**INDICATORS**

## The Quest Continues

# Comparing Seven Money Flow Indicators

*An overabundance of money flow indicators can clutter your desktop and could confuse you with contradicting signals. But do these indicators have any predictive value? If so, which is best?*

**S**ince Joseph Granville presented the first money flow indicator in 1963, other technicians have attempted to improve on Granville's original formula or devise a completely new approach using volume to predict market price moves. On-balance volume (OBV), Chaikin money flow (CMF), accumulation/distribution, volume price trend (VPT), volume oscillator (VO), ease of movement, negative volume index, positive volume index, Klinger oscillator, volume flow indicator (VFI), and the money flow index (MFI) are all indicators that technicians have developed to quantify the relationship between price and volume.

Yes, there are many. Bearing in mind that besides the stock chart and other price-based indicators there is only room on a 19-inch monitor for one or two volume indicators, you will have to choose from more than 15 money flow indicators for your standard layouts. An even more critical decision would be choosing a volume indicator for your trading system, given that two different indicators can produce contradicting signals.

Which ones work the best? To find out, I tested seven popular money flow indicators using two objective mechanical systems and a visual method. But first, here's some background information on these indicators.

*by Markos Katsanos*

LEELA CORMAN

| SYMBOL | STOCK GROUP | MARKET CAP ($bil) | TOTAL DIVERG | TOTAL DIRECTION |
|--------|-------------|-------------------|--------------|-----------------|
| BAC | Banking | 115 | -3,805 | 300 |
| HPQ | Computer | 95 | 12,367 | 27,800 |
| AMZN | Retail | 74 | 14,377 | 70,200 |
| SU | Oil & Gas | 50 | 48,004 | 53,800 |
| F | Auto | 49 | 21,852 | 20,000 |
| DOW | Chemicals | 34.8 | 43,425 | 25,400 |
| RIMM | Telecomm | 29.8 | 1,385 | 126,150 |
| CELG | Biotechnology | 28.5 | 91,238 | 70,700 |
| NSC | Transportation | 22.3 | 7,423 | 30,400 |
| VNO | REIT | 15.9 | 25,785 | 44,650 |
| RHT | Software | 8 | 91,098 | 95,040 |
| DNDN | Biotechnology | 5.3 | **276,266** | 171,450 |
| RMD | Medical Appliances | 4.8 | 19,934 | 32,140 |
| ATML | Semiconductor | 4.1 | 55,409 | 71,097 |
| RDC | Oil & Gas | 3.8 | 28,371 | 19,873 |
| ORI | Insurance | 3.1 | 30,268 | 1,117 |
| DRE | REIT | 3.1 | 10,614 | 22,420 |
| ASBC | Banking | 2.2 | 1,426 | -4,530 |
| ALK | Transportation | 1.9 | -1,214 | 49,153 |
| MMR | Oil & Gas | 1.6 | 139,724 | 169,500 |
| LPX | Materials | 1 | 59,546 | 51,930 |
| BCSI | Software | 1 | 10,358 | **206,076** |
| PRX | Drugs | 1 | 2,408 | 112,610 |
| PNK | Gaming | 0.8 | 32,862 | 25,250 |
| VVUS | Biotechnology | 0.6 | 54,540 | 26,530 |
| DYN | Utilities | 0.6 | 235 | 60,300 |
| SPF | Construction | 0.4 | 17,602 | 82,200 |
| SFN | Staffing | 0.4 | 17,196 | 7,900 |
| SWHC | Defense | 0.2 | 82,758 | 134,150 |
| GAP | Retail | 0.2 | 76,166 | 95,500 |

**FIGURE 1: COMBINED TOTAL PROFITS OF BOTH SYSTEMS ON A STOCK-BY-STOCK BASIS FOR THE DIVERGENCE (FOURTH COLUMN) AND THE DIRECTION TEST (FIFTH COLUMN).** The stocks are sorted by capitalization and colored according to profitability. The best performers were small- and mid-cap stocks and the worst performers were the financials.

**To find out which ones work the best, I tested seven popular money flow indicators.**

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## THE BASICS

Volume or money flow indicators can be divided into five categories:

- Those using volume based on the interday change in price from one day to the next. The best-known indicator in this category is Granville's OBV. Later variations include Markstein's volume price trend (VPT) and the volume flow indicator (VFI), which I introduced in my June 2004 STOCKS & COMMODITIES article (see "Suggested reading" at the end of this article).

- Those focusing on the change in prices on an intraday basis (such as the CMF and the intraday intensity).

- Those showing the periodic volume change without reference to price (such as the volume oscillator [VO]).

- Those using volume to improve on existing indicators (such as the volume-weighted moving average convergence/divergence [MACD] or the volume-weighted moving average).

- Those using both inter- and intraday price changes. The only indicator in this category is the finite volume elements (FVE). Details about this indicator can be found in my April and September 2003 articles.

## TRADING SYSTEMS AND COMPARISON

In evaluating the performance of these indicators, I used a sample of 30 popular stocks consisting of 10 large-, 10 medium-, and 10 small-capitalization stocks from different sectors of the economy (see Figure 1). I then designed two trading systems, the first one for evaluating the predictive value of the money flow divergence between the indicator and price and the other for evaluating direction and indicator level signal accuracy. The test results produced useful statistics at least for



*"I was hoping for a permanent government shutdown that included schools."*

incorporating money flow indicators in trading systems. Most people, however, use money flow indicators to help them in everyday decision-making concerning their open positions or to confirm signals picked by other price-based indicators, so I decided to evaluate the indicator readings by adding another visual comparison test simulating these circumstances.

## TESTING METHOD

Portfolio test simulations were carried out using MultiCharts' Portfolio Backtester and the 30-stock sample portfolio depicted in Figure 1. All tests started with initial equity of $100,000, and $10,000 was allocated per trade. No buying on margin was used for either system. The commission charged was $9 and dividends and interest were ignored. I chose a 10-year duration span from October 31, 2000, to October 31, 2010, which included two bear and two bull markets (including the current one).

The buy & hold profit was calculated by buying equal dollar amounts of all stocks in the sample ($100,000/30) on the test start date (October 31, 2000) and selling them on the last day of the test.

The indicator period used was one month (21 trading days) except for the OBV, VPT, and VFI. In the first two cases, the period was irrelevant as they started calculating volume totals from the first day of the loaded data. In the case of the VFI, the default six-month period (130 days) was used as this was designed as a long-term indicator. Each position was held for two months (42 trading days) at the latest unless an earlier exit, based on bearish indicator readings, was specified by the system.
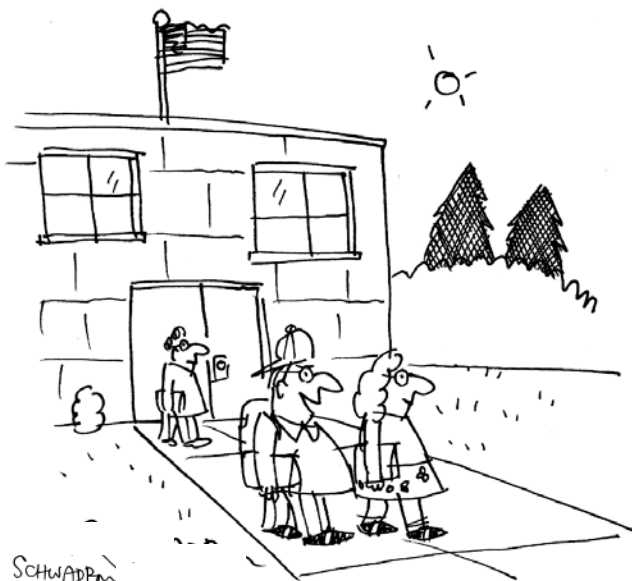
## DIVERGENCE TEST

My objective in designing the following simple divergence test was to show the indicators' general usefulness, not to construct a state-of-the-art system. So I tried to keep it simple and did not optimize any parameters.

The problem with mechanical systems is that divergence, which is obvious from eyeballing a chart, must be calculated mathematically. In this case, I decided to use the linear regression slope method to compare the divergence between the indicator and stock price. A buy signal was triggered if the linear regression slope of price was negative, while the 40-day slope of the indicator was positive.

To improve profitability and filter out trades during heavy selling, long trades were taken only if the indicator value was above the bullish threshold (which indicates accumulation). This wasn't applied to the OBV and VPT or the oscillators (VO and MFI), as the indicator level is irrelevant. But as I have pointed out elsewhere, divergence signals by themselves can produce large drawdowns because the stock can decline considerably further before starting to respond. To improve the timeliness of the divergence signals I added a third condition, which required a 15-day stochastic to cross above its six-day moving average to trigger a trade.

The VO was an exception, since it does not use any price criteria to classify positive or negative volume. So when

**MONEY FLOW DIVERGENCE TEST RESULTS**

| System | Buy & hold | FVE | VFI | CMF | MFI | OBV | VPT | Vol Osc |
|---|---|---|---|---|---|---|---|---|
| Account size | $100,000 | $100,000 | $100,000 | $100,000 | $100,000 | $100,000 | $100,000 | $100,000 |
| Net profit | $86,148 | $161,667 | $106,713 | $146,701 | $230,530 | $79,954 | $238,322 | $302,896 |
| Compounded ann. return | 6.4% | 10.1% | 7.5% | 9.5% | 12.7% | 6.1% | 13.0% | 15.0% |
| Total number of trades | 30 | 355 | 195 | 396 | 509 | 362 | 393 | 767 |
| Percent profitable | 53.3% | 56.6% | 57.4% | 56.6% | 53.4% | 53.0% | 55.2% | 50.6% |
| Avg. win/Avg. loss | 4.62 | 1.34 | 1.45 | 1.21 | 1.41 | 1.15 | 1.47 | 1.62 |
| Profit factor | 5.28 | 1.75 | 1.96 | 1.58 | 1.61 | 1.30 | 1.82 | 1.65 |
| Max intraday drawdown | -$164,150 | -$50,722 | -$50,167 | -$73,970 | -$109,907 | -$98,850 | -$93,805 | -$145,590 |
| Profit/drawdown | 0.52 | 3.19 | 2.13 | 1.98 | 2.10 | 0.81 | 2.54 | 2.08 |
| Max close drawdown | $0 | -$40,220 | -$41,156 | -$59,736 | -$63,529 | -$83,440 | -$67,904 | -$85,447 |

**FIGURE 2: TEST RESULTS OF THE MONEY FLOW DIVERGENCE SYSTEM FOR THE 10-YEAR PERIOD FROM OCTOBER 31, 2000, TO OCTOBER 31, 2010.** All tests were profitable and outperformed the buy & hold method by a wide margin. The VFI, VPT, and FVE were the best performers and the OBV the worst.

interpreting signals it is important to compare the direction and level of the oscillator to the prevailing price trend. Price breakdown accompanied with volume expansion is negative, so one interpretation is that both slopes should be negative (stock price falling on declining volume). The exception is a volume blowoff at the final bottom. This is a rare case, and moreover, the final bottom can only be established in retrospect, so I used the former (both slopes negative) in detecting positive divergence.

All positions were liquidated if the divergence turned negative (positive price slope with negative indicator slope) or after the specified two-month maximum holding period. Again, because of the lag between divergence signals and stock price and in order to eliminate premature exits, I added a second condition, requiring the indicator to cross below its 50-day moving average in order to trigger the exit.

Due to space considerations, we have only included the EasyLanguage code for the MFI tests in the sidebar, "Easy-Language Code For MFI Systems." The full code for all other money flow indicators can be found in the Subscriber's Area at www.traders.com.

### EVALUATING THE RESULTS

The main disadvantage of divergence systems is the high drawdowns, as divergences can exist for long periods and signals are seldom at the exact bottom or top. This was the case with the current system, but it still produced good overall results and some spectacular trades.

All tests (Figure 2) outperformed the buy & hold method considerably and with less risk. In fact, the buy & hold investor who bought an equal amount of all 30 stocks in the test would have suffered a traumatic drawdown of -$164,000 before recovering at the end. The same investor who decided to invest his entire account in a Standard & Poor's index fund or the SPY exchange traded fund (ETF) would have performed even worse, with his account under water until the end.

A number of results from this analysis are worth noting. The VO, VPT, and MFI outperformed on a net-profit basis, producing annualized returns of 15%, 13%, and 12.7%, respectively.

We do have to consider risk. The volume oscillator, although it generated the highest net profit, also had the highest drawdown, which in confluence with the low probability of winning (50.6%) makes it only suitable for Las Vegas traders. The FVE, on the other hand, outshined in that respect, producing the highest risk-adjusted return and smoother performance.

The real surprise was the VPT, which dramatically outperformed the OBV, returning more than twice the annual return with less risk. In fact, the OBV was the worst performer on all metrics.

The VFI had the highest profit factor and lowest drawdown, less than a third of the underlying investment's worst drawdown. The relatively low number of trades, however, resulted in the low net profit and annualized return. This can be blamed partly on the relatively short holding period, as the VFI was

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## EASYLANGUAGE CODE FOR MFI SYSTEMS

Shown here is the EasyLanguage code for the systems based on the MFI. The systems based on the other money-flow indicators discussed were similar and used only money-flow criteria except for the volume oscillator, which was used to confirm a price-based indicator. The full code for the other money-flow indicators can be found in the Subscriber's Area of our website at **www.traders.com**.

If you wish to replicate the tests, keep in mind that for the test to begin producing signals, the indicators and linear regression should first be calculated, and this requires a minimum of 81 bars to be loaded.

```
MFI DIRECTION TEST
INPUT:MFPERIOD(21),MABUY(50),MASELL(30),MFBUY(50),
    MFSELL(60),
XTIME(42),PREV(7),SDCR(1);
vars: TP(0),POSMF(0),NEGMF(0),UpSum(0),DnSum(0),MFI(0);

//MFI CALCULATION
IF BARNUMBER>MFPERIOD THEN BEGIN
TP = (H+L+C)/3;
PosMF=IFF(TP > TP[1],TP *V,0);
UpSum=Summation(PosMF,MFPERIOD);
DnSum=Summation(NegMF,MFPERIOD);
MFI=UPSUM*100/SUMMATION(TP*V,MFPERIOD);END;

//BUY
IF MFI CROSSES OVER AVERAGE(MFI,MABUY) AND
    MFI>MFBUY
AND MFI-MFI[PREV]> SDCR*StandardDev(MFI,30,1)
THEN BUY("MFI") NEXT BAR AT CLOSE+.05*C/100 STOP;

//EXIT
IF MFI CROSSES UNDER AVERAGE(MFI,MASELL) AND
    MFI<MFSELL
THEN SELL("SELLMACROSS") NEXT BAR AT MARKET;

IF marketposition=1 and barssinceentry>Xtime THEN
SELL("XTIME")ALL SHARES NEXT BAR AT MARKET;

MFI DIVERGENCE TEST
INPUT:MFPERIOD(21),LRSBARS(40), STOCHBARS(10),STAV
    GBARS(6),MASELL(50),
XTIME(42);
vars: TP(0),POSMF(0),NEGMF(0),UpSum(0),DnSum(0),MFI(0),
```

```
STOCH(0),STOCHAVG(0);

//MFI CALCULATION
TP = (H+L+C)/3;
PosMF=IFF(TP > TP[1],TP *V,0);
UpSum=Summation(PosMF,MFPERIOD);
DnSum=Summation(NegMF,MFPERIOD);
MFI=UPSUM*100/SUMMATION(TP*V,MFPERIOD);
//STOCHASTIC
IF BARNUMBER>STOCHBARS THEN BEGIN
IF  AVERAGE(HIGHEST(H,STOCHBARS)-
    lowest(L,STOCHBARS),3) >0 THEN
STOCH=(average(C-lowest(L,STOCHBARS),3)*100)/
    (AVERAGE(HIGHEST(H,STOCHBARS)-
    lowest(L,STOCHBARS),3))
ELSE STOCH=100;
STOCHAVG=Average(STOCH,STAVGBARS);
END;

//BUY
IF BARNUMBER>MFPERIOD+LRSBARS THEN BEGIN
IF  LinearRegSlope(C,LRSBARS)<0  AND
    LinearRegSlope(MFI,LRSBARS)>0 AND
STOCH CROSSES OVER STOCHAVG
then BUY("BUY DIV") next BAR AT market;
//SELL
IF  LinearRegSlope(C,LRSBARS)>0  AND
    LinearRegSlope(MFI,LRSBARS)<0
and MFI CROSSES UNDER AVERAGE(MFI,MASELL)
THEN SELL("NEG DIV") NEXT BAR AT MARKET;END;
//time exit
IF marketposition=1 and barssinceentry>Xtime THEN
SELL("XTIME")ALL SHARES NEXT BAR AT MARKET;
```

designed as a long-term indicator. In fact, by increasing the divergence lookback period to 60 days and the holding period to six months, net profit increased 77% to $190,000, while drawdown increased only 16% to only -$58,000. In addition, the accuracy of trades increased to 62%. The CMF, which was the only representative of the intraday money flow school, did not perform well on this test.

All systems suffered the maximum drawdown during the last phase of the 2008–09 bear market, as positive divergence signals were usually overruled by the general market sentiment and ended up losing money.

As you can see in Figure 1, the 14 best-performing stocks (except Celgene [CELG] and Dow Chemical [DOW]) had a

market capitalization below $8 billion. In addition, Bank of America [BAC], which had the highest capitalization of the group, was the worst performer.

Besides capitalization, response to divergence signals varied according to stock groups. In fact, only three biotech stocks produced almost a third of the total profits. The next-best performers were software, semiconductor, and oil & gas stocks.

**All systems suffered the maximum drawdown during the last phase of the 2008–09 bear market.**
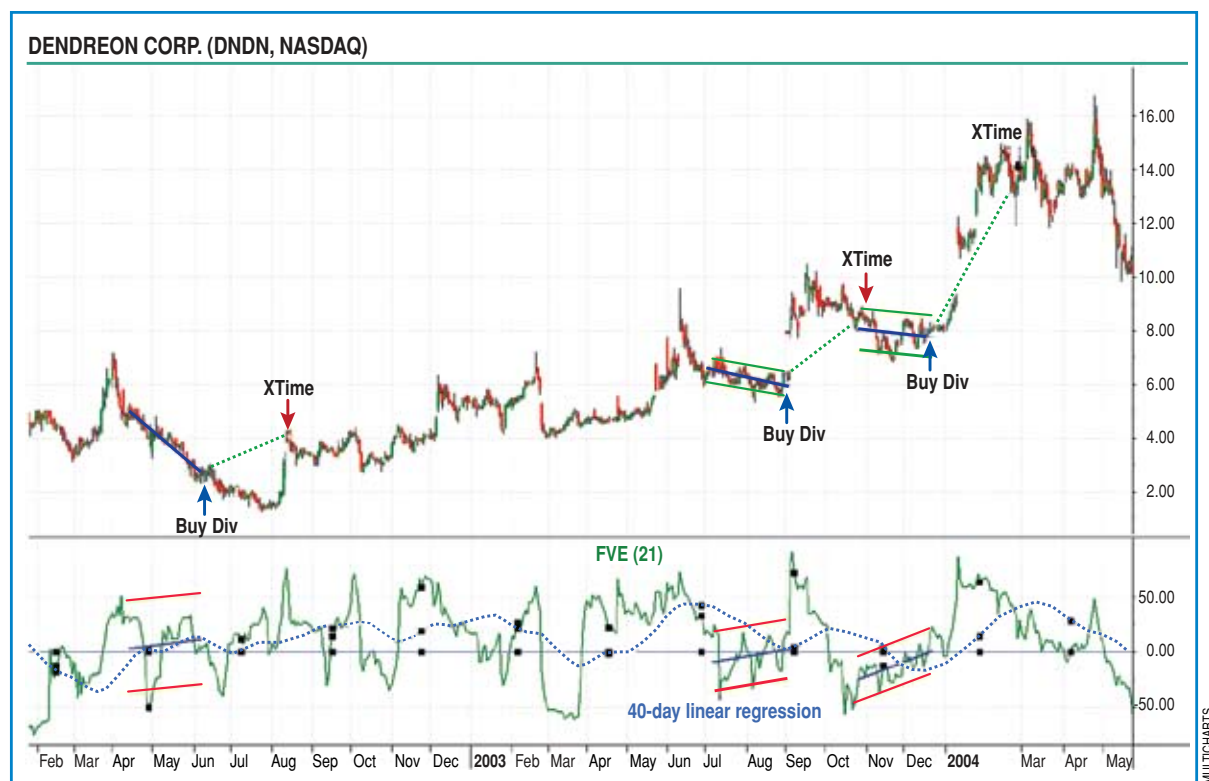
**FIGURE 3: AND THE WINNER IS...** Dendreon Corp. (DNDN). Note the divergence between the FVE (bottom window) and price during the 40-day period preceding each buy signal.

The worst-performing group was financial stocks and banks.

In Figure 3 you see some divergence signals triggered by the FVE test superimposed on the chart of Dendreon Corp. (DNDN), which was the best-performing stock producing double the profits of the second best.

As Granville pointed out, the key to the effective use of a money flow indicator is the presence of informed smart money competing with the uninformed general public for trading profits. If this phenomenon does exist, being able to discern the side of the market that the informed investor is on and trading in a likewise direction is crucial.

Volume action in the large-cap or major index component stocks, however, tends to be distorted due to program trading, portfolio adjusting, tax selling, index trading, and so on. This confuses volume-based indicators. Although the sample was too small for a statistically significant conclusion, the fact that biotech stocks outperformed all other groups is not a coincidence. This is because information about the progress of a company's research on a new drug is well known in advance by insiders or their relatives or even statisticians who compiled the application to the FDA. Insider transactions can therefore be easily detected by money flow analysis, as most biotech stocks are usually very thinly traded.

In other industries, analyst recommendations entice insider trading. The information of an analyst's intention to upgrade or downgrade a stock might be leaked to prospective retail customers hoping for future business from the investor (through investment banking or trading). This increase in activity would

be detected by money flow indicators, especially in the case of small-cap and low-freefloat stocks because the stock would be either closing above the midpoint of the day or the volume would be heavier on up days. However, it would be difficult to detect a few thousand shares of extra activity in large-cap and large-float stocks. It is likely that Bank of America (BAC) stock was the worst performer not because there was no insider trading, but because none of the money flow indicators were successful in detecting it.

## DIRECTION ACCURACY TEST

In addition to being divergence signals, an indicator can offer other useful information. These are what I tried to evaluate with the following simple system:

### Testing method

A buy signal was triggered if the 21-day MF indicator crossed above its moving average while the indicator level was above the bullish threshold (indicating accumulation). This was optimized for each individual indicator.

In order to deal with the common problem of whipsaws around the moving average, I added a second condition to filter out marginal crossovers. In the case of the OBV and VPT, where no such indicator reference point exists and for the sake of consistency, I used the relative position from a long-term moving average. All trades were liquidated if the indicator crossed below its moving average or after the specified two-month maximum holding period.

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| PROFIT-LOSS REPORT FROM DIRECTION TEST | | | | | | | |
|---|---|---|---|---|---|---|---|
| System | FVE | VFI | CMF | MFI | OBV | VPT | Vol osc. |
| Account size | $100,000 | $100,000 | $100,000 | $100,000 | $100,000 | $100,000 | $100,000 |
| Net profit | $185,157 | $277,000 | $246,180 | $214,298 | $274,530 | $334,920 | $370,000 |
| Compounded ann. return | 11.0% | 14.2% | 13.2% | 12.1% | 14.1% | 15.8% | 16.7% |
| Total no. of trades | 372 | 390 | 421 | 616 | 1151 | 855 | 688 |
| Percent profitable | 57.8% | 58.2% | 58.4% | 46.8% | 40.5% | 43.3% | 51.5% |
| Avg. win/Avg. loss | 1.57 | 1.96 | 1.56 | 2.27 | 2.48 | 2.30 | 1.87 |
| Profit factor | 2.15 | 2.73 | 2.19 | 1.99 | 1.69 | 1.75 | 1.98 |
| Max intraday drawdown | -$23,965 | -$30,520 | -$48,341 | -$21,586 | -$55,610 | -$64,540 | -$59,351 |
| Profit/drawdown | 7.7 | 9.1 | 5.1 | 9.9 | 4.9 | 5.2 | 6.2 |
| Max close drawdown | -$17,290 | -$16,950 | -$41,630 | -$13,286 | -$46,370 | -$47,770 | -$55,320 |
| PARAMETERS | | | | | | | |
| MF Period | 21 | 130 | 21 | 21 | | | 5/21 |
| MA (Buy signal) | 60 | 40 | 50 | 50 | 5 | 5 | 50 |
| MA (Sell signal) | 60 | 30 | 40 | 30 | 30 | 60 | 10 |
| MF Level (Bullish) | 10 | 0 | 5 | 50 | 70 | 50 | 25 |
| MF Level (Bearish) | 0 | 0 | -5 | 60 | | | 25 |
| Std. dev. | 0.5 | 0 | 1 | 1 | 0.5 | 0.5 | |

**FIGURE 4: TEST RESULTS OF THE MONEY FLOW DIRECTION SYSTEM FOR THE 10-YEAR PERIOD FROM OCTOBER 31, 2000, TO OCTOBER 31, 2010.** The trading amount was $10,000 per stock and the account size $100,000. The buy & hold results are shown in Figure 2. All tests were profitable and outperformed the buy & hold method by a wide margin. The MFI and VFI were the best performers and the OBV the worst.

For the reasons mentioned in the previous test, I modified the volume oscillator system. I applied the moving average on price and used the volume oscillator only for confirmation. This is because I wanted to trigger a buy signal only when price crossed its optimized moving average on heavy volume (high indicator readings).

The money flow indicators on the test used different computation methods and philosophy, and as a result, indicator readings and speed varied accordingly. For a fair comparison, I decided to optimize all parameters except the indicator period and holding time, both of which were kept constant at 21 and 42 trading days, respectively.



*"Alex, are we rich enough to deserve a tax break?"*

### Evaluation of results

The results of applying the various indicators are displayed in Figure 4. As you can see, they are stunning. All tests were profitable and outperformed the buy & hold method and divergence test (seen in Figure 2) and with less risk.

Admittedly, this testing environment is an uneven match and it is questionable whether the same performance can be reproduced, as it required optimization of the moving average period and critical indicator levels, which was not the case with the divergence test parameters. The condition setup was also different. The current system uses volume information to gauge the health of existing trends, whereas the divergence test generated trades while the stocks were still in a downtrend.

None of the systems made any money during the 2000–02 and 2008–09 bear markets, but some of them, such as the FVE, VFI, and MFI, managed to get through with minimal losses. The MFI suffered the lowest drawdown and had the highest risk-adjusted return.

Two indicators stood out: the MFI based on an outstanding (nearly 10:1) risk/reward ratio but a lower annualized return and profit factor, and the VFI with the highest profit factor and reliability of trades. The VO, although the most profitable on a net profit basis, again produced the highest close drawdown (-$55,000), which made it unsuitable for risk-averse traders. Nevertheless, the fact that such a simple indicator would generate the most profits in both tests is indeed worth noticing and underscores the importance of the role of volume in supporting price trends.

The OBV was the worst performer again with the lowest reward/risk and profit factor. This time, however, it performed

better than in the divergence test, producing a respectable 14% annualized return. On the other hand, the VPT did not perform as well, barely managing to outperform the OBV.

That the OBV underperformed its descendants doesn't in any way discredit or diminish the importance of Granville's work. After all, the OBV *was* the first technical study to use volume to predict price movement at a time before computers or even electronic calculators were available for stock analysis. The CMF, the only pure intraday indicator used, performed better in this test, but the relatively high drawdown and low profit/reward ratio pushed it down to fifth place.

The CMF formula allows for intraday price movement rather than just close-to-close price differentials. While Marc Chaikin's premise seems logical, it misses out on important information on price gaps from yesterday's close to today's open. By looking at the CMF buy and sell signals and examining some of the worst losers, a common pattern emerged. In most cases, the CMF was moving in opposite directions from interday indicators like the VFI and MFI. Some false signals were preceded by price gaps and others by brief market rallies in downtrends. In these cases, the FVE, which was the only hybrid indicator in the group (taking into account both inter- and intraday differentials), sometimes resembled the CMF and at other times the MFI, but managed to avoid most of CMF's losing trades. You can find examples of contradicting signals between the OBV and CMF in my S&C April 2003 piece and also in Andrew Tomlinson's article in the October 2004 issue of S&C.

As you can see in Figure 1 — it's déjà vu — small- and medium-cap stocks were the best performers. In fact, the 10 best-performing stocks (except RIMM) had a market capitalization below $8 billion. The stock and industry group selection also played an important role. The best-performing industry groups did differ from the previous tests. Software stocks (BCSI, RHT) displaced biotechs to second place, with oil & gas stocks (MMR, SU) a close third. In fourth place were retail stocks (GAP, AMZN).

The best-performing stock was Blue Coat Systems (BCSI), which is in the Internet software business. The worst-performing stocks were the financials (BAC, ASBC, ORI). Associated Banc-corp (ASBC) was, in fact, the only loser.

### VISUAL COMPARISON

Evaluating your open positions from a visual perspective may be, however, more important than a money flow trading system. This can only be achieved by choosing the best indicator that would warn you of an imminent price plunge or prevent you from selling at the bottom. This time, I used a different sample and, in order to evaluate each indicator's predictive qualities concerning the overall market direction, I included three popular stock index ETFs. Then I examined indicator readings and divergence one day before historical tops and bottoms during the last 10 years:

the March 2000 NASDAQ top, the October 2002 bear market bottom, the October 2007 bull market top, and the March 2009 bear market bottom. I decided to use ETF surrogates and not the actual indexes because of the confusion concerning an index's volume.

Although some data providers include volume data for indexes, it is not the actual total volume of the constituent stocks. It is the overall market or exchange volume and could be misleading, as it includes volume of preferred and other interest-sensitive stocks.

The stock selection was not random, but I tried to include stocks that suffered an excessive price drop or a breakout because of an event like a positive or negative earnings surprise, analysts upgrade or downgrade, takeover announcement, or a drug rejection by the FDA. Then I evaluated each indicator's predictive quality and ability to detect insider activity by grading direction and divergence one day before the event using a point system. I awarded one point for negative divergence at tops, one point for positive divergence at bottoms, and one point for the correct indicator direction.

To identify a divergence I used the classic method — that is, when the indicator refused to mirror the respective new highs or lows of price action. I awarded one point to direction signals if the indicator was below its 40-day moving average before price reversed direction downward and one point if the

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| Symbol | Industry group | Date | Direction after | % change | Event | MF indicator predictive quality | | | | | |
|--------|----------------|------|-----------------|----------|-------|-----|-----|-----|-----|-----|-----|
| | | | | | | FVE | VFI | CMF | MFI | VPT | OBV |
| QQQQ | Index ETF | 3/27/00 | Down | -25.2% | Nasdaq top | 1 | 1 | 2 | 1 | 0 | 0 |
| QQQQ | Index ETF | 10/09/02 | Up | 39.6% | Bear market bottom | 0 | 1 | 0 | 0 | 1 | 0 |
| QQQQ | Index ETF | 10/31/07 | Down | -24.6% | Bull market top | 2 | 2 | 0 | 2 | 1 | 0 |
| QQQQ | Index ETF | 3/09/09 | Up | 43.6% | Bear market bottom | 0 | 1 | 0 | 0 | 1 | 0 |
| SPY | Index ETF | 3/24/00 | Down | -27.6% | Bull market top | 1 | 0 | 0 | 0 | 0 | 1 |
| DIA | Index ETF | 3/09/09 | Up | 44.5% | Bear market bottom | 0 | 1 | 0 | 0 | 0 | 0 |
| VGK | Index ETF | 11/04/10 | Down | -11.8% | European debt crisis | 2 | 0 | 1 | 2 | 0 | 0 |
| DNDN | Biotech | 4/02/09 | Up | 291% | New drug news | 1 | 1 | 1 | 2 | 2 | 0 |
| ITMN | Biotech | 5/04/10 | Down | -75.0% | FDA drug rejection | 2 | 2 | 2 | 2 | 1 | 2 |
| AMLN | Biotech | 10/19/10 | Down | -46.2% | FDA drug rejection | 2 | 2 | 2 | 2 | 0 | 0 |
| CADX | Biotech | 11/02/10 | Down | -13.0% | Analyst downgrade | 1 | 2 | 1 | 2 | 0 | 1 |
| ADSK | Software | 2/24/10 | Up | 35.3% | Analyst Upgrade | 1 | 0 | 0 | 1 | 1 | 2 |
| PUDA | Mining | 10/08/10 | Up | 81.3% | Analyst Upgrade | 2 | 1 | 2 | 2 | 2 | 2 |
| BDC | Electrical Equip. | 3/26/10 | Up | 20.3% | Analyst Upgrade | 2 | 1 | 2 | 2 | 1 | 1 |
| F | Auto | 4/27/10 | Down | -20.4% | Analyst Downgrade | 2 | 1 | 2 | 2 | 1 | 1 |
| PDLI | Biotech | 3/26/09 | Up | 11.5% | Analyst Upgrade | 2 | 2 | 2 | 2 | 1 | 1 |
| CRXL | Biotech | 9/16/10 | Up | 55.9% | Takeover | 1 | 1 | 0 | 1 | 1 | 2 |
| KG | Pharmaceuticals | 10/11/10 | Up | 39.7% | Takeover | 1 | 1 | 1 | 0 | 1 | 1 |
| ADCT | Communication | 7/08/10 | Up | 49.9% | Takeover | 2 | 0 | 0 | 1 | 2 | 2 |
| ACTL | Semiconductor | 10/01/10 | Up | 30.8% | Takeover | 1 | 1 | 0 | 1 | 2 | 2 |
| STX | Data Storage | 10/14/10 | Up | 22.2% | Takeover | 2 | 1 | 2 | 2 | 1 | 1 |
| ISLN | Data Storage | 9/30/10 | Up | 28.5% | Takeover | 0 | 0 | 0 | 0 | 1 | 2 |
| GYMB | Retail | 9/30/10 | Up | 56.1% | Takeover | 1 | 0 | 1 | 2 | 1 | 0 |
| NC | Farm Machinery | 11/03/10 | Up | 10.8% | Earnings surprise | 2 | 0 | 2 | 1 | 1 | 1 |
| AGM | Financial | 11/09/10 | Up | 16.3% | Earnings surprise | 0 | 0 | 0 | 1 | 1 | 0 |
| SCR | Pharmaceuticals | 11/10/10 | Up | 21.9% | Earnings surprise | 0 | 2 | 0 | 0 | 0 | 0 |
| VRX | Pharmaceuticals | 11/03/10 | Down | -12.9% | Earnings surprise | 1 | 1 | 0 | 1 | 1 | 1 |
| ACTU | Software | 5/03/10 | Down | -18.9% | Earnings surprise | 0 | 2 | 0 | 0 | 0 | 0 |
| DGIT | Services | 8/04/10 | Down | -60.5% | Earnings surprise | 0 | 1 | 0 | 0 | 2 | 1 |
| CSCO | Communications | 11/10/10 | Down | -16.2% | Earnings surprise | 1 | 1 | 0 | 1 | 0 | 0 |
| **TOTAL SCORE** | | | | | | 33 | 29 | 23 | 33 | 26 | 24 |

**FIGURE 5: PERFORMANCE SCORE BASED ON PREDICTIVE DIVERGENCE AND DIRECTION OF MONEY FLOW INDICATORS ONE DAY BEFORE A DRAMATIC PRICE-MOVING EVENT WAS ANNOUNCED.** In the third column is the date that the performance was evaluated (usually one day before the event was announced or, in the case of index ETFs, the date of the final market bottom or top). In the fifth column is the percent change until the first short-term (but not the final) bottom or top which, in the case of takeovers or FDA announcements, was usually the next day.

indicator was above its 40-day moving average at the bottom and before the breakout. For events like analyst upgrades, when news usually leaks only a few days before the announcement, long-term divergence signals were irrelevant so I looked at only the nearest minor tops or bottoms. I decided to exclude the VO from this study since it involved complex subjective interpretation of volume together with price trend.

## EVALUATION

As you can see from Figure 5, no indicator was infallible. The MFI and FVE produced the most accurate signals, predicting the outcome in more than half of the cases. The CMF and the OBV were again the worst performers. As with everything else concerning stock predictions, nothing is black & white. Taking a closer look at the scores in context of the nature of an associated event and the relevant chart revealed more valuable information about the predictive quality, strong points, and weaknesses of each indicator, which can be summarized thus:

■ None of the indicators excelled in detecting ETF and market turning points accurately. The VFI was the best performer in this category, diverging from price in five out of six cases, but failing to cross its moving average as required by the second rule (see chart of DIA in Figure 6).

- All indicators except the OBV accurately detected insider activity concerning drug development news of biotech stocks (see chart of AMLN in Figure 7).

- Analyst upgrades or downgrades were also easy to detect. In these cases, faster indicators like the FVE, MFI, and CMF performed better as divergence developed over a shorter period of time.

- In the case of takeovers or leveraged buyouts, divergences took a relatively longer time to develop and were not as obvious as with other events. This may be because of strict SEC rules concerning corporate insider activity related to potential takeover offers. Therefore, slower indicators like the VPT and OBV were the most accurate in predicting these events.

- Earnings surprises were the most difficult to detect. This may be because of heavy volume before the official earnings release or because the surprise had already been discounted by the market.

- The performance of the faster indicators like the FVE, MFI, and CMF was very similar at specific events suggesting a higher correlation, especially between the FVE and MFI.

In addition to specific event preferences, certain indicators appeared to be better at detecting tops or bottoms. The OBV and VPT had a distinct upside bias perhaps because of the tendency for volume to
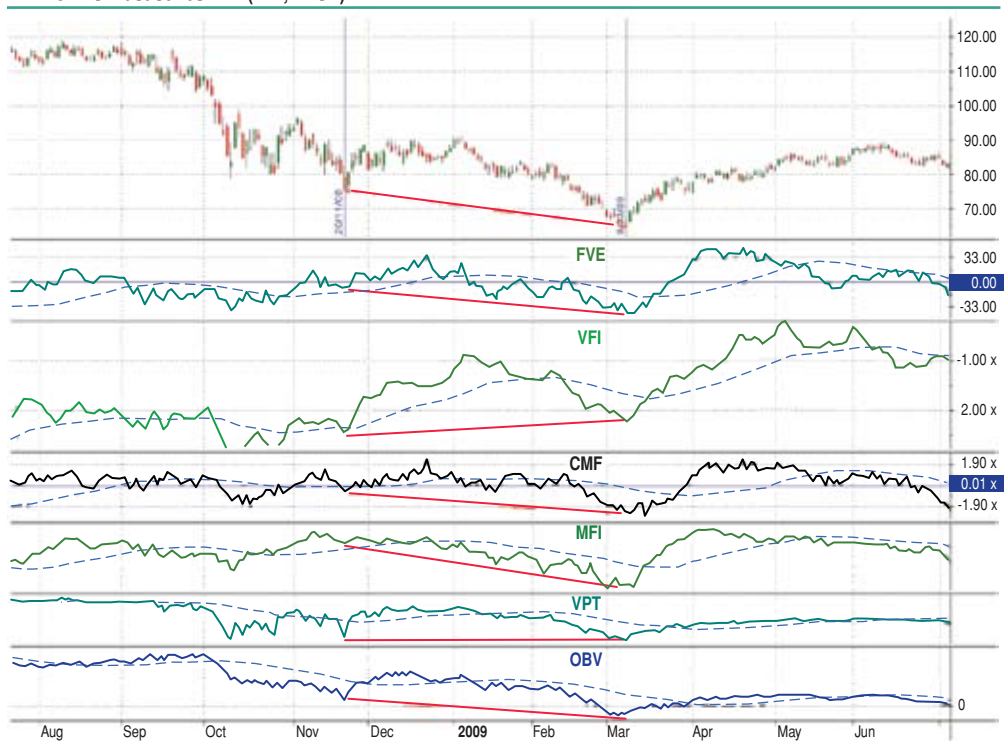


**FIGURE 6: CHART OF THE DIA ETF (SURROGATE OF THE DOW JONES INDUSTRIALS) FROM AUGUST 2008 TO JUNE 2009.** Only the VFI (third window from the top) correctly predicted the current bull market at the final bottom on March 9, 2009, diverging from price and making a higher bottom. The VPT was the second-best performer, refusing to make a lower bottom. All indicators were below their 40-day moving averages at the bottom, but the MFI was the first to cross its moving average five days later, followed by the VFI the next day.
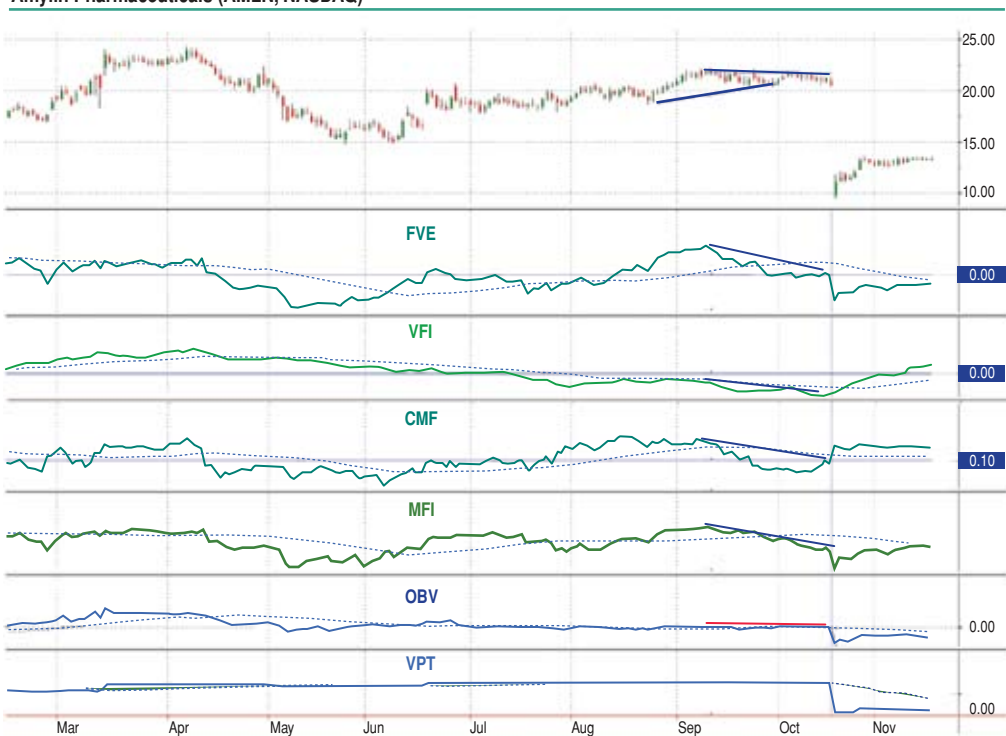


**FIGURE 7: CHART OF AMYLIN PHARMACEUTICALS (AMLN) FROM APRIL TO DECEMBER 2010.** All indicators except the OBV and the VPT correctly predicted the devastating 46% decline in the stock price when the FDA, on October 19, 2010, declined to approve the company's promising diabetes drug. Money flow indicators detected the heavy selling correctly and turned sharply lower even though the stock price had been going up or sideways more than a month before the announcement.

**INDICATORS**

expand on rising days and contract on declining days. As a consequence, the indicators provided little, if any, warning of trouble at market tops.

Signals, however, tended to be more reliable and abundant at market bottoms. For example, the VPT had a score of 20 in detecting bottoms (positive divergence) and only six in detecting tops (negative divergence). Similarly, the FVE, MFI, and CMF had a slight bias in detecting positive divergence at bottoms. The score, however, was not so prejudiced on the positive side, with a score of 18 positive to 14 negative for the FVE and MFI and 13 to eight for the CMF. The VFI, on the other hand, had a slight negative bias and was the best in detecting tops (negative divergence).

### SO WHICH IS THE BEST?

The results in my search turned out to be somewhat disappointing, as no clear winner emerged. The search wasn't in vain, however, because I did discover a number of important findings, and the footprints uncovered by this quest provided invaluable information, revealing the weaknesses and idiosyncrasies of each indicator.

The findings of this study suggest that relying on a single indicator is not the best approach because it will inevitably fail. On the other hand, to use several money flow indications is essentially redundant, since some of them tend to be highly correlated. Nevertheless, the preponderance of evidence narrowed my choice to the MFI, FVE, and VFI, which consistently outperformed in all tests. A bottom-up approach also exposed two indicators that consistently underperformed: CMF and OBV. The OBV was a huge disappointment, as valid signals occurred infrequently, especially at market tops, with the indicator providing little if any warning of impending market downturns.

An effective combination of indicators is more likely to give a clear picture of the strength or weakness of any particular market move. An effective layout should include a fast indicator like the FVE or MFI, the VFI for uncorrelated and more reliable longer-term divergence analysis, and the VO

for trend confirmation. It is also important to choose a time span consistent with your trading style and speed, as different indicator periods will give different results.

If you decide to use the trading systems presented in this article, you should keep in mind that while a money flow system can be a standalone method for trading, it can also be combined with a classic price-based technical system. The money flow indicator adds value by filtering out trades and improving, sometimes dramatically, the profitability of your system.

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### SUGGESTED READING

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‡MultiCharts

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