MEASURING trend momentum

Most technical analysis indicators monitor either price direction or price momentum.

Here's an indicator that does both, changing its behavior with the dynamics of the market.

BY TUSHAR CHANDE

O f all the price-based technical indicators, few are as popular as simple moving averages. A simple moving average (SMA) is the average of a specific price point, usually the close, over a prescribed time period.

The primary function of moving averages is to "smooth" prices, thus identifying the underlying trend. Countless systems have been built using moving averages and many billions of dollars traded based on their signals. As a tool, they are robust, simple to construct and easy to understand.

As with all technical indicators, SMAs have their limitations. Since they smooth past data, they lag the actual price movement (i.e., any decline in the price of a stock will not be detected by the SMA until several time periods later). Many attempts have been made to make moving averages more sensitive to recent data.

The weighted moving average (WMA), for example, gives greater weight to recent data. Similarly, the exponential moving average (XMA) also gives the greatest weight to the most recent data, but unlike the WMA, the XMA takes all available data into account. In these instances, fixed weights are assigned to the data in calculating the moving average.

Adding dynamics

The variable-index dynamic moving average (VIDYA), originally developed in 1992, uses market information — such as volatility — to make the weighting scheme used to compute the moving average more responsive to market action. Since its inception, it has been added to many commercial software packages and inspired many other traders to build their own dynamic moving averages.

One of the features of VIDYA that makes it particularly attractive is that it flattens when the market consolidates. (To learn more about this indicator see *The New Technical Trader*, Chande and Kroll, John Wiley & Sons, 1994, and *Beyond Technical Analysis*, second edition, John Wiley & Sons, 2001.)

However, a new variable moving average — one that is, like VIDYA, responsive

to market consolidations but is more directly tied to the trend — can be constructed. It is formed by combining the ideas behind the following three common indicators: the average directional index (ADX), the stochastic oscillator and exponential moving averages (XMA). The resulting indicator is called the Chande Directional Moving Average (CDMA).

Refresher course

A complete discussion of the ADX, stochastic oscillator and XMAis beyond the scope of this article, but a brief summary will provide the necessary background for our new indicator.

The ADX has a rather complex calculation; it can be approximated by taking the simple moving average of a simple moving average of closing prices (double smoothing). While the ADX responds unevenly to price action, it is generally considered an excellent indicator of trend strength.

The stochastic oscillator is comprised of two lines: %K and %D, the latter of which is a moving average of %K. To calculate %K, subtract the lowest price of the most recent n bars from the most recent close, and divide that total by the range (high-low) of the most recent n bars. Stochastics range from 0 to 100. A reading over 80 is considered overbought and a reading below 20 is considered oversold.

An exponential moving average is constructed by adding a fixed percentage, x, of the latest closing price to (1-x) of the previous value of the moving average. For example, an XMA could add 20 percent of the latest close to 80 percent of yesterday's XMA to find today's XMA. An XMAis designed to give recent prices greater weight.

A new plan of attack

The plan behind the new CDMA is to apply the stochastic oscillator to the values of the ADX. When the ADX is rising, there will be a trend, and a stochastic applied to the ADX will be near the top of its range. Conversely, when the ADX is falling, which implies a lack of trend, a stochastic of the ADX will be near the bottom of its range. The stochastic reading (translated into a value between 0 to 1, instead of 0 and 100) will then be used to weigh the XMAfor the current bar.

If the stochastic oscillator applied to the ADX indicator is 0, the assumption is that there is no trend and the new value of the XMAwill be equal to the old value of the XMA. Hence, the CDMAwill flatten out. When the CDMA confirms the XMA action, the trend has strong momentum; when they diverge, caution may be warranted.

Figure 1 (below) shows the CDMA (solid line) and the equivalent 20-day XMA (small crosses) on a continuous chart of the Nasdaq 100 futures. The lower half of Figure 1 shows a plot of the 20-day ADX. The market is trending when the ADX is above the reference level of 20 and rising. The values chosen for the length of the ADX and the reference level are arbitrary.

Sample market situations

In October 1999, the ADX was at a low level, indicating a lack of trend, and the CDMA and the XMA had separated. As the market broke out of a trading range, the ADX quickly rose above 20 and the CDMA and XMA values converged rapidly, confirming the rally. During the consolidation in January, the ADX declined but stayed above 20, showing a weakening trend. Hence, CDMAand XMA separated, with the CDMAflattening out.

| FIGURE 1 | CONFIRMING THE TREND |

Notice how the Chande Directional Moving Average (solid line) has a more stable appearance than a regular exponential moving average. This characteristic can help you filter out whipsaw trades that are common during market consolidations.
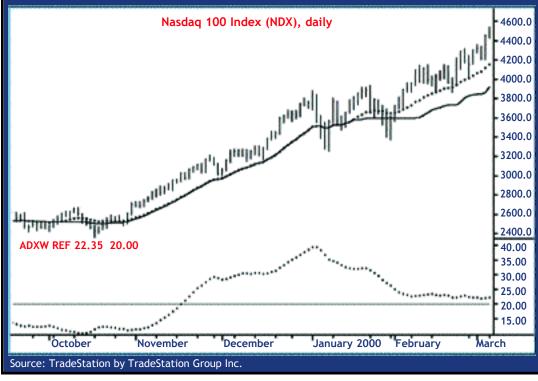

Source: TradeStation by TradeStation Group Inc.

FIGURE 2 WORKING IN TANDEM

During May and June 1999, the CDMA stayed flat, indicating the market was in a consolidation and that the crossover signals between price and the XMA should be ignored. However, when the market broke down in September, both MAs were moving in tandem, signaling a valid trading opportunity.

Source: TradeStation by TradeStation Group Inc.

Programming code

{Tushar Chande 2001: VIDYA/CDMA}

Input: Len(10);
Vars: Diff(0), MyConst(0), MyAdx(0), Varma(0), EmaIndex(0);

{... Index of EMA ...}
If Len > 0 then EmaIndex = (2 / (1 + Len)) else EmaIndex = 0.20;

{... Stochastic oscillator using ADX ...}
MyAdx = ADX(20);
Diff = Highest(MyAdx, 20) - Lowest(MyAdx, 20);
If Diff > 0 then MyConst = (MyAdx - Lowest(MyAdx, 20))/Diff else MyConst = EmaIndex;

{... Clamp length to that implied by input value of Len ...}
If MyConst > EmaIndex then MyConst = EmaIndex;

{... Create the variable MA ...}
If CurrentBar < 50 then Varma = Close else Varma = (1 - MyConst) * Varma[1] + MyConst * Close;

Plot1(Varma, "VarMA") ;
Plot2(XAverage(Close, Len), "XAvg")

This code can be copied from www.activetradermag.com/code.htm.

When the Nasdaq rally resumed in February, the CDMA followed the XMA reluctantly, as the ADX had flattened out, even though it was above the 20 level. This is typical of rallies after brief consolidations within prolonged bull trends. The difference in behavior between the CDMA and XMA is explained by the fact that the CDMA responds to changes in momentum rather than prices.

Figure 2 (left) shows a continuous chart of Dow Jones futures. Note how the CDMA (solid line) flattened out during consolidations, and how the CDMA and the 20-day XMA (crosses) came together during declines, confirming the bearish tone of the market.

Rounding off

The CDMA is a valuable variation on traditional moving averages but, like any other indicator, it has limitations. For example, price could continue to rise or fall slowly after an initial strong move. In this case, the ADX will be declining and the CDMA will flatten out, showing a lack of trend. However, the price action in this instance would be worth trading, as in the most recent period in Figure 1.

Even so, you can use the CDMA to confirm that market momentum supports the move indicated by the equivalent XMA. You can also use it for any time frame, ranging from intraday to monthly data, and it gives you the ability to combine multiple time frames, as well as momentum data, into a single indicator. ☊