

Figure 1: PAC chart representation of volume for Pfizer (PFE) from 10/2003 to 02/2005. PAC charts evaluate the volume traded at each price point and accumulate it over time, revealing often hidden volume buildups that can precede major moves, as well as resistance and support levels (see case study for details).

Introducing Price Activity (PAC) charts: an innovative, profit-generating visualization of volume

by Francois Bertrand

Detecting the strength and direction of investor sentiment towards a stock at an early stage is critical for successful trading. Volume, the number of shares traded for a stock on a given day, has long been recognized as a premier indicator of investor emotion and is used daily by traders under one form or another.

This article introduces Price Activity (PAC) charts: a potent yet highly intuitive method of charting, whose innovative layout of data offers analysts unparalleled visual insight on volume with respect to both price and time. These charts are simple in concept and very potent at detecting breakouts, the strength and location of actual resistance/support levels and by their very nature leverage well-known formations such as pennants, triangles, flags and consolidation areas (figure 3).

Concept and benefits

Like many well-established indicators, PAC charts aim at measuring investor emotion levels (through volume measurement) for a given stock. However, PAC charts innovate by tracking volume independently at each price point, not just total volume for the entire stock. In addition, this information is compounded and weighed over time. While this approach is similar in some ways to "price by volume" histograms, the tracking and compounding of data per price point, per day, effectively increases the amount of information provided by PAC charts by an order of magnitude.

In effect, per price-point information reveals exactly at which prices, at which point in time and in which quantities have investors been trading. This data offers real benefits to investors:

- First, the compounding of volume information is very apt at detecting volume buildups, making it a powerful tool for detecting breakouts and differentiating between actual and false breakouts. Breakouts with high volume are regarded as being

more likely to succeed.

•Also, it directly reveals the strength and location of resistance and support levels. If we define those levels as prices where there is a lot of fresh "supply", PAC charts often reveal significant trading levels that would otherwise remain unseen. With PAC charts, resistance and support levels are no longer a hand-drawn approximation on a graph, but (as in real life) they are *embedded* in the data!

Construction and analysis

The process for building PAC charts represents a slight paradigm shift from standard charting, but is straightforward and described in figure 5. The end result is a chart that represents the accumulated volume recently traded at each price point, with the data color-coded for easy interpretation. Any color scheme will do, but a rainbow pattern (as chosen for this article) was found to best highlight differences. In this color scheme, often used in infrared thermal imagery, the "hotter" the color the more volume has been traded at that price recently.

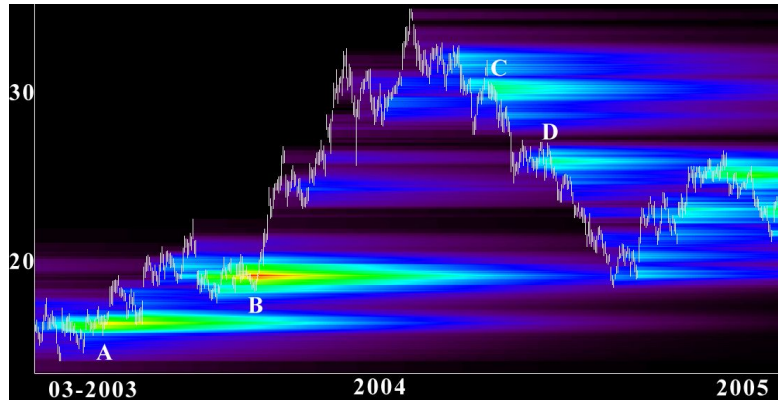


Figure 2: Texas Instruments (TXN) from 03/2003 to 02/2005. High volume activity levels strongly suggest breakouts (A, B) as well as breakdowns (C,D) a few days before they occurred.

It is important to note that the color coding provides a *relative scale* from no volume to the maximum volume accumulation. For example, on a three-month chart, the color red would represent the largest volume accumulation in the past three months; on a two-year chart, it would be the largest in two years. Consequently, a given point that is red on a three-month chart might only be green (less significant) on a two-year chart if there were larger accumulation during those two years. The longer the timescale, the more significant each high-activity area (yellow, red colors) is.

Also noteworthy is the fact that PAC charts use a constant timescale, as opposed to Candlevolume or Equivolume charts, making them easier to use in conjunction with standard indicators and oscillators.

Profiting with PAC charts

One of the most common uses of traditional volume indicators is to detect the strength of breakouts, where strong and successful breakouts are usually preceded by an increase in volume and/or high volume on the day of the breakout. A great strength of PAC charts is that by their very nature, they intuitively reveal this information and with much greater precision than traditional methods. One-day spikes in volume, volume surges and steadily increasing volume all automatically get compounded into an easily identifiable area of high activity (warm yellow, red colors). These areas are quickly identifiable and are often precursors to major breakouts or selloffs; see figure 2, as well as other figures used throughout this article. As an added bonus, these areas of high activity also indicate future support and resistance levels.

Another profitable approach to using PAC charts is to analyze how the stock (i.e. its stockholders!) *reacts* when the stock enters, leaves or goes right through an area of prior high activity. To portray this kind of analysis, we will examine two case studies.

Case study: LU

First, we will study a closeup of the PAC chart for Lucent Technologies (LU) from 09/2004 to 02/2005 (figure 4). Our analysis starts at the high activity period in (A1) where LU surges exactly to the top of a prior high activity level. Then, the stock falls back to (A2), following a brief period of intense trading (the green band at B). The question raised by this high activity on the downslope at (B) is: was this a selloff, or merely short-term profit-taking where part of this activity was caused by the same medium-term bulls who bought in (A1)?

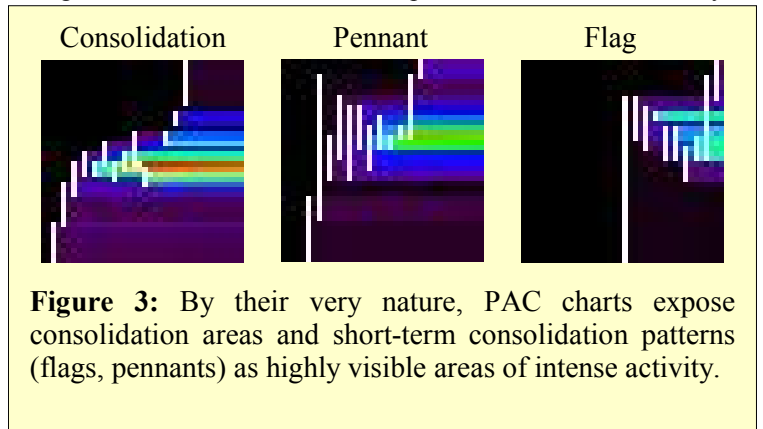


Figure 3: By their very nature, PAC charts expose consolidation areas and short-term consolidation patterns (flags, pennants) as highly visible areas of intense activity.

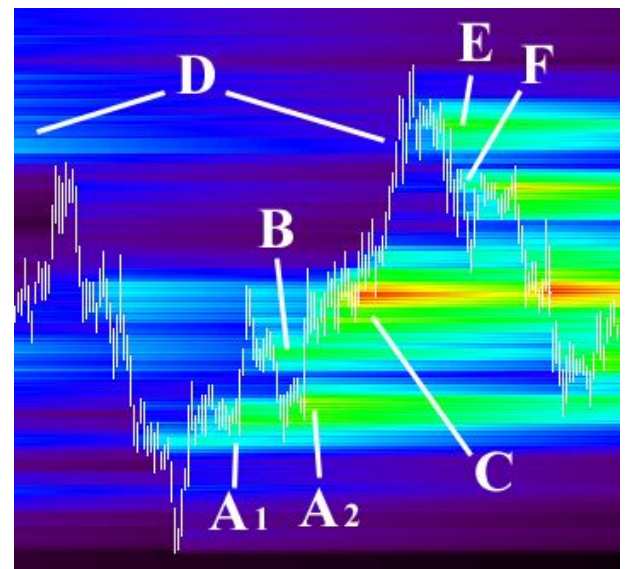


Figure 4: Close-up and analysis of a breakout/breakdown cycle in late 2004 for Lucent Technologies (LU).

The answer comes quickly when the stock "rests" on the upper portion of the recent activity (at A2) and starts showing increased activity (yellow line near A2). The clincher is when LU surges past the recent supply (resistance) at (B) without flinching. This is a bullish sign, as the stock completely ignores this fresh supply (B) and continues its upward movement with high volume (C).

Notice how different this reaction to resistance is, compared to how the stock behaves when it stops and gets stuck in the (F) resistance area a little later. In that case, the stock hesitates and creates an even stronger resistance area; time for the bulls to take profits! This analysis of a stock's reaction to resistance and support can tell a *lot* about investors' general mood (bullish or bearish) and is one of the keys to making profits.

Now back at (C), the uptrend quite literally ignites, as the stock trades well-above-average volume (yellow & red areas) while continuing its relentless climb. Notice how the stock seems to "ride" on the high volume area (in green, yellow and red): this is a very bullish sign, as the stock climbs fast, supported by heavy volume. The opposite can also be true for bearish trends, as seen in figure 1-D.

At this point, LU is screaming "buy me!". After a hefty surge, the stock stops its climb and "sits" on a prior resistance level (D). A few days before the eventual breakdown, the compound activity level increases as profit-taking starts; a good time to do so yourself, and even get in as a short. At (E) there are absolutely no support levels all the way down to where the surge started, and it's very likely that if the stock is to fall it will go all the way to that level.

It promptly does so, but notice the high activity level it leaves behind at (F), midway through the descent. These new stockholders offer the fresh supply that stops cold the rally that occurs just a few days later after LU bounces right off the support. This subtle indication in the PAC chart forecasts potential trouble at this exact level, a fact that would have been very hard to detect using conventional volume analysis methods. Even more useful than detecting the additional resistance level, this extra activity as the stock drops is also an advance indicator that the bears are gaining momentum.

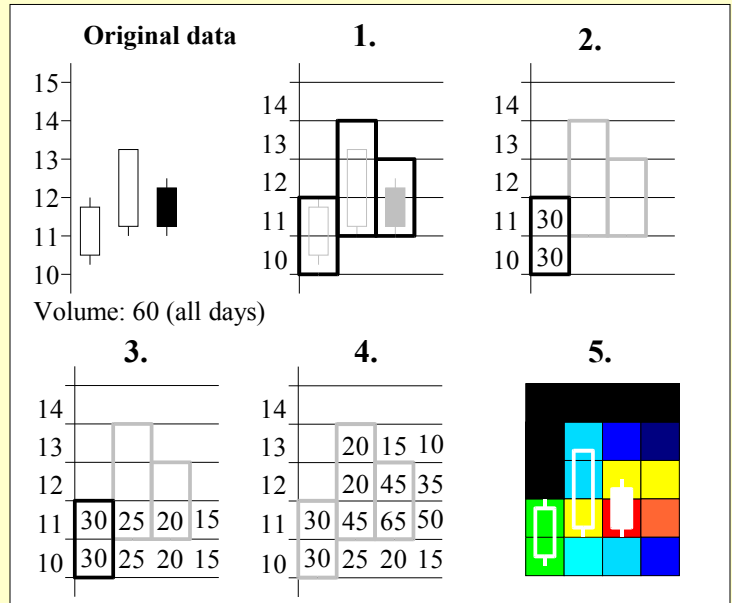
Finally, all the bearish pressure (E and F) gets to LU and pushes it down past the first F support level, down to the lowest support in the vicinity after a brief but intense struggle. The stock in barely touches that support level then starts moving up again, propelled by another surge in volume implying a possible return of the bulls. The real test will occur when the stock either breaks down on the now-resistance level (C), or surges right past it to (E) or (F).

Case study: PFE

In our second case study, we take a look at PFE from 10/2003 to 02/2005 (figure 1). The graph starts out with a very strong and predictable breakout (A) that propels PFE to "sit" on top of the previous high activity level (B). A second period of high activity promptly begins and sends PFE on another series of surges up-and-down, and every time the stock bounces right off the resistance, even increasing its activity level. However, the bounces start getting lower and lower as PFE shows signs of fatigue.

The PAC chart starts telling a grim story, starting at (C) where higher volume levels start to grow, creating resistance and hinting at the presence of more sellers and profit-takers. After the next bounce, (D) confirms larger and larger amounts of selling on the downslope. At that moment, given all these indications, it is very likely that PFE will finally break the support and fall back to the previous support

Figure 5: Constructing a PAC chart



1. Create a "price grid" where each row in the grid represents a range of prices. Then, identify the range of boxes in the grid that encompasses each day's trading range (from low to high). This step is somewhat similar to how Point & Figure charts are constructed.
2. Then, for the first day, distribute the day's volume evenly in the range of boxes. This estimates the number of shares that were traded at each price point during that day.
3. Simulate the gradual selling of those shares by their owners in the future. This is done by copying the total for each box in the following days on the graph, but reducing the number of shares every day that passes.
4. Repeat steps 2 and 3 for every day in the chart, summing all the results together.
5. Color-code all grid elements according to their relative values (black = 0, red = highest number).

level. This is exactly what happens, and after a false rally (E, lacking the strength of the surge in A), the stock goes right through this last strong support level. As a last nail in the coffin (for the bulls, at least), the stock stops a last-ditch rally cold after hitting the bottom of the now-resistance level (F).

Moving forward

Like Japanese candlesticks, PAC charts are an innovative visualization of raw data that provides analysts with instant, visual insight on how a stock is being traded. PAC charts can be used to give powerful buy/sell signals, reveal investor sentiment and detect actual support/resistance levels as well as their strength. In many cases, they pick up information that would have been very hard to detect through standard charting methods. A wise trader always relies on more than one analysis tool to make his or her decision. I have found that PAC charts' different approach can contribute unique insight to a trader's decision-making process.

Future work on PAC charts should explore the use of their data for new indicators, signals and oscillators. Also, current implementations use end-of-day data to evenly distribute volume by price point. Much greater volume distribution accuracy could be achieved by using 5 or 15-minute intraday data. Experimenting could also be performed on the main two variables in PAC chart construction: the attrition function (step 3) and the price interval size (step 1).

You are encouraged to visit www.paccharts.com where you can consult the PAC charts for your favorite stocks, and get a feel for this exciting new type of chart. I hope you will find it, as I did, a profitable addition to your arsenal of trading tools.

Francois Bertrand is a veteran programmer with over 8 years of experience in the fields of graphics, artificial intelligence and database programming. He is currently employed as a senior programmer at Sony Computer Entertainment of America and can be reached through the PAC charts web site at www.paccharts.com.