Professional Trader Series:

Moving Average Formula & Strategy Guide

by John Person

MOVING AVERAGE FORMULAS & STRATEGY GUIDE

In an online seminar conducted for the Chicago Board of Trade, I shared how to apply Moving Averages to help traders determine buy and sell decisions and how to apply them in order to build a systematic trading method. In addition, I gave insights on how to effectively apply filters for buy and sell signals using popular indicators such as Stochastics and MACD. So goes the adage that there is no holy grail for any one single trading indicator or style. I believe traders should use multiple indicators to help decipher trading signals for various market conditions. I believe a successful trader needs to be aware of the fact that market conditions change, as does the markets state of volatility. Mostly this happens due to peoples perception on a product's given value or anticipated value in any given time. I believe that combining Moving Averages with indicators such as Stochastics and MACD during certain market conditions can be vital to your success in discovering trend and consolidation phases and for determining various signals such as divergences or convergences. They both can be used for pinpointing reversals. The one fact is that in trending markets MACD can be your friend in helping you to stay in a trade longer based on the fact that this indicator is built on moving average values.

In this booklet I would like to review and cover:

- What is a Moving Average?
- How many types of moving averages are there to use.
- How to calculate a moving average.
- Which inputs to average?
- Time dimensions for moving averages.
- Cross over signals.
- Moving average channels.
- Filters on moving average signals using Stochastics, MACD and other indicators.
- Use of Fibonacci as moving average settings.
- Use of Pivot Points as a moving average system.

Simply put Moving Averages are a math calculation that averages out a series of numeric values. A moving average series can be calculated for any time series. In finance it is most often applied to stock and derivative prices, percentage returns, yields and trading volumes. There are three universal types of moving averages to calculate. The simple moving average is one of the most popular indicators used and is easy to calculate. There is also a weighted and an exponential moving average which are more sensitive to price fluctuations but more complicated to formulate.

Here is how to calculate a Simple Moving Average (SMA). If we take the close of the last ten periods add them together then divide by ten we get the mean or average of the last ten periods. As a new period is added we drop the oldest time period.

Periods: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 =

13600, 13620, 13615, 13580, 13565, 13600, 13610, 13650, 13660, 13650,

Sum = 136150 ÷ 10 = 13610

A weighted average is any average that has multiplying factors to give different weights to different data points. But in technical analysis a weighted moving average (WMA) has the specific meaning of weights which decrease arithmetically. Weighted M/A's give a greater weight to more recent price data. These are complicated and need the aid of a computer.

WMA = the latest day has weight n, the second latest n-1, etc, down to zero.

Exponential moving averages (also called exponentially weighted moving averages). The EMA applies weighting factors which decrease exponentially. EMA's reduce the lag by applying more weight to recent prices relative to older prices. The shorter the EMA's period, the more weight that will be applied to the most recent price.

EMA = (Price (current) – EMA (previous) (x Multiplier) + EMA (previous)

Pros

Defines average price changes over time and smoothes out trading noise.
Excellent trend trading tool.
Used to identify, triggers, entries, support and resistance levels.
Can be used in trading systems & one can study the back-tested performance results.

Cons

M/A's lag behind markets price changes.
Not effective in choppy markets.
Not effective in discovering price extensions.
Can't predict turning points like Fibonacci or Pivot analysis only changes in trends

Variables to use as choices to average.

Highs
Lows
Close
Opens
Average of range (High-Low)
Average of typical price (HLC/3)
Volume
Volatility measurements (VXN, VIX VXO)

There are several ways to identify the direction of the trend with moving averages. If we look at the relationship between prices and the moving average we can study not only the direction of the moving average but the location of price in relationship to the moving average values and the crossovers points of interest.

Simple rule of thumb:

- If the moving average is rising, and prices are above the M/A, the trend is considered up.
- If the moving average is declining, and prices are below the M/A, the trend is considered down.

An additional filter to trigger a signal on a price change would be if the close is above or below the moving average. Another method is if the entire range of the price components (O, H, L, C) are trading above or below the moving average. Another filter is if those factors are for more than one session.

In figure 1 below we have a daily chart on soybeans with indicator triangles. Green marks buy signals and orange highlights sell signals. We can see where the entire range (O, H, L, C) not just the close, crosses and remains above or below the moving average line which heightens the fact that a trend change has occurred.

This method is highly effective in identifying and confirming a directional price change. Not all times will this work, and in some cases the signal is generated after a huge move has already taken place, but one can use this concept as a building block for a trading system. Especially for trend followers since the exit strategy would be confirmed once prices closed below a moving average and the entire range for more than one time period.

Figure 1

In figure 2 we have a weekly chart on corn to illustrate that this concept works on various markets and in different time frames. This method would keep you in the majority of the trend.

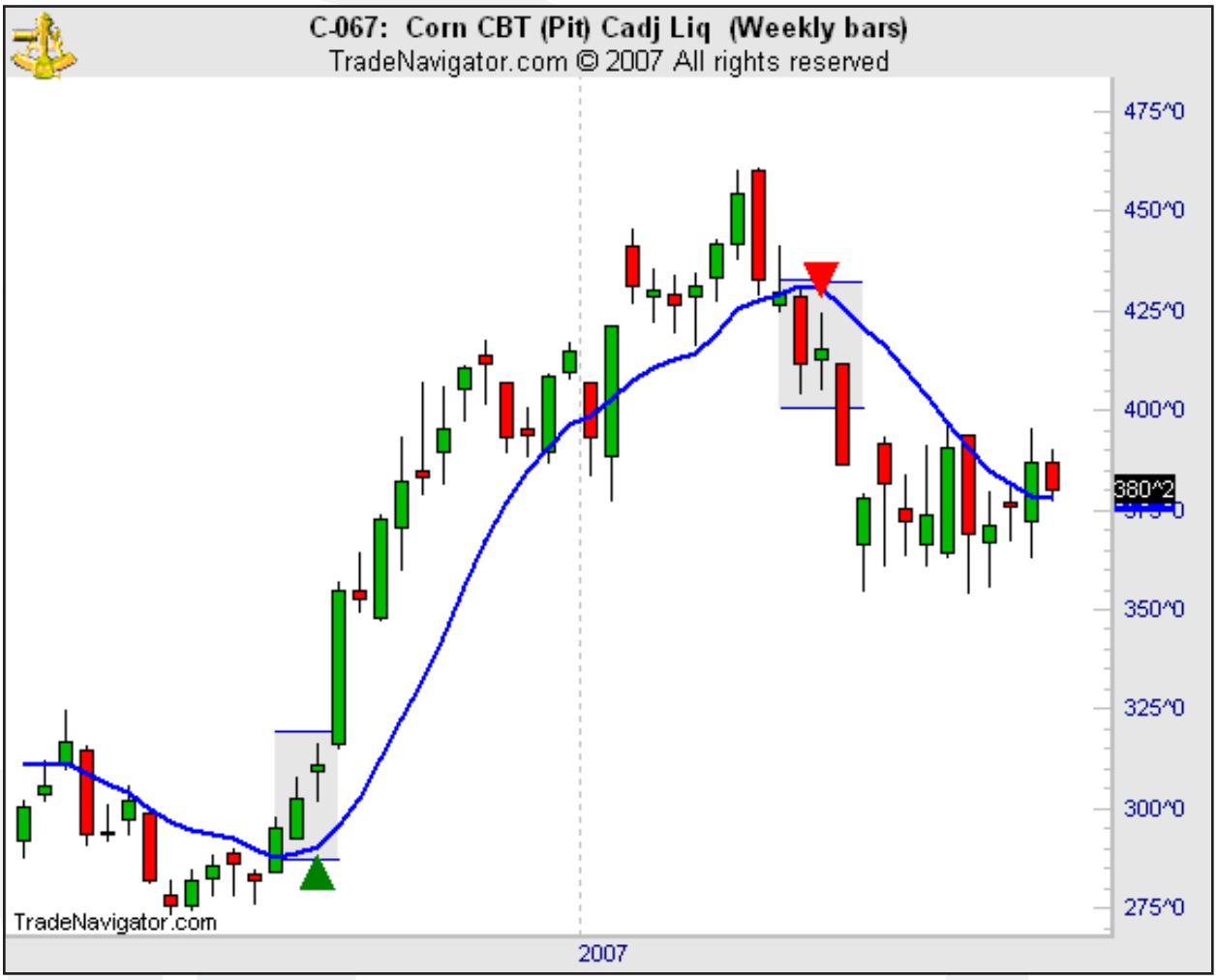

Figure 2

In figure 2 notice the green triangle which illustrates a buy signal as two or more entire ranges are above the moving average line. Then a sell signal is generated when two or more time period's entire ranges are below the moving average value. This is the added filter method to use as a confirming indication of when a trend will reverse or remain in tact.

We can enhance any system with trade management techniques. Most traders have a hard time making fast decisions under pressure while examining the price relationship and moving averages. The aid of adding filters to signals can enhance a traders performance especially when we include trade management techniques to determine entry, risk, position add on's, scale outs or flat-out exit levels.

What time periods should I use?

The question some traders have is which time periods should they program a moving average for Several time considerations include lining the moving average with a specific time frame such as the number 5 which equals a full trading week. A 20 day and 40 day M/A works out to one and two month moving average.

Day traders can break down the use of multiple time frame analysis such as a 15 minute period and a 5 minute period (which is divisible by 3). Traders can and often do tie in time periods with the Fibonacci numbers series. Which are 1,1,2,3,5,8,13,21, 34, 55, 89, 144, 23, etc. The more popular numbers used are 3,5, 8 13 and 21. Futures traders use shorter time periods, equity traders generally use longer term periods. Just remember that the shorter the time periods used that they are more sensitive to price changes.

Multiple Moving Averages

When we introduce more than one moving average with multiple time periods it helps identify shorter term and longer term trends and changes within those time frames. This concept can be used to identify support and resistance levels to help you increase profits and reduce risks. Always remember that the closing price causes a crossover: that is when a signal is generated.

There are two terms technicians use to identify trend changes:

- **Dead Cross- bearish or negative cross-over of a shorter term M/A than a longer term M/A.**
- **Golden Cross- Bullish or positive cross-over of a shorter term M/A than a longer term M/A.**

In figure 3 below we have a 15 minute chart with a trading system I designed based on the aid of proprietary moving average settings combined with specific algorithms which give me indications of price changes. Also I have combined the use of Pivot Point support and resistance levels to aid me in identifying what makes the markets move, these two considerations are time and price. As you can see, simply put, when the blue line crosses below the yellow line a double triangle forms giving me an indication of a dead cross, or sell signal. When the opposition occurs we have a golden cross concept. During periods of sideways action moving average systems have a weak link in that they generate false buy and sell signals. Therefore we need to add some filters to help us in determining which signals to take or fade.

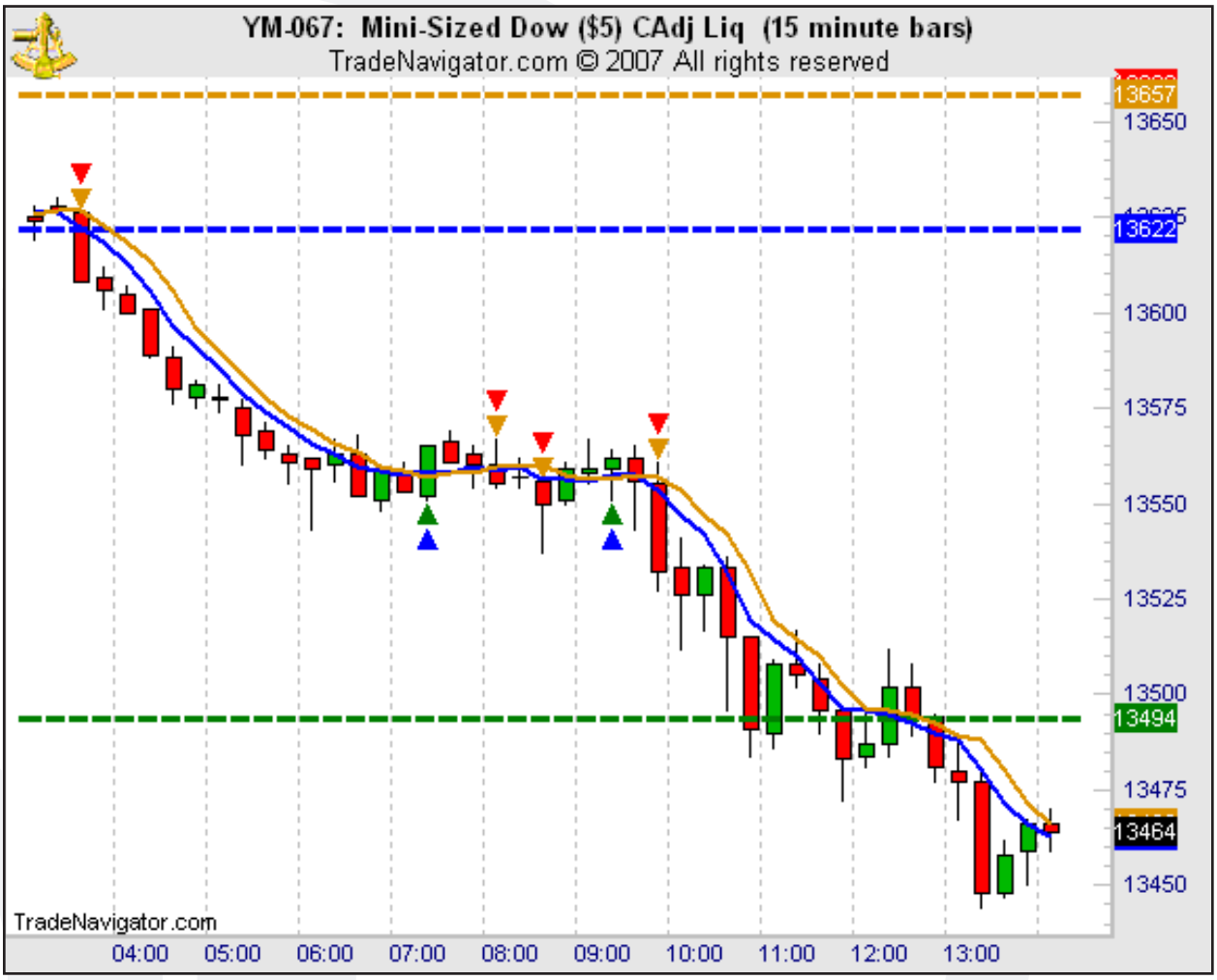

Figure 3

Filtering tools

Stochastics a range based oscillator it is also considered a momentum oscillator George C. Lane is credited with creating the formula. I had the privilege of working for George back in 1980 through 1982.

His indicator is a popular technical tool used to help determine whether a market is overbought, meaning prices have advanced too far too soon and due for a downside correction, or oversold, meaning prices have declined too far too soon and due for an upside correction. It is based on a mathematical formula that is computed to compare the settlement price of a specific time period to the price range of a specific number of past periods.

The theory works off the assumption that in a bull or up trending markets, prices tend to make higher highs and the settlement price usually tends to be in the upper end of that time periods trading range.

When the momentum starts to slow the settlement prices will start to fade from the upper boundaries of the range and the Stochastics Indicator will show that the bullish momentum is starting to change. The exact opposite is true for Bear or down trending markets. There are two lines that are referred to as %K and %D. These are plotted on a horizontal axis for a given time period and the vertical axis is plotted on a scale from 0% to 100%.

The formula to calculate the first component, %K: (14 period)
The value of %K =c-Ln/Hn-Ln*100
c=closing price of current period, Ln= lowest low during nperiod of time, Hn=highest high during nperiod of time and n=number of periods.

The second calculation is the %D (3 period)
It is the moving average of %K.
It is calculated by: %D=100(Hn/Ln)
HN= the nperiod sum of (c-Ln).

What is important is understanding the rules of how to interpret buy or sell signals. When the readings are above 70%, and %k crosses over the %D line and both lines are pointing down, a “hook” sell signal is generated. The exact opposite is true to generate a buy signal when %K crosses above %D when the reading is below 30% and both lines are both pointing up.

There are other techniques associated when using Stochastics. There is Fast Stochastics and Slow Stochastics. The difference is how the parameters are set to measure the change in price. This is referred to as a gauge in sensitivity. A higher rate of sensitivity will require the number of periods in the calculation to be decreased. This is what “fast” Stochastics does. It enables one to generate faster and a higher frequency of trading signals in a short time period.

One other method to use the stochastic indicator is trading off of pattern’s called bullish convergence. It is used in identifying market bottoms. This is where the market price itself makes a lower low from a previous low but the underlying stochastic pattern makes a higher low. This indicates that the low is a “false bottom” and can resort to a turn around for a price reversal. We see a great example of when we combine moving average values, pivot point support and resistance levels, candle charts and indicators how we can identify trade signals and filter out false sell signals with some simple rules. Two rules of thumb I teach traders look for buy signals at support and sell signals at resistance. Figure

4 shows a bullish convergence in the Stochastics as prices made a lower low, but the indicator made a corresponding higher low. The horizontal green line was the pre-determined pivot point support and we had the green triangles give buy signals.

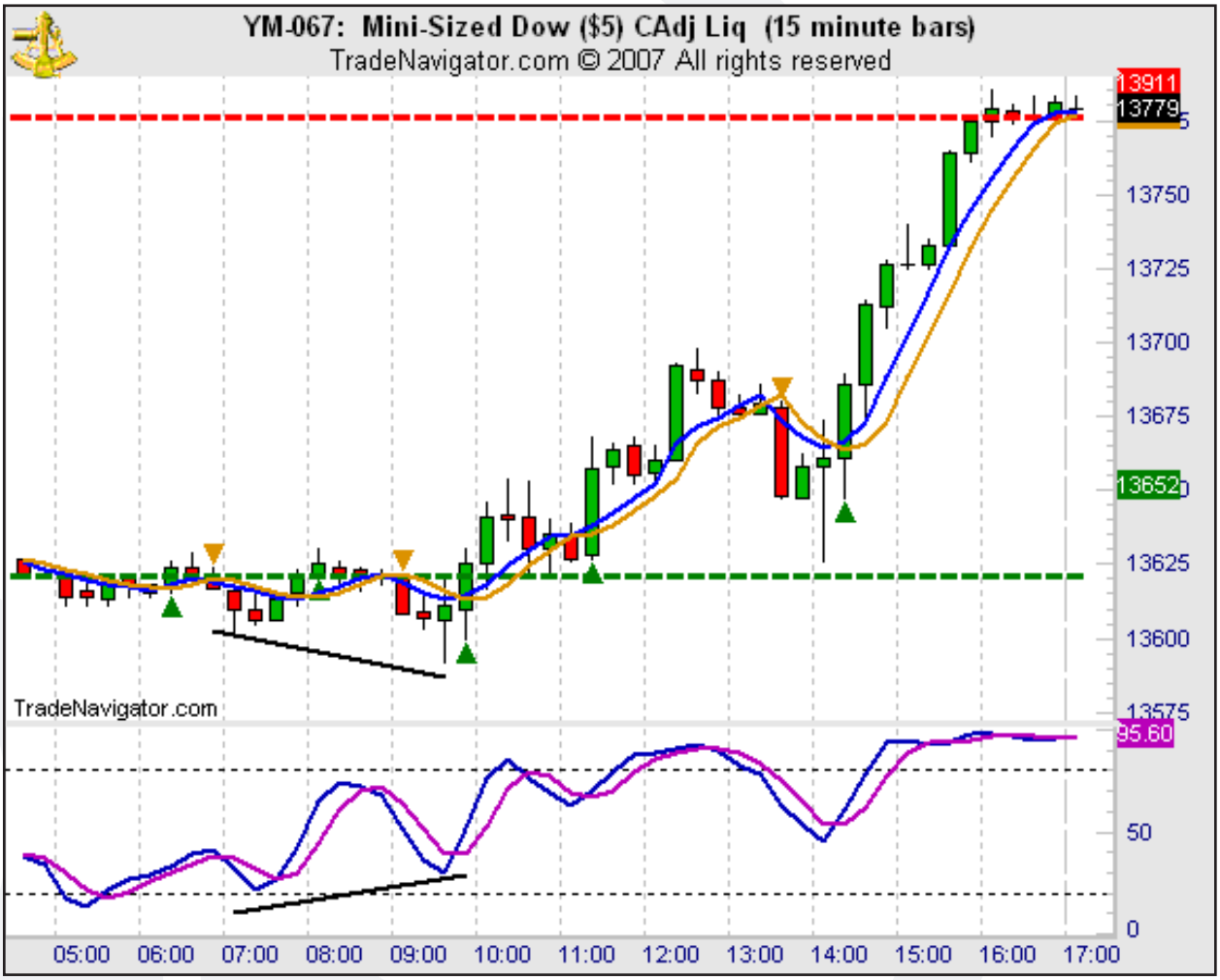

Figure 4

Another signal is a trading pattern called bearish divergence. It is used in identifying market tops. This is where the market price itself makes a higher high from a previous high but the underlying stochastic pattern makes a lower high. This indicates that the second high is a "weak" high and can resort to a turn around for a lower price reversal. As you can see in Figure 5 once again using multiple indicators to help filter out trade signals generated by moving average cross overs as is the case with this dead cross signal a orange triangle generated a sell signal with a corresponding bearish divergence stochastics pattern.

Figure 5

Moving Average Convergence/Divergence otherwise known as **MACD** in simplest terms is an indicator that shows when a short term moving average crosses over a longer term moving average. Gerald Appel developed this indicator as we know it today and it is my understanding that he developed it for the purpose of stock trading. It is composed of using three exponential moving averages.

The initial inputs for the calculations were a 9 period, a 12 period and a 26 period. I might add that since traders are now more computer savvy than ever before it is easy to change or "tweak" the variables in his original calculations.

Traders can increase the time periods in the moving average calculations to generate less trade signals and shorten the time periods to generate more trade signals.

This technique and concept applies to the use of moving averages as covered previously. The concept is this, there are two lines one is the 9 period exponential averages (slow line) and the other is the difference between the 12 and 26 period exponential moving average (fast line). This is important information because you do not want to use moving similar time settings overlaid on your charts as this would not be a confirming tool but a duplicate signal generating component.

MACD signals react quickly to changes in the market that is why a lot of analysts including myself use it. It helps clear the picture when moving average crossovers occur. It measures the relative strength between where current prices are as compared to past time frames from a short term perspective to a longer term perspective. MACD signals are generated after the market has moved in an opposite direction of the original trend, and therefore is why it is considered a lagging indicator.

Some general points to help you understand how to use this indicator are first; when the fast line crosses above the slow line a buy signal is generated. The opposite is true for sell signals. MACD also has a zero base line. If MACD line is above the zero line prices are usually trending higher. The opposite is true if MACD is declining below the zero line.

Another method, and more reliable, however one that does not form often is a pattern called bullish convergence. This is where the market price itself makes a lower low from a previous low but the underlying MACD pattern makes a higher low. This indicates that the low is weak or "false" bottom and can resort to a turn around for a price reversal. MACD has the same principles as far as a sell signal with what is known as Bearish Divergence. This is where the market price itself makes a higher high from a previous high but the underlying MACD crossover lines make a lower high. This indicates that the second high is a "weak" high and can resort to a turn around for a lower price reversal. We see more divergence patterns in the histogram component than we do in the actual moving average MACD lines.

The chart in Figure 6 is a daily chart on the 30 Year Treasury Bonds with the MACD indicator in the lower pane beneath the price bars. I used blue vertical line to help illustrate when the MACD lines corresponded with the indicator triangles and moving average cross overs. As you can see we have situations where the histogram component forms bullish and bearish divergence when it does not appear in the MACD moving average lines.

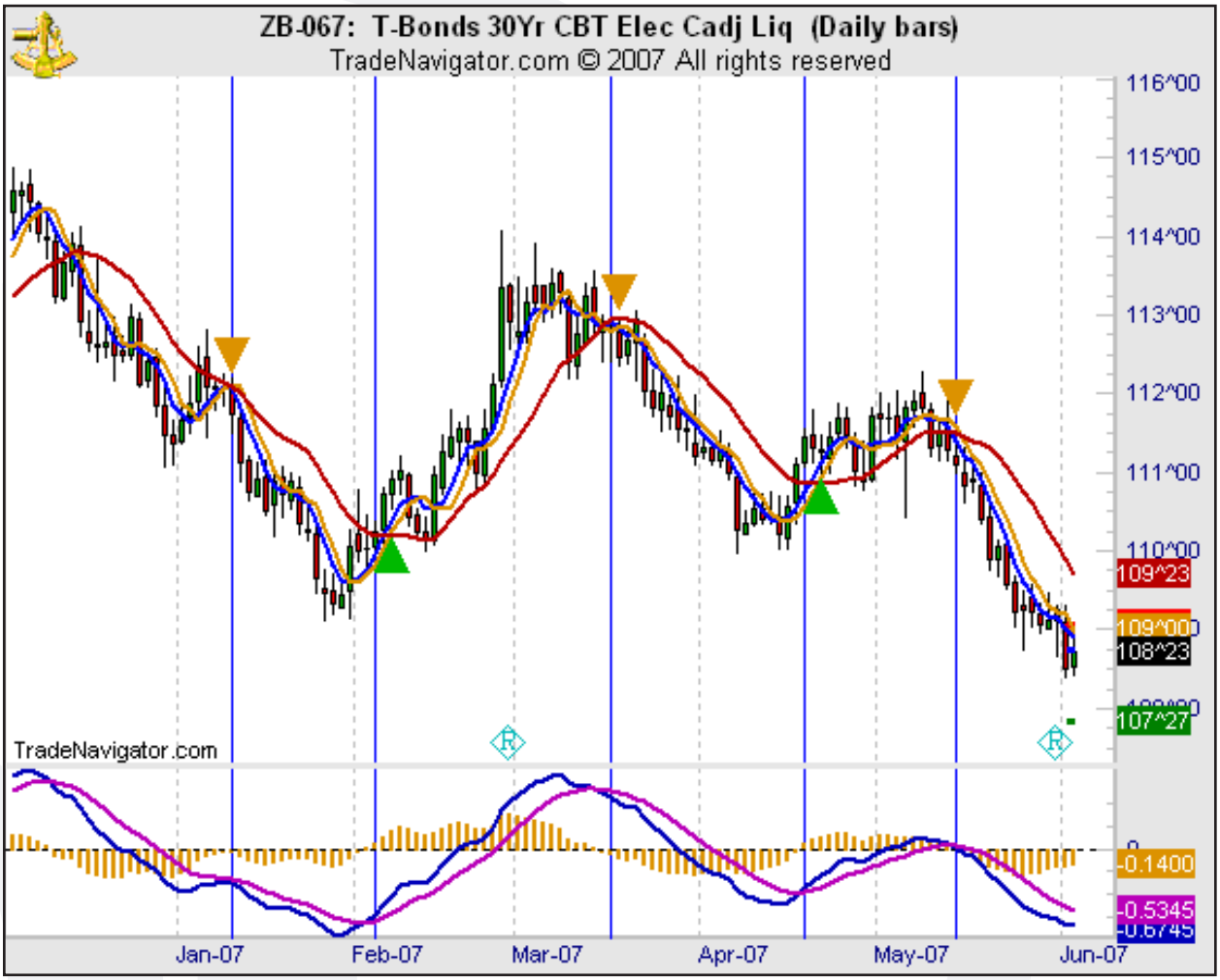

Figure 6

The next chart in figure 7 has the MACD in the middle pane and the CCI indicator at the bottom. Looking at the corresponding moving average crossovers we can see where the two other indicators line up confirming a market turn. This shows the benefits of using the two indicators as one can generate a cleaner signal and in this case the moving average crossover feature of the MACD confirms the sell signal.

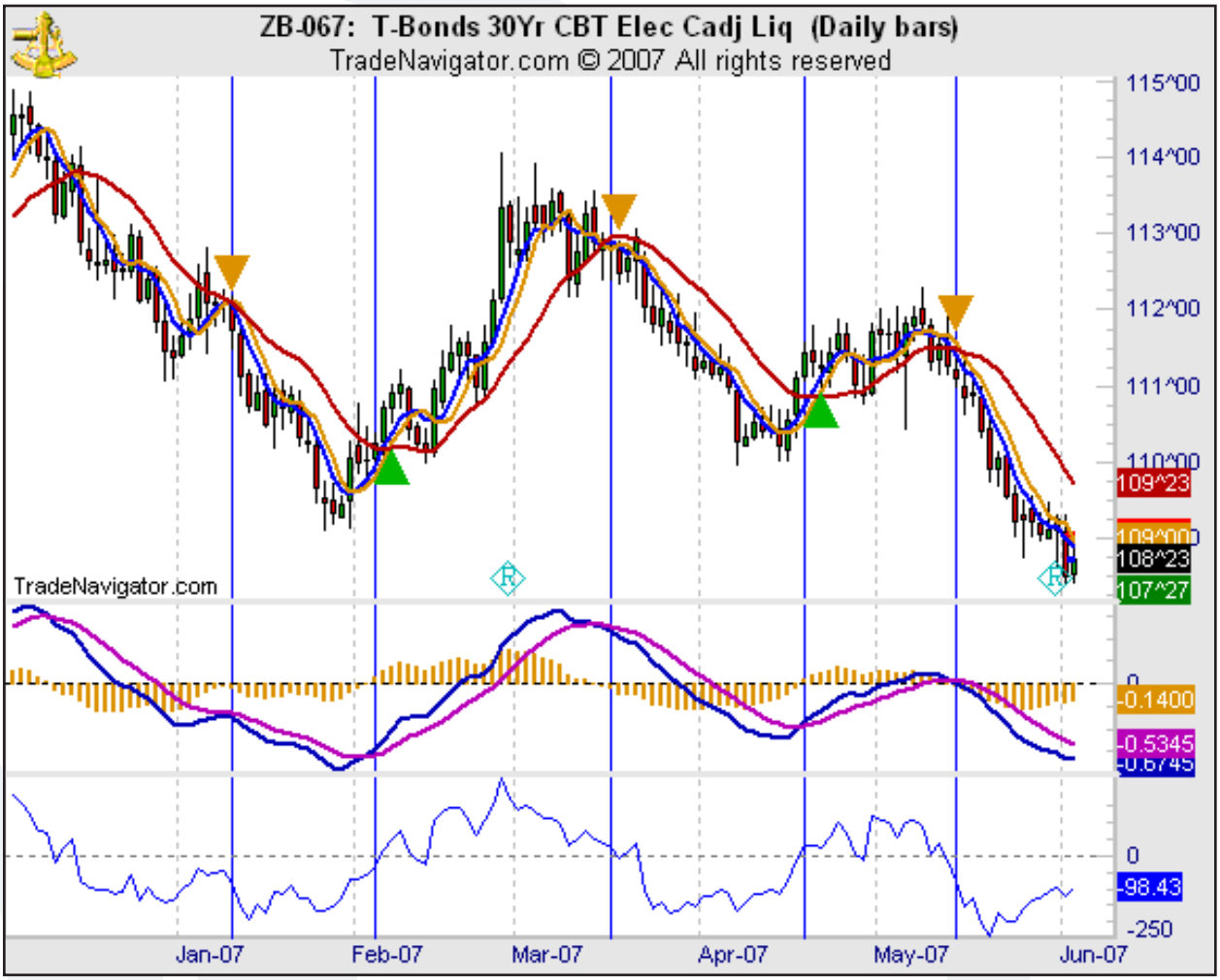

Figure 7

There is more to trading besides indicators!

Technical studies such as we discussed using Moving Averages with the aid of filters (confirming indicators) are just a part of helping making a trading decision. Trading requires use of risk management, patience or the "waiting game" as I call it. Trading also involves additional training on the skills needed to know when to exit or add on to positions. I encourage you to further your education in trading skills as well as in how to use technical analysis. This study guide is designed to illustrate how traders can use various conditions such as the pivot point, the high, the low and the traditional close value for constructing a moving average. This guide also brings to you the concept that one should use non-correlated confirming tools to substantiate a trade signal. I have included a section with common questions along with answers that others have asked and perhaps this will help you as well. If you are looking for specific information on concise rules entries parameter settings may I suggest you visit www.nationalfutures.com for more helpful educational material.

Common questions:

Q: Do you think it is wise to use MACD combined with ADX for rising and falling trends and RSI and ADX for sideways trend? And which timeframes do you normally use on these? The standard values or not?

A: All signals can be tweaked or adjusted to account for sensitivity for a faster or slower signal. I find Stochastics more reliable than RSI due to the crossover feature from %D & %K plus the convergence and divergence patterns offer me a more valid signal.

Q: How do you act when the same indicator gives you two different readings in two different time frames?

A: That depends on the time frames, if you are referring to a 60 minute and a five minute then the answer is simple, I give more weight to the longer term as the shorter term time frame can change on a dime.

Q: How many indicators do you suggest using at one time? Do you get analysis paralysis from using too many?

A: Great Question, the answer is I use these two indicators in addition to Volume studies on the Futures for conformation on the strength or weakness of a trend or major reversal. As for shorter term day trading I look for certain patterns and sequence of conditions rather than indicators for trading signals. I do incorporate Pivot Points from various time frames to help me pin point reversal target levels. Then I wait for a signal for a shift in momentum.

Q: Can you rank the indicator signals such as VOL, MACD and RSI etc apart from price in determining a breakout or breakdown?

A: I am able to identify certain chart patterns for breakdown or breakouts. I look for a sequence of events such as higher closing highs at predetermined Support and Resistance levels.

Q: What indicator can we use to see that the market is going to whipsaw?

A: The indicator that your higher power gave you between your left ear and right ear. It is called your brain. Traders need to anticipate markets price action. Since trending conditions only exist for 30-40% of the time, one can anticipate that after a nice trend direction move the market will develop into a consolidation phase or "whipsaw" as you call it. In choppy conditions the Stochastics is your friend, in trending market conditions MACD will give you truer signals. Watching for Breakdowns or breakouts of trading ranges will give you a hint that a market will develop into a trending move.

Q: Do you use these indicators to trade divergences?

A: Absolutely, plus I watch for both as one may give a Divergence or Convergence signal while the other will not.

Q: I am using MACD quite often and seem to find it less reliable in strong trends, is that true?

A: I am not sure what or if you have altered your default settings and if you know how to use the moving average cross over feature or if you are just using the histogram feature. You should learn all about the indicator and the way your trading software is calculating it. It was specifically designed as a trend trading tool.

Q: What values do you use for both of them?

A: Default settings, however I use fast stochastics and will adjust the MACD depending on what market I am trading for smaller range less trending markets, a higher setting is warranted, therefore the indicator is not too sensitive so it does not give me too many false or early signals.

Q: Do you compare them both before entering a trade, like "working in pairs"'.

A: No I use them mainly for confirming tools. I look for a specific set-up in the charts for a turn signal. Indicators after all are lagging indicators Fibonacci and Pivot Points are leading or predictive tools.

John Person is a 26-year veteran trader in the futures and options markets and is a registered Commodity Trader Advisor (CTA). His book, The Complete Guide to Technical Analysis for the Futures Markets, was the first book to illustrate how to use candlesticks combined with pivot point analysis. His second book, Candlestick and Pivot Point Trading Triggers, released in the November of 2006 gave valuable insights for Stock and futures traders. His third book Forex Conquered, gave specific formulas for treading systems for Tradestation and Genesis users. He is the editor of the weekly Bottom Line newsletter and the nation's most respected business journalists call on him for his market opinions. He is widely quoted by CBS Market Watch, Reuters, Dow Jones, Bloomberg and he also appears regularly on CNBC.
