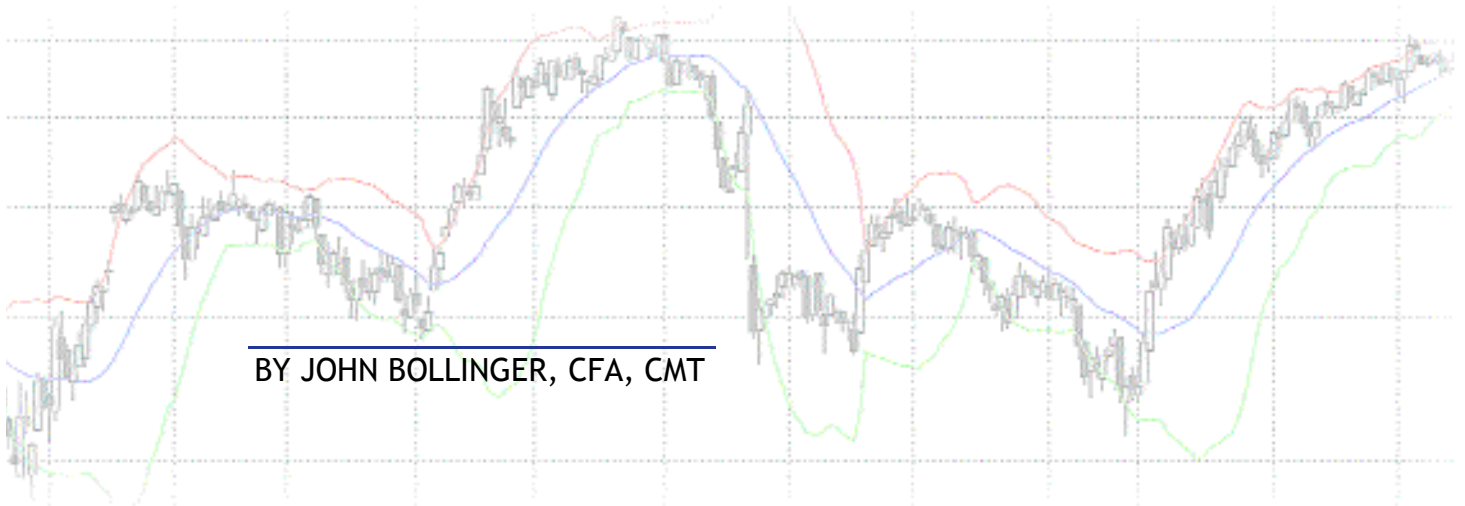




Volume INDICATORS revisited

Because volume is independent of price, volume-derived indicators can give traders a fresh perspective on market action.

Analyst John Bollinger reviews the origins of volume indicators and explains how traders can benefit from understanding these tools.



BY JOHN BOLLINGER, CFA, CMT

Volume and volume-based indicators are under-utilized resources that offer traders fertile ground for exploration in the already well-turned field of technical analysis.

However, because of the relative obscurity of some volume indicators and their often confusing nomenclature, many traders and analysts know less about this area of technical analysis than they should. Increasing your awareness of these valuable tools and their respective purposes will help you properly identify and deploy them in a rational manner.

Money flow, supply-demand, accumulation-distribution, buying power and selling pressure are all terms designed to convey the issue at the heart of technical analysis: the sometimes not-so-delicate balance between buyers and sellers. Technical analysis assesses this balance by examining a market's price structure and related variables. A large number of indicators have been created

to clarify the relationship between supply and demand. Some are derived from price, some are based on sentiment and others are based on volume.

One of the keys to understanding the balance of the marketplace is the actual balance of trade, which is volume. In the number of shares or contracts traded we see the sum of all fact and opinion translated into action. Delicate balance or landslide, feint or blow, confusion or conviction, ebullience or depression, victory or capitulation — all is ultimately captured in trade volume.

A fuzzy picture

Unfortunately there is a great deal of confusion about how to use volume indicators. Relative obscurity is one factor in this confusion. Volume indicators are far less common in market literature than momentum and trend indicators, and they are less frequently used than price-derived indicators.

This is a shame, as the technician's set of tools is small enough to start with,

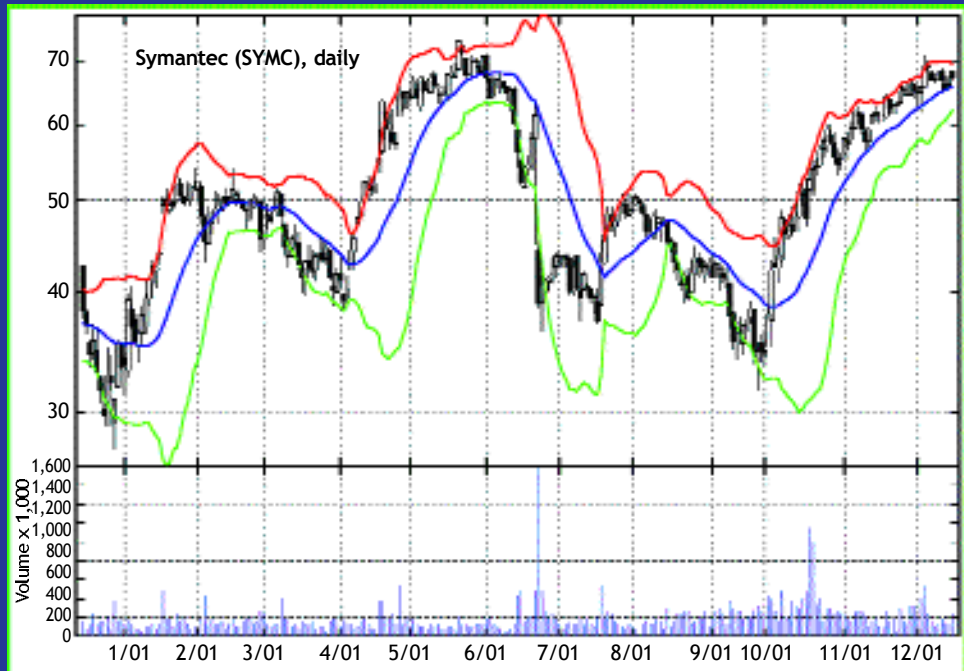
consisting primarily of (in order of popularity) closing prices, highs, lows and volume, with opening prices and the occasional relative comparison or psychological indicator rounding out the set.

A major factor inhibiting wider use of volume indicators is the confusion created by the inconsistent naming scheme for volume indicators. Some volume indicator formulas have had two, three or even more names applied to them, while some common names, such as accumulation-

Volume contains the sum total of all fact and opinion translated into action.

FIGURE 1 VOLUME: CONFIRMING PRICE

Volume has long been used to verify the validity of price movement. Because it is independent of price, volume offers an uncorrelated input traders can use to strengthen their market analysis.



Source:www.EquityTrader.com

distribution, masquerade in front of several unique formulas.

A fresh perspective

Solid analysis and trading decisions are the product of using a set of non-correlated indicators to aid in interpreting price action. There are many possibilities, including trend, momentum, supply-demand and psychological indicators.

The “one-from-column-A, one-from-column-B” method provides the most robust approach because it gathers the most information with the least redundancy. Volume indicators are very useful in this regard, because most approaches do not incorporate them. As a result, volume indicators offer new, non-correlated analysis inputs (see Figure1, above right).

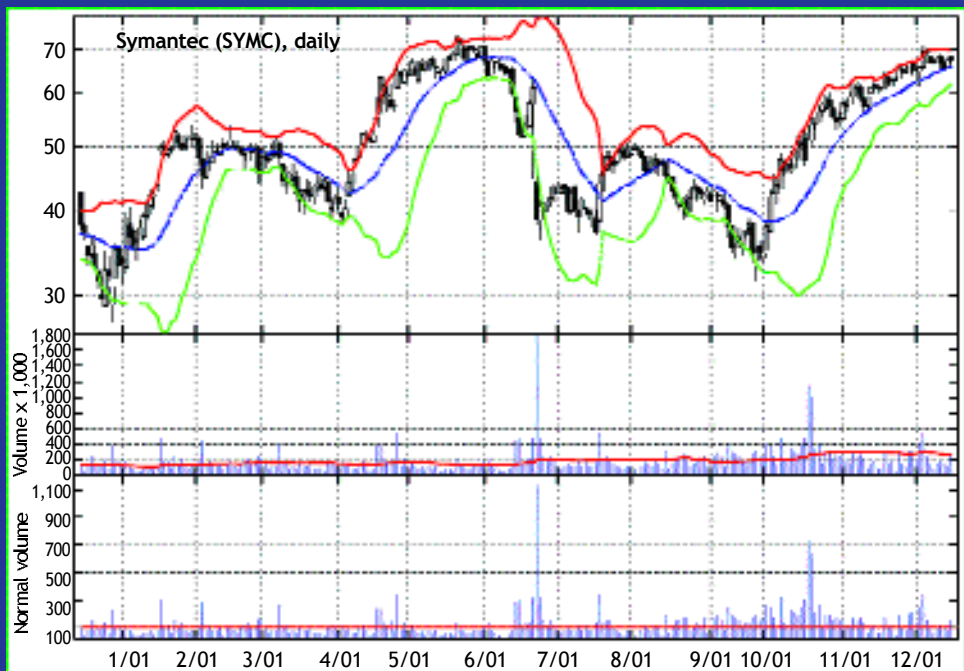
One of the underpinnings of volume analysis is the notion that volume precedes price. This basic technical concept is discussed in the earliest technical analysis writings. For example, early 20th-century authors such as Richard Schabacker and Richard Wyckoff covered volume extensively in their works. However, it was not until the 1950s and 1960s that volume-based indicators began to gain wide appreciation.

The earliest use of volume was to confirm chart patterns. The classic description of a head-and-shoulders pattern includes diminishing volume across the developing formation followed by increasing volume on the break of the neckline.

continued on p. x

FIGURE 2 AVERAGING VOLUME

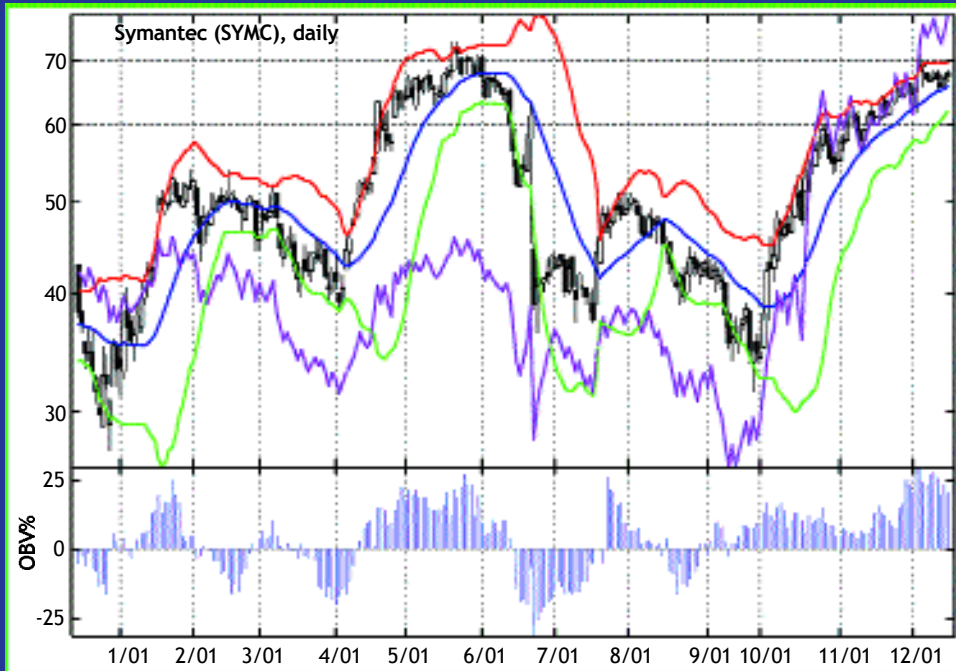
Calculating a moving average of volume can help determine relatively high and low volume levels. Here, the upper volume plot is overlaid with a 50-day moving average, and the lower plot is %v or normalized volume, an indicator that allows for direct comparison of volume from issue to issue.



Source:www.EquityTrader.com

FIGURE 3 ON BALANCE VOLUME (OBV)

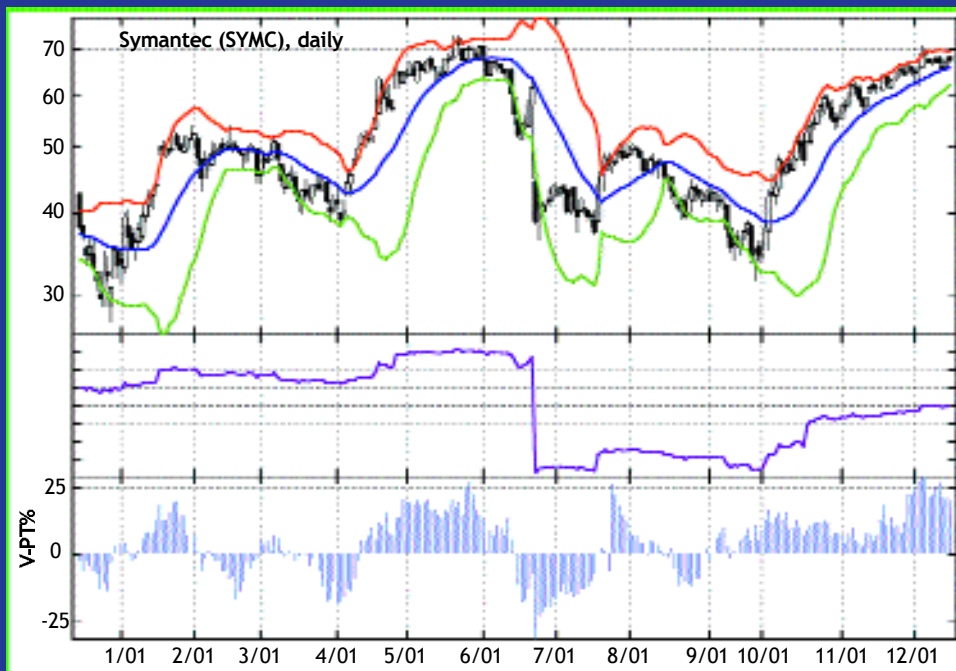
Standard OBV (overlaid on the price series) is a running total of the period-to-period volume, added when the current bar closes above the previous bar, and subtracted when the current bar closes below the previous bar. Divergences between price and OBV, such as occurred between the June and October lows, highlights shifts in market dynamics. The oscillator version of OBV (lower panel) is a 20-day sum of OBV divided by a 20-day sum of volume.



Source:www.EquityTrader.com

FIGURE 4 VOLUME-PRICE TREND (V-PT)

The Volume-Price Trend (V-PT) indicator is a variation of OBV that multiplies volume by the daily percentage price change. Here, V-PT is overlaid on the price series and the lower panel shows 20-day V-PT%. Note the sharp break in the indicator caused the the large percentage drop in price. This is a vulnerability of this formulation.



Source:www.EquityTrader.com

Typically, a bar chart with volume plotted at the bottom was used to aid this type of analysis.

However, there can be interpretation problems. How are we to know what constitutes high volume or low volume? The eye can guess, but it is better to use an average of volume (see Figure 2, p. xx). By definition, days where volume is above the average are high-volume days, and vice versa. Typically, 20- and 50-day averages are used for this purpose, with the latter preferred by many practitioners.

A useful refinement is to divide volume by its moving average, multiply by 100 and plot the result. This transformation creates a relative volume measure that perfectly complements the relative price framework created by Bollinger Bands. This normalized measure of volume is called “%v.”

There are five basic ways to create volume indicators. First, you can tabulate volume in terms of the price change from the prior period. Second, you can use the relationship of the open, high, low and close of the time period under consideration to create the indicator. Third, the change in volume from the prior period can be used to drive the calculation. Fourth, you can compare the ebb and flow of volume to itself. Finally, you use volume as an input in the calculation of other indicators, such as the relative strength index (RSI) or the moving average convergence-divergence (MACD) indicator. Roughly, that is the order in which volume indicators were developed.

One note: Transaction analysis, a special type of volume analysis that takes into account each trade, is beyond the scope of this survey. Transaction indicators are usually called tick volume or money flow. Typically an accumulation is made of each trade using the formula: price multiplied by volume multiplied by the tick,

where the tick is +1 if the trade rose in price from the previous trade (an uptick) or -1 if it fell (a downtick).

There are many possible variations: block trades vs. non-block trades, how sequential trades at the same price are handled (stale ticks), etc. Don Worden developed the transaction analysis concept in the early 1960s. He computed money flow by hand from the printed records of each trade. After many years he felt the technique no longer conveyed an advantage and abandoned it, choosing to focus on proprietary indicators such as Time Segmented Volume, which is more akin to the other indicators discussed in this section. Sam Hale and Laszlo Birinyi are the best-known modern-day proponents of transaction analysis.

The following sections will discuss 10 indicators, two for each of the previously outlined construction methods.

Volume modified by price change

The first category of volume indicators uses change in price to parse volume. In 1963 Joe Granville introduced an indicator to the public called **On Balance Volume (OBV)** in Granville's *New Key to Stock Market Profits* (Prentice Hall). It appears that Frank Vignola originally developed OBV. However it was Granville who popularized OBV, and it is Granville who is associated with OBV and its numerous derivatives today.

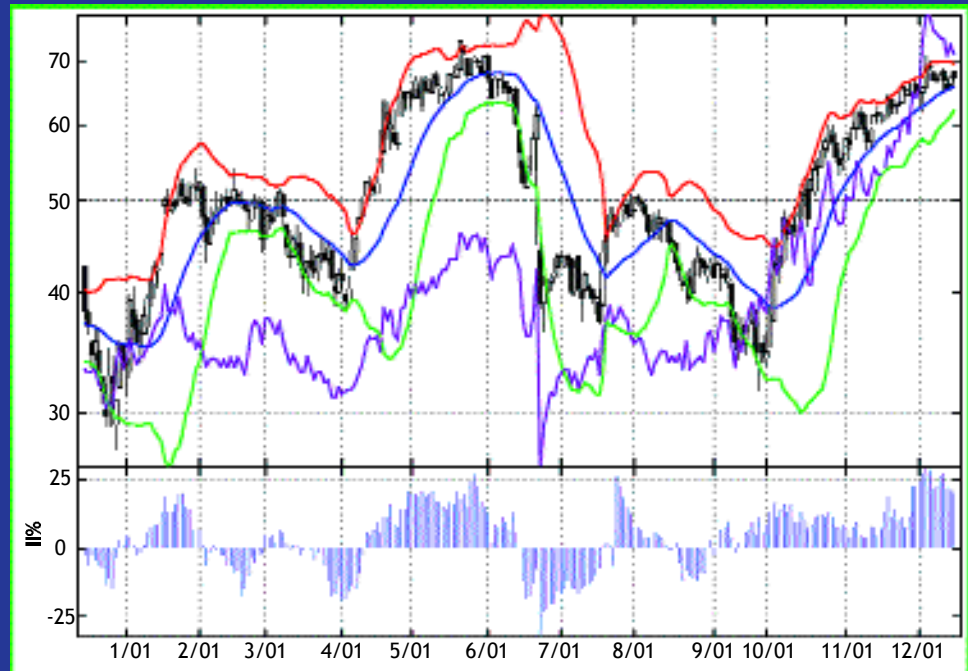
OBV is a simple accumulation (running total) of volume times the sign of the price change. To calculate the OBV, start at some convenient figure (e.g., 0), then add the daily volume to the OBV indicator total on days when price rises and subtract it on days when price falls.

The idea behind OBV is that volume is the motive force behind price action. Therefore, volume on days when price

continued on p. x

FIGURE 5 INTRADAY INTENSITY (II)

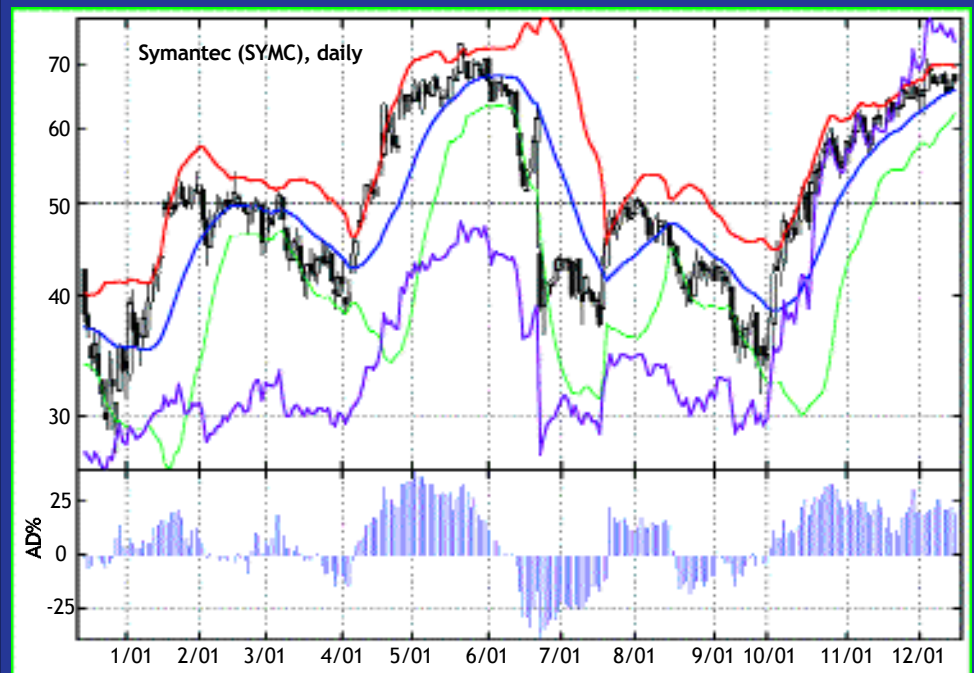
Intraday Intensity (overlaid on price) compares the closing price to a bar's range. The higher the close, the higher the II value. The lower panel depicts 21-day II%, known as Money Flow percent to many institutional investors.



Source: www.EquityTrader.com

FIGURE 6 ACCUMULATION-DISTRIBUTION (AD)

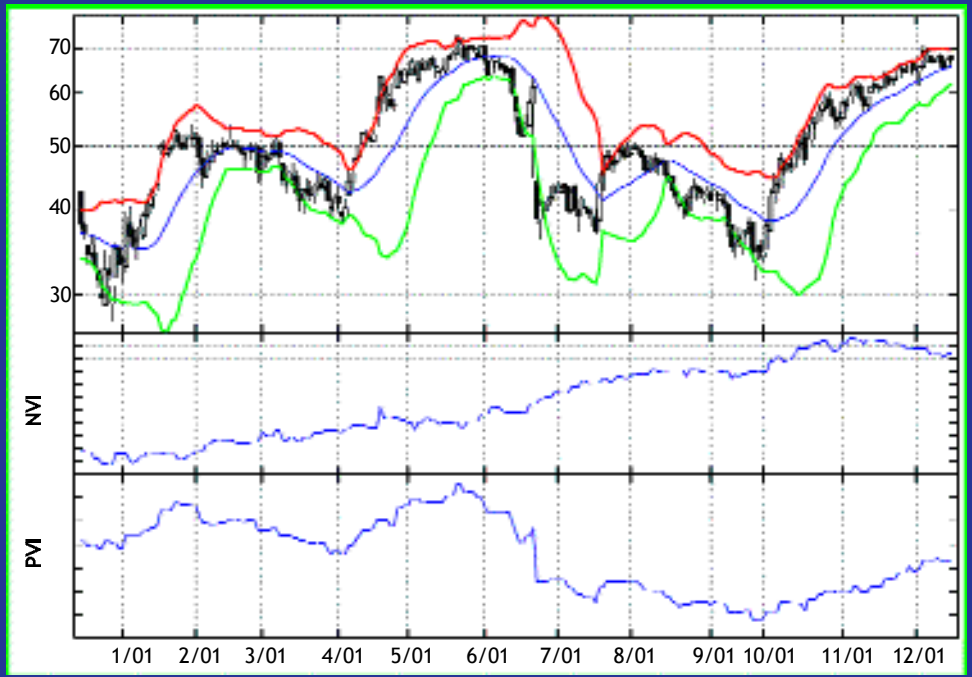
AD (overlaid on price) compares the relationship of the open and close to that of the high and the low, multiplied by volume, to indicate the intraday momentum of a bar. The lower panel depicts 20-day AD%,



Source: www.EquityTrader.com

FIGURE 7 NEGATIVE AND POSITIVE VOLUME INDICES

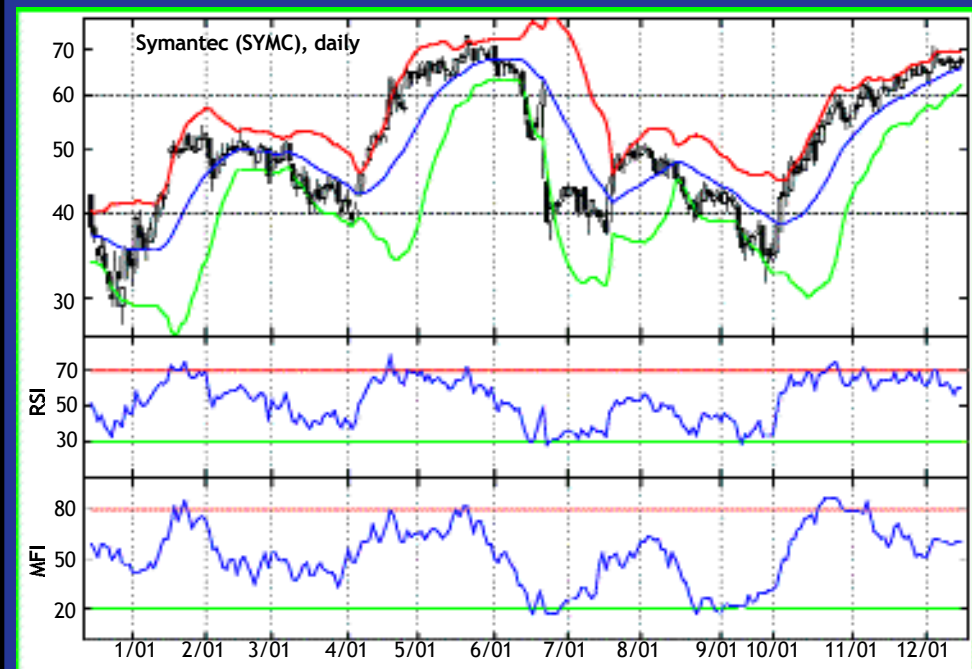
The Negative Volume Index (NVI, middle panel) sums price changes when volume falls. Its inverse, the Positive Volume Index (PVI, lower panel), accumulates price changes when volume rises. Some managers regard PVI as a good trend indicator.



Source:www.EquityTrader.com

FIGURE 8 MONEY FLOW INDEX (MFI)

The MFI (lower panel) modifies the RSI (middle panel) by multiplying by volume the price changes used in the latter indicator's calculation.



Source:www.EquityTrader.com

risers indicates positive market behavior, while volume on declining days implies the opposite.

Typically price and OBV are plotted together on the same chart, though with different scales (see Figure 3, p. xx). Action is taken on divergences between the indicator and price: selling if price makes a new high but the indicator does not, or buying when price records a new low and the indicator fails to do the same.

Typical of the patterns OBV can help clarify are: advances on low volume resulting in weak OBV, and sideways price movement in a base accompanied by increasing volume on up days that results in the OBV moving up before price. Many technicians consider OBV to be a good trend indicator.

The next development in this area, **Volume-Price Trend (V-PT)**, came in 1966 from David Markstein in *How to Chart Your Way to Stock Market Profits*. V-PT is a variation on OBV that multiplies volume by the daily percentage price change (see Figure 4, p. xx). V-PT considers not only whether prices rise or fall, but by how much. Interpretation is along the same lines as OBV.

Volume modified by intraday (bar) activity

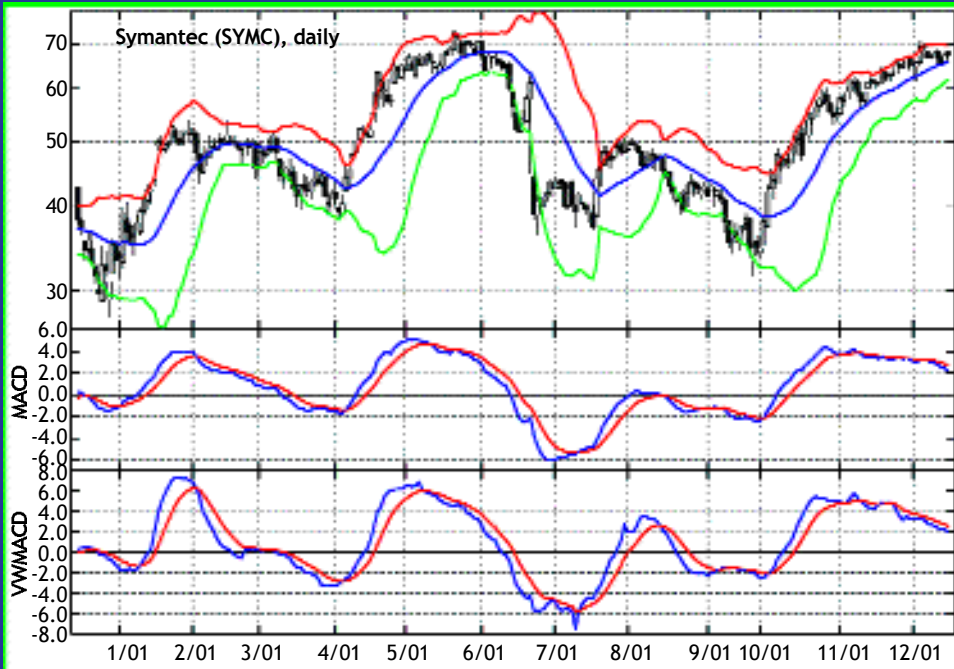
The indicators in the second category make no reference to price change. Instead they parse volume as a function of the day's activity to uncover underlying strength and weakness.

The nomenclature of the volume indicators discussed so far is fairly well agreed upon. Beyond this point, however, there is tremendous disagreement about indicator names.

The term "money flow" has been applied to many concepts and calculations. For example, Marc Chaikin deliberately changed the name of Intraday Intensity to Money Flow to help his research clients absorb tech-

FIGURE 9 VOLUME-WEIGHTED MACD (VW-MACD)

The VW-MACD (lower panel) modifies the standard MACD (middle panel) by using volume-weighted moving averages instead of the standard 12- and 26-day exponential moving averages of price (the VW-MACD's signal line remains a nine-day EMA). Note the greater sensitivity of VW-MACD.



Source:www.EquityTrader.com

nical concepts. Every effort to get the indicator nomenclature correct has been made, but there still may be some unavoidable controversy.

Economist David Bostian created the **Intraday Intensity Index** (see Figure 5, p. xx), which is called Money Flow by Instinet, Accumulation-Distribution by MetaStock and the Daily Volume Indicator by TechniFilter. Bostian's original monograph on the subject appeared in 1967 and can be found in *Encyclopedia of Stock Market Techniques*, published by Investors Intelligence.

Intraday Intensity compares the closing price to the range of the day. Closes near the highs result in positive values for the indicator; closes in the middle of the range in small or zero values; and closes near the lows in negative values.

Bostian based Intraday Intensity on the idea that the need of institutional traders to complete their positions becomes increasingly urgent as the close of trading looms. As they move to fill their needs late in the day their actions cause prices to rise or fall, which is reflected in the relationship of the close to the day's range.

Accumulation-Distribution (AD) was created by Larry Williams in the 1960s and published in his *The Secret of Selecting Stocks for Immediate and Substantial Gains* in 1972. AD is based on the same concept as Japanese candlestick charts. The Japanese have long focused on the relationship of the open and the close within the context of the day's trading range. The open and the close define the body of a candle, while the high and the low define the shadows.

AD mathematically compares the relationship of the open and close to that of the high and the low and multiplies the result by volume (see Figure 6, p. xx). A day where the open is at the low and the close is at the high results in a strong reading; a day where the open and close are relatively close together within a wider daily range creates a flat indication; and a day where the open is at the high and the close is at the low creates a strong negative reading.

Studying the basic concepts of Japanese candlestick charting will greatly help you understand the function of this indicator. (Many people used Intraday Intensity as a substitute for AD

during the years when the opening price wasn't available and AD couldn't be calculated.)

Price change modified by volume

The first two categories of indicators in this survey parsed volume using price. The third category of volume indicators reverses that process and accumulates price change based on volume action.

The **Negative Volume Index (NVI)** and its sibling, the **Positive Volume Index (PVI)**, are indicators based on volume changes. The NVI accumulates price change when volume falls; the PVI accumulates price change when volume rises (see Figure 7, opposite page, top).

The NVI is a contrarian indicator. Price change is accumulated on days when volume falls vs. the prior day, based on the thought that these days reveal the underlying action of the so called "strong hands" vs. the irrational exuberance of the "crowd" on days when volume

rises. The NVI is most often used these days as a tool to analyze the broad market, while some have found the PVI to be a useful trend indicator for individual stocks. (When the negative Volume Index is used for market timing it is often driven by the advance-decline figures instead of volume. This was the original formulation.)

The credit for NVI apparently belongs to Paul Dysart. The PVI — the inverse of the NVI — may have been created by Paul's son Richard. Unfortunately, neither father nor son apparently published outside their advisory service, Trendway, so the correct attribution is hard to determine.

Solo volume

The fourth category of volume indicator considers only volume. No reference is made to the price structure at all; the ebb and flow of volume alone is used to interpret a market. Of the two indicators in this category, one is of my own construction, the previously mentioned %v, and the second is the **Volume Oscillator (VO)**.

The VO is a classic indicator for which

continued on p. x

the proper attribution is unknown. To create a VO, two moving averages of volume (typically 10- and 20-day averages, although other lengths can be used) are calculated, with the longer average subtracted from the shorter average. The VO can be normalized in several ways. You can divide the difference of the moving averages by the longer average, or you can divide the difference by an even longer average, such as a 50- or 100-day.

The VO is derived exclusively from volume; this has the effect of separating cause (volume) from effect (price). Tuning the VO average periods to model the major and minor swings of a particular market can increase the indicator's accuracy. For example, markets that trade in choppy patterns should use shorter moving average lengths than those that trend a great deal of the time.

Volume as an input to existing indicators

The members of the fifth and final cate-

gory of volume indicators are modifications of existing indicators to include volume: in this case, the RSI and the MACD.

The adaptation of Welles Wilder's RSI is called the **Money Flow Index (MFI)**, which was introduced by Gene Quong and Avrum Soudack in March 1989. The RSI is a normalized comparison of the average price action on up days vs. that on down days. MFI incorporates volume by multiplying the price changes by volume (see Figure 8, p. xx). This results in the marriage of a classic price-momentum indicator to the driving force behind the price movement, volume.

A rally in which volume is stronger on the advances than on the pullbacks will produce a stronger MFI pattern than it would an RSI pattern. (MFI places the emphasis on the "typical price" [(high+low+close)/3 or (open+high+low+close)/4] rather than the close. (The use of the typical price is recommended for Bollinger Band calculations, but not all software allows you to do so.)

The idea for the volume-based adaptation of Gerald Appel's MACD was presented in an unpublished CMT paper by Buff Dormeier as a moving-average crossover system and then subsequently applied to MACD. (CMT stands for Chartered Market Technician, the professional designation of the Market Technician's Association's, www.mta.org.) The author showed the inclusion of volume, resulting in the volume-weighted MACD (VW-MACD), improved the performance of the basic MACD system in several dimensions (see Figure 9, p. xx).

It is a fairly simple adaptation: Volume-weighted moving averages were substituted for the first two exponential moving averages Appel used in his original formulation (the signal line remains an exponential average). The VW-MACD's value is its heightened sensitivity, derived from volume confirmation/non-confirmation of the trend.

Presentation of volume indicators

With the exception of MFI and the VW-MACD, all the indicators presented here are open-ended — that is, they are free to rise or fall in an unlimited manner. Some analysts find this presentation disconcerting and prefer to see the indicators in oscillator form — swinging above and below a zero line as do momentum indicators such as rate of change, bounded by 0 and 100 like stochastics, RSI or MFI, or in some other contained form.

All open-ended accumulative indicators can be converted to oscillator form by taking a simple n-day sum of the single-period figures rather than continuously accumulating them; a 10- or 20-day sum can be tried as a starting point. The idea is to pick a time period short enough to maintain sensitivity, but not so short that the signal is lost in the noise. (Our procedure is to start short and lengthen the accumulation period until you get satisfactory signals.)

It is also possible to normalize these oscillators so they offer comparability from market to market. The easiest

Web sites

www.BollingerBands.com

www.EquityTrader.com

www.FundsTrader.com

www.BollingerOnBollingerBands.com

approach is to divide the oscillator value by the sum of the volume from the same period used to calculate the oscillator. Thus, normalized 21-day Intraday Intensity is 21-day Intraday Intensity divided by a 21-day sum of volume.

The choice between the open and closed forms is really a function of time frame. In our work we look for the confirmation/non-confirmation of Bollinger Band tags and tend to focus on the oscillator forms of these indicators for trading signals. However, for longer-term considerations and trend analysis we tend to look at the open forms.

The right tool for the job

The volume indicators we have reviewed are not universally applicable. Some may be superior to others depending on the situation. For example, some stocks work beautifully with Intraday Intensity while others work well with Accumulation-Distribution and make Intraday Intensity seem like a broken clock.

Some factors that may impact volume indicator effectiveness include whether a particular security is listed vs. over-the-counter, company size, market development/efficiency and pricing rules (e.g., minimum tick and decimals versus fractions).

Most technical analysis relies heavily on momentum and trend indicators derived from price, while little emphasis is placed on volume. For most traders this means volume indicators are a rich new source of trading information not strongly correlated to the indicators they already use.

However, volume indicators are no panacea. The successful use of volume indicators entails testing on the instruments that you trade, in the manner that you trade or plan to trade. Luckily, these days it is fairly simple to test which indicators best fit your approach to the market. The addition of the appropriate volume-based indicator(s) will add a new and profitable dimension to your trading process. 📌

To see formulas of the indicators discussed in this article, as well as an extensive bibliography, see the online version at www.activetradermag.com/toc.htm from Feb. 4 to March 3. A preliminary version of this material was presented to the MTA in May 2000. For more information about the author, see p. xx.