TRADING SYSTEMS

Finding The Edges Of Trend

Exponential Standard Deviation Bands

Traders hunt for volatility, but how can you find it? Here's one technique you can apply that'll help you see volatility while a stock is trending.

Sometimes you see it right in front of your eyes. Other times you may have to look hard to find it. Either way, volatility needs to exist if you want to make successful trades. Lucky for you, there are many ways to measure volatility. One way is the exponential standard deviation bands (ESD bands), which are volatility bands placed above and below an exponential moving average. The bands are based on the exponential standard deviation, which changes as volatility increases and decreases. The bands automatically widen when volatility increases and narrow when volatility decreases. This means they can be used on different securities with standard settings.

Calculating Them

Here is how the bands are formulated:

Middle band = 20-day exponential moving average (EMA)

Upper band = 20-day EMA + (20-day exponential standard deviation of price × 2)

Lower band = 20-day SMA - (20-day exponential standard deviation of price × 2)

For more details on calculating ESD bands, please see the sidebar "Calculating ESD Bands." You'll find that ESD bands look similar to Bollinger Bands in that they consist of a middle band with two outer bands. The middle band is an exponential moving average (EMA) that is set at 20 periods. An EMA is used because the ESD formula also uses an EMA. The lookback period for the ESD is the same as for the EMA. The outer bands are usually set two ESDs above and below the middle band. You may adjust the settings to suit the characteristics of particular securities or trading styles. Changing the number of periods for the moving average also affects the number of periods used to calculate the ESD.

Interpreting Them

In Figure 1 you see a chart of the S&P 500 index from May 2016 to October 2016 with the ESD bands (20,2) overlaid on the price chart. The ESD bands indicator

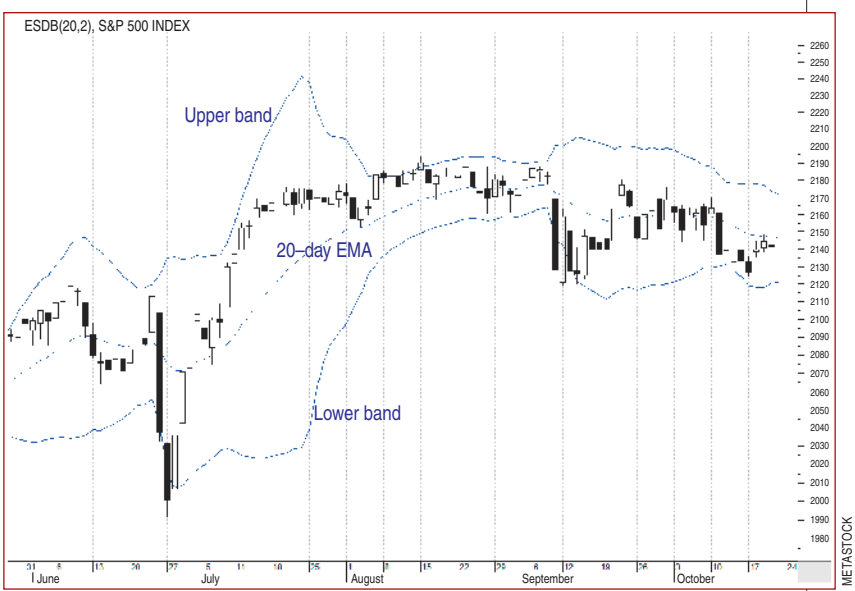


FIGURE 1: WHERE DOES IT BEGIN AND WHERE DOES IT END? Trends often start with strong moves in one specific direction. A surge above the upper band shows extraordinary strength while a plunge below the lower band shows extraordinary weakness. Such strong moves can signal the end of one trend and beginning of another.

by Vitali Apirine

PATRICK KELLEY

CALCULATING ESD BANDS

Exponential standard deviation measures the amount of variability or dispersion relative to the exponential moving average (EMA). Generally speaking, ESD is the difference between the actual value and EMA value. The larger this dispersion or variability, the greater the exponential standard deviation is. The smaller this dispersion or variability is, the lesser the exponential standard deviation.

How to calculate exponential standard deviation (ESD)

1. Calculate the exponential average price for the number of periods
2. Determine each period's deviation (close minus exponential average price)
3. Square each period's deviation
4. Sum the squared deviations
5. Divide this sum by the number of periods
6. The standard exponential deviation is equal to the square root of the number derived in 5.

The lookback period for the exponential standard deviation is the same as for the exponential moving average (EMA). The EMA starts with the simple moving average value (1140.67) in the first calculation (see Sidebar Figure 1). After the first calculation, the normal formula takes over. Because an EMA begins with a simple moving average (SMA), its true value will not be realized until 20 or so periods later.

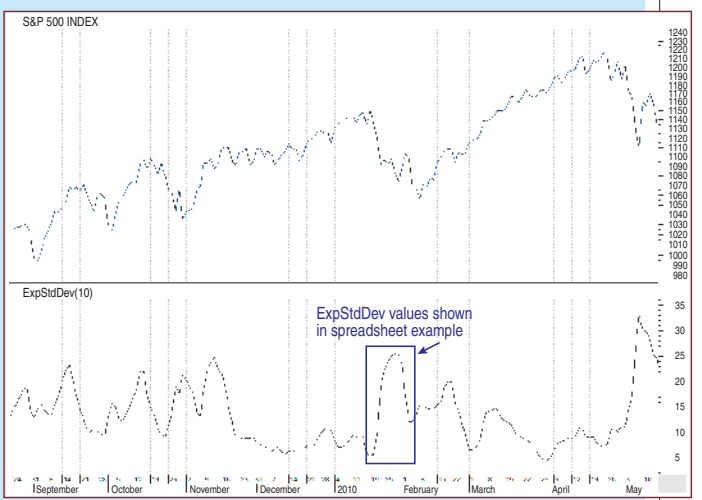
In Sidebar Figure 1 you see a spreadsheet example of a 10-day standard deviation and a 10-day exponential standard deviation for the S&P 500 large-cap index. The spreadsheet also shows the 10-day standard deviation using the STDEVP function in Excel for comparison. The values of the exponential standard deviation derived from the spreadsheet are charted in Sidebar Figure 2.

Exponential standard deviation vs. standard deviation

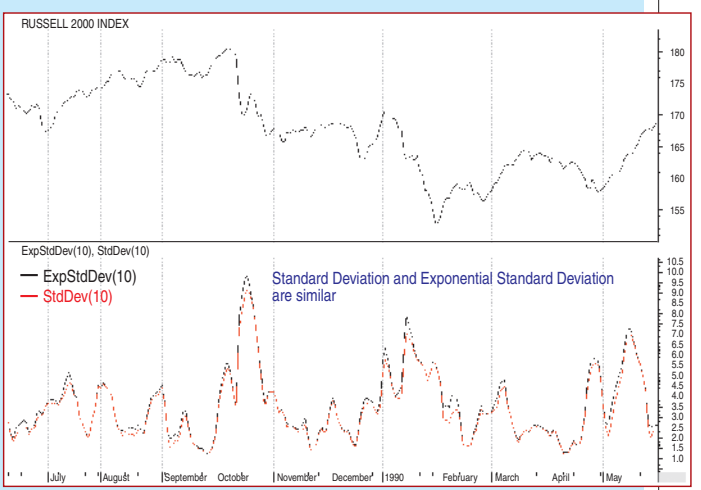
Exponential standard deviation and standard deviation are similar. Standard deviation measures dispersion around an average. The chart in Sidebar Figure 3 of the Russell 2000 small-cap index shows the ExpStdDev(10) and StdDev(10) in the subchart for comparison.

Date	SPX Close	Smoothing Constant 2/(10+1)	10-day EMA	10-day Exponential Standard Deviation	10-day Standard Deviation using STDEVP in Excel
1/4/2010	1132.99				
1/5/2010	1136.52				
1/6/2010	1137.14				
1/7/2010	1141.69				
1/8/2010	1144.98				
1/11/2010	1146.98				
1/12/2010	1136.22				
1/13/2010	1145.68				
1/14/2010	1148.46				
1/15/2010	1136.03		1140.67	5.25	5.25
1/19/2010	1150.23	0.18	1142.41	5.27	5.27
1/20/2010	1138.04	0.18	1141.61	5.20	5.12
1/21/2010	1116.48	0.18	1137.04	9.94	9.33
1/22/2010	1091.76	0.18	1128.81	18.54	17.30
1/25/2010	1096.78	0.18	1122.99	21.81	20.42
1/26/2010	1092.17	0.18	1117.38	23.86	22.55
1/27/2010	1097.50	0.18	1113.77	24.79	23.62
1/28/2010	1084.53	0.18	1108.45	25.33	24.42
1/29/2010	1073.87	0.18	1102.16	25.14	24.51
2/1/2010	1089.19	0.18	1099.81	23.32	23.09
2/2/2010	1103.32	0.18	1100.44	17.12	16.99
2/3/2010	1097.28	0.18	1099.87	12.08	10.72
2/4/2010	1063.11	0.18	1093.19	12.34	11.59
2/5/2010	1066.19	0.18	1088.28	13.50	13.37

SIDEBAR FIGURE 1: CALCULATION OF EXPONENTIAL STANDARD DEVIATION BANDS USING A SPREADSHEET



SIDEBAR FIGURE 2: EXPONENTIAL STANDARD DEVIATION, CHARTED



SIDEBAR FIGURE 3: EXPONENTIAL STANDARD DEVIATION AND STANDARD DEVIATION COMPARED

is designed to encompass most price action, which means that moves above or below the upper or lower exponential bands are relatively rare. Trends often start with strong moves in one direction or another. A surge above the upper band shows extraordinary strength while a plunge below the lower band shows extraordinary weakness. Such strong moves can signal the end of one trend and the beginning of another.

ESD bands are a trend-following indicator and lag price action because they are based on the EMA. The direction of the EMA dictates the direction of the ESD bands. In general, a downtrend is present when the bands move lower, while an uptrend exists when the bands move higher. The trend is flat when the bands move sideways.

An upturn and break above the upper band can signal the start of an uptrend. A downturn and break below the lower band can signal the start of a downtrend. Sometimes a strong trend does not take hold after an upper or lower band breakout, and prices will oscillate between the bands. Such trading ranges are marked by a relatively flat moving average. The band boundaries can then be used to identify overbought and oversold levels for trading purposes.

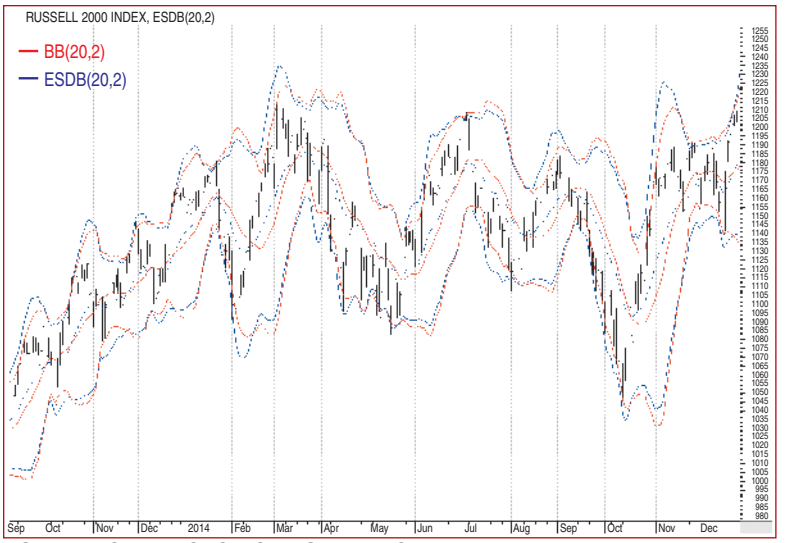


FIGURE 2: ESD BANDS VS. BOLLINGER BANDS. The Bollinger Bands are in red and the ESD bands are in blue. There is a little bit of a difference between the two.

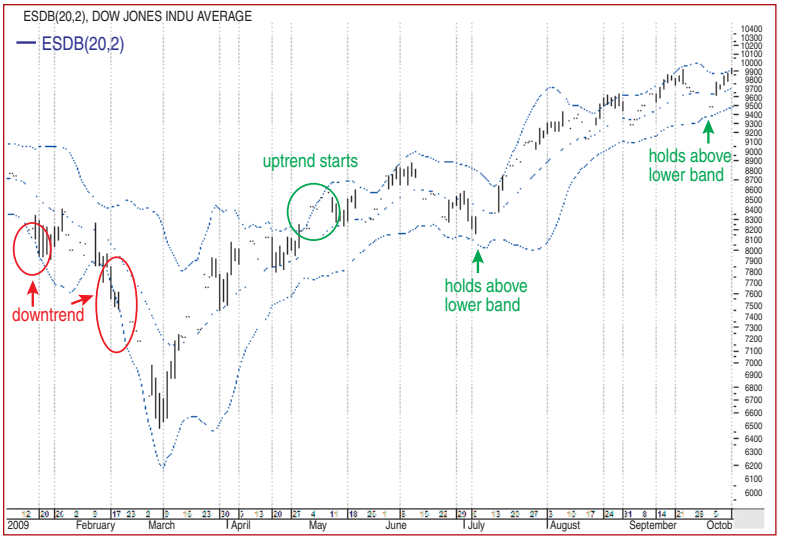


FIGURE 3: IT'S AN UPTREND. The Dow Jones Industrial Average was in a downtrend as prices continued to pierce the lower band. With a strong thrust up, prices exceeded the upper band at the end of April and the bands turned up to start a new uptrend. Prices held above the lower band on dips in July and October.

Compare with Bollinger Bands

ESD bands use an EMA, which is more sensitive than the simple moving average used in Bollinger Bands. In Figure 2 you see the Russell 2000 index with ESD bands (blue) and Bollinger Bands (red) for comparison.

Uptrend

The chart in Figure 3 is a display of the Dow Jones Industrial Average (DJIA) starting an uptrend as the ESD bands turn up and the index surges above the upper band. See how the DJIA was in a downtrend as prices continued to pierce the lower band. With a strong thrust up, prices exceeded the upper band at the end of April and the bands turned up to start a new uptrend. Prices held above the lower band on dips in July and October.

Downtrend

In Figure 4 you see the London Financial Times Stock index (FTSE 100) started a downtrend with a decline below the lower band in October 2000. After this initial break, the index met resistance near the upper band.

Flat trend

A trading range can be identified with a flat moving average and the average directional index (ADX). In Figure 5 you see the S&P 500 index with ESD bands (20,2) and ADX(10). The 20-day EMA flattened out from February to early August.

The indicator window shows ADX (black line) confirming a weak trend. Low and falling ADX suggests the trend is weak. High and rising ADX indicates a strong trend. ADX

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was below 40 the entire time. In fact, it was often below 30. This reflects the absence of trend. As you can see, the ADX peaked in January and fell until late May.

AND THE VERDICT IS …

ESD bands are considered to be trend-following, so they can help identify the underlying trend. A trend can be up, down, or flat. It is well-known that bullish trades are favored in an uptrend and bearish trades are favored in a downtrend. But what about during a flat trend? This is when ESD bands can come into play. Prices often peak at the upper band and trough at the lower band in a flat trend. And if you use them together with other indicators or analytics, they can act as a strong confirming indicator.

Vitali Apirine is a programmer engineer with an interest in technical analysis, especially the application of relative strength index to trading. He may be reached at vitapirine@mediacombb.net.

*See our **Traders' Tips** section beginning on page 48 for commentary and implementation of Apirine's technique in various technical analysis programs. Accompanying program code can be found in the Traders' Tips area at Traders.com.*

FURTHER READING

Apirine, Vitali [2016]. "The Middle-High-Low Moving Average," *Technical Analysis of* STOCKS & COMMODITIES, Volume 34: August.

_____ [2016]. "Higher Highs & Lower Lows," *Technical Analysis of* STOCKS & COMMODITIES, Volume 34: February.

_____ [2015]. "Average Percentage True Range," *Technical Analysis of* STOCKS & COMMODITIES, Volume 33: November.

‡MetaStock
†See Traders' Glossary for definition
‡See Editorial Resource Index

FIGURE 4: WHEN THE TREND IS DOWN. Here you see the London Financial Times Stock index (FTSE 100) started a downtrend with a decline below the lower band in October 2000. After this initial break, the index met resistance near the upper band.

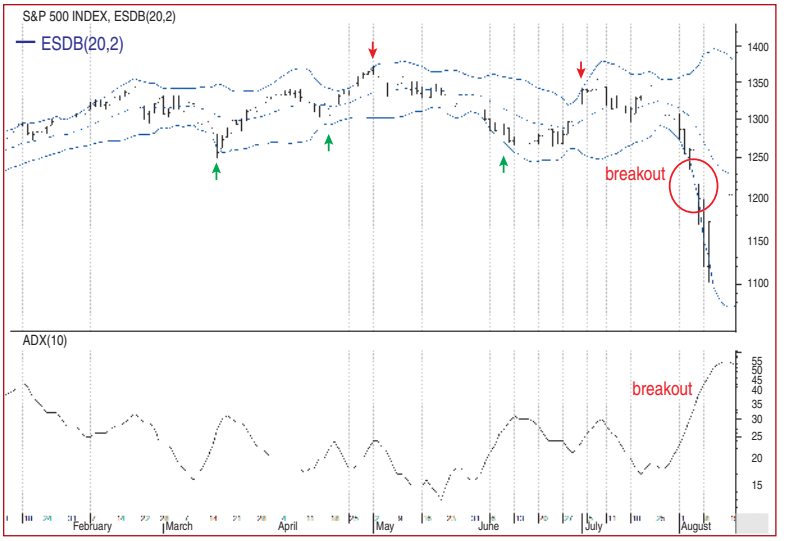

FIGURE 5: AND WHEN IT'S FLAT. Here you see the S&P 500 index with ESD bands (20,2) and ADX(10). The 20-day EMA flattened out from February to early August. ADX was below 40 the entire time. In fact, it was often below 30. This reflects the absence of trend. As you can see, the ADX peaked in January and fell until late May.