



One Step Ahead

Leader Of The MACD

If the moving average convergence/divergence (MACD) is essential to your analysis, then an indicator that often leads it at critical situations will be of great interest to you.

by Giorgos E. Siligardos, PhD

The moving average convergence/divergence (MACD) is one of the best-known trend momentum indicators. Introduced by Gerald Appel in the 1960s, it later became widely used with the popularization of personal computers as both an analysis tool and an essential component of trading systems. Its popularity, however, may be why it has lost much of its prestige in the current era. Although MACD has been criticized as a trend indicator that produces many whipsaws and is inappropriate for simple trading decisions, it is nevertheless heavily used as a trend-analysis tool and is offered in most technical analysis reports and newsletters. This article is for those who actively use the MACD and would like to know how to get warning signals of possible changes in its direction.

A SHORT OVERVIEW OF MACD

The MACD is computed by subtracting a 26-period exponential moving average (EMA) of the closing price from a 12-period EMA of the closing price:

$$\text{MACD} = \text{EMA}(12) - \text{EMA}(26)$$

The main purpose of MACD is to provide a smooth trend indicator, and many analysts use its sign to characterize the long-term trend as bullish or bearish: When MACD is positive, the long-term trend is considered bullish, and when MACD is negative, the long-term trend is considered bearish. For the characterization of the short-term trend, a nine-period EMA of MACD is usually used as a signal line: When MACD is greater than its signal line, the short-term trend is considered bullish, and when MACD is lower than its signal line, the short-term trend is considered bearish.

The divergences between MACD and the price are often used by technical analysts as an early warning of a trend reversal. Successively higher highs of the price during a bullish trend, accompanied by successively lower highs of MACD, is considered a negative divergence, and analysts consider this as an indication of a coming trend reversal. Further, successively lower lows of the price during a bearish trend, accompanied by successively higher lows of MACD, are considered a positive divergence. It is also considered a forewarning of a trend reversal.

LAGGING BEHIND PRICE IS NOT ALWAYS BAD

Smoothing methods have lag, and since MACD makes use of moving averages, it usually lags behind price. You cannot eliminate lag completely when trying to filter the price data and take out all its noisy wiggles, but the point of smoothing is to ignore negligible price wiggles. It is the lag that helps reduce the whipsaws in many cases (see Figure 1).

THE GOAL

Most analysts pair MACD with short period indicators in an effort to be forewarned of a change in its direction. But this means that they take into account the erratic, very short-term price movement and the indicators they use, which are also often erratic. While using different indicators offers a more complete picture of the price dynamics in various time frames, there is the danger of disorientation from the time frame we are interested in.

So how can we create an adequately smooth indicator capable of providing information about the intentions of MACD, especially at critical instances? Moreover, the indicator must have the unique personality of MACD built into it.

THE TOOL

Among the various techniques for removing the lag between price and moving average (MA) of the price, one in particular stands out: the addition to the moving average of a portion of the difference between the price and MA.

Consider, for example, that we want to reduce the lag between the price (P) and an exponential moving average of the price (EMA(P)) without giving much of the smoothness of the EMA(P). The difference between P and EMA(P) is (P - EMA). Adding a portion of this difference in EMA(P) generates a new version of a moving average usually referred to as a zero-lag moving average (although its lag is not zero).

There is a problem, however. What portion of the difference should we use? A similar but more natural approach is not to add a portion of the difference to EMA(P) but instead add the EMA of the difference and create the following indicator: $EMA(P) + EMA(P - EMA(P))$. This one tracks the price closely while providing smoothness, since the differences are being averaged.

MEET THE LEADER OF MACD

Since MACD is created by subtracting a 26-period EMA from a 12-period EMA, it is tempting to see what we can get by substituting the EMAs of MACD with less-laggard moving averages in its formula using the same periods. More precisely, according to the second method of the previous paragraph, we can create two indicators as follows:

$$\text{Indicator1} = \text{EMA}(C, 12) + \text{EMA}(C - \text{EMA}(C, 12), 12)$$

$$\text{Indicator2} = \text{EMA}(C, 26) + \text{EMA}(C - \text{EMA}(C, 26), 26)$$

(where C denotes the closing price) and then take the difference:

$$\text{Indicator1} - \text{Indicator2}$$

The result is a new indicator that I will call "Leader." The code for Leader for MetaStock and Tradecision is shown in the sidebars "MetaStock code for the Leader" and "Improvisian code for the Leader," respectively.



FIGURE 1: LAGGING IS NOT ALWAYS BAD. In this daily chart of AMER TOWER CP, the lag of the long-term moving average (red line) helped filter out the short-term reaction during the first weeks of May 2006 and made it possible to avoid the whipsaw pitfall.

After familiarizing yourself with the Leader, you will make it an inseparable companion to MACD in your charts.

THE PERSONALITY OF A LEADER

The Leader has three main features:

- 1 It is similar to MACD in smoothness.
- 2 It can be plotted along with MACD in the same window using the same scaling.
- 3 It has the ability to lead MACD at critical situations.

The first feature should come as no surprise, given the formula of the Leader. The second feature should also be expected, since both MACD and the Leader express similar differences of moving averages.

The third feature is what makes the Leader, well, a leader. Almost all smoothing methods you encounter in technical analysis are based on a relative-weighted sum of past prices, and the Leader is no exception. The concealed weights of Indicator1 and Indicator2 (components of the Leader) are such that more relative weight is used in the more recent prices than the respective weights used by the components of MACD. In effect, the Leader expresses more changes in average price dynamics for the recent price movement than

METASTOCK CODE FOR THE LEADER

```
Indicator1:=Mov(C,12,E)+Mov(C-Mov(C,12,E),12,E);
Indicator2:=Mov(C,26,E)+Mov(C-Mov(C,26,E),26,E);
Leader:=Indicator1-Indicator2;
Leader;
```

IMPROVIAN CODE FOR THE LEADER

```
Var
shortEMA:=EMA(C,12);
LongEMA:=EMA(C,26);
Indicator1:=ShortEMA+EMA(C-ShortEMA,12);
Indicator2:=LongEMA+EMA(C-LongEMA,26);
Leader:=Indicator1-Indicator2;
End_Var

Return Leader;
```

TRADING STRATEGY

MACD, thus eventually leading MACD, especially when significant trend changes are about to take place.

WHAT TO EXPECT AND WHAT NOT TO EXPECT

Does the Leader itself offer a better alternative to MACD? Generally, no (recall that the lagging feature of moving averages is not always bad). You might argue that if MACD lags behind the price and the Leader leads MACD, then the Leader moves in tune with the price. But it is not that simple.

As far as the long-term price trend is concerned: MACD and the Leader have similar momentum characters. Two moving averages can converge while the trend remains intact. Convergence between two moving averages means some kind of reduction in the velocity of the price movement, not necessarily a change in price direction. Add to this the fact that the Leader tries to uncover the price dynamics of the recent movement, and you will understand why the leading nature of the Leader is not panacea.

Using the Leader as a trend indicator for the price will result in focusing more on the short-term price fluctuations. In effect, using the position of the Leader relative to zero for spotting the long-term trend of the price (as usually done for MACD by the analysts) will be erroneous in many cases. Care should be taken not to use the Leader in the same way as MACD since the Leader, being a short-term momentum indicator, fails to provide clues about the prevailing price trend.

As far as the short-term price trend is concerned: If you study the behavior of the Leader, you will see that there will be times when its movements will be in harmony with the short-term price swings — way better than the laggard MACD (the Leader is essentially a short-term type of convergence-divergence indicator).

But whether an exclusive use of the Leader provides better results than those provided by the already known technical analysis tools is questionable. For example, creating a histogram from the Leader the same way that the MACD histogram is created (see sidebar, “Does a histogram for the Leader give an edge?”) gives early short-term signals at times, but at many other times its performance is worse than the MACD histogram.

Bottom line: The Leader is constructed to provide information about the prospects of MACD. Deducing information from direct comparison between the Leader and price via the classic way technical analysts do does not enhance the already known methods and can be misleading at times.

THE CONCEPT OF DIVERGENCES

There are some points on the concept of divergence I would like to elaborate on before moving on to the basic signs the Leader can offer:

Defining simple and complex divergences: The term “divergence” is general and necessary to make a distinction between simple and complex divergences. Consider indicators I and J , where J is used to provide clues about the future of I .

DOES A HISTOGRAM FOR THE LEADER GIVE AN EDGE?

A common derivative of MACD used by technical analysts is the MACD histogram, which is the difference between MACD and its signal line (the nine-period EMA of MACD) plotted as a histogram. The usual application of the MACD histogram involves the crossing of the histogram through zero: A long signal is generated when the MACD histogram crosses the zero line from below and a short signal is generated when the MACD histogram crosses the zero line from above. We can derive a similar histogram from the Leader (namely, Leader histogram) by taking the difference between the Leader and its nine-period EMA.

So is there any significant gain from using the Leader histogram over the MACD histogram? Most of the time, no. We may get some very nice early instantaneous long/short signals from the Leader histogram, but there will also be a lot of premature signals and whipsaws.

In sidebar Figure 1, a daily chart of DJIA can be seen. Below the chart, you can see the subcharts of Leader histogram and MACD histogram. The black and blue ovals stress the long/short signals provided by the Leader histogram. The blue ovals show the nice and on-time signals, while the black ovals show the premature and unwanted ones. Overall, the performance of the Leader histogram is not better than that of the MACD histogram.



SIDEBAR FIGURE 1: LEADER HISTOGRAM VS. MACD HISTOGRAM. Overall, the good signals provided by the Leader histogram (blue ovals) do not compensate the bad ones (black ovals).

Simple and complex divergences between I and J can be defined as follows (see Figure 2 for a visual reference):

- A simple top divergence between I and J occurs when I is moving upward and J is moving downward smoothly and without making significant swings. A simple bottom divergence between I and J occurs when I is moving downward and J is moving upward, again smoothly and without making significant swings.
- A complex top divergence between I and J occurs when both I and J are moving upward, each making at least two clearly defined tops where the tops of I are successively higher and the tops of J are successively lower. A complex bottom divergence between I and J occurs when both are moving downward, each making at least two clearly defined lows where the lows of I are successively lower and the lows of J are successively higher.

Although these definitions are not mathematically accurate, the charts later for the real-life examples will be immediately comprehended.

TRADING STRATEGY

Interpreting divergences: Technical analysts usually interpret simple or complex divergences as a warning signal of a trend reversal for the indicator *I*, even though this is a naïve simplification. Depending upon the construction and character of *I* and *J*, divergences between them may or may not indicate a trend reversal for the indicator *I*.

For example, in my article “Dissecting The RSI” for *The Technical Analyst*, I argued that due to the specific nature of the relative strength index (RSI), simple divergences between the price and RSI can occur during continuation price patterns. In addition, the internal mathematical structure of indicators plays an important role in the kind of divergences you should expect to see. In my S&C article “Divergence Bias,” I show that some momentum indicators are prone to produce more top divergences with the price and others tend to produce more bottom divergences with the price.

Divergences and subjectivity: While simple divergences are plain, more or less objective, and can be adequately defined algorithmically, complex divergences are indeed a complex matter (especially as far as dealing with cases involving more than two tops or bottoms is concerned). Moving well in the history of a chart, we can probably find complex divergences to support any thesis.

To summarize, study the behavior of your indicators with respect to divergences in the context of the indicators’ character and be cautious when trying to derive conclusions from complex divergences between two indicators or between an indicator and the price.

THE BASIC SIGNS OF THE LEADER

There are two essential and timely signs the Leader can offer with respect to MACD: simple divergences and crossovers.

■ Simple divergences

Shortly after a simple divergence between the Leader and MACD occurs, MACD often turns and takes the direction of its Leader.

■ Crossovers

A crossover occurs when the Leader crosses the line of MACD. Shortly after the crossing, MACD usually follows the Leader. Often, crossovers follow simple divergences at extremes.

The signals of the Leader are not of equal value but depend on the situation. It is not unusual to see the Leader being under MACD for a long period while the trend is bullish and it is not unusual to see the Leader over MACD for a long period while the trend is severely bearish. As a rule of thumb, extreme and violent crossovers after prolonged trends of MACD are the most important signs to be aware of.

Of almost equal importance are the forewarning signs of violent and severe divergences, again after prolonged trends of MACD. The nice thing about the Leader? To effectively use it, you don’t have to rely upon correct interpretation of complex divergences. In fact, you can ignore all complex

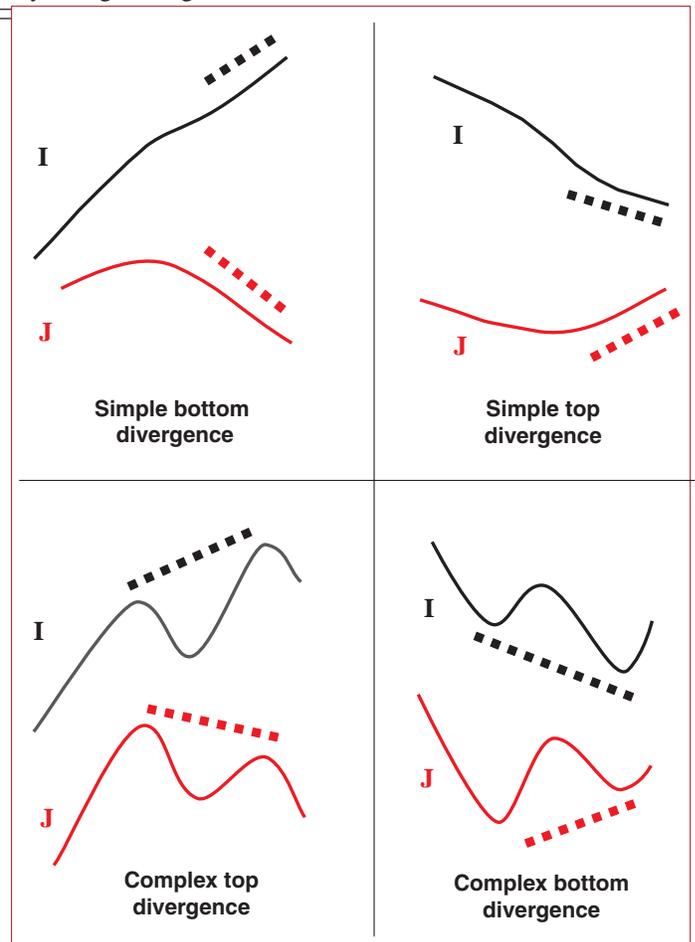


FIGURE 2: SIMPLE AND COMPLEX DIVERGENCES. Here are the four types of divergences you expect to see between two indicators. Technical analysts interpret these signals as a forewarning of a change in the trend of the indicator *I*.

divergences between the Leader and MACD, since crossovers and simple divergences usually provide plenty of decent and on-time signs.

A LEADER IN ACTION I (CROSSOVERS)

In Figures 3 through 6 you can see the performance of the leader in various cases with respect to crossovers. All these figures show the price in the upper chart and the Leader, MACD, and the signal line of MACD (the nine-period EMA of MACD) in the lower chart. To make the charts readily understandable and to stress the leading nature of the crossover signs, I have numbered many of them according to whether they precede the traditional signals generated by the signal line of MACD. More precisely:

- A blue number indicates that a crossover sign significantly precedes a traditional crossover between MACD and its EMA.
- A green number indicates that a crossover sign occurs almost simultaneously with a traditional crossover.
- Finally, a black number indicates that a crossover sign follows a traditional crossover.

All crossover signs in these figures are clear and on time except for crossover 15 in Figure 4 (enclosed in parentheses). This crossover was premature and emphasizes that the Leader should not be used as a price trend indicator if you are

TRADING STRATEGY

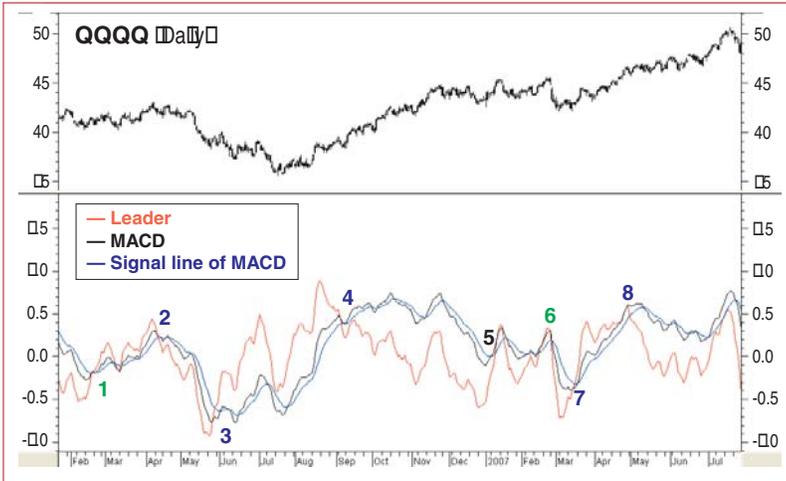


FIGURE 3: LEADING MACD SIGNALS IN THE DAILY CHART OF QQQQ. The blue numbers (2, 3, 4, 7, 8) indicate crossovers between the Leader and MACD that precede crossovers between MACD and its signal line. The green numbers (1, 6) indicate points where a crossover between the Leader and MACD occurs almost simultaneously with a crossover between MACD and its signal line. The only instance where the traditional MACD signal precedes a crossing of the Leader through MACD in this chart is indicated by the black number (5).

interested in the time frame covered by MACD. In the case of point 15, the Leader crossed the line of MACD and preceded the crossing of MACD through its signal line, but MACD kept moving upward. A significant length of time had elapsed before the MACD started heading down. Even when MACD reversed its uptrend and started moving down, the trend of the price was still up.

After crossover 15, the Leader stayed below MACD. This behavior could be taken as a forewarning for the final plunge of MACD to point 16. But if you were to take the movement of the Leader as a price trend advisor, in this case, you would have missed out on a steady bullish trend. The Leader can often mislead when paralleled directly to price.

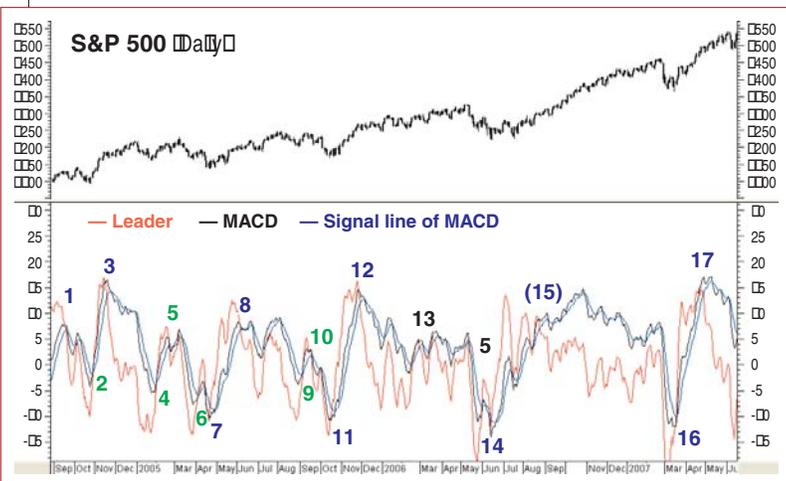


FIGURE 4: PERFORMANCE OF THE CROSSOVER SIGNS IN THE SP500 INDEX. The ability of the Leader to cross MACD early but timely at critical situations (points 11, 12, 14, 16) is remarkable. Shortly after the crossover signs provided by the Leader, a traditional MACD signal follows. Note that the more violent crossing signs of the Leader have usually more dramatic implications for the trend of MACD, especially when the MACD is at relatively extreme values. The only crossover sign that was premature was the one at point 15.

A LEADER IN ACTION II (SIMPLE DIVERGENCES)

In Figure 7 you can see the daily chart of AN (AutoNation), which covers almost three years of price data (from February 2005 to January 2008). Below the chart there is a subchart showing MACD (black) along with the Leader (red). All prominent simple divergences between the Leader and MACD are emphasized. All but two (those stressed in green, which took place near the end of 2005 and the start of 2006) of these divergences were helpful in the sense that they preceded a decent change in the directional movement of MACD. If you study Figure 7 in detail, you will note some complex divergences between the Leader and MACD, which could be correctly interpreted as a forewarning sign of change in the trend of MACD.

The point, however, is that it does not add much value paying attention to them since in most cases, a simple divergence or crossover sign will offer a more timely and accurate signal (see Figure 8 as an example).

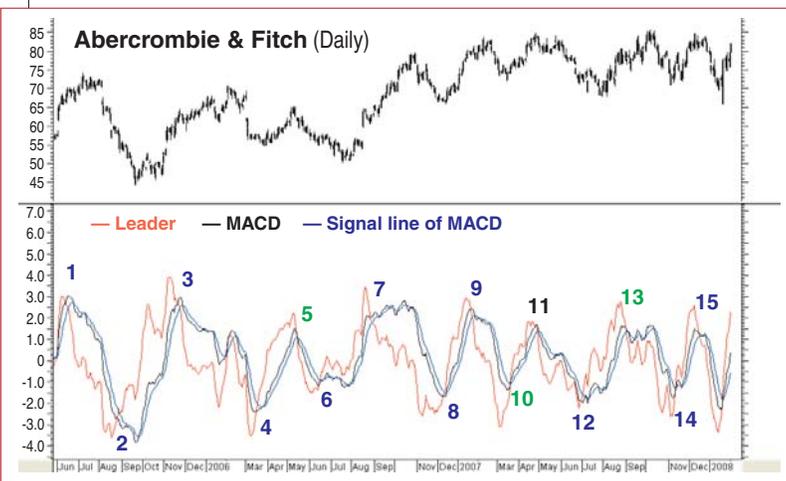


FIGURE 5: CROSSOVER SIGNS IN A NONTRENDING MARKET. The performance of the crossover signs of the Leader is noticeable in this daily chart of ANF. Even though ANF had not a specific long-term trend from mid-2005 to the end of 2007, MACD oscillated nicely during this period and the Leader was able to spot accurate timely crossover signs.

“UNUSUAL” DOES NOT MEAN “UNEXPLAINED”

An important observation that merits mention in Figure 7 is the unusual behavior of MACD and its Leader (surrounded by a blue oval) during the last months of 2007 and the corresponding price movement. In reality, there isn't anything weird in this situation since the price declines in a choppy fashion, making the EMAs of MACD converge and forcing MACD to approach zero.

The Indicator1 and Indicator2 components of the Leader, on the other hand, are tracking the price more closely than the EMAs of MACD, thus crisscrossing each other and forcing the Leader to eventually take some positive values. Once again, this stresses the danger of relating the Leader di-

TRADING STRATEGY

rectly to price for identifying the prevailing trend and the ambiguity that some complex divergences can produce.

Had you relied on the behavior of the Leader in this case, you would have been completely out of phase. The short-term character of the Leader was not short enough to help you be in tune with the sudden small rallies. In addition, had you taken a complex divergence between MACD and price as a trend reversal signal during this period, you would have been completely out of phase as well.

EPILOGUE

The purpose of this article is to introduce a smooth indicator that will provide early and clear warnings for changes in the trend of MACD at critical times (way better than those offered by the traditional nine-period EMA of MACD). If MACD is essential to your analysis, then it is my guess that after using the Leader for a while and familiarizing yourself with its unique character and personality, you will make it an inseparable companion to MACD in your charts. In fact, at critical times you will probably end up using the nine-period EMA of MACD not as the signal of a change in the trend of MACD but as the confirmation.

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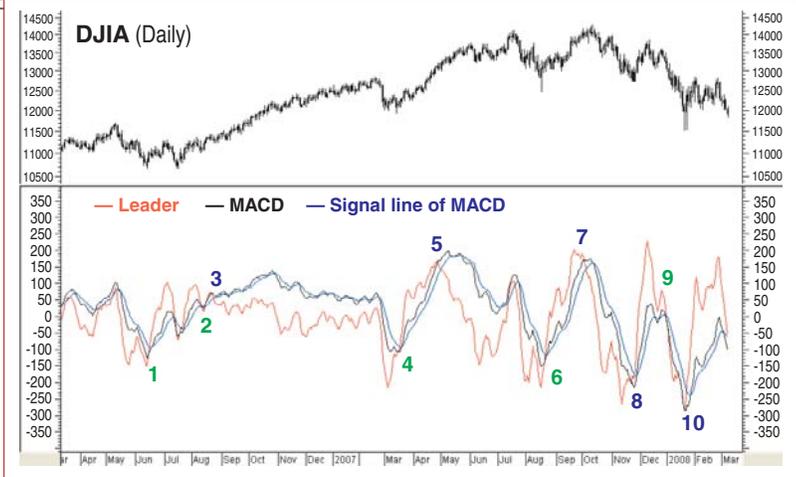


FIGURE 6: CROSSOVER SIGNS IN THE DJIA. Although the overall performance of the crossover signs is decent in this chart, there is a small bias for better signs during strong directional movements of MACD (points 4, 5, 6, 7, 8, 9). Note the implications of violent crossover signs such as 6 and 7.

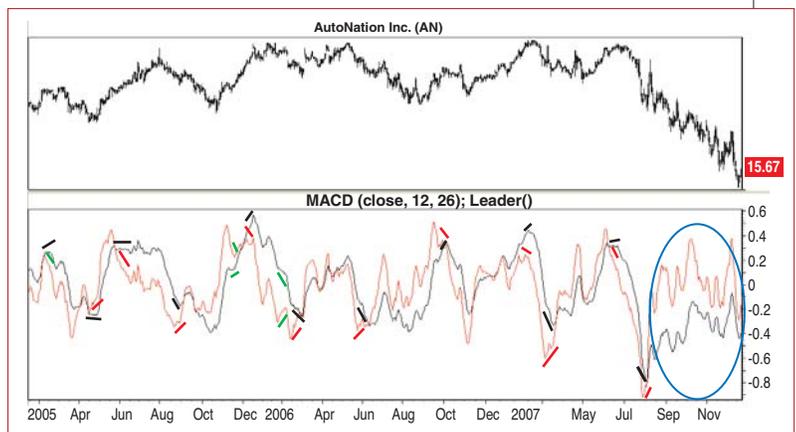


FIGURE 7: SIMPLE DIVERGENCE SIGNS. In this daily chart of AN, the Leader (red line in lower subchart) seems like it is in front of the MACD (black line in the lower subchart) and actually leading MACD. The simple divergence signs of the Leader are stressed using black and red straight line segments in MACD and the Leader, respectively. The only ugly divergence signs were those that took place near the end of 2005 and in the beginning of 2006 (green straight line segments). The blue oval at the right of the lower subchart emphasizes the possible behavior of the Leader during a serious bear market and points out that the Leader should not be directly related to the price for identifying the prevailing trend.

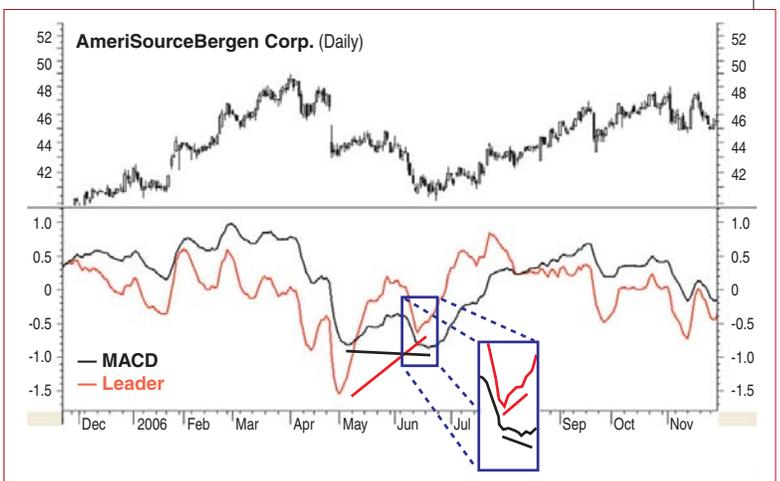


FIGURE 8: SIMPLE DIVERGENCES-CLEARER AND TIMELIER. In this daily chart of ABC, the complex divergence between the Leader and MACD (emphasized by the red and black straight line segments) was not of much value since the simple divergence sign (shown at the magnified rectangle) was strikingly instantaneous.

