OSCILLATORS

TradeSmart Education Center
TABLE OF CONTENTS

Oscillators

- Bollinger Bands .......................................................... 2
- Commodity Channel Index ............................................. 5
- Fast Stochastic ............................................................ 7
- KST (Short term, Intermediate term, Long term) ............... 10
- MACD ..................................................................... 12
- Momentum ................................................................. 13
- Relative Strength Index ............................................... 15
- Slow Stochastic .......................................................... 17
- Williams %R ............................................................... 20
Oscillators

Oscillators are based on mathematical formulas that incorporate historical or recent prices of the stock.

Bullish or Bearish:

- Bollinger Bands
- Commodity Channel Index
- Fast Stochastic
- KST (Short-term, Intermediate-term, Long-term)
- MACD
- Momentum
- Relative Strength Index (RSI)
- Slow Stochastic
- Williams %R
Bollinger Bands

Implication

*Bullish*: When the price closes more than 2 standard deviations below the 20 period moving average of price, a bullish event is generated.

*Bearish*: When the price closes more than 2 standard deviations above the 20 period moving average of price, a bearish event is generated.

TradeSmart identifies a Bollinger band event based on a condition of price over-extension leading to an expectation of reversal. Some enhanced interpretations of Bollinger bands require secondary inputs such as RSI to validate a continuation or reversal position strategy. Refer to the Trading Considerations section below for further information regarding enhanced strategies for Bollinger bands.

Description

Developed in the early 1980's by John Bollinger, Bollinger bands were one of the first adaptive volatility envelope tools. Rather than fixed percentage envelopes being drawn above and below the moving average, Bollinger bands are calculated based on the standard deviation of an instrument's closing price.

Bollinger bands use standard deviation and a simple moving average to help traders determine buy and sell events, or to help confirm other patterns. A price chart that uses Bollinger bands displays four lines; price, the upper and lower Bollinger bands, and the moving average.

The upper and lower Bollinger bands typically appear 2 standard deviations above and below the 20-day moving average. TradeSmart supports these typical settings.

For shorter-term trends, some technical analysts prefer 1 1/2 standard deviations with a 10-day moving average. For longer-term trends, a 2 1/2 standard 50-day moving average may better suit their purposes.

The purpose of Bollinger bands is to provide an indication of high and low price range. By definition prices will be high at the upper band and low at the lower band. Price tends to bounce between the upper and lower Bollinger bands, but touches or penetrations can be tradable. The expansion or contraction of the band's width around the moving average indicates periods of high or low volatility respectively.
Trading Considerations

There are several successful trading strategies that are used in conjunction with Bollinger bands. Typically they involve monitoring the price action after a Bollinger band penetration, or reference to a secondary indicator or oscillator to qualify the potential for a continuation or reversal of the present price trend. Some traders watch for a succession of Bollinger band touches to track upside or downside momentum.

Periods of rising price volatility lead to a widening of the Bollinger bands, and conversely, low price volatility causes tightening of the bands. Because there is a tendency for bands to alternate between expansion and contraction phases, some traders look for unusually wide bands and interpret that as a sign of trend reversal. Conversely, extremely narrow bands can be an indication that supply and demand are in a fine state of balance and can be easily upset, potentially leading to the initiation of a new and powerful trend move.

Both John Bollinger and the classic text "Technical Analysis of Stock Trends" by Edwards and Mcgee suggest using Bollinger bands penetrations as signals that are qualified by another indicator or oscillator. A common Bollinger bands and Relative Strength Index (RSI) based strategy is:

- "When price touches or penetrates the upper Bollinger Band, and the RSI is below 70, it is an indication that the trend will continue. Conversely, when price touches or penetrates the lower Bollinger Band, and the RSI is above 30, it indicates the trend should continue."

- "If a price touches or penetrates the upper Bollinger Band and the RSI is above 70 (possibly approaching 80) the trend may reverse and decline. On the other hand, if a price touches or penetrates the lower Bollinger Band and the RSI is below 30 (possibly approaching 20) it indicates the trend may reverse and move upward."
In "Technical Analysis Explained", Martin J. Pring suggests that you can determine whether a price reversal is imminent by observing how price behaves following the initial Bollinger band crossing. He states: "If the price makes several failed attempts to cross or touch a band, but in doing so traces out a classic reversal price formation, you can expect a price trend reversal."

In "The Master Swing Trader", Alan S. Farley suggests that a move that leads to a price bar extending over 50% beyond the Bollinger band is over-extended and encountering resistance and thus overdue for a reversal. This is the interpretation that TradeSmart implements.
Commodity Channel Index (CCI)

Implication

TradeSmart identifies the following CCI events:

- A bullish event when the CCI rises above the +100% line.
- Another event signaling the end of the previous bullish trend occurs when the CCI subsequently falls below the +100% line.
- A bearish event when the CCI falls below the -100% line.
- Another event signaling the end of the previous bearish trend occurs when the CCI subsequently rises above the -100% line.

Description

Although the name CCI uses the term "commodity", the oscillator is commonly used for analyzing equities. A CCI is based on a comparison of price and moving average. The CCI is expressed as percentage that oscillates between -100 and 100. However, these levels can be exceeded.

The Commodity Channel Index quantifies the relationship between the asset's price, a 20 bar moving average (MA) of the asset's price, and the mean of the absolute deviations (D) from that average. It is computed with the following formula:

Typically, if the price is greater than the moving average, then the CCI will rise towards or above the 100% line. If the price drops below the moving average, then the CCI will drop towards or past the -100% line. There are divergences and exceptions to this price/CCI behavior that technical analysts should be aware of when making trades.
Trading Considerations

Technical analysts use CCI in a couple of ways 1) to predict a price reversal, and 2) to determine overbought or oversold conditions.

To predict a price reversal, compare the direction trend lines for the price and CCI. If the direction of the price trend line is different than the direction of the CCI trend line a divergence is said to have occurred, and a price reversal may follow.

The most popular way to use the CCI is to watch for overbought or oversold conditions. A stock is considered overbought when it is reaches 100% or higher, and oversold when it is -100% or lower. Some technical analysts use CCI with the view that an overbought condition precedes a price drop, and that an oversold condition precedes a rise in price.

Colby, however, identifies the trading rules for using CCI as follows:

- **Buy long when CCI rises above 100%**

  Buying long means that you are buying stock to own with the expectation that price will rise. You expect to earn a profit when you sell the stock at a higher price.

- **Sell long when CCI falls below 100%**

  Selling long means selling stock that you own, ideally, at a higher price than when you bought it so that you will earn a profit.

- **Sell short when CCI falls below -100%**

  Selling short means that you are selling stock that you have borrowed with the expectation that price will fall. If the price falls, you can profit by buying back the stock at a lower price and using it to replace the higher-priced stock that you borrowed. For example, if you sell stock for $100.00 per share, buy it back later at $70.00 per share, and then return the stock to the lender, your profit is $30.00 per share.

- **Cover short when CCI rises above -100%**

  Covering short means that you are buying stock to replace stock that you have borrowed. To maximize your profit you will want to buy back the stock at a price that is lower than it was when you sold.
Fast Stochastic

Implication

TradeSmart identifies an event for a fast stochastic oscillator when:

**Bullish:** %K and %D lines fall below and then rise above the 20 threshold, indicating bullish potential, along with a %K line cross above the %D line, triggering a bullish signal event if these 3 crossovers occur within a 5-day period.

**Bearish:** %K and %D lines rise above and then fall below the 80 threshold, indicating bearish potential, along with a %K line cross below the %D line, triggering a bearish signal event if these 3 crossovers occur within a 5-day period.

Description

The fast stochastic oscillator compares two lines called the %K and %D lines to predict the possibility of an uptrend or a downtrend. In price charts, the %K line typically appears as a solid or bold line, and the %D line appears as a dotted or softer line. The fast stochastic oscillator can be used effectively to monitor daily, weekly or monthly periods.

According to Martin J. Pring, George Lane developed the stochastic oscillator with the premise that during an uptrend, the closing price tends to rise. However, when the uptrend matures, price tends to close towards the bottom of the price range for the period. Likewise, in a downtrend, the reverse holds true.

The difference between the fast and slow stochastic oscillators is the way that the %K and %D values are calculated. Slow stochastics are based on the moving averages values calculated for fast stochastics. As such, John J. Murphy writes that most traders favor slow stochastics because they tend to be more reliable.
%K

For fast stochastics, the %K value is calculated as follows:

\[
%K = 100 \left( \frac{C-L}{H-L} \right)
\]

Where:

- \(C\) is the latest closing price of the stock
- \(L\) is the lowest price of the stock for the period that you are monitoring. TradeSmart uses a 14-day period as the period to monitor.
- \(H\) is the highest price of the stock for the period that you are monitoring. TradeSmart uses a 14-day period as the period to monitor.

%D

For fast stochastics, the %D value is based on a 3-period moving average of the %K value.

Pring identifies that a way to differentiate the %K line from the %D line is to remember that %K represents "Kwick" movements, while %D shows movements that "Dawdle". As such, Edwards and Magee note that "[ordinarily], the %K Line will change direction before the %D Line. However, when the %D line changes direction prior to the %K line, a slow and steady Reversal is often indicated."

Trading Considerations

This section identifies considerations that inform trading decisions using stochastics. It should be pointed out, that many technical analysts use stochastics in combination with other patterns or oscillators. John J. Murphy, for example, suggests that "[one] way to combine daily and weekly stochastics is to use weekly signals to determine the market direction and daily signals for timing. It's also a good idea to combine stochastics with RSI."

When you are using stochastics with price charts, keep the following factors in mind:

- **Extremes**

  When the %K line nears the 100 or 0 line a powerful move is set to occur. Some technical analysts equate the extremes with overbought (above 80) or oversold (below 20) conditions, and that prices cannot get much higher or lower. However, Edwards and Magee identify that this is not true in all situations, and that the extremes instead represent the strength of a price move.
- **Divergences**

A divergence is said to have occurred when the price and oscillator trend lines move in different directions. A price reversal may follow.

- **Hinges**

Lane referred to a flattened %K or %D line as hinges. A hinge may indicate that the uptrend or downtrend has become exhausted, and that a price reversal may occur.

- **Crossovers**

When the stochastic has reached 80 or higher, and a divergence has occurred, a crossover is the sell signal. To summarize Lane, Robert W. Colby writes that "the sell signal is more reliable when %D has already turned down when %K crosses below %D".

Similarly, when the stochastic has reached 20 or lower, and a divergence has occurred, a crossover becomes the buy signal. Robert W. Colby writes that "the buy signal is more reliable when %D has already up down when %K crosses above %D".
Know Sure Thing (KST)

Implication

A bullish signal is generated when the KST, "Know Sure Thing", rises above its moving average. When the KST falls below its moving average, the Technical Event® is a bearish signal.

Supported "Short-term KST" events are suitable for investors interested in a time frame of 2-6 weeks. "Intermediate-term KST" events are suitable for those interested in 6-39 week trends. Supported "Long-term KST" events are suitable for a 9-month to 2-year time frame.

Description

Price at any one time is determined by the interaction of many different time spans. Normally oscillators are constructed from a single time span so they ignore cycles not related to that specific period. The KST, on the other hand, consists of four different periods that are combined into one oscillator. Each time span used in the KST is smoothed with a moving average. Weightings are given to each moving average according to the length of the time span. Longer periods have greater weight in order to bring out a smoother curve. The KST changes direction sooner in response to price moves than similar oscillators using one time span because of the inclusion of shorter time spans.

The KST can be interpreted in the same way as other smoothed oscillators but most commonly indicates bullish and bearish momentum signals as it crosses above and below its moving average respectively. Because of the leading characteristics of this oscillator, it is important to make sure that some kind of trend confirmation is given by the price itself. This could be a price pattern breakout, trendline violation or moving average crossover.

Three time frames are supported (short-term, intermediate-term and long-term), however the KST can be calculated for trends of any other term. Further information on the KST and its formula can be found in the book "Technical Analysis Explained" by Martin J. Pring.
Note that Intermediate-term KST events from this service are recognized at the end of the week in which the crossover was found. For example, the event date is always on a Friday even if the crossover occurred in the middle of the week. Similarly, Long-term KST events are recognized at the end of the month in which the crossover occurred, therefore the event date is always the end of the month even if the crossover occurred mid-month.

Trading Considerations

The KST usually moves in a deliberate path which means that changes in direction offer bullish and bearish momentum signals. When the KST turns upward this indicates a bullish situation. When it turns downward, a bearish situation is likely. This service recognizes events when the KST crosses its moving average, which indicates a more distinct change in direction. This is the more reliable approach to interpreting the KST. However the investor may look for earlier signals by watching for changes in the direction of the KST before a crossover might occur; in particular the investor may watch for the KST converging with its moving average to anticipate a crossover earlier.

Usually it is better to delay trading decisions until the price confirms the situation implied by the KST. This confirmation might be a trendline violation, price pattern breakout or moving average crossover.

Overbought and oversold reversals have a higher degree of reliability than reversals that take place near the equilibrium level. The magnitude of KST fluctuations will depend on the volatility of the price and the type of trend being measured. This means that overbought/oversold levels are determined on a trial and error basis with reference to the oscillator's past history.

Divergences (when market trends go in a different direction than market indicators predicted, usually signifying the onset of a trend change) occur when the price makes a new high (or low) that is not confirmed by a new high (or low) in the KST. Prices usually correct and move in the direction of the KST.
Moving Average Convergence/Divergence (MACD)

Implication

When the MACD crosses the signal line or the zero line (the event), a bullish or bearish signal is generated depending on the direction of the crossovers.

Description

The MACD, "Moving Average Convergence/Divergence", shows the relationship between two moving averages of prices. The MACD is the difference between a 26-day and 12-day exponential moving average. A 9-day exponential moving average called the "signal line" is plotted on top of the MACD to show bullish and bearish signal points. A bullish signal is generated when the MACD rises above the signal line, or above zero. A bearish signal occurs when the MACD falls below the signal line or below zero.

Trading Considerations

The MACD is best used in strongly trending markets.

The MACD indicates overbought and oversold conditions. An overbought situation occurs when prices have risen too far too fast and are ready for a downward correction. An oversold situation occurs when prices have fallen too far too fast and are ready for an upward correction. When the shorter moving average pulls away from the longer moving average (i.e., the MACD rises), it is likely that the financial instrument's price is too high and will soon return to more realistic levels.

An indication that an end to the current trend may be near occurs when the MACD diverges from the financial instrument's price. A bearish divergence occurs when the MACD is making new lows while prices fail to reach new lows. A bullish divergence occurs when the MACD is making new highs while prices fail to reach new highs. Both of these divergences are most significant when they occur at relatively overbought/oversold levels.
Momentum

Implication

When the Momentum rises above 0, a bullish Technical Event® signal is generated. When the Momentum falls below 0, the Technical Event® is a bearish signal.

Description

Momentum measures the amount that a financial instrument's price has changed over a given timeframe. Momentum is significant because it signals the strength of price trends. A healthy price trend tends to exhibit strong momentum, while weakening trends often have decreasing momentum indicating a trend reversal or correction. Momentum can also indicate short-term market extremes referred to as overbought and oversold levels. A bullish signal is generated when the Momentum rises above 0 and a bearish signal is generated when the Momentum falls below 0.

Momentum is calculated as a ratio of today's price compared to the price 10 periods ago. The formula is 

\[
\frac{(Close - Close \text{ 10 periods ago})}{Close}
\]

Trading Considerations

Momentum can be used as a trend-following oscillator similar to the MACD. A bullish signal is generated when the indicator bottoms and turns up. A bearish signal is generated when the indicator peaks and turns down.

If the Momentum indicator reaches extremely higher low values (relative to its historical values), a continuation of the current trend may be called for. For example, if the Momentum indicator reaches extremely high values and then turns down, one could assume prices will probably go still higher. In either case, only trade after prices confirm the signal generated by the indicator (e.g., if prices peak and turn down, wait for prices to begin to fall before selling).
The Momentum indicator can also be used as a leading indicator. This method assumes that market tops are typically identified by a rapid price increase (when everyone expects prices to go higher) and that market bottoms typically end with rapid price declines (when everyone wants to get out). As a market peaks, the Momentum indicator will climb sharply and then fall off—diverging from the continued upward or sideways movement of the price. Similarly, at a market bottom, the Momentum indicator will drop sharply and then begin to climb well ahead of prices. Both of these situations result in divergences between the indicator and prices.
Relative Strength Index (RSI)

Implication

When the RSI rises above the 30 threshold after establishing a 0 - 30 oversold condition, a bullish signal is generated. Conversely, when the RSI falls out of the 70 - 100 overbought zone, a bearish Technical Event® is signalled.

Description

The Relative Strength Index (RSI) is an oscillator that measures a particular financial instrument's current relative strength compared to its own price history. The RSI should not be confused with relative strength which rates a financial instrument in relation to a market such as the S&P index.

The RSI is plotted on a vertical scale numbered from 0 to 100. The formula to calculate the RSI is $100 - \frac{100}{1+A}$ where $A$ is the average of the "up" closes over the calculation period divided by the average of the "down" closes over the calculation period. TradeSmart uses the popular 14-bar period in the calculation of the RSI. The "A" for a 14-day period is calculated by dividing the 14-day "up" close average by the 14-day "down" close average. An "up" close or a "down" close is defined as the absolute change in price from close to close.
**Trading Considerations**

The RSI sometimes shows more clearly than the price chart itself the support and resistance lines for a financial instrument. Failure Swings which are also known as support or resistance penetrations or breakouts can be detected by using the RSI. Failure swings occur when the RSI passes a previous high or falls below a recent low.

Divergences (when market trends go in a different direction than market indicators predicted, usually signifying the onset of a trend change) occur when the price makes a new high (or low) that is not confirmed by a new high (or low) in the RSI. Prices usually correct and move in the direction of the RSI.

A financial instrument is considered to be oversold when its RSI falls below 30 and overbought when its RSI rises over 70.
**Slow Stochastic**

**Implication**

TradeSmart identifies an event for a slow stochastic oscillator when:

*Bullish*: %K and %D lines fall below and then rise above the 20 threshold, indicating bullish potential, along with a %K line cross above the %D line, triggering a bullish signal event if these 3 crossovers occur within a 5-day period.

*Bearish*: %K and %D lines rise above and then fall below the 80 threshold, indicating bearish potential, along with a %K line cross below the %D line, triggering a bearish signal event if these 3 crossovers occur within a 5-day period.

**Description**

The slow stochastic oscillator compares two lines called the %K and %D lines to predict the possibility of an uptrend or a downtrend. In price charts, the %K line typically appears as a solid line, and the %D line appears as a dotted line. The slow stochastic oscillator can be used effectively to monitor daily, weekly or monthly periods.

According to Martin J. Pring, George Lane developed the stochastic oscillator with the premise that during an uptrend, the closing price tends to rise. However, when the uptrend matures, price tends to close towards the bottom of the price range for the period. Likewise, in a downtrend, the reverse holds true.

The difference between the slow and fast stochastic oscillators is the way that the %K and %D values are calculated. Slow stochastics are based on the moving averages values calculated for fast stochastics. As such, John J. Murphy writes that most traders favor slow stochastics because they tend to be more reliable.
%K

For slow stochastics, the %K value is based on a 3-period moving average of the %K fast stochastics value. See fast stochastics for information about the %K calculation.

%D

For slow stochastics, the %D value is based on a 3-period moving average of the %K slow stochastics value (described above).

Pring identifies that a way to differentiate the %K line from the %D line is to remember that %K represents "Kwick" movements, while %D shows movements that "Dawdle". As such, Edwards and Magee note that "[ordinarily], the %K Line will change direction before the %D Line. However, when the %D line changes direction prior to the %K line, a slow and steady Reversal is often indicated."

Trading Considerations

This section identifies considerations that inform trading decisions using stochastics. It should be pointed out, that many technical analysts use stochastics in combination with other patterns or oscillators. John J. Murphy, for example, suggests that "[one] way to combine daily and weekly stochastics is to use weekly signals to determine the market direction and daily signals for timing. It's also a good idea to combine stochastics with RSI."

When you are using stochastics with price charts, keep the following factors in mind:

- **Extremes**

  When the %K line nears the 100 or 0 line a powerful move is set to occur. Some technical analysts equate the extremes with overbought (above 80) or oversold (below 20) conditions, and that prices cannot get much higher or lower. However, Edwards and Magee identify that this is not true in all situations, and that the extremes instead represent the strength of a price move.

- **Divergences**

  A divergence is said to have occurred when the price and oscillator trend lines move in different directions. A price reversal may follow.
• **Hinges**

Lane referred to a flattened %K or %D line as hinges. A hinge may indicate that the uptrend or downtrend has become exhausted, and that a price reversal may occur.

• **Crossovers**

When the stochastic has reached 80 or higher, and a divergence has occurred, a crossover is the sell signal. To summarize Lane, Robert W. Colby writes that "the sell signal is more reliable when %D has already turned down when %K crosses below %D".

Similarly, when the stochastic has reached 20 or lower, and a divergence has occurred, a crossover becomes the buy signal. Robert W. Colby writes that "the buy signal is more reliable when %D has already up down when %K crosses above %D".
**Williams %R**

**Implication**

*Bullish:* After spending time in the oversold area below –80, the %R line rises back above -80 and continues up to cross the -50 line within 14 days. TradeSmart identifies an event at the -50 line crossover.

*Bearish:* After spending time in the overbought area above –20, the %R falls back below -20 and continues down to cross the -50 line within 14 days. TradeSmart identifies an event at the -50 line crossover.

**Description**

Williams %R, developed by Larry Williams, tracks the relative position of an instrument’s close price to its highest-lowest price range over a 14-bar period. %R values range from zero (higher – price is at the top of the 14-bar highest high range) to -100 (lower – price is at the bottom of the 14-bar lowest low range).

The goal of the %R oscillator is to detect overbought or oversold conditions, with values in the extreme end zones of the range signaling extenuated pricing.
**Trading Considerations**

When the %R drops under the -80% line the instrument is considered oversold. Conversely, when the %R surpasses the -20% line the instrument is considered overbought. Some technical analysts prefer to use the -75% and -25% lines to define the oversold/overbought boundary conditions.

It should be pointed out that a %R outside the -80% or -20% lines does not necessitate a price reversal. In fact, the price can continue to rise, fall or just stabilize at its present level. To control whipsaw effects, TradeSmart identifies the Technical Event® after the %R has left the oversold or overbought ranges and has re-crossed the -50% center line.

The Williams %R is best utilized when a price is oscillating within a non-trending trading range. If the price is trending, then another approach is to use indicators to classify the underlying price trend and then trade on %R events that support this trend. If the price is trending up, then Williams %R center line crossovers heading from -80 to -20 should be considered as long trade opportunities. If the price is trending down, then Williams %R center line crossovers heading from -20 to -80 should be considered as shorting opportunities.

Good trading practice dictates that this oscillator should not be used in isolation: fundamental data, sector and market indications and other technicals should be used to support your trading decisions.