In phase with THE MARKET

A technique called slope divergence can provide a smoother ride when you're trying to maneuver between trending and congestion periods and identify emerging momentum moves.

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Markets have two primary phases: the trend phase, which is characterized by a persistent movement in one direction, and the congestion phase, in which price essentially moves sideways.

The easiest way to make money is to hold a position when the market is consistently moving in one direction (provided you're on the right side of the market), then exit and stay out of the market when it is moving sideways. Consequently, the ability to quickly determine whether a market is in a trend or congestion phase is an important trading skill.

We will use a concept developed by William Blau called "slope divergence" to identify situations when the market is moving out of congestion regions and embarking on new trends (see "Additional research," p. xx). We can then design trading rules to take advantage of this information.

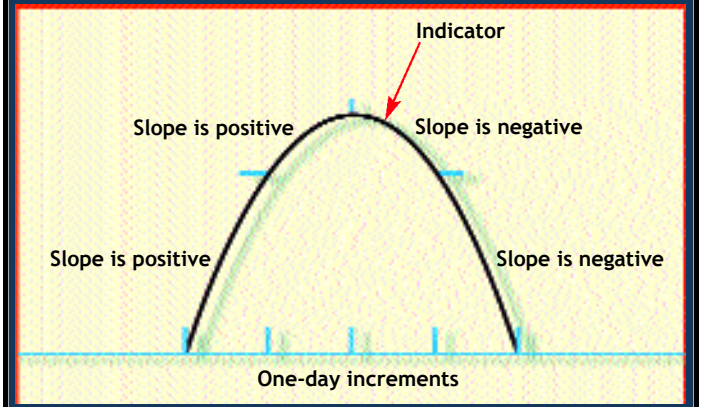
Hitting the slopes

In general, slope refers to the rate of change of values over a given period. When applied to a technical indicator, slope is the difference between today's indicator value and its value *n* bars ago, divided by *n*.

The slope-divergence method calculates the difference between today's indicator value and yesterday's, which means n is 1. If the one-day indicator difference is positive, the slope is positive; if the one-day difference is negative, the slope is negative (see Figure 1, above right).

FIGURE 1 SLOPE

Slope reflects the rate at which values change over time. In terms of slope divergence, slope is the difference between today's and yesterday's indicator values.



For this strategy, we will use an indicator called the SD_TSI, which compares the one-day slope of two indicators: 1) a momentum indicator (the True Strength Index, TSI) and 2) a trend indicator (a smoothed moving average). The SD_TSI determines if the slope directions of the two internal indicators agree. If they do, the market is trending; if they disagree — i.e., a slope divergence (SD) occurs — the market is in congestion.

In addition, we will use crossovers of a more sensitive version of the TSI and its signal line as a second component for entry and exit signals. "Double smoothing, the True Strength Index and slope divergence" (p. xx) describes these indicators and their formulas in detail.

Trading rules

The following strategy combines indicator signals with a simple stop-loss approach.

For long trades:

1. Go long if the SD_TSI is above zero and the positive (greater than zero) TSI crosses above its signal line.

2. Exit with a profit when the SD_TSI returns to zero (indicating flat or congested prices) or the TSI crosses below its signal line.
3. Exit with a loss if the stock trades below the lowest of the entry bar [?] and two bars prior to the entry bar.

For short trades:

1. Go short if the SD_TSI is below zero and the negative (less than zero) TSI crosses below its signal line.
2. Exit with a profit when SD_TSI returns to zero (indicating flat or congested prices) or the TSI crosses above its signal line.
3. Exit with a loss if the stock trades over the highest of the entry bar [?] and two bars prior to the entry bar then exit the trade.

The TSI and its signal line used for trading signals should use slightly shorter smoothing constants than those used for the TSI component of the SD_TSI. The result is a slightly more sensitive entry and exit oscillator. The formulas below have different values, and if you look closely at the trade example charts in the next section, you will see that the TSI indicator (TSI_Indic) will turn down, while the plot of the SD_TSI is still rising.

For the trading signals, the setup is:
TSI(Close, 39, 5, 5).

For the Slope Divergence, the setup is:
SD_TSI (39, 13, 3, 39, 13).

Again, the SD_TSI is comparing the one-day slope of the triple-smoothed TSI(39, 13, 3) to the one-day slope of the double-smoothed exponential moving average(39,13).

Trade examples

Figure 2 (top, right) shows Rubbermaid (NWL) in the upper panel. The TSI and SD_TSI are plotted in the two lower-panels. At point A, the crossover of the TSI and its signal line in late September signaled a momentum upturn, but the market was still in congestion because the SD_TSI was at zero.

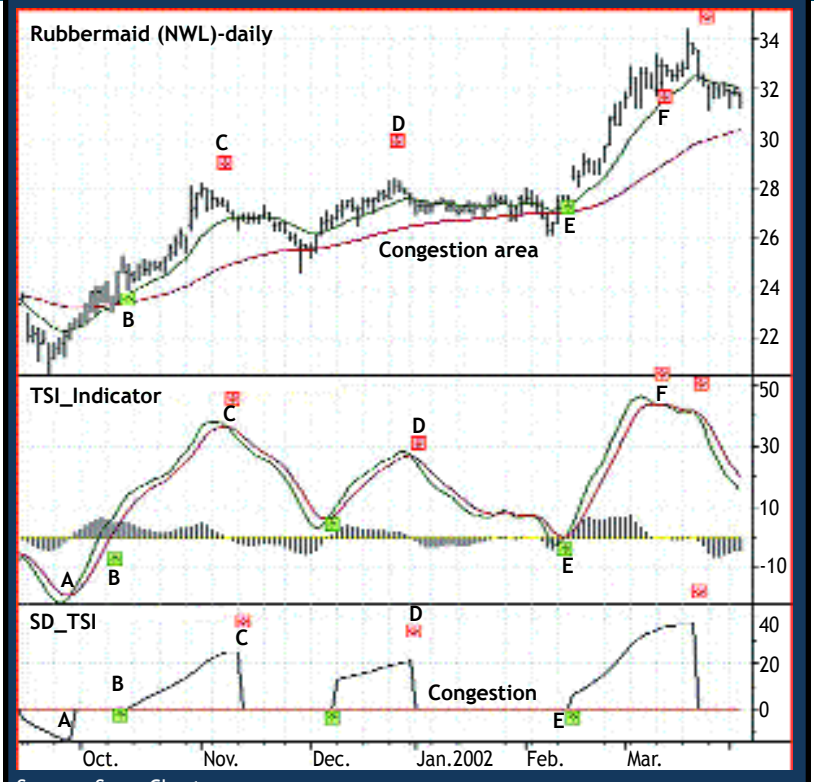
On Oct. 10, 2001, the SD_TSI confirmed the trend by rising above zero (B). A long position was taken because the slopes of TSI and SD_TSI are in the same direction. This trade was exited at point C when the TSI dropped below its signal line. (Notice the SD_TSI plot dropped to zero a few bars later.)

Another minor trend ended in January 2002 (D): The TSI was below the signal line, and the SD_TSI had reverted to zero, indicating a divergence in the trends and thus a congestion area. A

continued on p. x

FIGURE 2 SIGNALS IN SYNC

Trade signals occur when the TSI crosses above or below its signal line in the same direction as the SD_TSI, as was the case on Oct. 10.



Source: SuperCharts

FIGURE 3 NAVIGATING THE TREND

Although, the TSI crossed above its signal line near the beginning of the chart, no trade was entered until the SD_TSI moved above zero.

Source: SuperCharts

new trend formed and a new long position was established in February 2002 when the TSI crossed above its signal line (E) and the SD_TSI indicated a positive trend. This trade was exited when the TSI crossed below the signal line (F).

In Figure 3 (p. xx), a rising trend was signaled by the SD_TSI when the plot rose above the zero line (B) and the TSI was above the signal line. In the first week of December, this trend ended when the TSI crossover (C) signaled a falling or flat trend. The SD_TSI also confirmed the trend was over by dropping to zero, flashing a congestion phase. The long position was closed. After about four weeks of congestion area trading, another bullish crossover signal (D) was given by the TSI and SD_TSI in January 2002. A bearish crossover (E) in February 2002 signaled the end of the bullish trend. Although a bullish crossover (F) occurred in the beginning of March, the confirmation of trend was not confirmed until the TSI crossed above the zero line. At G, the SD_TSI signaled a new bullish trend as both the TSI and SD_TSI slopes were positive.

Figure 4 (right) shows a rise in the trend in September 2001 (the TSI crossover), but the SD_TSI did not confirm the trend

Double smoothing, the True Strength Index and slope divergence

A moving average of price filters noise and makes trends more apparent. However, the longer its lookback period, the more a moving average lags changes in price direction. Blau's solution to this problem was "double smoothing." He calculated a moving average of a moving average, which he found resulted in a more effective indicator for reducing market noise without introducing as much lag as applying a single moving average. Blau used exponential moving averages (EMA) and used the following nomenclature:

EMA(close,r,s) or EMA(EMA(close,r),s)

where *r* and *s* represent smoothing constants for the two EMAs.

The True Strength Index

The True Strength Index (TSI) is a double-smoothed momentum indicator, which functions as a proxy for price with almost no lag at major and intermediate turning points.

First, the one-day momentum (today's close minus yesterday's close) is calculated. Then, the one-day momentum is double-smoothed with two EMAs to produce the TSI. Finally, an EMA of the TSI line is added as a signal line (similar in function to the signal line of the moving average convergence-divergence (MACD) indicator. (For more information on the TSI, see "The True Strength Index," *Active Trader*, January 2002, p. 58.)

The formulas for the TSI and its signal line are:

TSI (Close,r,s)=100 * EMA(mtm,r,s)/EMA(_mtm_,r,s)

signal line = EMA (TSI(Close,r,s)),u)

where

One-day momentum (mtm) = (today's close – yesterday's close)

EMA(mtm, r) = Exponential moving average (EMA) of mtm for r days

EMA(mtm,r,s) = Double smoothing of mtm for r and s days

EMA(_mtm_,r,s) = Double smoothing of the absolute value of mtm for r and s days

Figure A (left) shows the TSI and representative buy and sell signals generated by the TSI line crossing above and below its signal line.

Any smoothing calculation such as a moving average will introduce some measure of lag. Although double-smoothed momentum results in reduced lag, the TSI is best suited to trending market conditions. During congestion phases, the TSI is prone to identify ambiguous or erroneous trends.

Triple smoothing and the SD_TSI

Smoothing price data does not have to stop with double smoothing. A triple smoothed moving average is EMA(close,r,s,u), which is the double-smoothed average

FIGURE A THE TRUE STRENGTH INDEX (TSI)

The True Strength Index (lower panel) is constructed by smoothing a moving average with a second moving average, a process called "double-smoothing."

Source: SuperCharts

until Nov. 3. The SD_TSI, confirmed by the TSI slope above zero, gave an uptrend signal (B). This trend ended at the TSI crossover at (C), signaling a congestion area. During this congestion period, the SD_TSI was still above zero but the TSI was below the signal line.

Although the primary trend was still in the positive direction, the trade was exited conservatively (B) for cautious purposes. At D, the SD_TSI and TSI confirmed a new uptrend. A stop-loss was set at the lowest of the entry bar at D and the prior two bars. At E, the SD_TSI and the TSI crossover of the signal line signaled the end of the trend. There was a minor peak after the signal at E, and the congestion phased flashed by the SD_TSI indicated to avoid taking any additional trades.

FIGURE 4 SETTING STOPS

Stops are set just below the lowest of the entry bar (D) and the two bars that preceded it.

Source: SuperCharts

smoothed again by a third EMA with a smoothing constant of u.

The Slope-Divergence True Strength Index (SD_TSI) is based on the comparison of two indicators: first, the triple-smoothed version of the TSI, and second, a double-smoothed exponential moving average. Blau's notation for the indicator is:

SD_TSI(Close, r, s, u, x, y)

The indicator consists of exponential moving averages of r, s, and u time intervals (referred to by the first three parameters above) for the TSI, and also a double-smoothed exponential moving average of price [EMA(close,x,y)] using x and y intervals (the final two parameters above).

Indicator slope is calculated by comparing the current indicator value to a previous value (e.g., an hour, day, week or month ago). In terms of the indicators used in the SD_TSI (the TSI and the second EMA), the formulas are:

Slope1 = TSI_Value (current value) – TSI_Value (previous value)
Slope2 = EMA_Value (current value) – EMA_Value (previous value)

In rising trends, both Slope1 and Slope2 should be positive; in falling trends, Slope1 and Slope2 should be negative. When the two slopes agree (which should occur during trending periods), the SD_TSI returns the TSI value; if the two slopes do not agree (i.e., slope divergence occurs), the indicator returns the value 0 (which should occur during congestion periods). The formula for plotting the SD_TSI is:

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If  Slope1 > 0 and Slope2 > 0 then
Pos.TSI = TSI (Close,r,s,u)
else Pos.TSI = 0

If Slope1 < 0 and Slope2  < 0 then
Neg. TSI = TSI (Close,r,s,u)
Else Neg.TSI = 0

SD_TSI = Pos.TSI + Neg.TSI
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Smooth sailing

Many traders use smoothing techniques to detect trends. Unfortunately, smoothing price with a standard moving average results in lag. Although some amount of lag is unavoidable, smoothing momentum (rather than price) can significantly reduce lag. Double smoothing further decreases lag.

Combining the Slope Divergence technique with the True Strength Index (TSI) makes it possible to more accurately identify trending and non-trending periods, thereby avoiding trades that might occur in ambiguous congestion areas.

For information on the author see p. xx.

Additional research

Momentum, Direction and Divergence
by William Blau
(Wiley Trader's Advantage, 199x).

"The True Strength Index"
by Thom Hartle
Active Trader, January 2002.