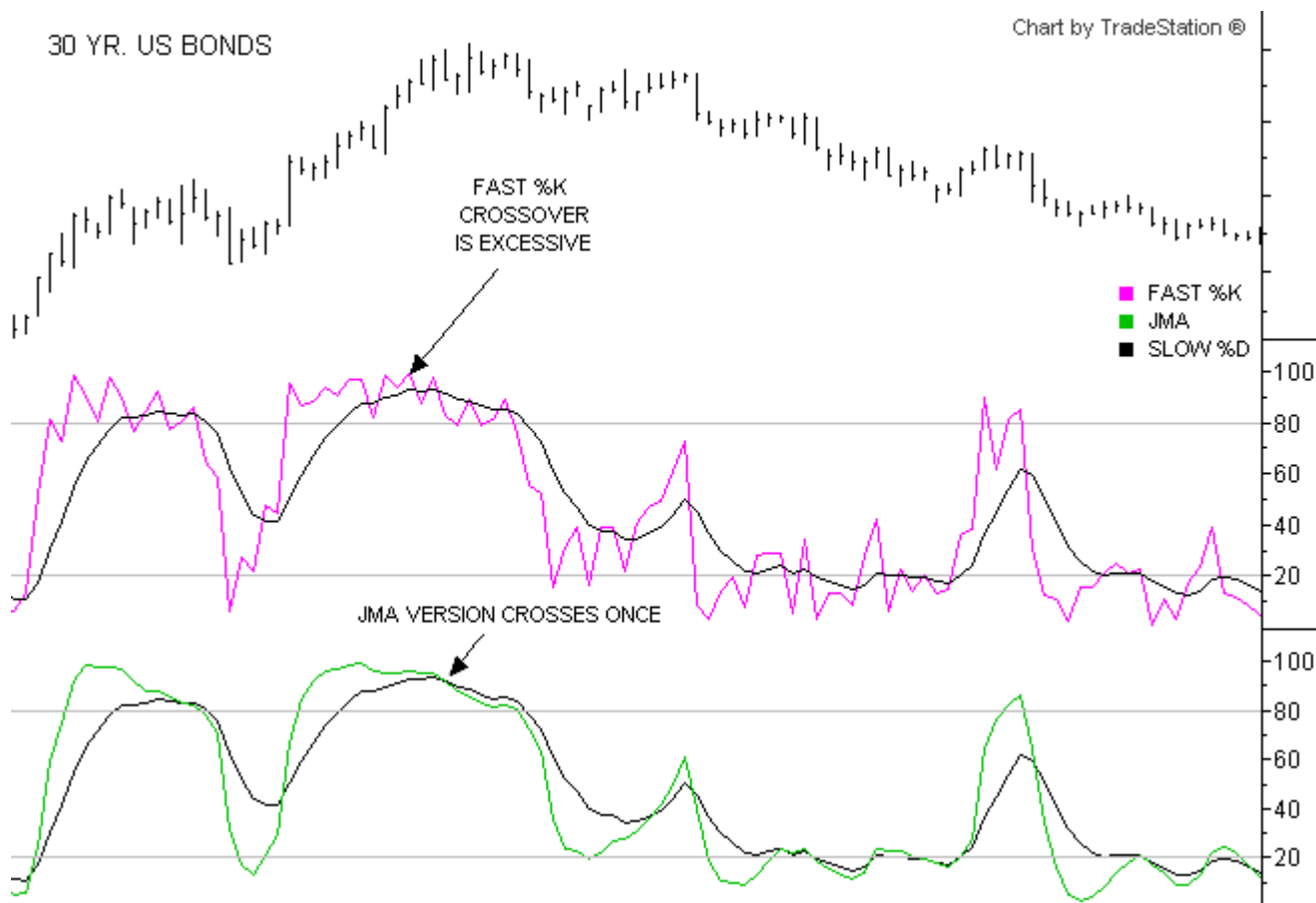
Feeding the Price Proxy To RSX

This section is relevant only to those users whose charting platforms allow them to take the results of JMA, perform additional calculations and feed those results to RSX. If your charting platform does not support this feature, please skip this section.

Additional power can be attained by combining Jurik tools. One way is to run various indicators independently of each other and construct trading rules based on their mutual agreement or confirmation. Another approach is to feed the results of one Jurik tool into another, thereby producing an even more powerful indicator. This section describes the latter technique.

We will be combining JMA with RSX. To run the demonstrations described herein, you will need to have both JMA and RSX installed and available on your charting platform. If you do not have RSX, details about RSX and how to acquire it are available on our web page at Jurik Research .

As shown earlier, price data can be smoothed by applying JMA. We now want to illustrate the power in applying RSX to this price proxy, rather than to the original price data. This form of data preprocessing transforms the nature of RSX.

The chart below shows price bars and four plots by RSX. The four plots differ in the amount of pre-smoothing by JMA. As the amount of pre-smoothness increases, unwanted oscillations in RSX disappear. This creates a "cleaner" signal, whose advantage is that there would be fewer crossovers against an arbitrarily placed threshold line. This results in fewer false triggers. The tradeoff, however, is that greater JMA smoothness yields more lag, so the user must strike a balance between reducing crossovers and reducing lag.
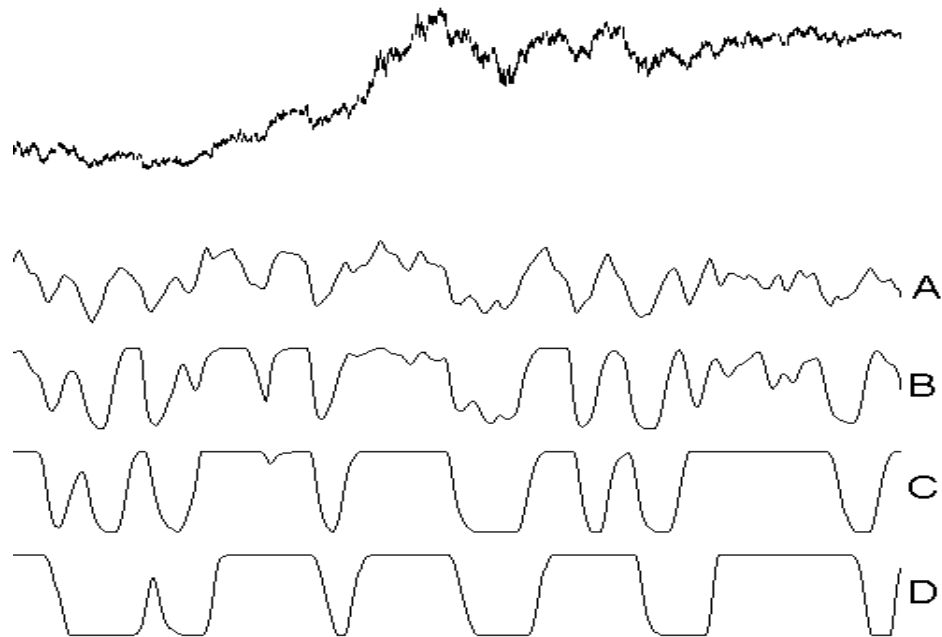
Each of the four chart plots A, B, C, D, was created by first running JMA over the closing price and then feeding the results to RSX with length=14. The differences are summarized as follows:

| Plot	JMA length	JMA phase
A	1	0
B	10	0
C	30	0
D	60	0

RSX

Theoretical Advantages

Ultra smooth, accurate, low lag indicator of trend direction and purity

Analysts use Wilder's RSI to estimate the direction, purity and turning points of market trends. These estimates are severely crippled by the jagged nature of their chart lines. By rapidly crisscrossing threshold levels, a noisy RSI can trigger excessive trade signals. In addition, the jagged lines obscure the true story, consequently delaying analysis until the picture is more certain. Meanwhile, good trading opportunities are missed. Unfortunately, attempts to mitigate these problems by smoothing RSI also make the signal slower, further delaying analysis and trades. … You can do better!

Imagine that you could remove all the noise from RSI without either distorting the true signal or adding lag. With Jurik Research's RSX you can now have a crystal clear picture of both direction and strength of market trends. Its accurate and smooth performance removes noisy crisscrossing, and its low-lag agility opens up new opportunities for analysis. For example, the speed and direction measurements of RSX are smooth and accurate. Not so with RSI.

The best way to illustrate the power of RSX is quite simple: compare it with the RSI. In the chart below, we see daily bars of U.S. Bonds analyzed by RSX and the classical RSI. RSX is very smooth. Typically any indicator can be smoothed by a moving average, but the penalty is added lag to the resulting signal. Not only is RSX smoother than RSI, but its smoothness comes **without added lag**. RSX permits more accurate analysis, helping you avoid many trades that would have been prematurely trigged by the jagged RSI. Once you begin using RSX, you may never apply the classical RSI again!
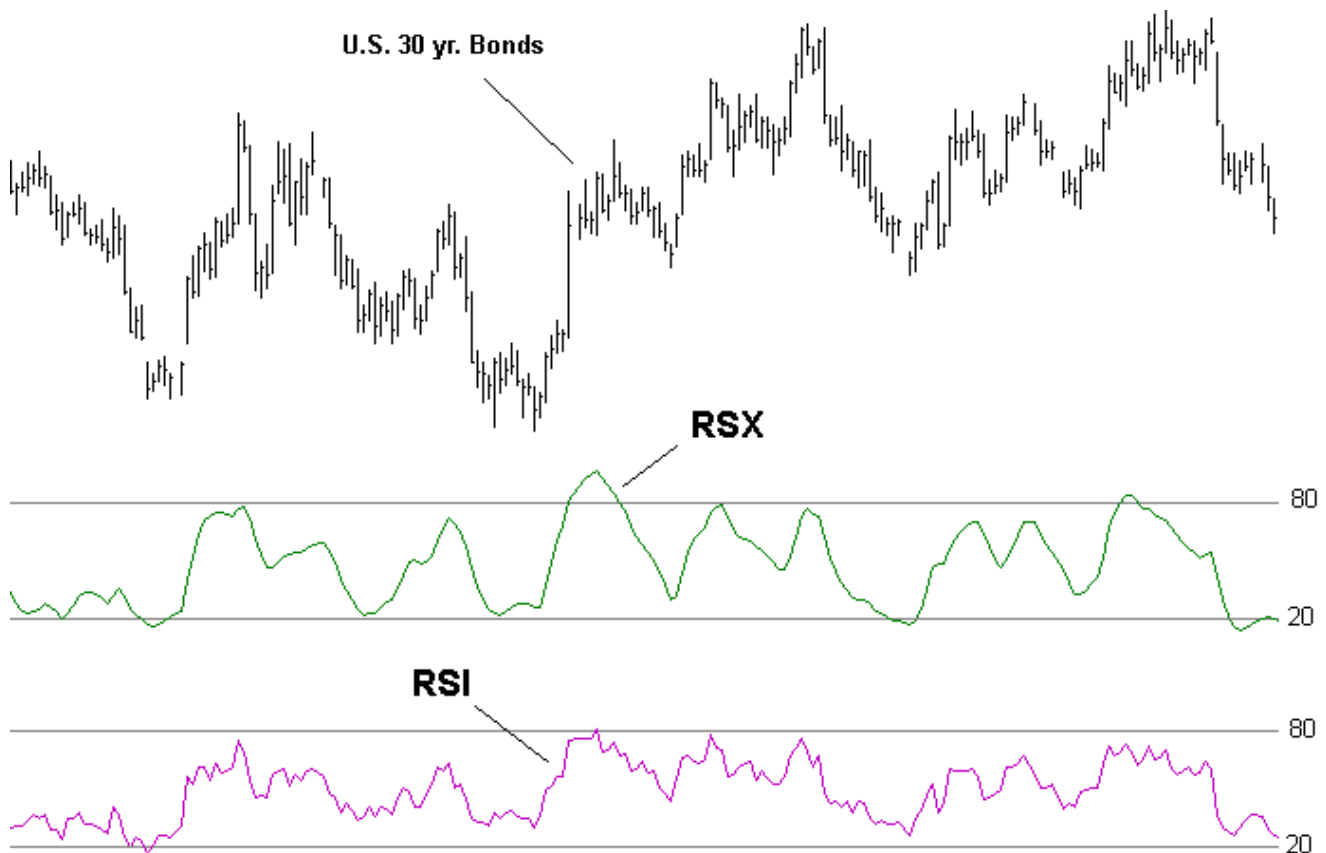
Sample Applications

Length Parameter

RSX has one performance adjusting parameter: LENGTH. Adjusting LENGTH varies the smoothness of RSX. Small values make RSX respond rapidly to price change and larger values produce smoother, flatter curves. Typical values for LENGTH range from 5 to 80.

RSX Momentum

RSX measures two aspects of market trend simultaneously: momentum and purity. Trend momentum is the speed with which price is moving, and trend purity is concerned with the relative proportion of bars that are actually moving in the direction of trend. A fast moving upward trend with 90% of the last 20 bars moving in the same direction will produce a strong RSX value (a value close to either 0 or 100). Congested price movement will have about half of the price bars moving up and half moving down. In that case, RSX will produce a neutral value of 50 out of 100 (just as the classical RSI would).

Trend momentum and purity are import aspects to consider when timing trade entries and exits. Because RSX is so smooth, you can create new indicators based on the slope (speed of change) of RSX. Many simple trading strategies can be built around the values of RSX and its slope. The following demonstration trading system is based on the following key rules: Buy when RSX is rising, sell when RSX is falling.
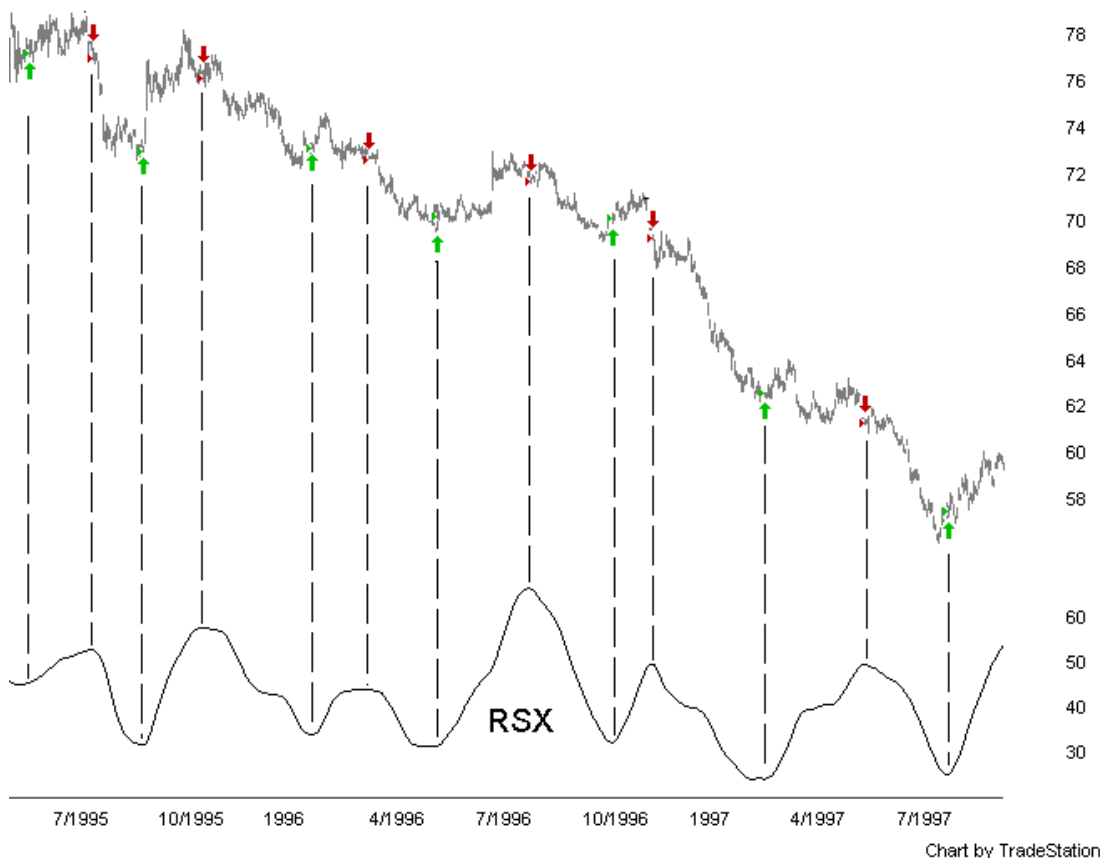

Chart by TradeStation

This strategy is only for demonstration purposes. The exact parameters used for RSX may not work for other markets and time frames. Do not trade real money using this system, it does not have all the necessary safety features for limiting exposure to risk. You should thoroughly test any trading strategy.

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RSX Threshold

Trading signals can also be generated when RSX crosses a threshold line (a constant). That is, BUY LONG when RSX crosses above the threshold line and SELL SHORT when RSX crosses below. Such a strategy would have 2 adjustable parameters: RSX length and the value of the threshold line.

The chart below shows the type of trade signals produced by this method. The parameters were:

RSX series	closing prices
RSX length	17
threshold	43 (note – RSX range is from 0 to 100).

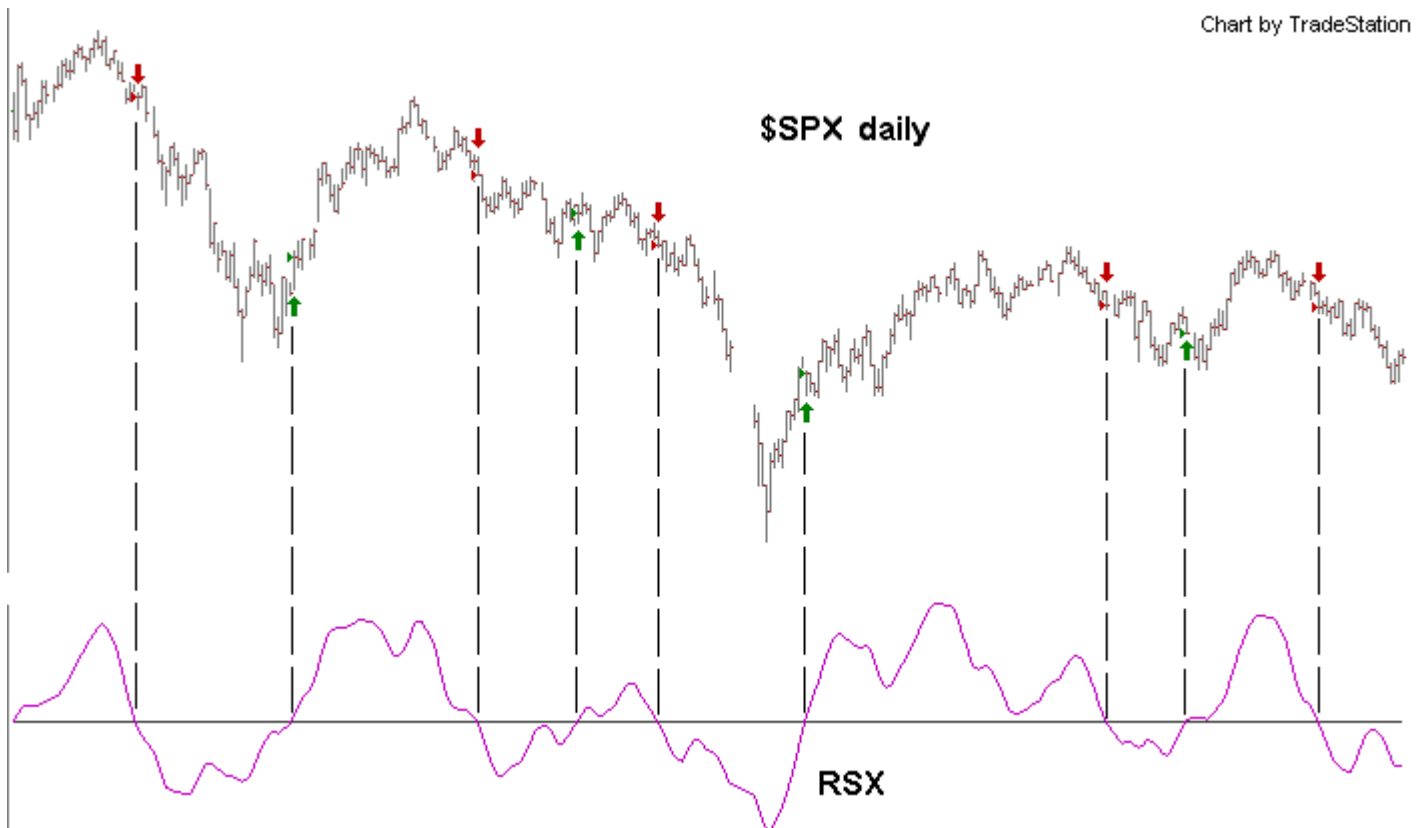Chart by TradeStation

$SPX daily

RSX

This strategy is only for demonstration purposes. The exact parameters used for RSX may not work for other markets and time frames. Do not trade real money using this system, it does not have all the necessary safety features for limiting exposure to risk. You should thoroughly test any trading strategy.

Tips for Improved Performance

Because RSX is sensitive to trend quality, you typically get better performance using a time series that is less noisy than the simple market values: open, high, low and close. One technique, as mentioned in the previous section, is to use JMA to pre-smooth the time series prior to applying RSX. A simpler method is to use HIGH+LOW+CLOSE, or just HIGH+LOW. Both versions are considerably more stable than CLOSE.

RSX - JMA Crossover

This section is relevant only to those users whose charting platforms allow them to take the results of RSX, perform additional calculations and feed those results to JMA. If your charting platform does not support this feature, please skip this section.

Instead of having RSX cross a fixed threshold value, you can have RSX cross its own moving average. JMA is the moving average used in the chart below. The trade logic is to BUY LONG when RSX crosses over JMA and to SELL SHORT when RSX crosses below JMA. The parameter values used in this example:

RSX   time series   HIGH + LOW
      length   26

JMA   time series   RSX values
      length   24
      phase   0
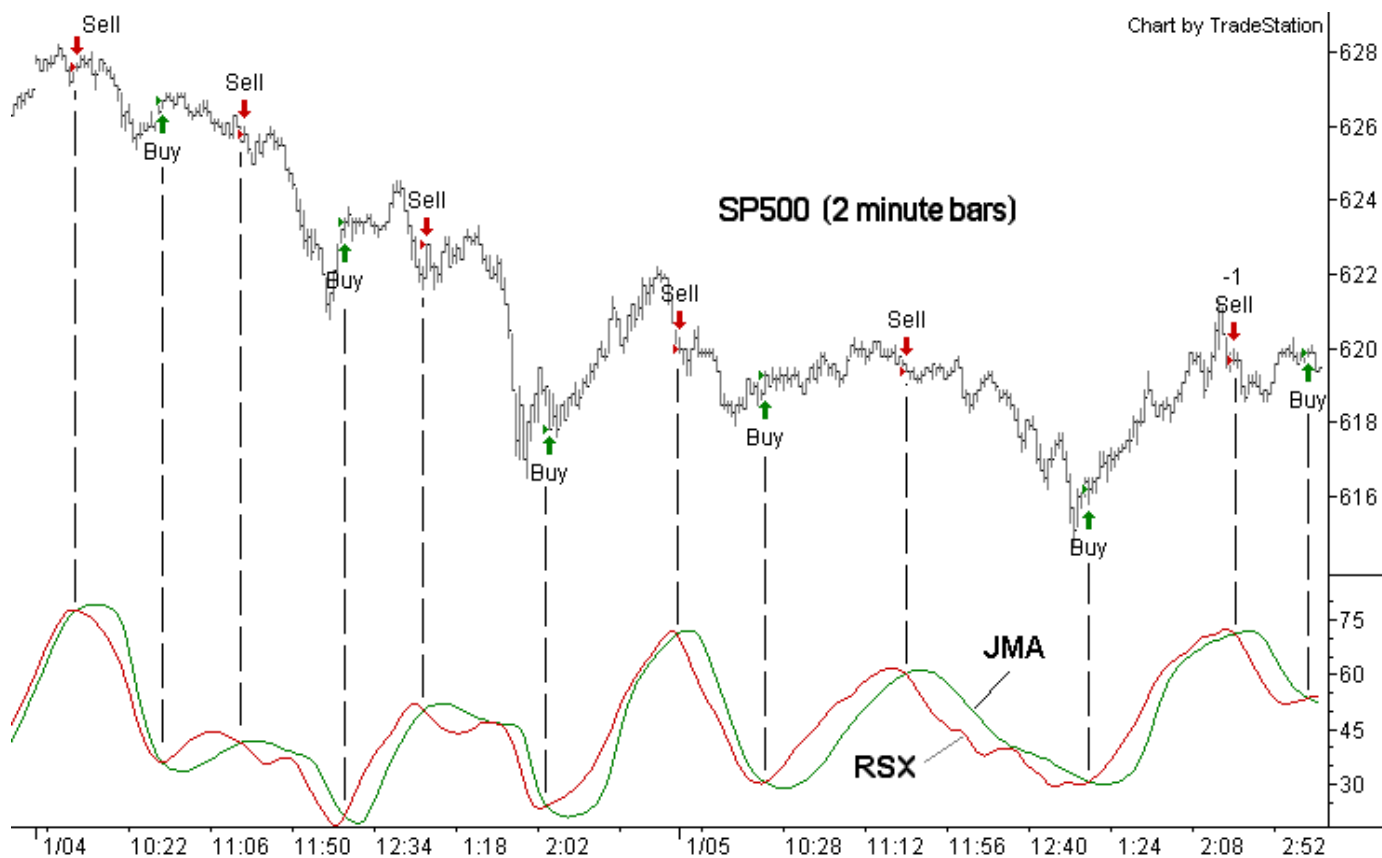
This strategy is only for demonstration purposes. The exact parameters used for JMA and RSX may not work on other markets and time frames. Do not trade real money using this system, it does not have all the necessary safety features for limiting exposure to risk. You should thoroughly test any trading strategy.

CFB

Theoretical Advantages

CFB is an index that reveals the market's trending time frame, ideal for creating adaptive window sizes of various technical indicators.

All around you mechanisms adjust themselves to their environment. From simple thermostats that react to air temperature to computer chips in modern cars that respond to changes in engine temperature, r.p.m.'s, torque, and throttle position. It was only a matter of time before fast desktop computers applied the mathematics of self-adjustment to systems that trade the financial markets.

Unlike basic systems with fixed formulas, an adaptive system adjusts its own equations. For example, start with a basic channel breakout system that uses the highest closing price of the last N bars as a threshold for detecting breakouts on the up side. An adaptive and improved version of this system would adjust N according to market conditions, such as momentum, price volatility or acceleration.

Since many systems are based directly or indirectly on cycles, another useful measure of market condition is the periodic **length** of a price chart's **dominant cycle**, (DC), that cycle with the greatest influence on price action.

The utility of this new DC measure was noted by author Murray Ruggiero in the January '96 issue of Futures Magazine. In it, Mr. Ruggiero used it to adaptively adjust the value of N in a channel breakout system. He then simulated trading 15 years of D-Mark futures in order to compare its performance to a similar system that had a fixed optimal value of N. The adaptive version produced 20% more profit!

This DC index utilized the popular MESA algorithm (a formulation by John Ehlers adapted from Burg's maximum entropy algorithm, MEM). Unfortunately, the DC approach is problematic when the market has no real dominant cycle momentum, because the mathematics will produce a value whether or not one actually exists! Therefore, we developed a proprietary indicator that does not presuppose the presence of market cycles. It's called **CFB** (Composite Fractal Behavior) and it works well whether or not the market is cyclic.

CFB examines price action for a particular fractal pattern, categorizes them by size, and then outputs a composite fractal size index. This index is smooth, timely and accurate.

Essentially, **CFB** reveals the length of the market's trending action time frame. Long trending activity produces a large **CFB** index and short choppy action produces a small index value. Investors have found many applications for CFB which involve scaling other existing technical indicators adaptively, on a bar-to-bar basis.
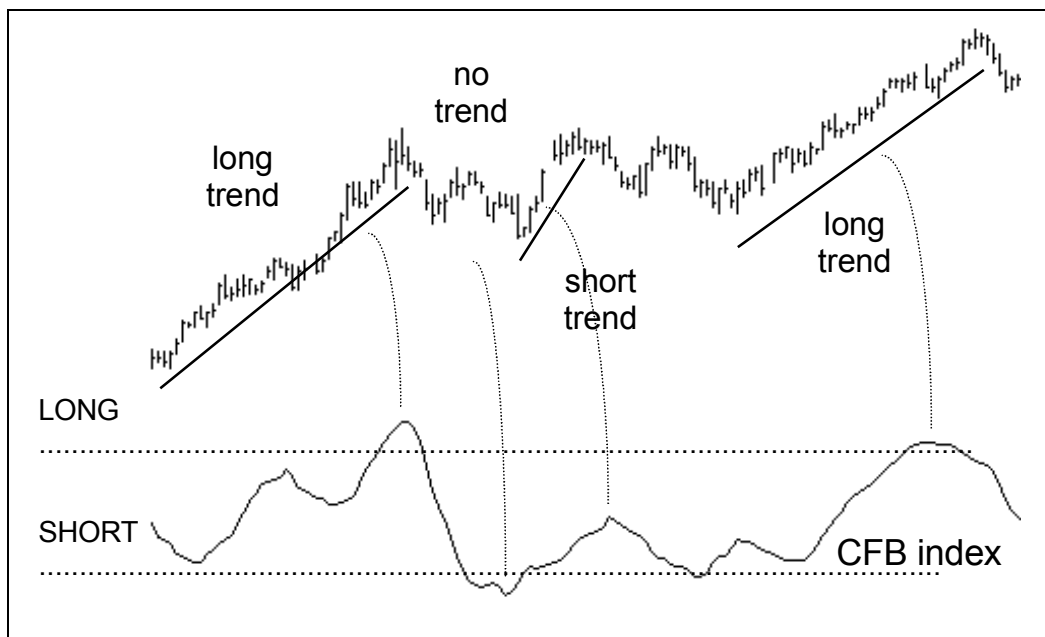
Sample Applications

Four Sizes Of CFB

CFB is composed of fractal filters. A fractal of length N examines trends N bars long. There are four CFB filters, and the only difference between them is the size of the largest fractal within. The largest fractal effectively governs the "length" of a CFB filter. You can choose from four possible lengths of CFB which cover a wide range of time periods: 24, 48, 96, 192.

CFB as an Early Warning Signal

The value CFB produces at any point in time represents the composite size of the strongest trending fractals in the market at that point in time. The longer the market has been trending, the larger the CFB index value.

CFB looks for clean trends, so if the trend quality is smooth, the fractals register strongly. If the trend becomes jagged or excessively volatile, the fractals degrade and the CFB index immediately begins to decline. One simple application of CFB is to detect the demise of a trend, offering an early warning signal to exit a trade.

The chart below shows two locations along CFB where rapid decline in value correlated with the ending of an upward and then downward trend. This does not imply the trend will always end, nor does it imply one must exit current trade that's riding the trend. It does suggest you would be wise to perform additional analysis, looking for confirmation.
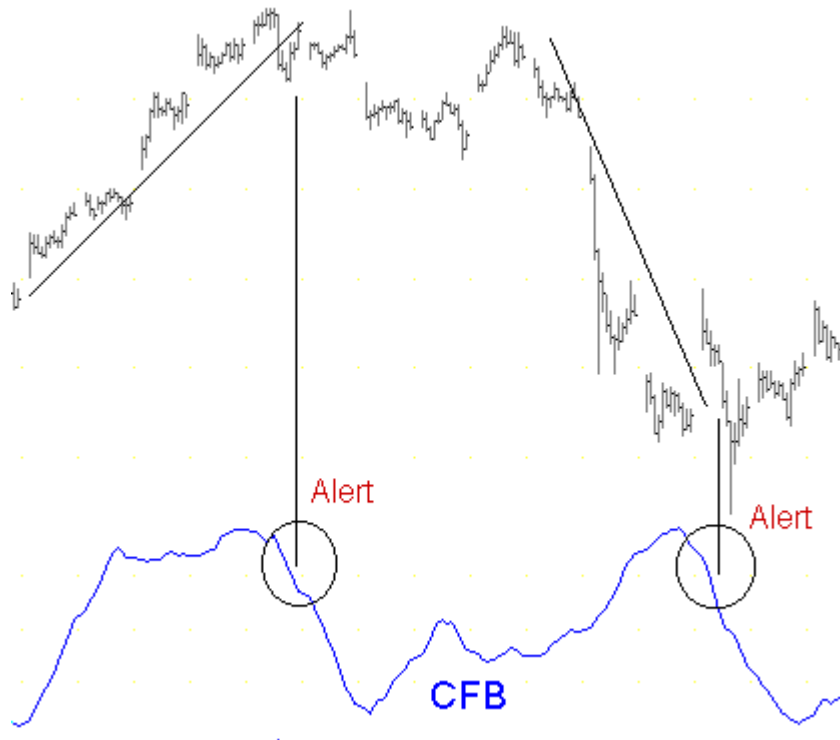
Using CFB to modulate Momentum Analysis

This section is intended for advanced users whose charting platforms allow them to code their own indicators.

This section discusses how to use CFB results to alter, on a bar-by-bar basis, the LENGTH parameter of VEL, Jurik's velocity indicator. This produces a momentum analysis of market prices, with a dynamically self-adjusting filter speed.

Your charting platform must allow you to take the results of CFB and perform additional calculations to attain a new LENGTH value for VEL, at each point in the time series.

Not all versions of VEL can accept a different value for its length parameter at each data point in the price time series. The versions that can are:

VELRT	real-time version of generic DLL
VELUT	(for eSignal only)
VEL2_scalar	(for ProSuite 2000*i* and TradeStation only)
VEL_update	(for Microsoft Excel only)

The version of VEL that <u>cannot</u> accept a dynamically varying LENGTH parameter is:

VEL   batch mode version of generic DLL

The following platforms use only this batch mode version of VEL: Neoticker, AmiBroker, WealthLab, WaveWi$e, NeuroShell.

The purpose of this technique is to specify how much short term market movement we want to ignore by adjusting VEL's length parameter appropriately. CFB makes it possible to automate these adjustments in a manner that makes VEL slower during large (long) up/down trends, and faster during small (short) up/down trends.

The first step is to translate CFB's measure into an oscillator, something like a Fast %K stochastic, whose value slides from a minimum possible value of 0% (when CFB is at its lowest value) to a maximum possible value of 100% (when CFB is at its largest value). This oscillator value is then used to slide VEL's length value between user-specified upper and lower bounds. Finally, VEL is called on each bar with the calculated length parameter value.

The programming pseudo-code begins on the next page.

The following pseudo-code is written in generic form. It should be rewritten using syntax compatible with your software application.

```
{ Lo.Limit is the lowest value of VEL you want used }
{ Hi.Limit is the highest value of VEL you want used }

USER INPUTS:  TimeSeries.array(1...N), Lo.Limit, Hi.Limit

{ initialize variables }

CFB.max = 0
CFB.min = 99999      { 99999 is a very large arbitrary value }

{ run CFB through entire data array, creating another array }

CFB.result.array = CFB ( TimeSeries.array , smoothness=1, fractalsize=24 )

{ loop through N data points of CFB results array}

For k = 1 to N

    CFB.result = CFB.result.array(k)

    { evaluate stochastic ratio of CFB result }

    if CFB.result > CFB.max then CFB.max = CFB.result
    else if CFB.result < CFB.min then CFB.min = CFB.result

    denominator = CFB.max - CFB.min
    if denominator > 0
          then stoch.ratio = (CFB.result - CFB.min ) / denominator
          else stoch.ratio = 0.5

    { calc VEL length depth and evaluate VEL }

    VEL.length = ceiling( lo.Limit + stoch.ratio * (hi.Limit - lo.Limit) )
    VEL.result.array(k) = VELxx( TimeSeries.array(k), VEL.length )
    end
```
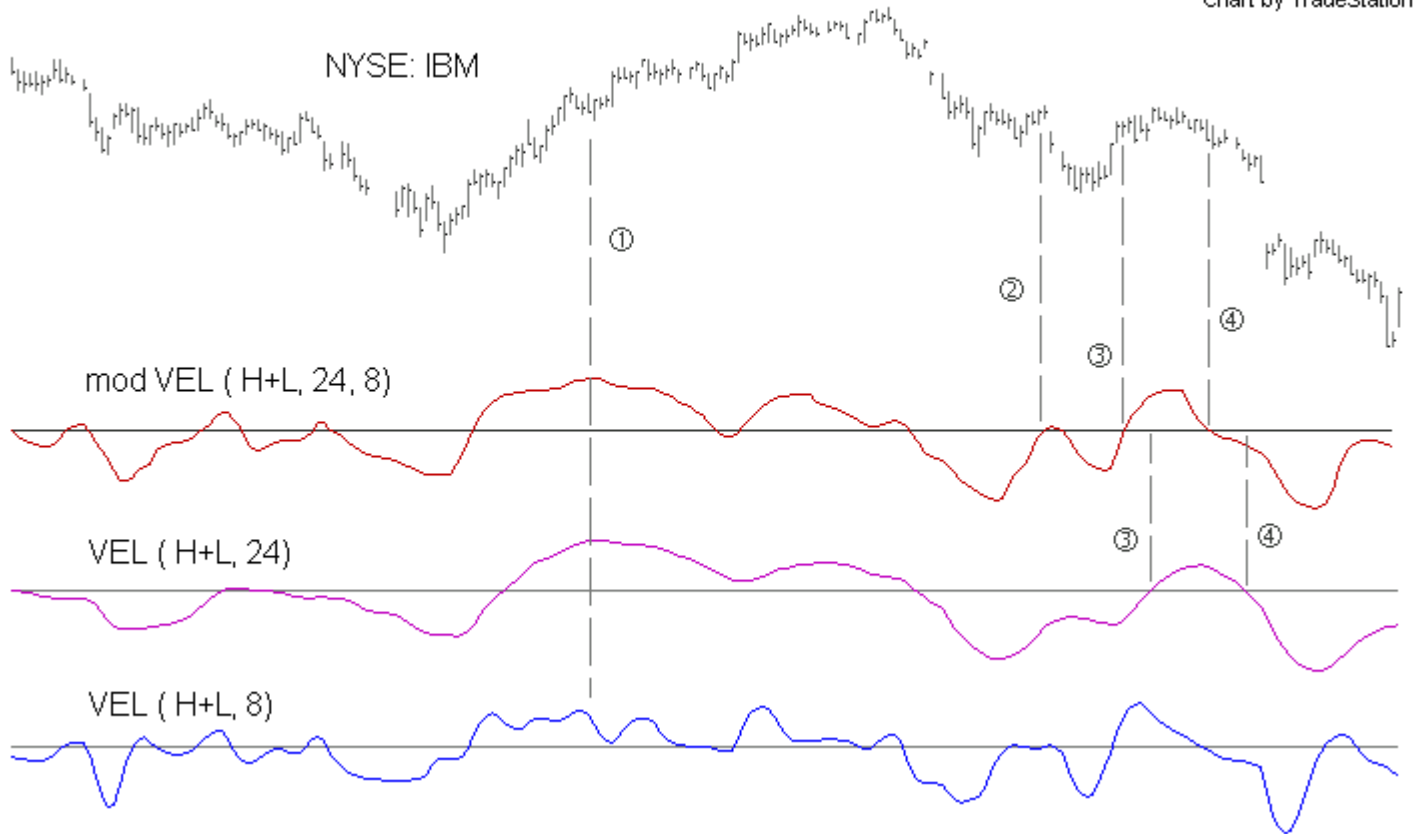
Note that the function written as "VELxx" may only be one of these : **VELRT, VELUT, VEL_scalar**.

The graphic chart showing results is on the next page.

Chart by TradeStation

The first plot shows daily bars of NYSE:IBM. Plot 2 is the modulated VEL produced by the algorithm shown above, using Lo.Limit = 8 and Hi.Limit = 24. The next plot shows the standard VEL with length = 24, and the last plot shows the standard VEL with length = 8, referred to as VEL-24 and VEL-8 respectively. For all three VEL plots, the time series was HIGH+LOW.

The improvement modulated VEL has over standard VEL can be seen at several locations on this chart. At time location #1, market price is rising and modulated VEL resembles VEL-24, both rising smoothly. In contrast, VEL-8 is very choppy and gets too close to the zero line; a behavior we would rather not have during a nice trend.

At time location #2, price has reversed and is starting to rise, yet VEL-24 is not responding well and has not crossed the zero line. However, mod VEL did because the upward price reversal caused CFB to decrease in value, in turn making mod VEL speed up and behave more like VEL-8.

At time slot #3, price has again reversed. Subsequently, mod VEL speeds up and crosses the zero line well before VEL-24. This occurs yet again at time location #4.

Mod VEL has the best of both worlds: smooth movement during trends and fast responses during market turn-arounds.

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DMX

Theoretical Advantages

DMX is the ultra-smooth, low-lag replacement for your classic DMI and ADX indicators.

The classic indicator ADX is a smoothed (and lagging) version of the more basic, and more noisy, DMI indicator. DMI itself is composed of two, non-negative jittery components, DMI+ (referred to here as DMI⇑), and DMI- (referred to here as DMI⇓), combined the following way ...

$$\text{DMI} \quad = \quad \frac{|\ \text{DMI}⇑\ -\ \text{DMI}⇓\ |}{\text{DMI}⇑\ +\ \text{DMI}⇓}$$

Let's create a new signal, called "Bipolar DMI", and let it be the same as the classic DMI formula above, except that the absolute value in the numerator is not applied. This lets the bipolar DMI be both positive (during upward trends) and negative (during downward trends). The new formula is ...

$$\text{Bipolar DMI} \quad = \quad \frac{\text{DMI}⇑\ -\ \text{DMI}⇓}{\text{DMI}⇑\ +\ \text{DMI}⇓}$$

LONG – The classic indicator DMI (Direction Movement Index) is so jagged (noisy) that its smoother version, ADX, is almost always used instead. Unfortunately, the smoothing process uses either a simple moving average or exponential average. Either way, the moving average adds unwanted lag to the signal, which, in turn, delays analysis and induces late trades. Jurik Research's DMX is a superior version of DMI. DMX replaces the classic moving average with JMA, producing ultra-smooth, timely and very responsive performance to fast market moves. Additionally, since there is no need to smooth DMX, both DMI and ADX are now obsolescent.

The following chart shows bipolar DMI to be very noisy (jagged). However, smoothing this line, thereby producing the classic indicator ADX, would add unwanted lag to the signal. Compare DMI to DMX. DMX offers a clean, smooth picture, allowing you to detect true market direction faster, and with greater accuracy. With DMX, there is no need to use ADX either ... because DMX is already ultra-smooth!
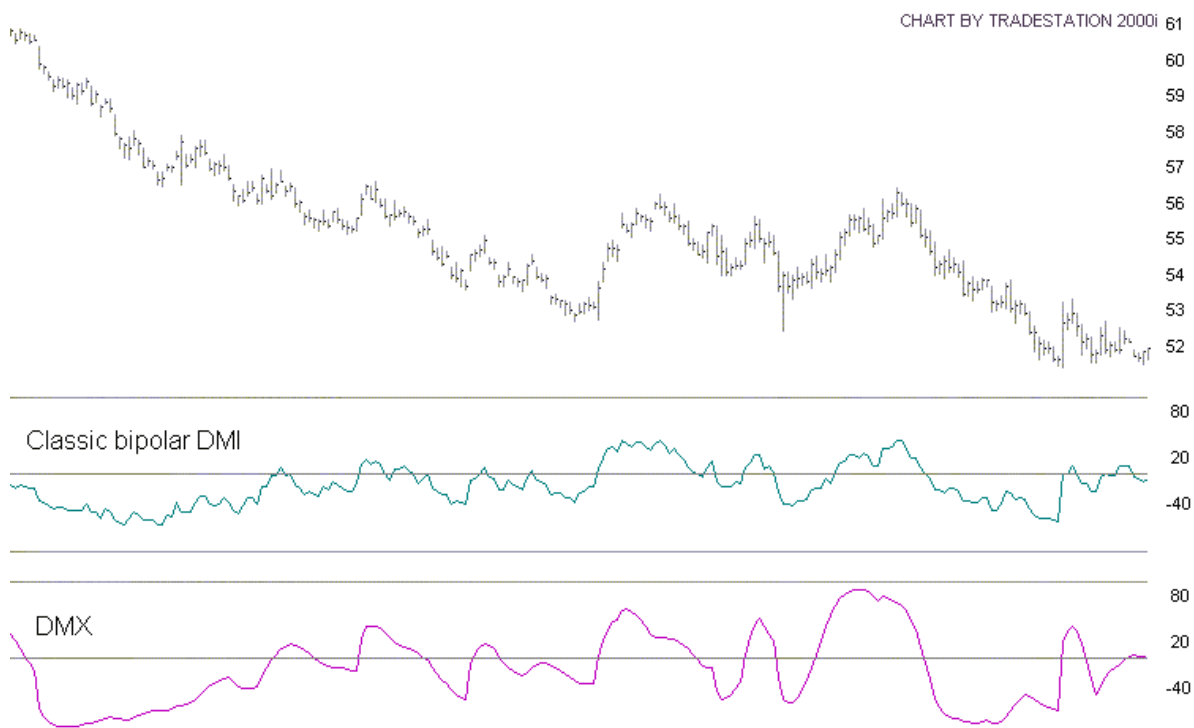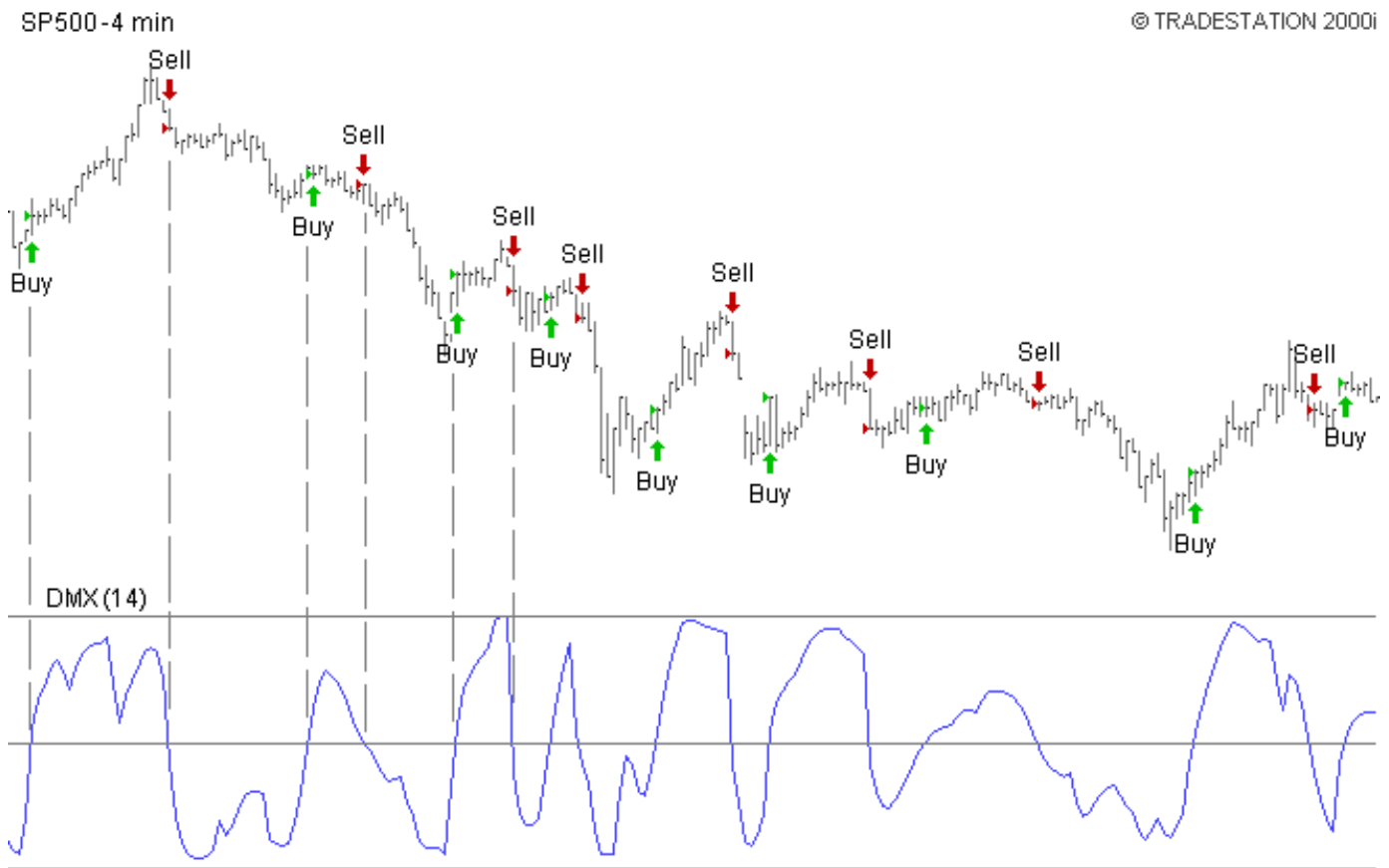
Sample Applications

Zero-crossing

There are several ways to use DMX. The first example shows trading signals produced when DMX crosses the zero line. The rule used here is to buy when DMX crosses above the zero line and to sell when DMX crosses below. DMX length parameter = 14.

This strategy is only for demonstration purposes. The exact parameters used for DMX may not work on other markets or time frames. Do not trade real money using this system, it does not have all the necessary safety features for limiting exposure to risk. You should thoroughly test any trading strategy.

Slope Reversal

This example shows trading signals generated when DMX reverses direction. To prevent unnecessary reversals, the DMX length parameter is increased to 32. This momentum technique would be virtually impossible using classic DMI, because the jagged lines produced by DMI with a shorter length would increase whipsaws, and a DMI with a longer length would lag considerably.
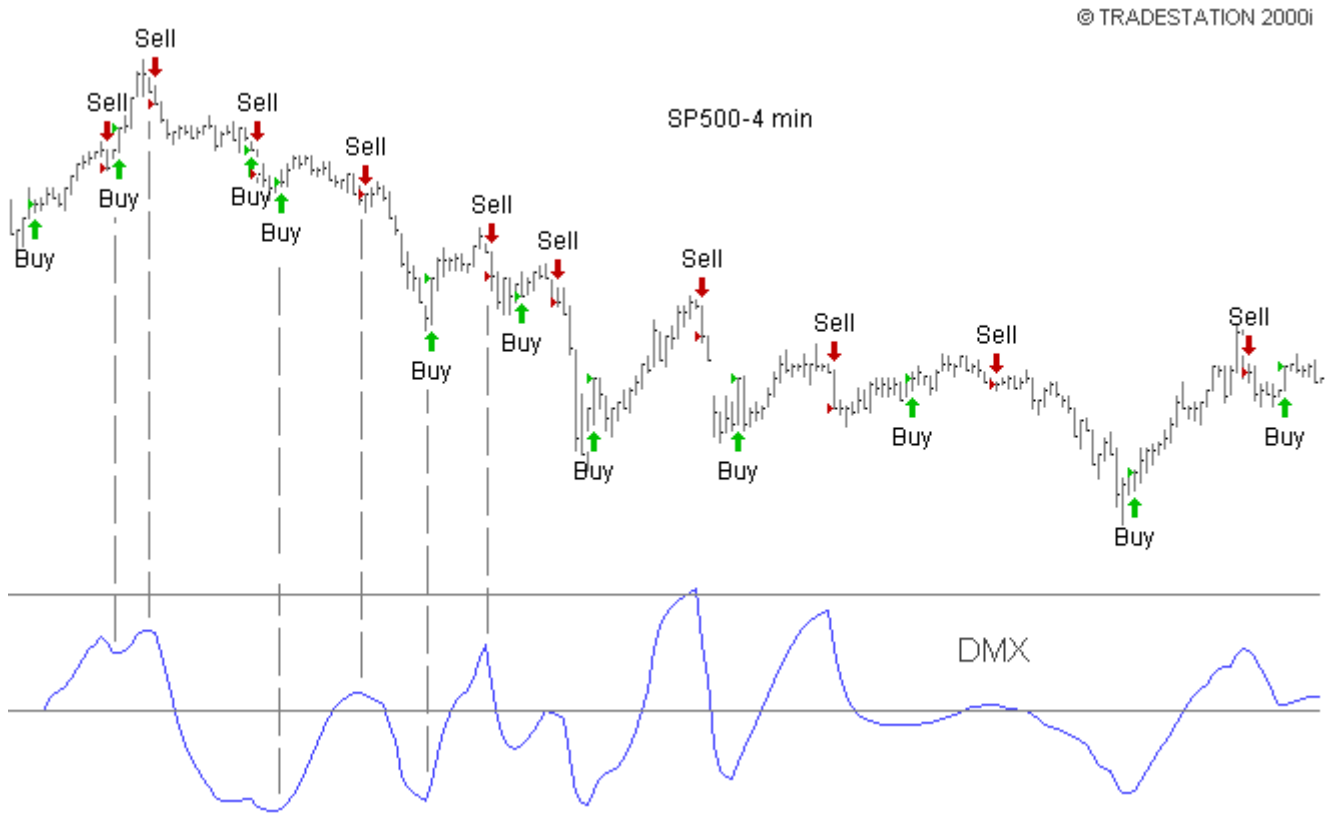
This strategy is only for demonstration purposes. The exact parameters used for DMX may not work on other markets. Do not trade real money using this system, it does not have all the necessary safety features for limiting exposure to risk. You should thoroughly test any trading strategy.

VEL

Theoretical Advantages

To obtain lag-free smoothing of the standard momentum indicator !

One of the simplest ways to play the market is to buy when prices are rising and sell otherwise. If the trends are long enough, this strategy does very well. The momentum indicator (ie. today's price minus that of N bars ago) is an effective indication of market direction. As N increases, more evidence is considered and the indicator becomes more accurate. However, the estimate's delay of N/2 bars also increases, delaying trades by a few critical bars, making them too late to be profitable. It is the classic tradeoff: **accuracy versus timing**. You cannot have both.... or can you?

You can with a new momentum oscillator from Jurik Research. By using sophisticated matrix algebra, it improves both accuracy <u>and</u> timing.

To see how, refer to the chart below. The first graph is the H-L-C daily price bars of D-Mark futures, from 8/92 to 12/92. The second graph (line A) is the ordinary 7-day momentum oscillator. N=7 is fast enough to capture the cyclic motion and not too fast to be extra jittery. Strategies using jittery indicators may place trades too often (and cost too much in commissions) as the indicator rises and falls almost every bar.
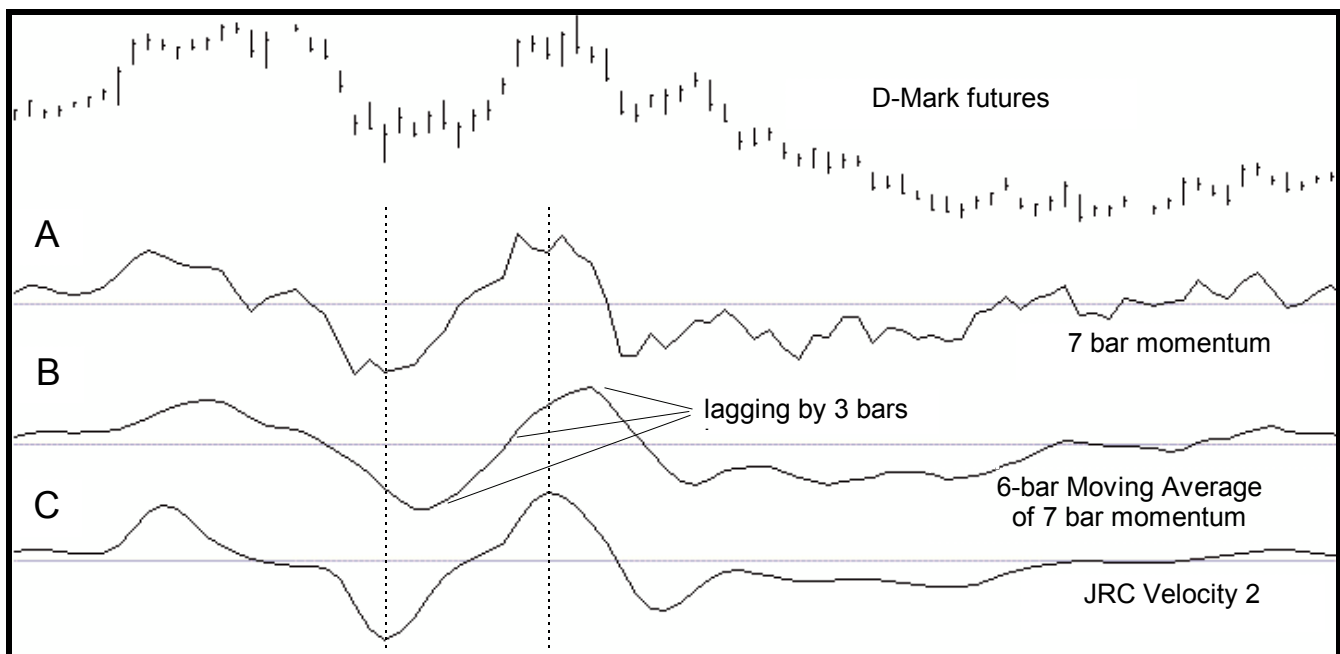
The classic method for reducing jitter is to use an M-bar wide moving average of the indicator. Note how

often the plain oscillator (line A) crosses the zero-threshold line in the right-half of the graph and how the 6-bar averaged version (line B) is smoother and crosses the zero-line much less frequently.

This improvement comes with a penalty. Note the tops and bottoms of line B lags behind those of line A by (6/2 = 3) bars, on average. There is also a corresponding lag at all locations where line B crosses the zero-threshold line. As you may have already experienced in your own trading, in these short cycles, being 3 bars late may be the difference between having a profit or a loss. The story is the same with long cycles and large values of M and N.

Line C was produced by our momentum oscillator, called "**VEL**". VEL has the best of both worlds, smoother lines than momentum and with no additional lag. Line C's tops, bottoms and zero-crossings all coincide with those of line A. You might call this deft feat "ZERO-LAG FILTERING of MOMENTUM", however, it was not achieved by running momentum through a filter. VEL applies a proprietary algorithm directly on the original price data.

VEL has only one adjustable parameter and it controls how many historical bars are processed when assessing momentum at any point in time on the chart.

D-Mark futures

A   7 bar momentum

B   lagging by 3 bars   6-bar Moving Average of 7 bar momentum

C   JRC Velocity 2

Sample Applications

VEL parameters

VEL's single adjustable parameter, DEPTH, determines the total number of bars back you want VEL to consider when making a calculation for the current bar. Typical values of DEPTH range from 5 to 40. Depth must be an integer (whole number).

VEL is similar to RSX, in the sense that both include market price momentum in their algorithm. Unlike RSX, VEL is not bounded within a fixed range (eg. 0 – 100), and that opens up opportunities for different applications.

Using VEL's Momentum

The first demonstration of VEL is similar to RSX, whereby the indicator's momentum is used to signal trading positions. The chart below shows the SP500, in 6-minute bars. The parameters for VEL were:

        Time Series … High+LOW
        LENGTH …   17

The trading strategy was to BUY if VEL is rising and SELL if VEL is falling.
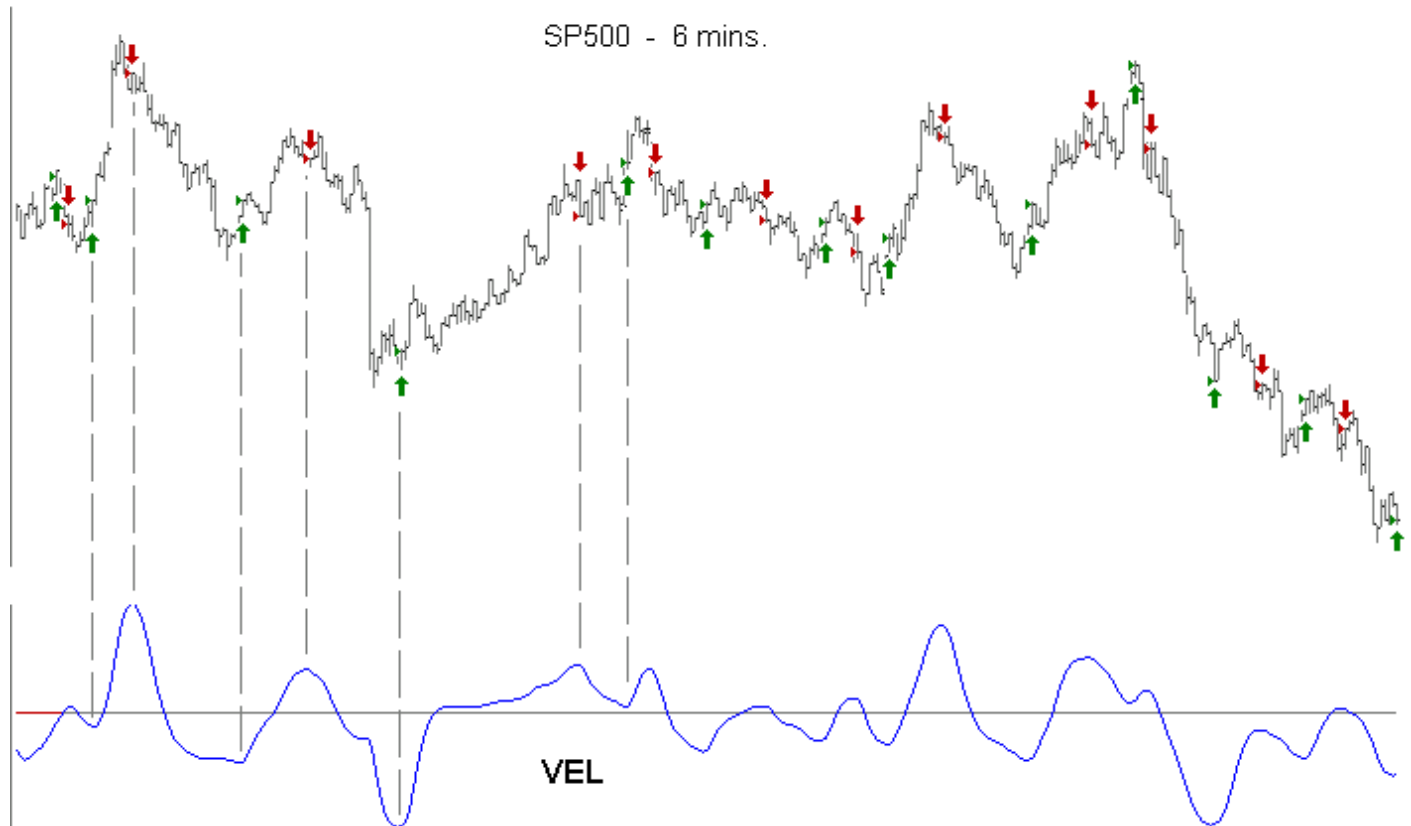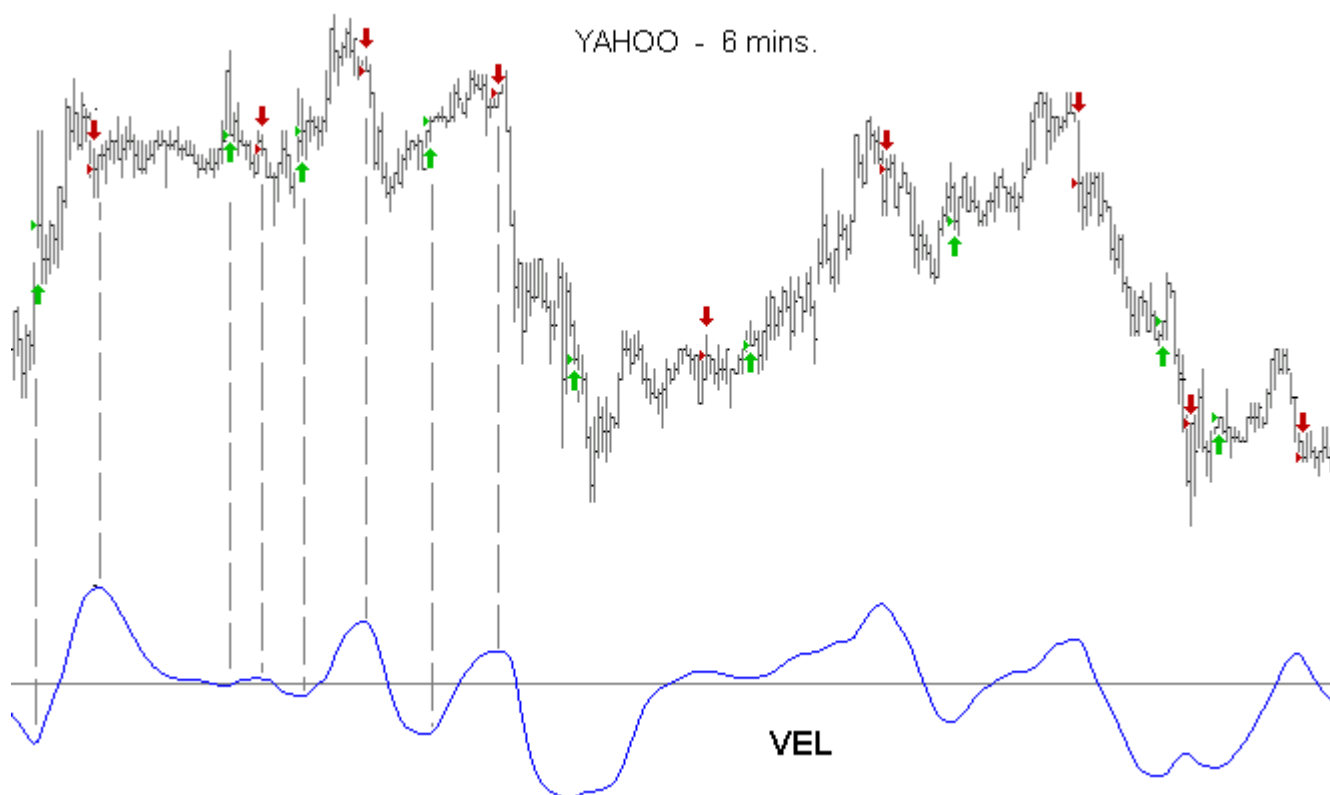

SP500 - 6 mins.

VEL

This strategy is only for demonstration purposes. The exact parameters used for VEL may not work on other markets or time frames. Do not trade real money using this system, it does not have all the necessary safety features for limiting exposure to risk. You should thoroughly test any trading strategy.

Using VEL's Momentum

Another example of using VEL's momentum involves YAHOO securities, charted in 6-minute bars. For this chart, VEL's parameters were …

Time Series	High+Low
Length	27

The trading strategy was to BUY if VEL is rising and SELL if VEL is falling.

YAHOO - 6 mins.

VEL

This strategy is only for demonstration purposes. The exact parameters used for VEL may not work on other markets. Do not trade real money using this system, it does not have all the necessary safety features for limiting exposure to risk. You should thoroughly test any trading strategy.

Using CFB to Modulate VEL

If your software charting platform has a built-in programming language, you may be able to increase the power of VEL by having its LENGTH parameter adjusted dynamically on a bar-to-bar basis. For more information about this technique, refer to the section on CFB.

Waveform Divergence

VEL's smoothness and accuracy lends itself to a very powerful form of divergence analysis. The chart shows higher swing-highs during segment A of both the price and VEL time series. This convergence suggests continued upward price movement, which occurs during price segment B. However, in segment B, the swing-high is now lower in the VEL series. This divergence says the upward price action is decelerating and suggests an upcoming reversal. As shown, price does trend lower during the 2nd half of the chart. In segment C we see price potentially starting a new uptrend, but its divergence with VEL's lower swing-highs suggests there's no real energy to the upside, and price continues its downward movement.

NOTE -- This divergence analysis technique is not 100% perfect. (What is?) Nonetheless, VEL users tell us it works well enough to be part of their overall trading strategy.
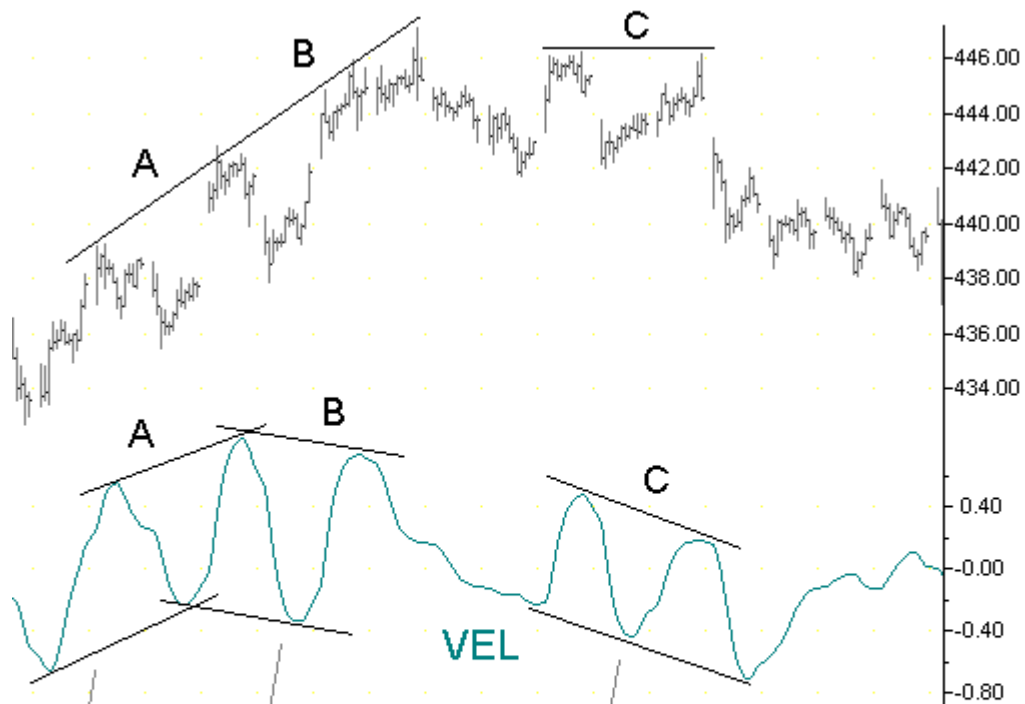
Although price is rising, falling oscillations in VEL indicate weakness and a probable downtrend

Rising oscillations in VEL suggest more upward price action

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Order Form

SHIP TO:

Name _____

Business Name _____

Street Address _____

_____

_____

Email Address _____

__ VISA   __DISC   Card Verification Value
__ AMEX   __MC   (Last 3 digits on
                    reverse side of card) _____

Credit Card Number _____

Exp. Date _____ Phone _____

Card Billing Address _____

_____

_____

Signature _____

To specify products, circle the relevant prices

	Programmer's Generic DLL	Microsoft Excel	TradeStation Supercharts	eSignal
(JMA) Jurik Moving Average	$ 205	$ 205	$ 205	$250
(VEL) Ultra-smooth Velocity	$ 205	$ 205	$ 205	*annual*
(CFB) Composite Fractal Behavior	$ 205	$ 205	$ 205	*license fee*
(RSX) Jurik Relative Strength Index	$ 205	$ 205	$ 205	*for toolset*
(DDR) Dimension Reducer and Decorrelator	$ 205	$ 205	$ 105 **	---
(WAV) Historical Data Waveform Sampler	$ 205	$ 205	$ 105 **	---

SAVE: circle any 3 individual tool prices above for only $445, add $75 for each additional tool above

TechniCell 80: technical indicator library for Excel	$ 145 / $ 205 *
Braincel: Basic Neural net builder	$ 195 / $ 245 *
TPO *(Annual license / lifetime license)*	$ 219 / $ 500
Evolver – Standard (80 variables)	$ 395
Evolver – Professional (250 variables + SDK)	$ 695
Evolver – Industrial (10,000 variables + SDK)	$ 995
Space, Time, Cycles and Phase (audio lecture)	$ 59
Financial Forecasting and Neural Networks (book)	$ 99
3D Smart View	$ 495
Pinnacle Commodity database – over 8000 contracts	$ 149
Pinnacle COT Database + DataMaker	$ 99
Pinnacle IDX DataBase: any 4 IDX groups	$ 149
all 12 IDX groups	$ 249
Pinnacle CLC Database + DataMaker + DataKeeper	$ 99

SHIPPING CHARGES

USA
  Priority $5   Express $16
Canada, Mexico
  Priority $15   Express $25
Overseas
  Priority $20   Express $40

-- Priority has no tracking number --

International deliveries by U.S. Global Priority and Express mail. Additional fee if you prefer using a different carrier.

** Requires you have Excel version of same tool

* $50 discount applies only if also ordering VEL, JMA, CFB, RSX, WAV or DDR. Otherwise use full price.

‡ If your product subtotal is over $550, you must select one of the following: EITHER you agree someone will provide a signature upon delivery, (if so, write "SIGNATURE" on the insurance line), OR if a delivery signature is not possible, then enter a delivery insurance amount of $6.50.

Product Subtotal   _____

California tax: add 7.25%
LA county: 8.25%   _____

Shipping   _____

Insurance ‡   _____

TOTAL   _____

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call   323-258-4860   **686 South Arroyo Parkway,   Pasadena, CA 91105**

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