

Trendline Algorithm

by Dirk Vandycke

This article isn't a discussion on how to use trendlines or about how valuable they are. Many traders use trendlines and it's well understood that they are valuable tools. If we hand over the task of detecting trendlines and the patterns and setups that depend on them to machines in the

THE BAD

Each person has their own way of analyzing trends and if you were to ask a handful of people to analyze the trend of one particular stock, don't be surprised if you end up with different trendlines. This brings up another challenge: How can you define a trendline independent of specific chart properties and at the same time get an objective outcome (as much as

INDICATORS

possible) of the algorithm? You want good trendlines while feeding the algorithm as few parameters as possible.

Keep in mind that trendlines are not the only way to analyze trends. You can use moving averages, regression analysis, or time series analysis, among other techniques. Some approaches may be easier to turn into algorithms because of their mathematical character. The biggest disadvantage of mathematical indicators is their time lag but I won't go into that in this article. Here, I'll focus on how to let computers detect trendlines and not on their analytic or predictive power.

THE UGLY

When originally tackling the problem, I played around with several ideas. One was to use a point & figure chart, since all trendlines have 45-degree angles on them. The problem I encountered is that because the time axis has no importance, it was difficult to return to the bar or candlestick chart.

A first step was solving support & resistance lines (horizontal trendlines). By projecting all data points in the chart onto the y-axis (price axis), you get a histogram like the one you see in Figure 1. The highest bars in the horizontal histogram point to the highest action prices, which indicate support & resistance areas on the price axis. I wanted to extend this concept to nonhorizontal trendlines as well, but that involves more than just rotating the concept. I tried different methods but all ended up futile. A good algorithm isn't going to look at the chart. It needs to dig into data.

THE GOOD

The problems I encountered led to the realization that trendlines do not have to be horizontal and that good trendlines will intersect with price at less important tops and bottoms.

I'll look at why a top or bottom is important, or why one may be less important than another. To figure that out you'll have to define the strength of support & resistance. From here onward, I'll focus on support lines (connecting bottoms) but the same applies to resistance lines (connecting tops).

The left support number at any point (current point) is defined as the maximum horizontal range from that point to its left where prices are above the current price. On a daily chart that space would be measured in days. Likewise, the right support number counts how many "days" to its right a price hasn't seen lower prices.

Take a look at Figure 2. Counting to the left and right from the red candle, there were seven and six days, respectively, where price wasn't lower or as low as the red candle. In this case, the red candle has a left support number of six bars and a right support number of five bars.

I'll define a bar's support number as the minimum of either the left or right support number. Support numbers can easily

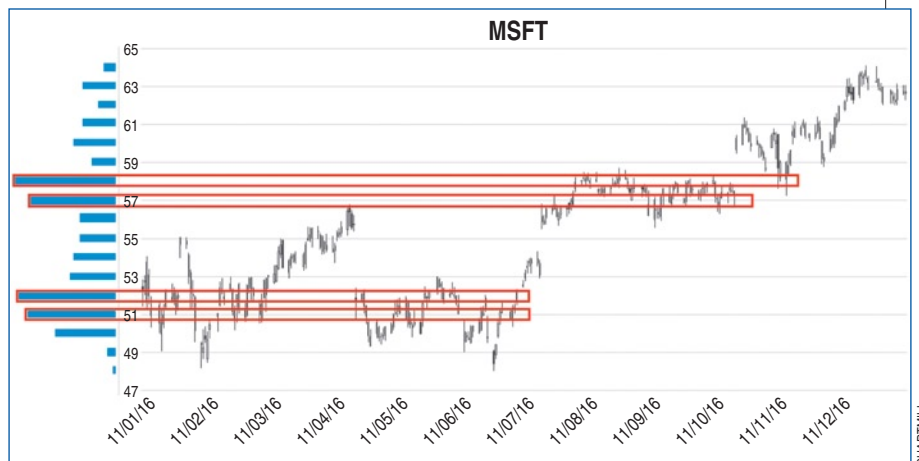


FIGURE 1: FINDING HORIZONTAL TRENDLINES. On the vertical axis of this chart of Microsoft Corp. (MSFT), a frequency spectrum of price action is added. The \$57 range seems to be closing in on an important horizontal support/resistance level. You could zoom in the histogram to narrow down the price level to a cent. In this example, the frequency spectrum was taken to \$0.50. Other high-frequency buckets, like the \$51 one, are not anywhere near a good example of a horizontal support/resistance line.

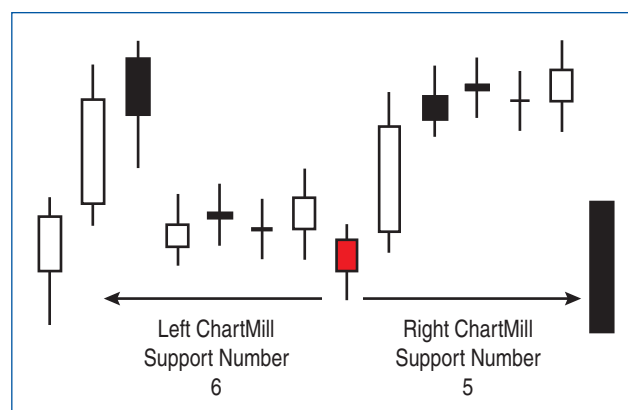


FIGURE 2: CHARTMILL SUPPORT NUMBERS. Here you see the left and right support numbers illustrated. The red candle has a left support number of 6, because seven candles ago, a lower price was seen. If you go to the right, you'll see that you'd have to wait six days for a lower price. Hence, the right support number is 5.

be calculated in two runs over all bars. A first run goes from left to right to calculate all left support numbers. The first bar gets a zero left support number, since it has no candles to its left. Each subsequent bar gets zero as its left support number, unless it shows lower prices, in which case it inherits the left support number from its left neighbor and adds one. That's all there is to it. For the right support numbers you repeat the process from right to left.

WRAPUP

Where does all this take us in our search for trendlines? Simply put, good trendlines will be the ones connecting bottoms with large-enough support numbers. The bigger a support number is, the more important the bottom will be. The logic is that if you connect bars with a support number larger than a certain threshold, the lines created will be good ones for a certain timeframe. I also played around with a maximum threshold and weighting more recent bars, but that didn't make much



FIGURE 3: CHARTMILL TREND LINES. Here you see two charts of different timeframes showing appropriate (but different) trendlines with the algorithm. Only the most recent/relevant trendlines are shown.

of an overall impact on trendline quality.

In Figure 3 you can see the algorithm at work that I created. I called it the ChartMill Trend Line Algorithm (CTLA). It selects relevant trendlines starting from the right of the chart and with a threshold based on the timeframe. As you can see, different timeframes make for different trendlines. I encourage you to experiment with them and share your feedback and ideas to come up with (even) better ones.

Dirk Vandycke has been actively and independently studying the markets since 1994 with a focus on technical analysis, market dynamics, and behavioral finance. He writes articles on a regular basis and develops software partly available at his co-owned website, www.chartmill.com. With master's degrees in both electronics engineering and computer science, he teaches software development and statistics at www.howest.be, a Belgian university. He's also an avid reader

Trendlines do not have to be horizontal and good trendlines will intersect with price at less important tops and bottoms.



of anything he can get his hands on. He may be reached at dirk@monest.net.

‡Chartmill.com

‡See Editorial Resource Index

‡See Traders' Glossary for definition

Find similar articles online at Traders.com

