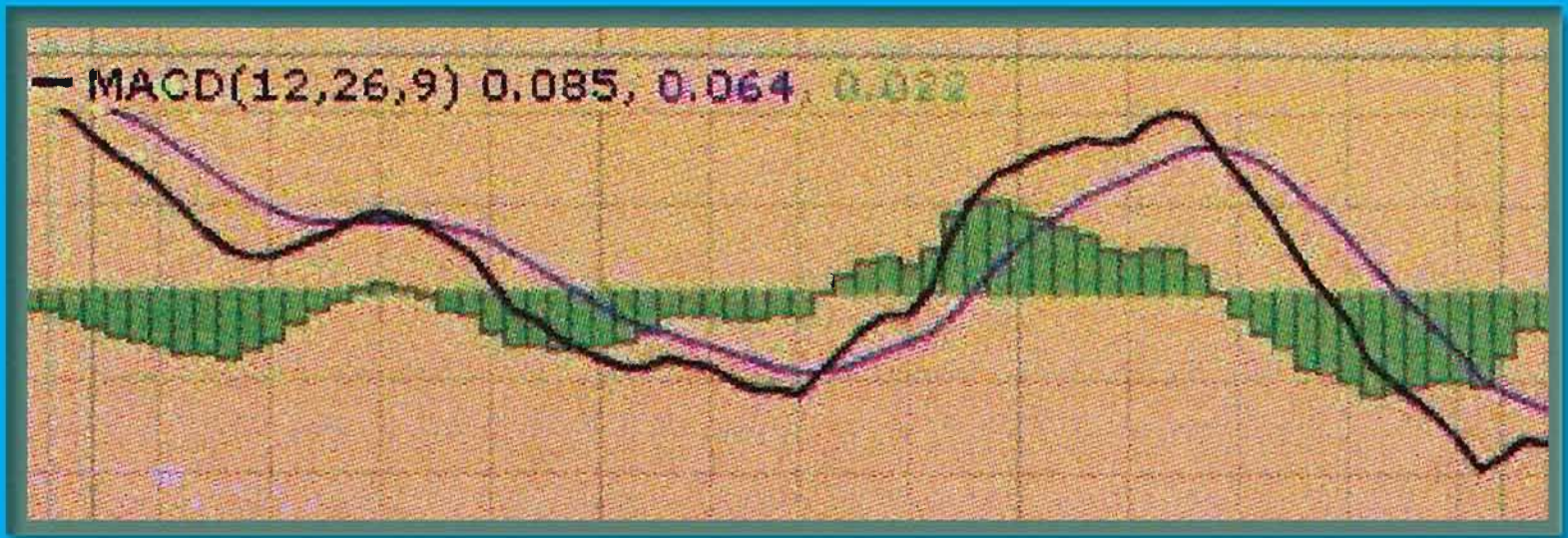


# Understanding MACD

(Moving Average Convergence / Divergence)



*Gerald Appel*



*Edward Dobson*

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# **Understanding MACD**

**Gerald Appel  
and  
Edward Dobson**



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*This booklet is dedicated to*

**Gerald Appel,**  
the creator of MACD  
and the chief contributor to the material presented herein.



**Gerald Appel**

## **Publisher's Foreword**

**I first learned about MACD (Moving Average Convergence-Divergence) in the early 1980's, shortly after Gerald Appel published his groundbreaking research report which "revealed" this new technical indicator. In 1986, he updated and expanded his original report, and shared with the reader how he used and interpreted it in his own market analysis. This updated report, reproduced in its entirety, is the heart of this work, which is intended to give the reader a basic understanding and knowledge of MACD and how to use it effectively in market analysis and timing. It is my belief that the most effective way to achieve this goal is to hear it straight from the "master" on the subject.**

**The idea for this book came about years ago one night when my old friend Gerald and I were having dinner with our mutual friend Alex Elder in Chicago. It has been a long time in the making since then. Originally, Gerald felt that the original manuscript and charts would need to be updated with current examples and commentary. He didn't even have a copy of the report, which had gone out of print and was no longer available. After a diligent search I was able to locate an old used copy, which was forwarded to him to be updated and revised. Surprisingly, after looking it over closely (this being some 20 years after it was written), he advised that he felt it was "OK" as it was, and needed no updating. I feel that this attests to the fact that markets, over time, do not really "change", and some indicators and principles stand the "test of time" and are just as valid today as they were decades ago. In terms familiar to systems developers, they are "robust".**



**My special thanks to Shelley Mitchell, whose painstaking research and diligent effort produced the listing of articles and annotated bibliography which add a valuable dimension to this work.**

**It is my hope that this reprinted material, along with the annotated bibliography of articles and references and a few brief comments of my own, will prove helpful to you in your pursuit of trading excellence.**

*Edward Dobson*

**Edward D. Dobson, President  
Traders Press, Inc.  
Greenville SC**



# Introduction

There has long been a need for this booklet. MACD (Moving Average Convergence-Divergence) has long been one of the most popular and widely available technical indicators since it was developed by Gerald Appel in the late 1970's. However, since Appel's last published research on the subject, published in 1986, went out of print and was no longer available, there has been no work solely dedicated to this topic. There are a number of excellent books which contain discussion and explanation of MACD, but only in passing and not in depth. Research of all past literature dealing with MACD shows that Appel's own in-depth work on the subject is the best resource for learning and mastering the use of this indicator....thus, this work is reprinted herein in its entirety. As explained in the Foreword, though this material is over twenty years old, it is still as relevant and applicable today as when it was originally written.

Those interested in furthering their knowledge of MACD are encouraged to take special note of the articles listed herein, and of the references in other works in the bibliography. The most notable of these works is Appel's own "*Technical Analysis: Power Tools for Investors*", which has a major section and treatment of MACD, and which was recently published in 2005. This book is a valuable reference and resource for serious traders and investors.

Of all the many technical indicators and studies available today in technical analysis software, it is my belief that MACD is one of the most helpful and reliable. An old acquaintance of mine, who spent literally thousands of hours over a period of years studying various technical indicators, eventually came to the conclusion that the only two indicators truly worth using were ADX and MACD, applied over multiple time frames simultaneously.



The MACD histogram, which shows the difference between the two MACD lines, was preferred over the two lines themselves. When this histogram crosses the zero line in either direction, it shows a crossing of the two lines. When the histogram reading peaks and turns up or down, indicating that the differential between the lines has run out of momentum and begun to decrease, is an early signal that occurs well before an actual crossing of the lines. My acquaintance used this occurrence as one of the main components of a trading methodology (coupled with ADX readings). I first became aware of the use of the MACD histogram in the late 1980's, when my friend Alex Elder used and discussed it extensively in a market letter he published at that time. Another reference I highly recommend for discussion of MACD and the Histogram is the relevant section in Elder's classic "*Trading for a Living*", one of the best and most helpful trading books ever written, in my opinion.

# Key Points

MACD (Moving Average Convergence-Divergence) is a technical indicator which is a featured indicator in virtually every computer based technical analysis software, trading program, and trading platform. Strangely, despite its overwhelming popularity, there has been relatively little written about it or the best ways in which it can be used. This work is intended to fill that void.

This section will give an overview of MACD by listing a number of key points which will give a basic understanding of the indicator. The section from Gerald Appel's original research report which follows gives copious illustrations of how to use and interpret MACD.

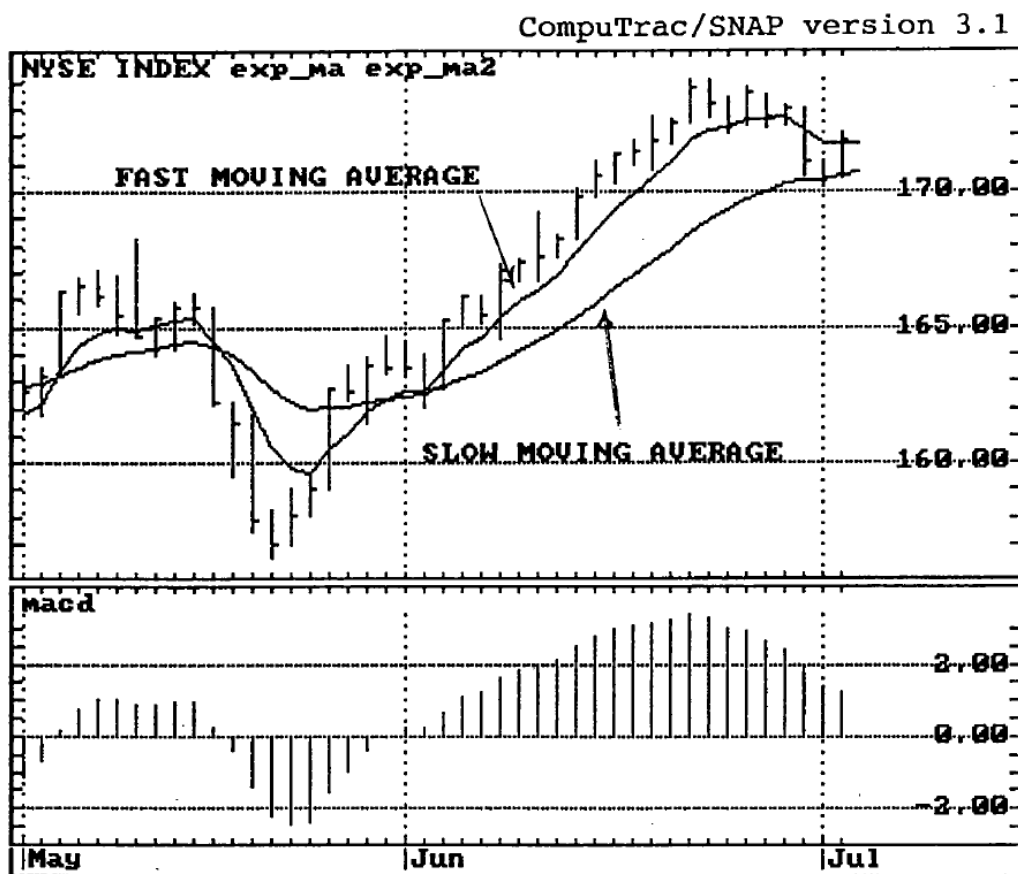
- MACD is a trend following momentum indicator
- MACD is generally considered to be one of the most effective indicators for defining trend
- MACD consists of three exponential moving averages
- An exponential moving average gives more weight to the latest data and less to the oldest data
- The most common exponential moving averages used to calculate MACD are 9, 12, and 26 periods. These are usually the default settings in most technical analysis software
- Shorter term moving averages respond to changes in prices more quickly, longer term averages more slowly

- The MACD indicator consists of two lines: the MACD line and the Signal line.
- The MACD line is the difference between a 12 and a 26 period EMA of prices and is plotted as a solid line.
- The Signal line is a 9 period EMA of the MACD line.
- Moving averages other than the standard 9, 12, and 26 may be used. Some traders try to optimize MACD by using other EMA combinations
- Few traders make these calculations by hand. A computer does the job much more quickly and accurately. The reader is urged to obtain and use technical analysis software for this job if not already employed.
- There are three methods commonly used to interpret MACD:
  1. Buy and sell signals are given when the MACD line crosses above or below the slower Signal line
  2. Divergence: when prices diverge from the MACD it often signals the end of a trend
  3. Sharp rise or fall in the MACD Line. When the difference between the MACD and the signal lines goes to an extreme and then changes direction prices are viewed as overbought or oversold
- The difference between MACD and the Signal line is often graphically depicted as an MACD-Histogram. It measures the spread between the two lines.

- The slope of the MACD histogram and changes in its direction can be helpful in spotting turning points.
- A reference that is very helpful in understanding how to use the Histogram and other trading rules is Elder's "Trading for a Living", pages 127-135. This is highly recommended reading.
- MACD analysis may be applied to any active security, commodity, or index
- In like manner, it may be used in virtually any time frame, from very short (minutes) to very long (monthly)
- Short term traders and long term investors alike will find this indicator useful
- The best signals are given when short term analysis coincides with longer term analysis, thus putting the trader "in sync" with the major long term trend
- The reader is urged to closely study price charts with corresponding MACD studies to observe first hand how the studies correlate to price movements before actually trading signals generated by MACD
- Like many useful technical analysis techniques, there is no claim made for the statistical validity of MACD, just the empirical observation that IT WORKS

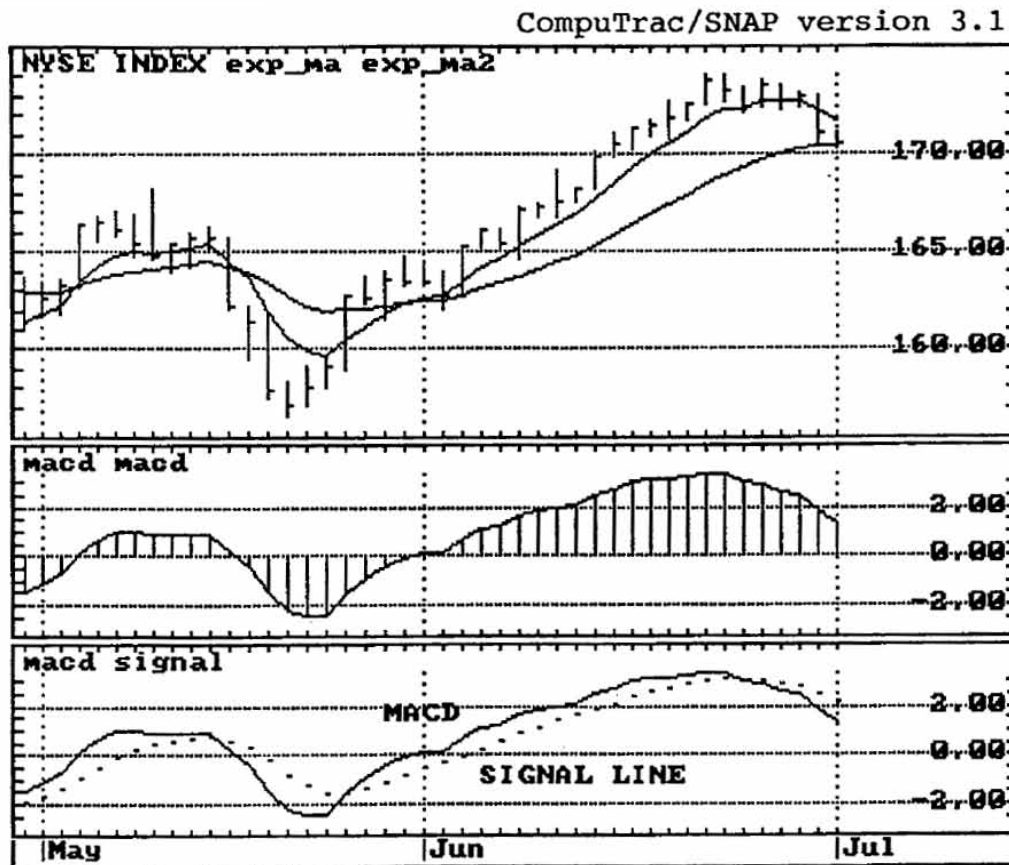
# **Moving Average Convergence-Divergence**

*Gerald Appel*



**CHART 1**  
**THE BASIC STRUCTURE OF MACD**

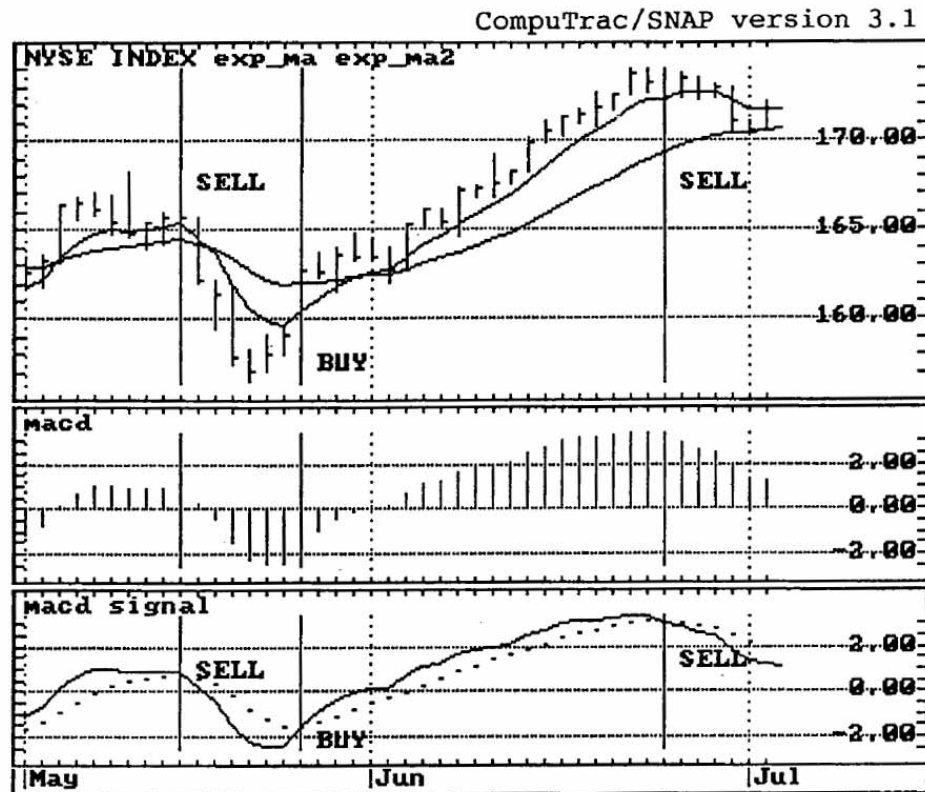
A shorter term moving average will rise more quickly than a longer term moving average during market uptrends. As the rise comes to an end, the slower moving average will catch up, narrowing the distance between them. This narrowing suggests an end to the advance. The same pattern occurs during market downtrends. The differential between the two moving averages may be plotted as a histogram.



**CHART 2**  
**INTRODUCING THE SIGNAL LINE**

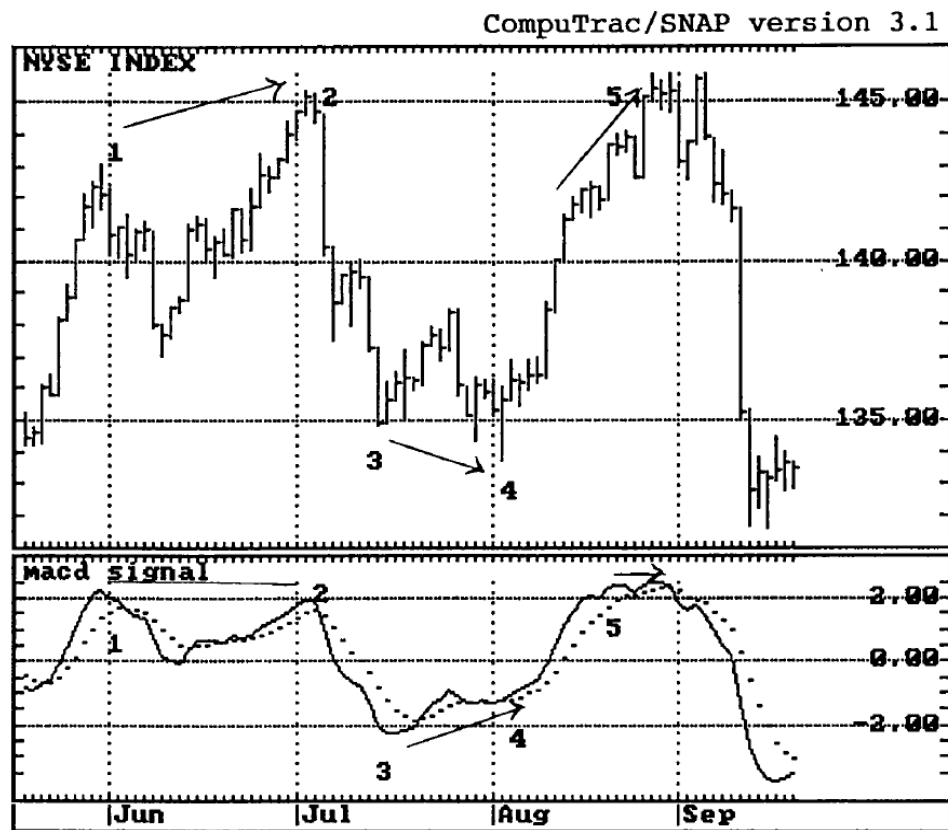
The differential between the two moving averages may also be plotted as a line, which will correspond to the high and low extremes of the histogram. A moving average is then created of the differential between the two moving averages that comprise MACD. We usually plot this moving average as a dotted line and refer to it as the signal line. The moving average signal line is usually between 5-10 days in length and serves to define the trend of the differential. When the differential lies above its moving average, MACD is in a positive mode. When the differential lies below its moving average, the trend of MACD is considered negative.





**CHART 3**  
**THE BASIC BUY AND SELL SIGNALS**

As a basic, buy signals are generated in MACD when the MACD line (the line that measures the differential between two moving averages) crosses from below to above its signal line. Sell signals are generated when the MACD line crosses from above to below its signal line. More advanced buy and sell signals will be illustrated on the following pages.

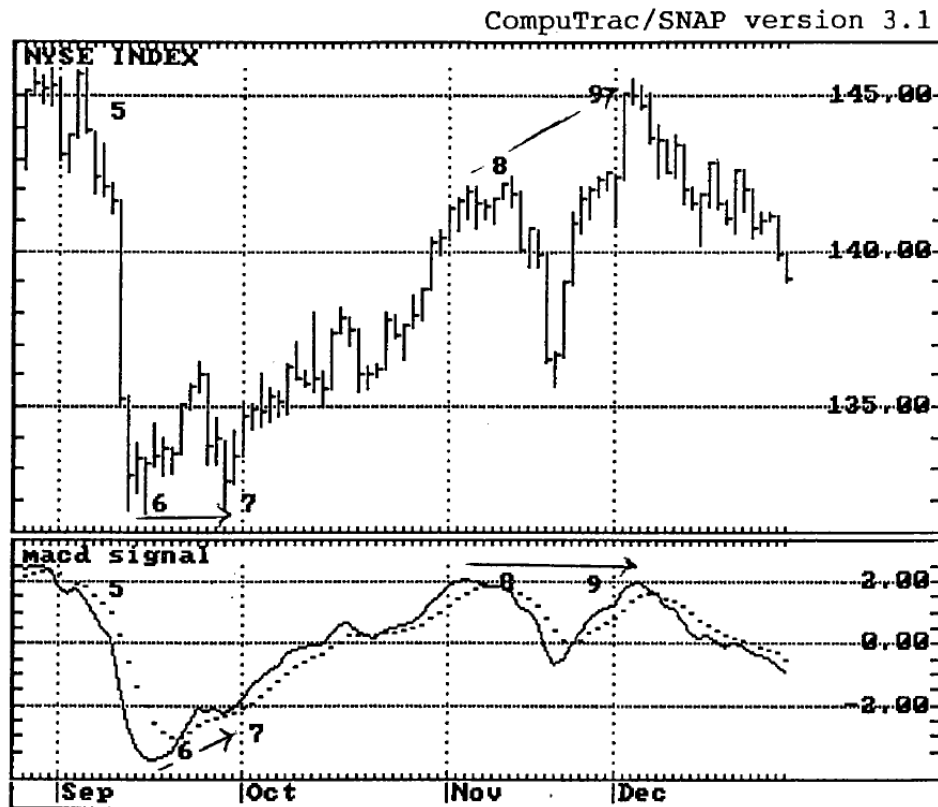


## CHART 4

### USING DIVERGENCES TO RECOGNIZE THE MOST RELIABLE SIGNALS

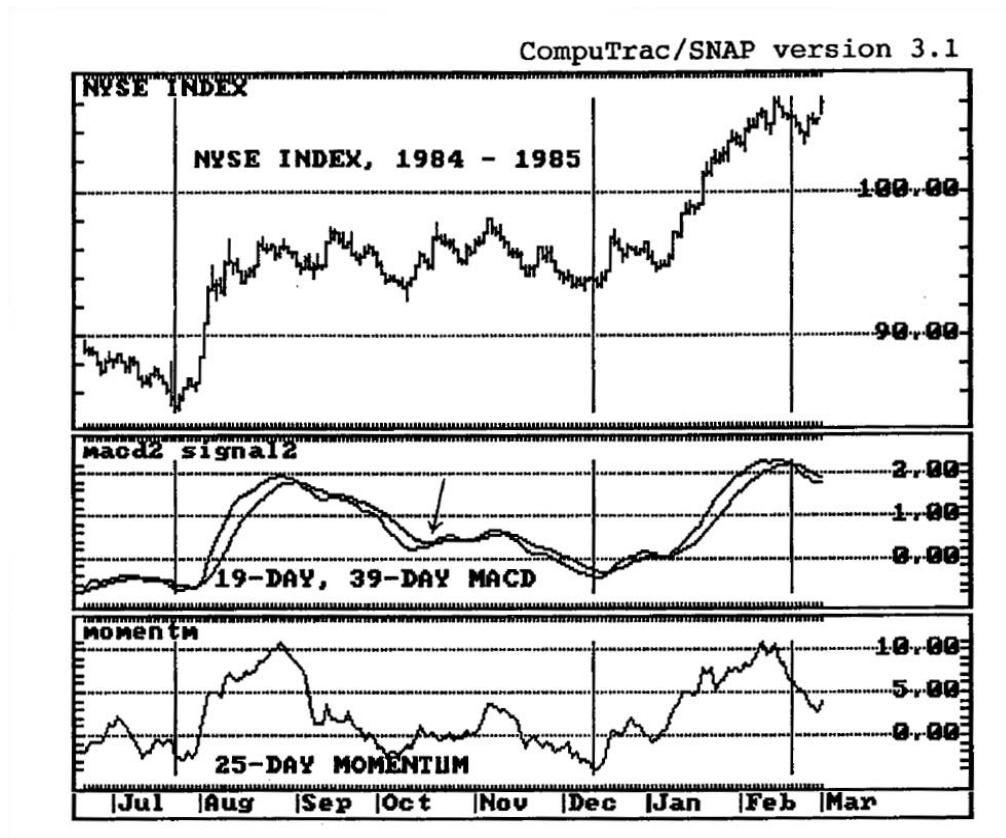
Divergences between price patterns and momentum patterns often serve to identify the most profitable buy and sell signals. A positive divergence exists when prices fall to a new low, but MACD fails to make a new low along with declining price movement. This divergence indicates decreasing downside momentum. A fine example is shown on the above chart between points 3 - 4. The buy signal that took place at 4 was likely to prove more reliable than the buy at 3 because of the positive divergence that preceded the buy.

Negative divergences exist when prices move to new highs but MACD fails to make a new peak along with price. Such patterns appear on the chart between Areas 1 - 2 and at Area 5. The sell signal at Point 2 was more likely to prove significant than the sell at Point 1 because of the negative divergence that preceded the sell in that area.



**CHART 5**  
**FURTHER EXAMPLES OF DIVERGENCES**

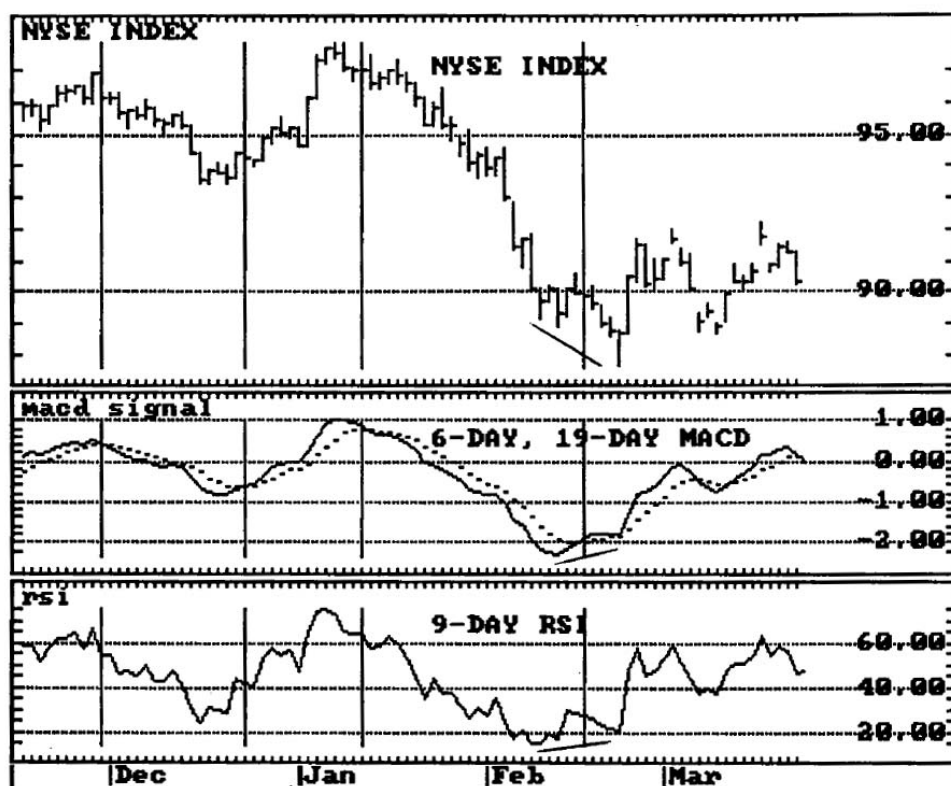
A positive divergence developed between Points 6 - 7, price formations showing equal lows while MACD traced out a rising formation. The sell at Point 9 was likely to prove more significant than the sell at Point 8 because of the negative divergence that preceded the sell signal.



**CHART 6**  
**COMPARING MACD TO A PRICE MOMENTUM OSCILLATOR**

MACD is a very smooth timing oscillator compared to daily momentum oscillator indicators. Its buy signals (July and December on the chart) are clearer as are its sell signals.

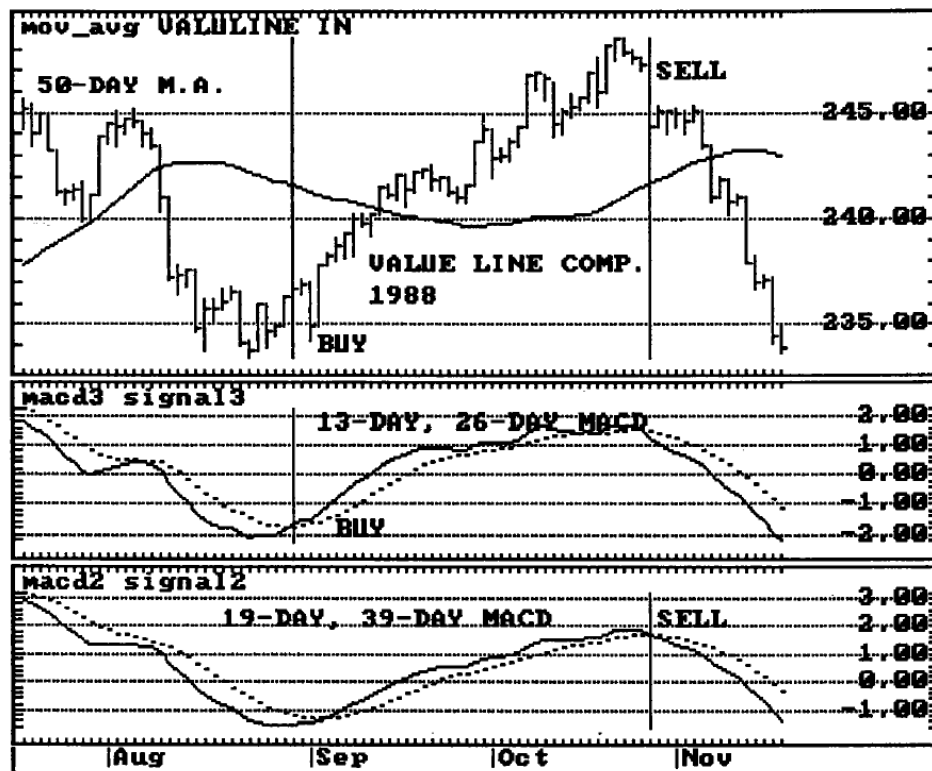
There was, incidentally, no buy signal in October even though MACD crossed from below to above its signal line. As a general rule, MACD must first fall below 0 as a precondition for a buy signal. MACD must rise above 0 once a buy signal is generated before a sell signal can be generated, unless the indicator falls to a new low, which then generates a sell below the 0 line.



**CHART 7**  
**COMPARING MACD TO THE RELATIVE STRENGTH INDEX**

RSI is an excellent technical tool with many applications. However, we see on this chart again that MACD provides much smoother lines, leading possibly to easier interpretation.

Both MACD and RSI generated fine positive divergences in February as both tools provided valid buy signals simultaneously.



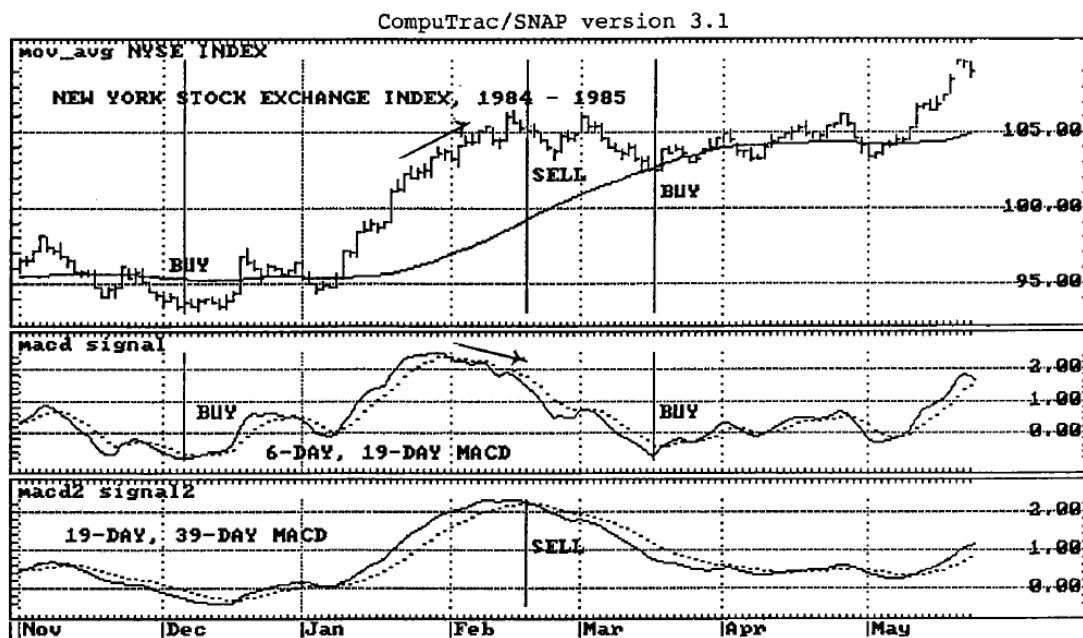
### CHART 8

#### COMBINING TWO MACD COMBINATIONS WITH TREND FOLLOWING TECHNIQUES FOR MORE ACCURATE SIGNALS

Since most markets tend to decline more rapidly than they rise, it is advisable to employ a more rapid MACD combination (shorter term moving average pairings) to track declining markets for buy signals and slower MACD pairings to track rising markets for sell signals. Otherwise, buy signals tend to occur late and sell signals tend to occur prematurely. In the above chart, we employ a 13-day, 26-day exponential average pairing to generate buy signals and a 19-day, 39-day pairing to generate sell signals.

A 50-day moving average is employed to define trend. If the average is rising sharply, indicating a strong uptrend, we would employ an even more rapid MACD pairing (6-day, 19-day) to generate buy signals and we might delay selling until negative divergences appeared, even if the signal line for the sell MACD is violated.

Trends in the above chart are, for the most part, neutral. Therefore, we do not employ a very rapid MACD combination for buying and we sell immediately upon violation of the signal line by the MACD line.



## CHART 9

### MACD DURING A STRONGLY UPTRENDED MARKET PERIOD

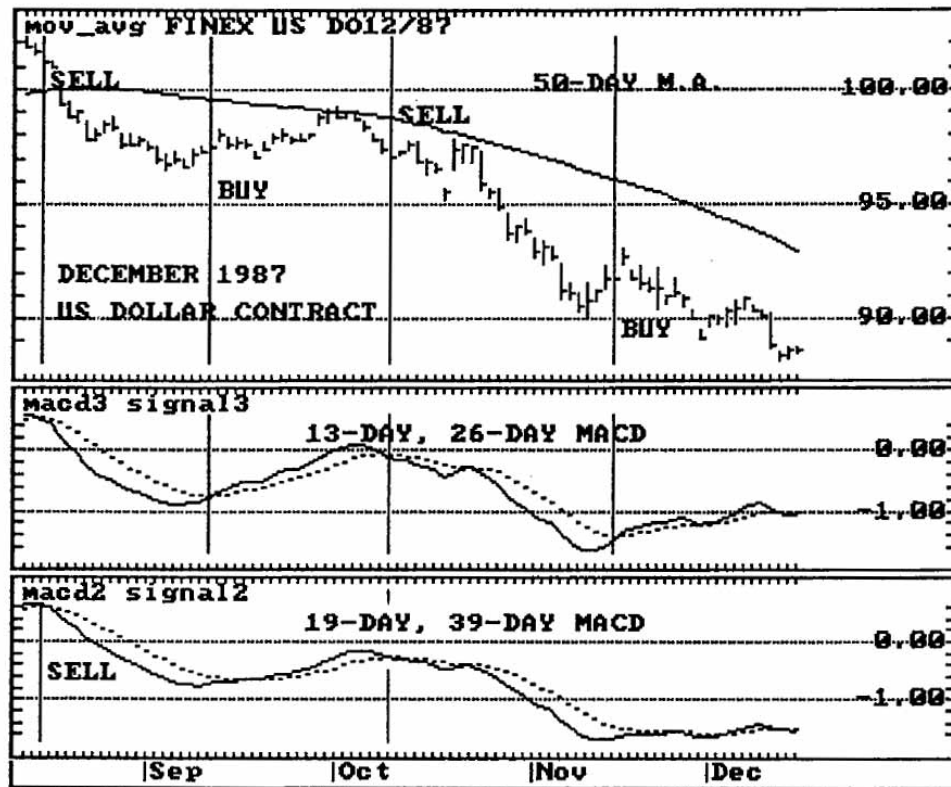
The stock market was in a general uptrend, the 50-day moving average flat to rising for the most part, so we employed a rapid (6-day, 19-day) MACD for buying, keeping the 19-day, 39-day MACD as our sell trigger.

Once you buy on the shorter MACD pairing, you hold until the longer MACD pairing (our sell trigger) rises to above 0, holding until that MACD line falls below its signal line. You are stopped out prior to this only if the short term MACD falls below the lowest level that immediately preceded its buy signal.

Buy conditions on the above chart were met when the 6-day, 19-day MACD line first fell below 0 and then rose through its signal line. Signals took place during December 1984 and March 1985. The sell signal (based upon the 19-day, 39-day MACD lines) in February was well timed.

The moving average was rising sharply at the time of the sell signal. In this case, we might have bypassed the sell if not for the negative divergence traced out by the shorter term MACD during the period preceding the sell.



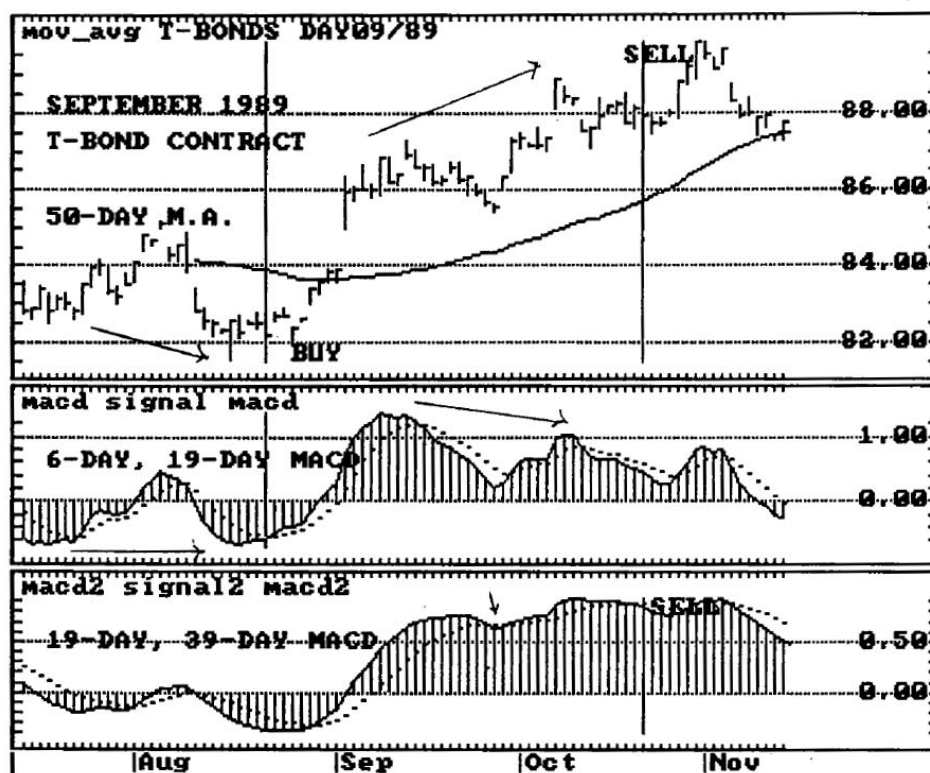


**CHART 10**  
**MACD DURING A STRONGLY DOWNTRENDED MARKET PERIOD**

The December 1987 US Dollar was in a very strong downtrend during the fourth quarter of 1987. You can see the pattern of lower prices, confirmed by a rapidly declining 50-day moving average.

In this situation, it is advised to sell rapidly when sell signals develop. On the chart above, you may have well taken the sell signal indicated by MACD lines crossing from above to below their signal lines even though the 19-day, 39-day MACD combination did not stand in positive territory, unable to rise above 0 following the buy signal in September.

Long side trades were not particularly profitable during the period shown. Short sales, however, did prove quite profitable because of the market declines that immediately followed sell signals.

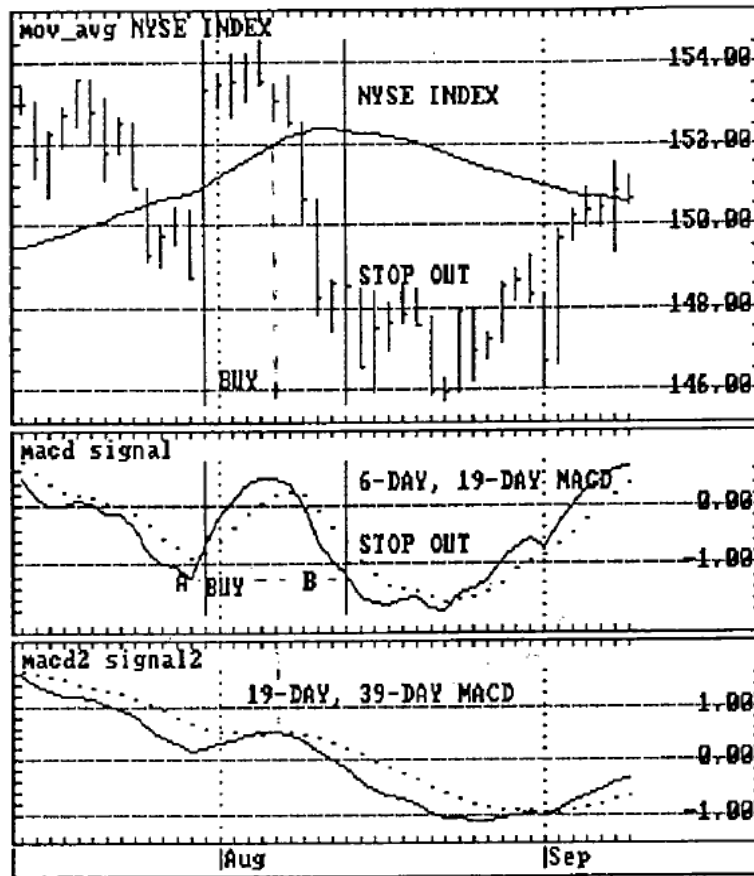


**CHART 11**  
**TREASURY BONDS, MACD, AND A STRONG UPTREND**

A fine buy signal was generated during August of 1989 by the 6-day, 19-day MACD.

The 19-day, 39-day MACD violated its signal line in September and investors might have taken profits at that time. You would not have sold short, however. The 50-day moving average was rising and even accelerating in its rise. No negative divergences existed.

Given the strength of the advance, intermediate term investors might have given the situation the benefit of the doubt, holding positions until a second sell signal was generated in October. By that time, clear negative divergences were being generated by the 6-day, 19-day MACD. There were, however, no divergences in the 19-day, 39-day MACD and the trend remained strongly up.

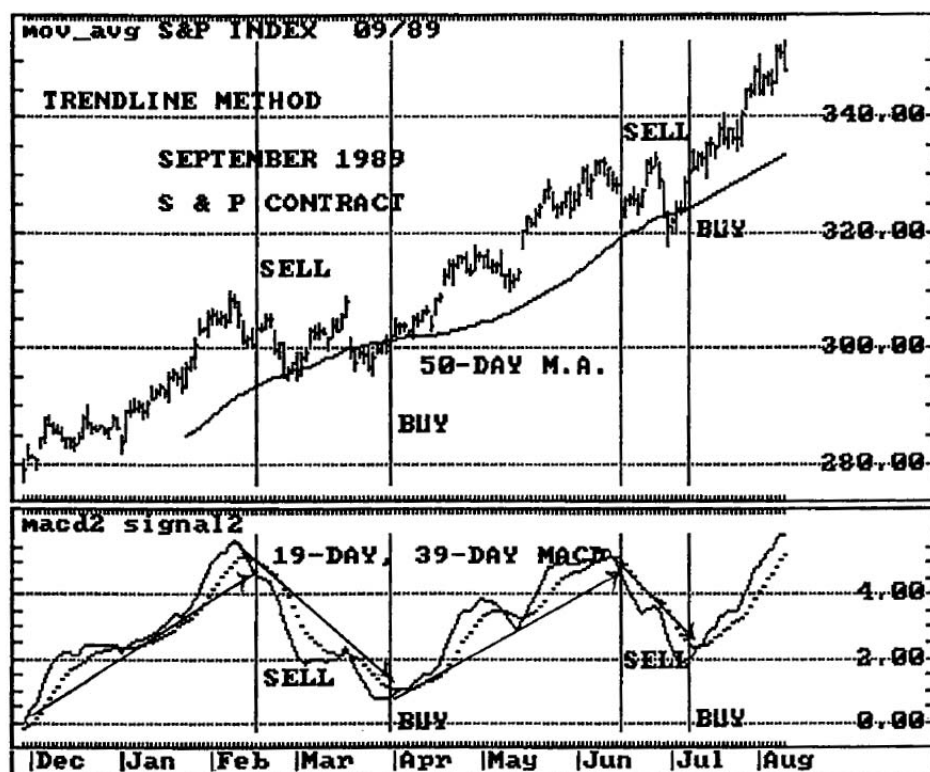


**CHART 12**  
**THE STOP LOSS SIGNAL FOR AN UNSUCCESSFUL TRADE**

MACD generated a buy signal at A, the 6-day, 19-day MACD crossing its signal line while the 50-day moving average was still rising.

However, the stock market turned down quickly and at Point B, the 6-day, 19-day MACD declined to a low below the low level that preceded the buy signal at A. This generated a stop loss sell signal. A loss on the trade had to be taken.

A new buy signal was generated several days later (not marked on the chart) and that buy signal did turn out to be quite profitable.

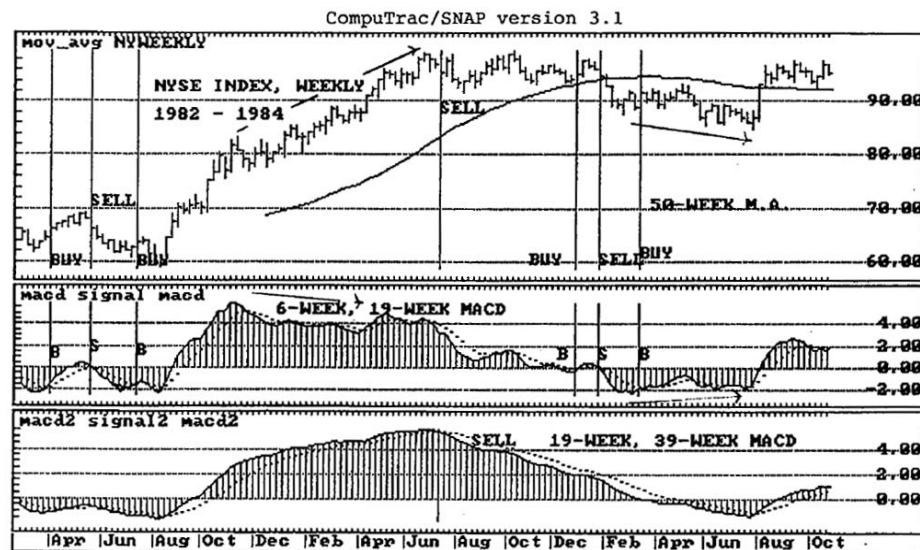


**CHART 13**  
**USING TRENDLINES TO CONFIRM BUY AND SELL SIGNALS**

The September 1989 Standard & Poor's (S&P) contract was in a very strong uptrend during the period shown on the chart.

Although we would not normally employ a long term MACD combination (the 19-day, 39-day) as a buying trigger during such a climate, you can see how the use of trendlines provided fine buy-sell confirmations of MACD - signal line crossings during this period.

During strongly uptrended market periods, where no negative divergences exist, you can usually bypass the first sell signals following very successful buy signals. Sometimes, you can even bypass the second sell signal, but as a general rule the second of a series of sell signals should be followed.



## CHART 14

### LONG TERM MACD SIGNALS—THE START OF A BULL MARKET

A major bull market started during the summer of 1982.

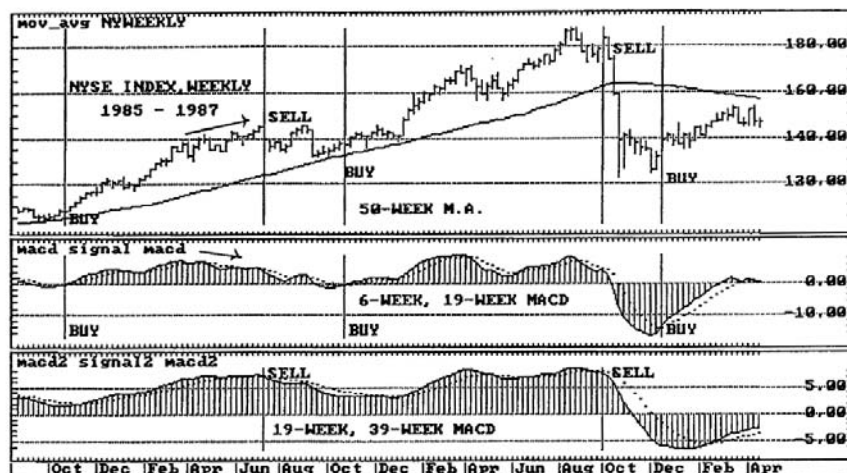
Following an aborted buy signal in April, a second buy during June held. The stock market, but not MACD, drifted lower into August, at which time prices started to move rapidly upwards.

With the trend rising — a 50-week moving average employed to define the weekly trend — sell signals were delegated to the 19-week, 39-week MACD line which generated a sell signal in June of 1983, fully one year after MACD's most recent buy signal.

It took some time for the buy signal of February 1984 to resolve, but patient holders were ultimately rewarded during August when the stock market finally emerged from its long term base formation.

Notice that we are able to employ the same parameters on a weekly as well as a daily basis. We simply convert daily data to weekly data.





## CHART 15

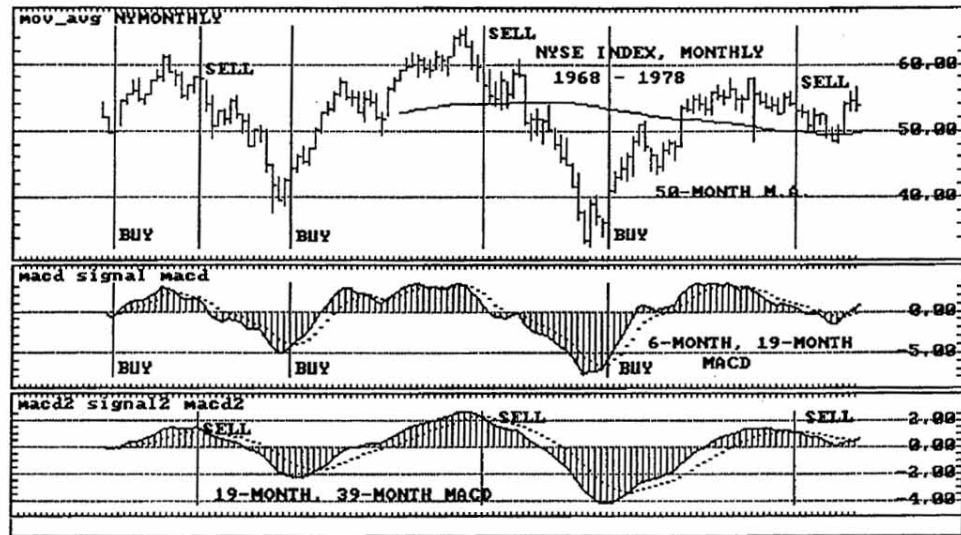
### A LONG BULL MARKET — THEN THE CRASH

With the trend still rising (signified by the rising 50-week moving average), buy signals were taken on the rapid 6-week, 19-week MACD line, sell signals on the slower 19-week, 39-week line.

This combination worked very well between 1985 - 1987, catching all market advances and even producing a timely sell signal just prior to the stock market crash of October 1987.

MACD provided a fine re-entry back into the stock market incidentally, following the crash.

MACD provides very reliable buy signals following severe stock market declines.



**CHART 16**  
**USING MONTHLY MACD TO DEFINE VERY MAJOR TRENDS**

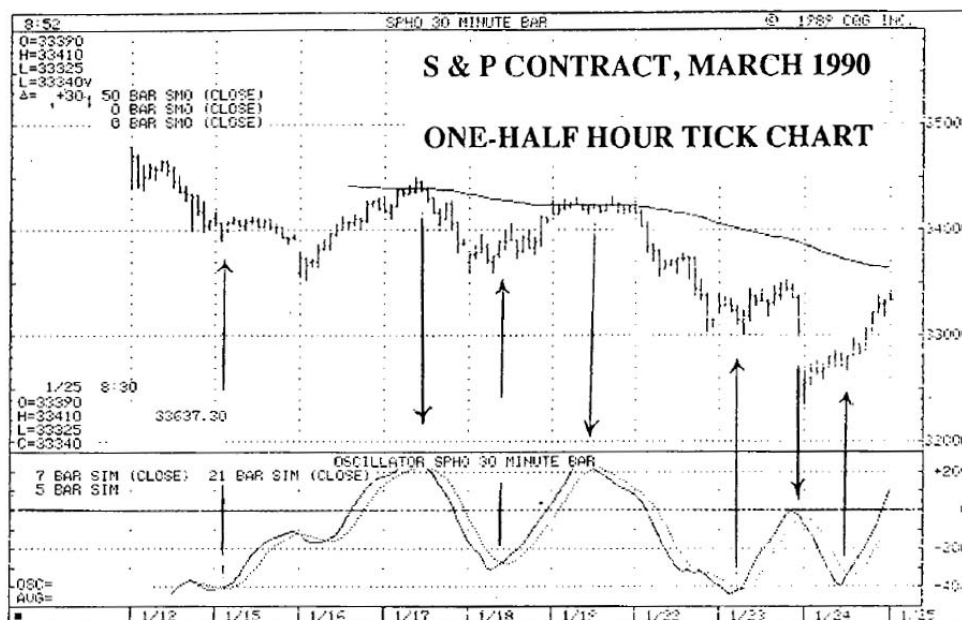
MACD may be maintained on a monthly basis to determine the major phases of the stock market cycle.

In the above chart, we employ the 6-month combination for buying and the 19-month, 39-month combination for selling. A 50-month moving average defines trend. The period shown spans nearly 10 years, from the autumn of 1968 into the spring of 1978.

The usual rules were employed. Buy on a crossing of the signal line (6-month, 19-month) and sell on a downside crossing of the signal line (19-month, 39-month). Signals were not as precise during the 1978-1990 period, but were still pretty much on target.

Again, you should note that we did not have to change our parameters or the rules of MACD, even for this long term chart. The same principles hold for long term trading as for short term trading.





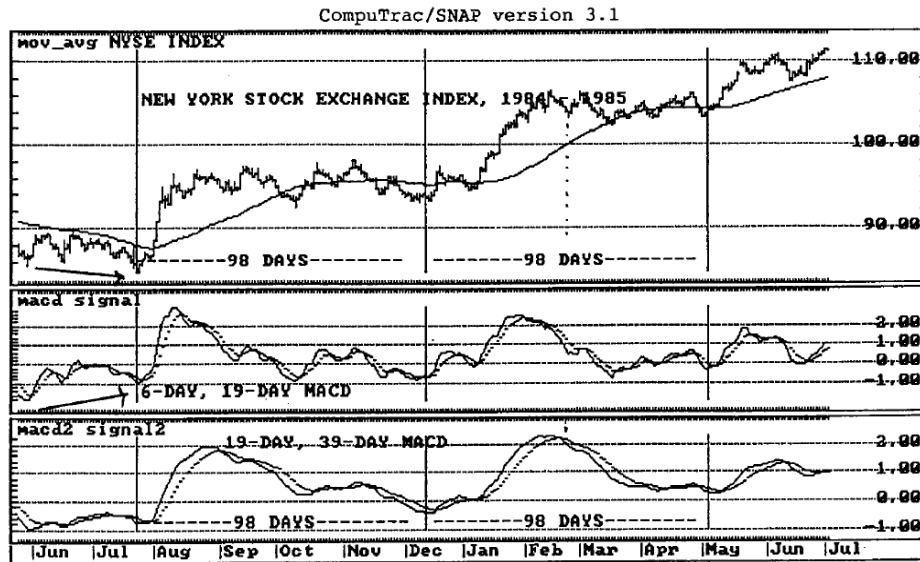
## CHART 17 MACD AS A DAY TRADING TOOL

MACD can be a very useful tool for day trading as well as for long term position trading.

The above chart is a 30-minute bar chart of the S&P contract. It employs a 50-unit moving average to define trend. A 7-unit, 21-unit MACD line is employed. Buy and sell signals are shown.

Buy signals were not particularly profitable (nor unprofitable) on balance during this period of declining prices. However, short sales on sell signals during the downtrend would have proven quite profitable.

Daily MACD patterns were clearly on sells during the period of time shown on the chart, January 1990, so intra-day sell signals were confirmed by daily MACD. If possible, you should conduct day trading operations in conformity to daily MACD signals.

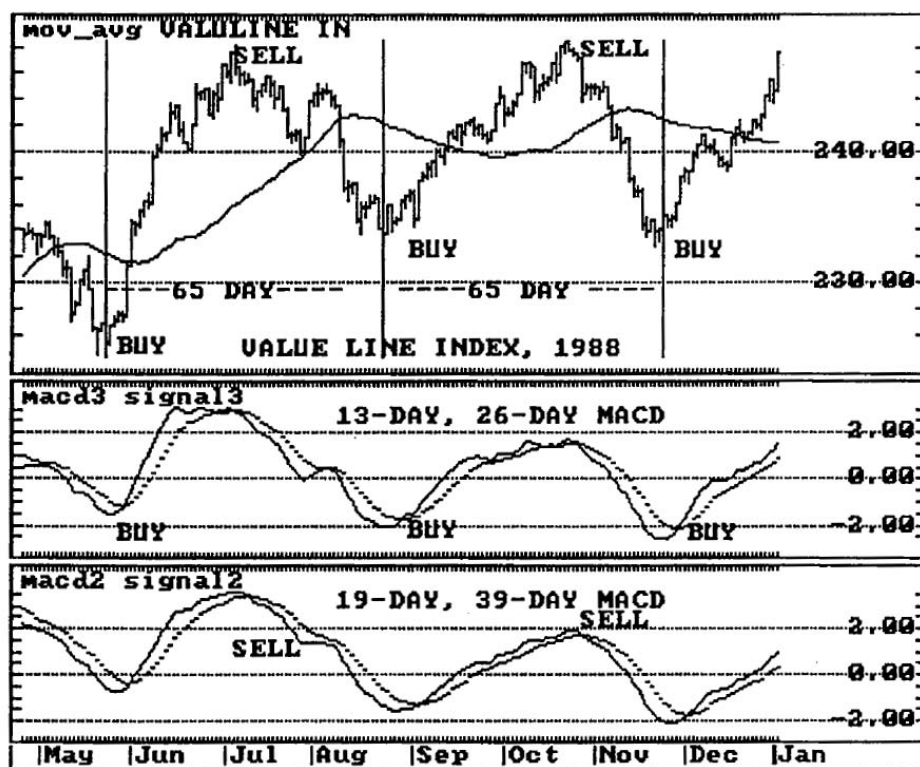


## CHART 18

### USING TIME CYCLES TO CONFIRM MACD SIGNALS

MACD signals that develop at important scheduled cyclical low points are likely to prove very successful. There was a 98-day period or approximately 20 weeks between the important MACD low in July 1984 and the low in December. We would then pay particular attention to any low and buy signal that developed 98 days from the December low.

Such a low and buy signal did develop in early May 1985, 98 days from the December bottom. As you can see, a good upmove in the stock market took place right on schedule.



## CHART 19

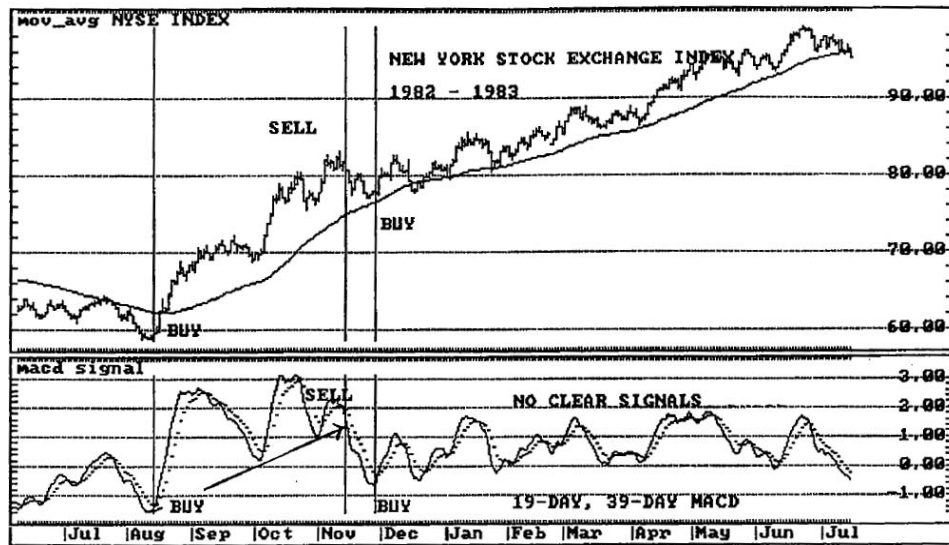
### USING TIME CYCLES TO CONFIRM MACD SIGNALS: A SECOND EXAMPLE

The American stock market often rises from low points on a quarterly or 13-week cycle.

The above chart shows this 65-day trading cycle, and MACD buy signals that developed at 65-day intervals during 1988. Notice again — buy signals are generated by the more rapid MACD combination, sell signals by the slower MACD combination.

We might have also employed a 6-day, 19-day combination for buying, but for the most part, trends, as signified by the 50-day moving average, pointed down at the time of buys so we opted to employ the somewhat more stringent 13-day, 26-day combination.

Investors are advised to experiment with different combinations. Markets may not necessarily be similar in the optimum MACD combinations to employ.



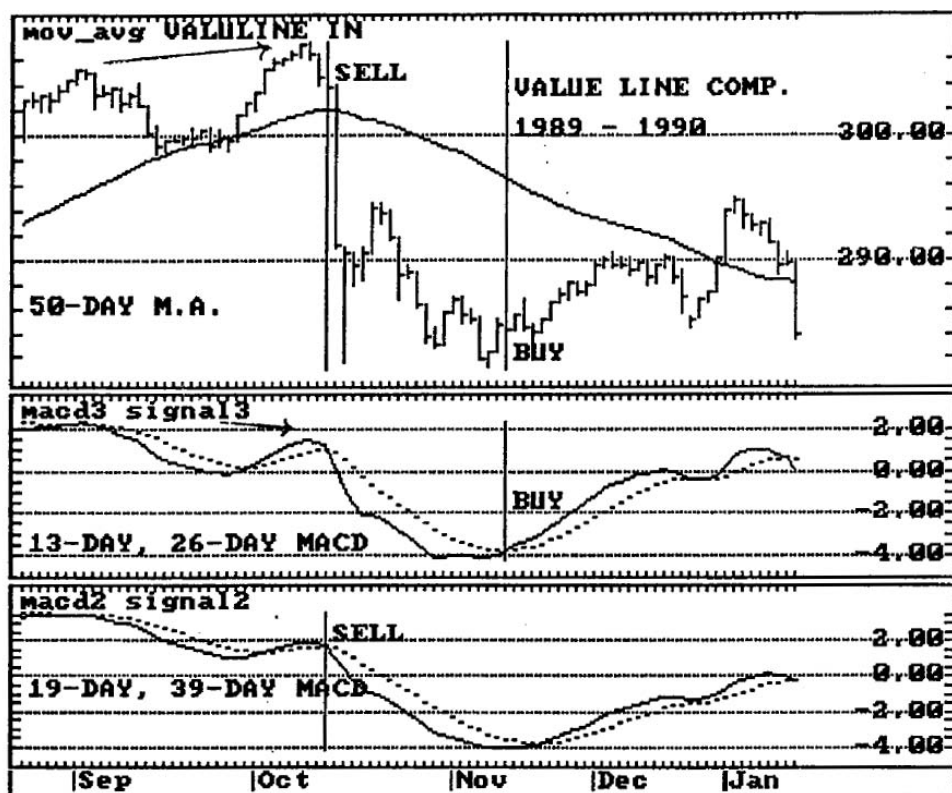
**CHART 20**  
**WHEN MACD DOES NOT PROVIDE TIMELY SIGNALS**

MACD does not work too well during gradual uptrends or gradual downtrends. It prefers more widely swinging stock market periods.

The 19-day, 39-day MACD provided fine signals during the second half of 1982, but swings in the summer of 1983 were too narrow for adequate signals. (Weekly MACD did very well during this period, however.)

There is not too much to be done once such a period starts, except to await the development of more volatile market climates. MACD is an excellent technical tool, but no tool should be employed in isolation.

The 50-day moving average did rise steadily during the period shown on the chart and, in the absence of clear MACD signals, positions may have been held based upon the 50-day moving average.



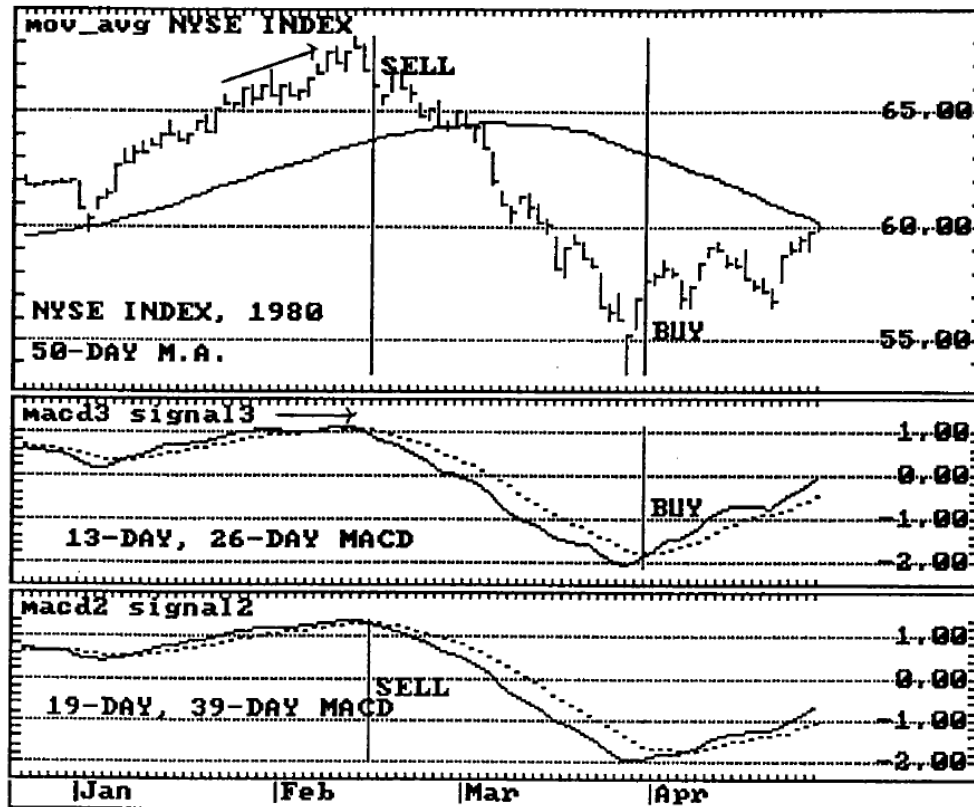
**CHART 21**  
**THE AMAZING ABILITY OF MACD TO CATCH THE ENDS OF**  
**SIGNIFICANT INTERMEDIATE MARKET DECLINES**

MACD is outstanding in its ability to define the conclusion of waterfall declines in various investment markets.

This chart shows the very serious stock market decline that took place between late October and early December during the 1973 bear market.

MACD was not fooled into buying too early, but it was also not late in its re-entry back into the stock market. A fine sell signal was generated by the 19-day, 26-day MACD and a fine buy signal was generated by the 13-day, 26-day MACD.

With trends sharply down — the 50-day moving average declining rapidly — we would not employ the very rapid 6-day, 19-day MACD combination. During such times, employ an MACD combination that makes it just a little more difficult to buy.



### CHART 22

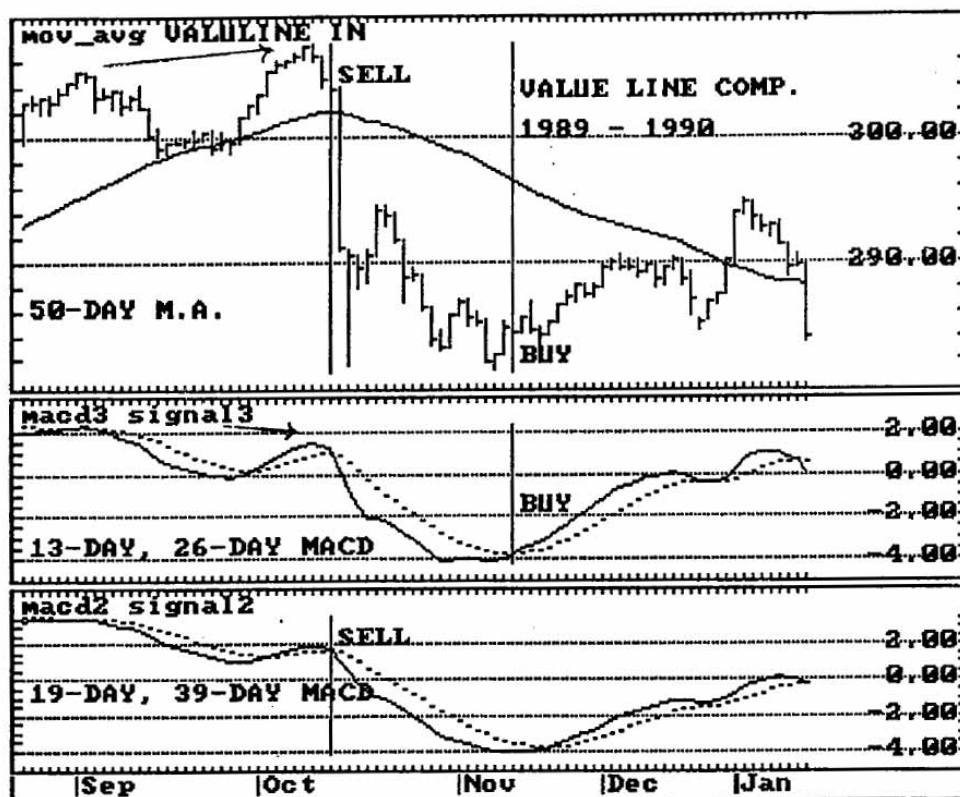
#### BOTTOM FINDING FOLLOWING A DECLINE: A SECOND EXAMPLE

The stock market decline of February - March 1980 was also very serious, lasting the usual 5-6 weeks.

MACD once again generated timely sell signals (via the 19-day, 39-day MACD) and an excellent re-entry back into the stock market (via the 13-day, 26-day MACD).

Traders should employ at least three MACD combinations — a very rapid pairing for buying when the trend is strongly up, a medium pairing for buying when the trend is down to neutral, and a longer term pairing for selling.





**CHART 23**  
**A FINAL EXAMPLE OF BOTTOM SPOTTING**

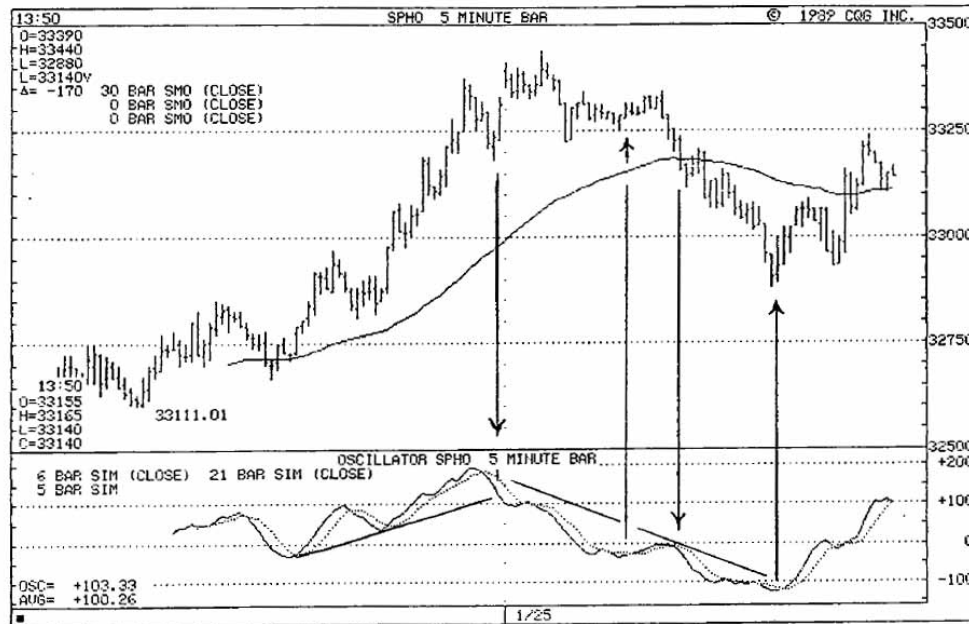
MACD generated a good sell signal just prior to the market hit of October 1989.

Moreover, its re-entry back into the stock market during November could not have been better timed.

Once again, MACD is truly excellent at handling this sort of situation and even if you prefer to employ other indicators most of the time, MACD is worth tracking if only for this sort of occasion alone.



The following charts and information provide further illustrations and instruction regarding the material discussed during the presentation.



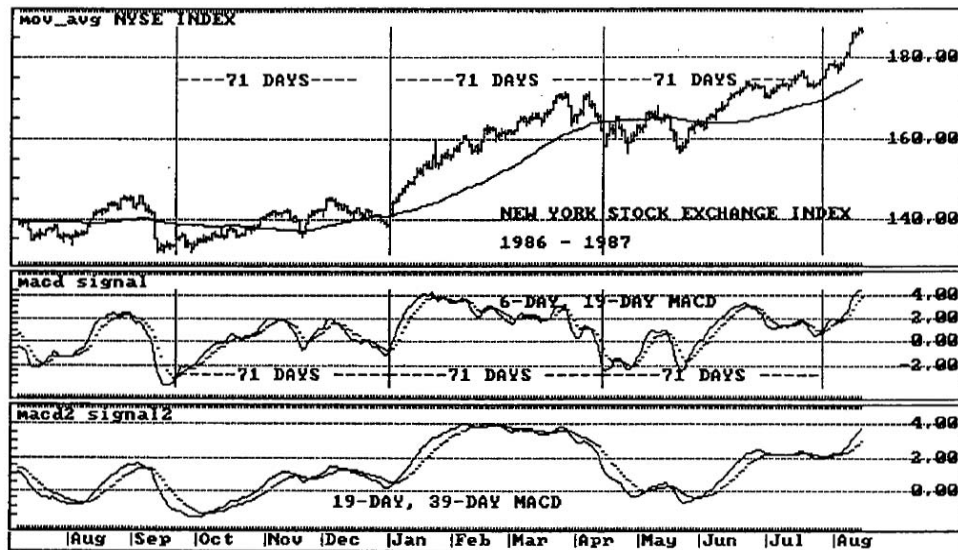
## CHART 24

### MACD AND THE 5-MINUTE TICK CHART

MACD may be employed for even the shortest time frames.

The above chart shows the March 1990 Standard & Poor's (S&P) contract, plotted at 5-minute intervals. The entire chart spans less than two trading days.

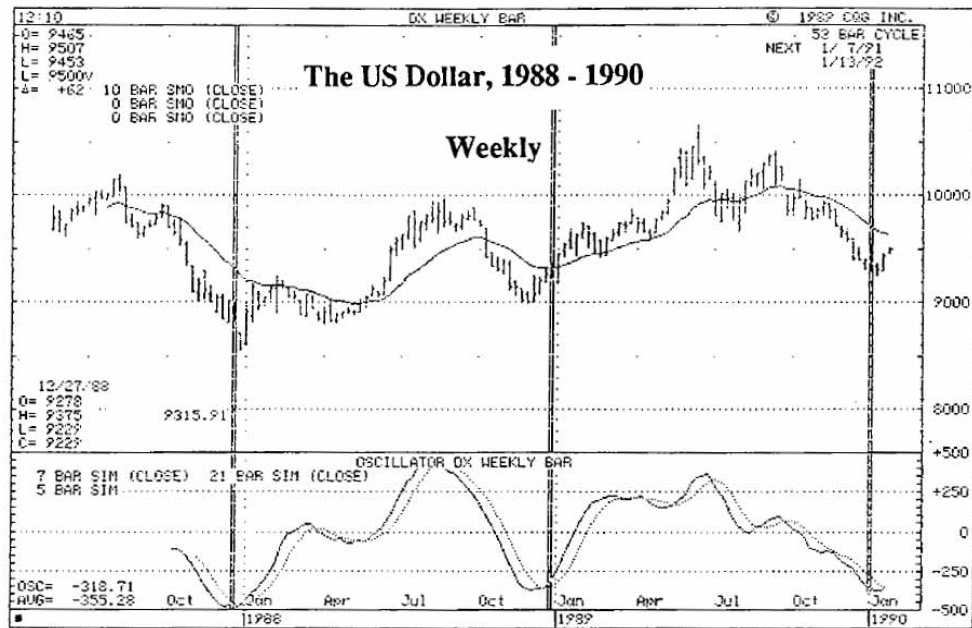
A 6-unit, 21-unit MACD is employed. Notice the use of trendlines during strongly uptrended periods, as signified, in this case, by a 30-unit moving average. You might also want to observe the use of down trendlines and the significance of their violation.



**CHART 25**  
**MACD AND THE 71-DAY MARKET CYCLE**

MACD provided significant entry junctures on a 71-day market cycle during 1986-1987, a cycle very close to the 65-day cycle that we examined previously in operation during 1988.

The 71-day cycle was very efficient during this time span. Cycles do expand and contract occasionally, but I have found over the years that the 8-week cycle, the 16-week cycle and the 24-week cycle all remain consistently significant, at least in terms of the American stock market.

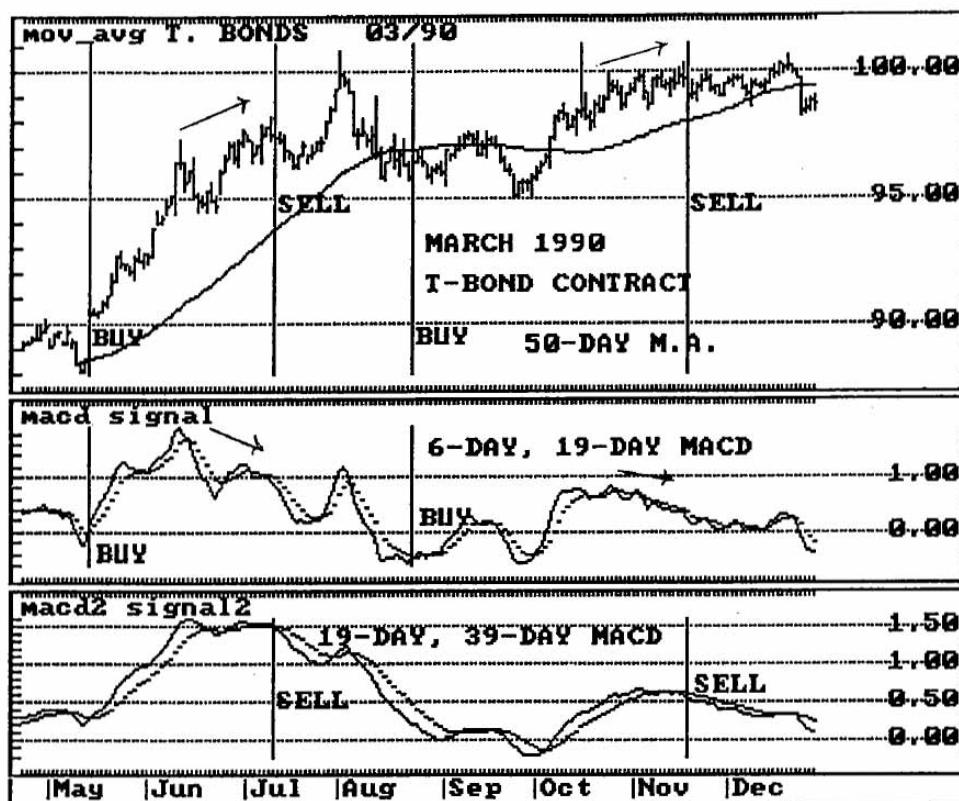


**CHART 26**  
**THE 53-WEEK CYCLE OF THE US DOLLAR CONTRACT**

The above is a weekly chart of the US Dollar futures contract.

A 53-week or approximate one-year market cycle seems to be operative as of January 1990. The very cyclical swings up and down mid-cycle are apparent. The MACD pairing is a 7-week, 21-week combination.

A one-year cycle is operative in the United States stock market as well. Important annual lows tend to develop during the months of October or November, with highs developing on an annual basis, very often within the second quarters of each year.



## CHART 27

### SHIFTING YOUR SELL PARAMETERS BECAUSE OF DIVERGENCE

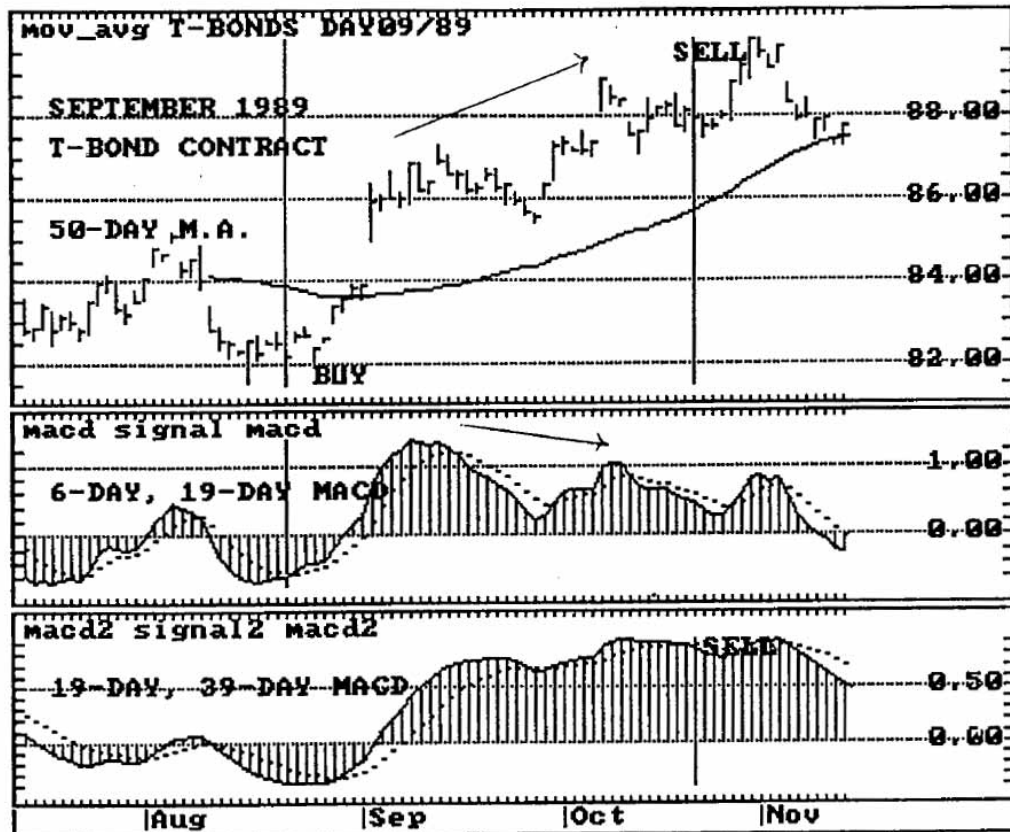
This is a very instructional chart.

With price trends favorable, we employ the rapid 6-day, 19-day MACD for entry into the treasury bond market, May 1989. In June, the 19-day, 39-day MACD line crosses from above to below its signal line. However, the sell need not be taken because the trend (50-day moving average) is rising rapidly and because there have been no negative divergences, both the short term and longer term MACD lines achieving new highs with the price of treasury bonds.

The sell signal in July is taken because it is preceded by negative divergences in both the short term and the long term MACD lines.

The sell signal in November is taken because that too is preceded by divergences in both the short term and longer term MACD lines.

Results of trading via MACD can be considerably improved if you employ this indicator in conjunction with other tools and concepts in this manner.



**CHART 28**  
**ANOTHER EXAMPLE OF THE DELAYED SELL**

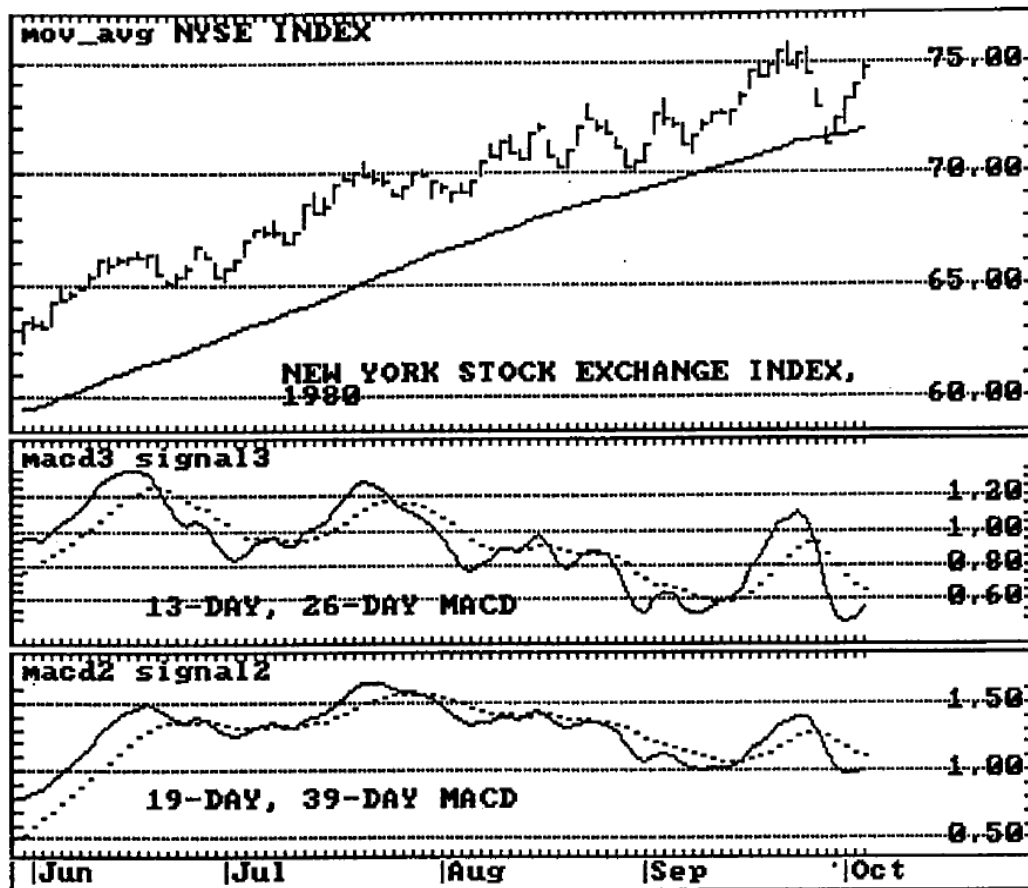
A fine buy signal was generated in August of 1988.

The 19-day, 39-day MACD crossed from above to below its signal line in late September but with the uptrend accelerating and with no negative divergences developing, the sell could have been bypassed.

By October, however, negative divergences had begun to appear and so we take the second sell signal that developed at the time.

As matters worked out, the market did rise to one final peak before declining. You would not sell short on the sell because price trends were still sharply rising.





**CHART 29**  
**A DIFFICULT CLIMATE FOR MACD**

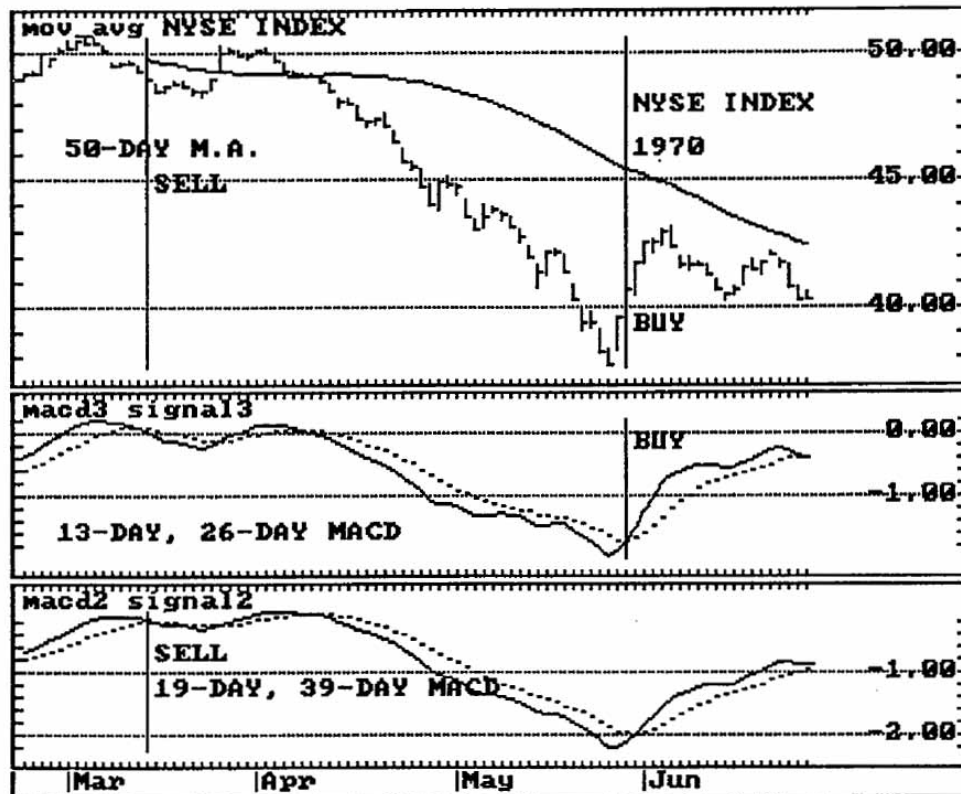
This is a period similar to the period shown during the presentation. Stock prices rose steadily between June and October 1980, but with narrow swings that are not tracked well by MACD.

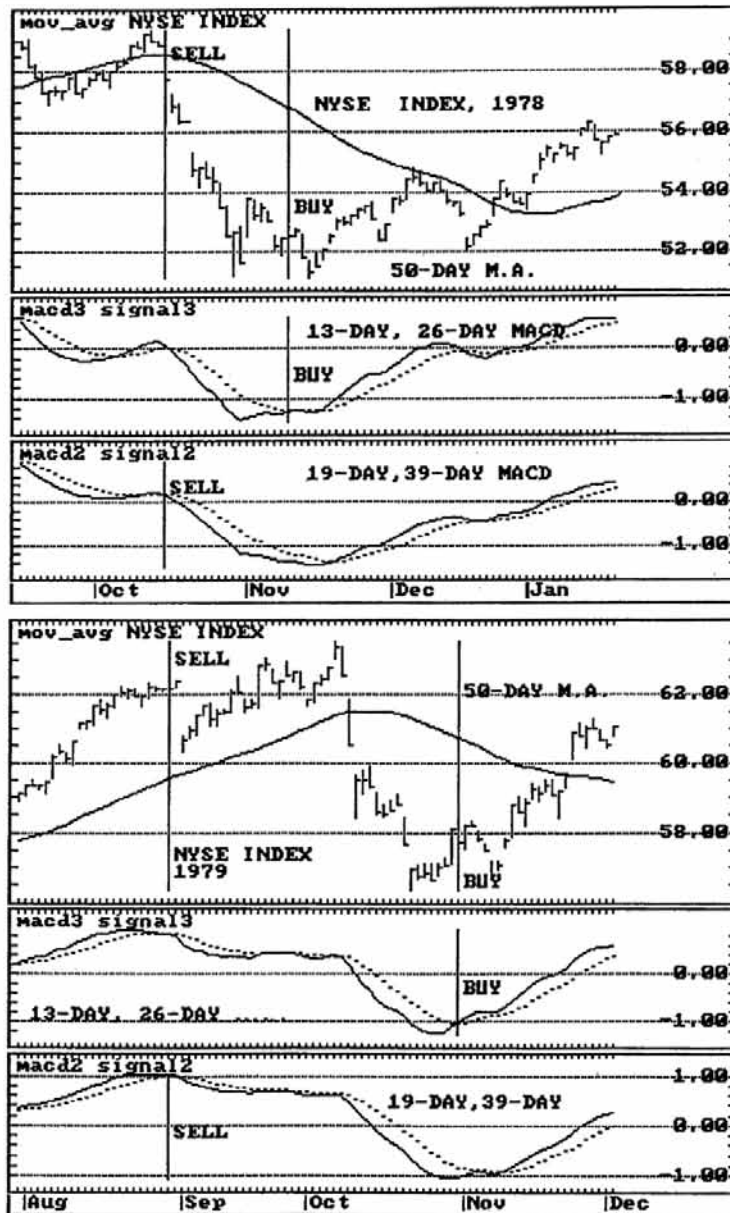
The longer term MACD produced sell signals during June and July, but MACD lines did not fall below 0 thereafter, thereby providing no re-entries back into the rising market.

Notice the similarities between this period and the period shown in Chart 20.

The following three charts all provide further illustration of MACD's ability to keep investors out of the stock market during serious market declines while, at the same time, providing excellent re-entry signals as declines come to conclusion.

The periods shown are the winter and spring of 1970 and October of 1978 and 1979. The charts, by this time, should be self-explanatory.







## HOW TO COMPUTE AND MAINTAIN EXPONENTIAL MOVING AVERAGES

MACD lines may be created with simple moving averages but my research into the use of MACD has involved exponential moving averages which track trends more closely. Differentials in performance between simple moving averages and exponential moving averages are not great, but once the method is known, exponential averages are simpler to maintain and possibly more efficient in their use.

Here is how to calculate exponential moving averages.

### THE SMOOTHING CONSTANT:

Before you can compute an exponential average, you must derive a smoothing constant which is based upon the number of trading units you wish represented in your average.

To derive your smoothing constant, you apply the following formula:

$$\text{Smoothing constant} = 2/(10+1) = 2/11 = .18$$

You wish to derive a smoothing constant for a 39-day exponential average:

$$\text{Smoothing constant} = 2/(39+1) = 2/40 = .05$$

### APPLYING THE SMOOTHING CONSTANT:

Once you have secured your smoothing constant, you apply it in the following manner:

$$\begin{aligned} \text{New Exponential Average} &= \text{Smoothing Constant (today's close - yesterday's exponential average)} \\ &+ \text{yesterday's exponential average} \end{aligned}$$

### EXAMPLES:

Let's suppose that you are employing a .10 smoothing constant, representative of a 19-day exponential average. Yesterday's exponential average of the NYSE Index stood at 190.00. Today's close of the NYSE Index came to 191.00.

What would today's 19-day exponential average of the NYSE Index come to?

### CALCULATIONS:

**The new exponential average would be calculated as follows:**

$$\begin{aligned} \text{New average} &= .10(191.00 - 190.00) + 190.00 \text{ (yesterday's exponential average)} \\ &= .10(1.00) + 190.00 = .10 + 190.00 = 190.10 \text{ (new exponential average)} \end{aligned}$$

For another example, let's suppose that yesterday's exponential average stood at 191.00, that, today, the NYSE Index closed at 190.00, and that you desired a 39-day exponential average reading. The smoothing constant for a 39-day exponential average is .05.

$$\begin{aligned}\text{New average} &= .05(190.00 - 191.00) + 191.00 \\ &= .05(-1.00) + 191.00 = -0.05 + 191.00 = 190.95\end{aligned}$$

You will have to achieve familiarity with the use of negative numbers to perform these calculations.

### **STARTING AND STABILIZING YOUR EXPONENTIAL AVERAGE:**

Exponential averages require a period of time for stabilization before they become accurate.

For practical purposes, you can establish initial exponential averages in the following ways:

- 1) Start with a straight average as your first assumed exponential average. In other words, if you want to secure a 19-day exponential average, take a simple average of the most recent 19 days and assume the result to be equivalent to your starting 19-day exponential average. This method is not precise, mathematically, but is close enough for all practical purposes.
- 2) As an alternative, you can simply assume that yesterday's price is equivalent to yesterday's exponential average and proceed from that point on. Your results will not be immediately accurate, but after a period, roughly double the period covered by the exponential, they will become accurate enough for practical purposes. If you are working on a .10 or 19-day exponential average, your results should become sufficiently stable after approximately 38 days ( $2 \times 19$ ) to be useful.

Once your exponential averages are under way, you will find them simpler to maintain than simple moving averages.

## **TABLE 1 — SUMMARY OF MACD PROCEDURES**

### **FOR YOUR MACD INDICATOR:**

Calculate and construct a very fast 6-unit, 19-unit MACD with a 6-day signal line for buy entries.

Calculate and construct a medium speed 13-unit, 26-unit with a 9-day signal line for buy entries.

Calculate and construct a slow speed 19-unit, 39-unit MACD with a 9-day signal line for sell entries.

Exponential averages are employed in all cases. Take these as starting combinations only. Test for the best combinations to use in your own markets. Position traders should calculate MACD on at least a daily and weekly basis, monthly possibly as well. Day traders should calculate at least the daily MACD in addition to the intra-day time frame in which they trade.

Calculate and construct a trend following moving average. I suggest a 50-unit simple moving average for starters, but you may want to experiment and optimize for your own markets.

### **BUY SIGNALS:**

First, test for trend with the 50-unit moving average.

Second, test for positive divergences in your buy MACD indicators.

Third, test for the presence of an important market low to low time cycle. We are looking for cycles of at least 6 weeks in length for daily trading, at least 4-5 days in length for day trading.

If two of the above three ingredients are in place, then use your most rapid buy MACD for long side entry. You may still employ the most rapid entry if one of the above is in place but risk will be somewhat higher.

If longer term trends are down, then you will generally want to employ the medium speed MACD as your entry. This will provide the markets a little more time to base following market declines during pronounced downtrends.

### **NOTES:**

Unless the trend is extremely favorable, or a clear positive divergence is in place or a significant down trendline is being violated, no buy signal can occur until the MACD that is being used for buying has first fallen below 0.

## TABLE 2 — SELL PROCEDURES

### SELL SIGNALS:

*When long term trends are rising and when there are no negative divergences in either the buy or the sell MACD combinations:*

Sell on sell signals generated by the 19-unit, 39-unit MACD.

At your option, you may bypass the first sell signal that takes place, allowing the market time for one more swing upwards. If you do bypass, then use your 50-day moving average as your stop, selling if the average is penetrated to the downside.

Always take the second of two sell signals generated by the 19-unit, 39-unit MACD.

*When long term trends are rising or neutral and when there have been negative divergences in either the buy or the sell MACD combinations:*

Sell on sell signal generated by the 19-unit, 39-unit MACD.

*When long term trends are clearly declining:*

Sell on sell signals generated by the buy MACD, probably (in this case) the 13-day, 26-day MACD.

### NOTES:

During positively trended or neutral market periods, no sell is possible until *both* the buy and sell MACD lines have crossed from below to above 0, unless the buy signal MACD falls to a level lower than the lowest level that immediately preceded the buy signal.

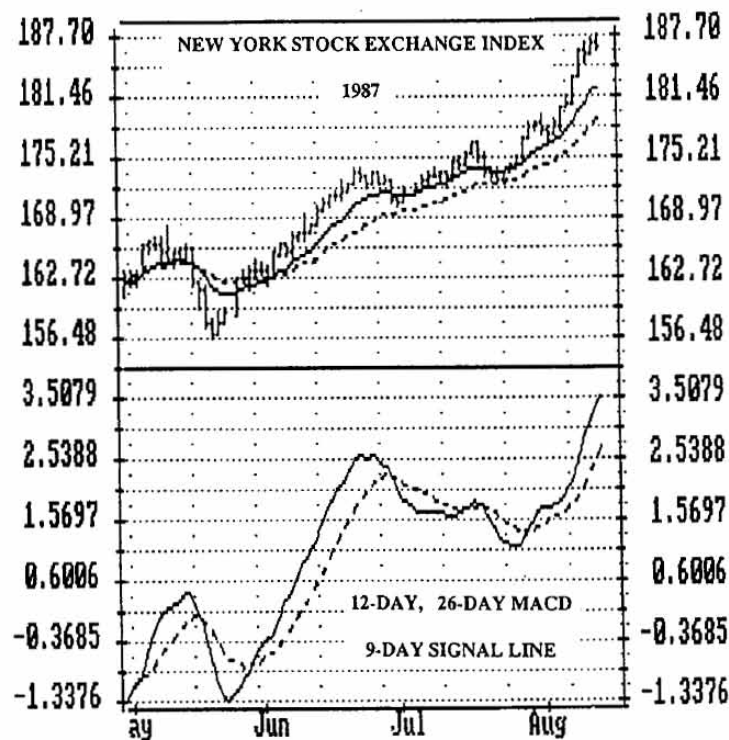
During negatively trended market periods, no sell is possible until at least the buy MACD has crossed from below to above 0, unless this MACD falls to a level lower than the lowest level that immediately preceded the buy signal.

The table below shows the layout of your daily posting of the data required for MACD. “EMA:12” is the column for the 12-day exponential average. “EMA:26” is the column for the 26-day exponential average. The column next to the last column on the right, “EMA:12 - EMA:26” is the differential between the 12-day exponential average and the 26-day exponential average, the MACD line. The column, “EMA:9” is the 9-day exponential average of the MACD line, the signal line.

The chart relates to the period partially covered by the data, which relates to the final month shown on the chart.

#### NYSE INDEX

DATE	OPEN	HIGH	LOW	CLOSE	EMA:12	EMA:26	EMA:12-EMA:26
870715	174.67	175.40	173.90	174.58	173.10	171.42	1.6755
870716	174.56	175.74	174.56	175.70	173.50	171.74	1.7588
870717	175.70	176.67	175.66	176.67	173.99	172.11	1.8813
870720	176.65	176.65	175.01	175.08	174.16	172.33	1.8291
870721	175.08	175.49	173.10	173.59	174.07	172.42	1.6484
870722	173.59	173.83	172.88	173.45	173.97	172.50	1.4769
870723	173.45	174.03	172.32	173.03	173.83	172.54	1.2923
870724	173.03	173.70	173.03	173.70	173.81	172.62	1.1863
870727	173.66	174.50	173.46	174.47	173.91	172.76	1.1512
870728	174.32	175.24	174.23	175.24	174.12	172.94	1.1720
870729	175.23	177.02	175.01	177.00	174.56	173.24	1.3153
870730	177.00	178.55	177.00	178.32	175.14	173.62	1.5179
870731	178.31	178.69	178.03	178.64	175.68	173.99	1.6849
870803	178.58	179.34	177.63	178.07	176.04	174.29	1.7510
870804	177.98	178.38	176.52	177.39	176.25	174.52	1.7286
870805	177.38	179.13	177.38	178.54	176.60	174.82	1.7831
870806	178.47	180.37	178.11	180.37	177.18	175.23	1.9515
870807	180.27	181.45	180.23	180.87	177.75	175.65	2.1011
870810	180.79	183.45	180.79	183.45	178.63	176.23	2.4001
870811	183.43	186.15	183.43	186.13	179.78	176.96	2.8208
870812	186.12	186.73	185.05	185.70	180.69	177.61	3.0840
870813	185.69	187.33	185.68	186.95	181.65	178.30	3.3548
870814	186.93	187.70	185.99	186.69	182.43	178.92	3.5079



# **BIBLIOGRAPHY**

**SOURCE: TECHNICAL ANALYSIS OF STOCKS & COMMODITIES**

Aspray, Thomas. "MACD Momentum, Part 1." Aug. 1988: 294-297.

Aspray, Thomas. "MACD Momentum, Part 2." Sept. 1988: 346-349.

Ehlers, John F. "The MACD Indicator Revisited." Oct. 1991: 391-395.

Gopalakrishnan, Jayanthi. "Trading the MACD" (Sidebar: "The MACD Spreadsheet"). Oct. 1999: 445-448.

Gopalakrishnan, Jayanthi. "Interview: Gerald Appel & the MACD." Sept. 2003: 84-93.

Hartle, Thom. "Interview: Gerald Appel, with 'Systems and Forecasts'." Mar. 1994: 98-105.

Penn, David. "Working Money: Symmetrical Triangles and the MACD." June 2004: 68-71.

Perkers, Kent. "Stocks, Interest Rates and the MACD." Nov. 1992: 467-470.

Raff, Gilbert. "The Relative Strength Ratio-MACD Crossover Indicator." Nov. 1994: 451-452.

Soudack, Avrum, and Gene Quong. "Volume-weighted RSI: Money Flow." Mar. 1989: 76-77.

Star, Barbara, Ph.D. "The MACD Momentum Oscillator." Feb. 1994: 81-85.

Star, Barbara, Ph.D. "The MACD Profit Alert"  
[Sidebar: "Moving Average Convergence/Divergence (MACD) and MACD Histogram," Sidebar: "The Bar Count."].  
Dec. 1998: 588-591.

Vakkur, Mark, M.D. "The Moving Average Convergence/Divergence." Apr. 1997: 345-353.

**SOURCE: ACTIVE TRADER**

Bierovic, Tom. "Triple Threat MACD." Feb. 2003: 42-47.

Bierovic, Tom. "Indicator Insight: Moving Average Convergence/Divergence (MACD)." Jul. 2001: 88-90.

Tilkin, Gary L. "MACD Divergences." Jun. 2001: 54-56.

Zieg, Dr. Kermit and Michael Berman. "Allocating Capital to Multiple Trading Signals." Nov. 2006: 28-34.



# Annotated Bibliography

Achelis, Steven B. Technical Analysis from A-Z.

New York: McGraw-Hill, 2001.

- (P. 199-202) Offers a detailed description of the specific calculations for MACD.

Appel, Gerald. Technical Analysis: Power Tools for Active Investors. New Jersey: Prentice Hall, 2005.

- (P. 165-198) Since Gerald Appel invented MACD, this book contains a lengthy description of many different aspects of the system. Certainly the most involved and diverse report on the subject, he refers to it as “the ultimate market timing indicator.” He introduces the chapter with the basic concepts and moves into more intense discussions and abundant illustrated examples, making it an exceptional read for both beginners and experts.

Brown, Constance. All about Technical Analysis.

New York: McGraw-Hill, 2003.

- (P. 169-172) Defies several common myths concerning which methods may or may not be used to confirm MACD results.

Colby, Robert W, CMT. The Encyclopedia of Technical Market Indicators. 2<sup>nd</sup> ed. New York: McGraw-Hill, 2003.

- (P. 412-413) A very concise definition which strictly provides Gerald Appel’s original ideas.

Elder, Dr. Alexander. Come into my Trading Room.

New York: John Wiley & Sons, 2002.

- (P. 102-109) An outstanding reference for extended illustrations and descriptions of the MACD histograms.

Elder, Dr. Alexander. Entries and Exits: Visits to Sixteen Trading Rooms. New York: John Wiley & Sons, 2006.

- (P. 119-135) No detailed references to MACD, but contains an excellent biographical chapter on Gerald Appel's personal and financial background.

Elder, Dr. Alexander. Trading for a Living.

New York: John Wiley & Sons, 1993.

- (P. 127-135) A detailed description of MACD including how it is calculated, market psychology that it reflects, trading rules, divergences and how to use the MACD histogram to make effective trading decisions.

Meyers, Thomas A. The Technical Analysis Course. 3<sup>rd</sup> ed.

New York: McGraw-Hill, 2003.

- (P. 187-189, 245, 253, 264) Illustrates examples of MACD through charts using several companies as examples. Also warns the reader about the use of MACD as a mechanical system.

Murphy, John J. Technical Analysis of the Financial Market.

New York: NYIF, 1999.

- (P. 252-255) Provides a general description of MACD, with a section that includes a more extensive explanation of MACD histograms.

Murphy, John J. The Visual Investor: How to Spot Market Trends.  
New York: John Wiley & Sons, 1996.

- (P. 119-133) Interesting suggestions about the possibilities of using MACD with stochastics.

Person, John L. Candlestick and Pivot Point Trading Triggers.  
New Jersey: John Wiley & Sons, 2007.

- (P. 103-108) Points out the changes in MACD since the popularization of computer software.

Pring, Martin J. Technical Analysis Explained.  
New York: McGraw-Hill, 2002.

- (P. 228-230) Provides an unusual definition of MACD, referring to it as a “form of trend-deviation indicator.”

Schwager, Jack D. Getting Started in Technical Analysis.  
New York: John Wiley & Sons, 1999.

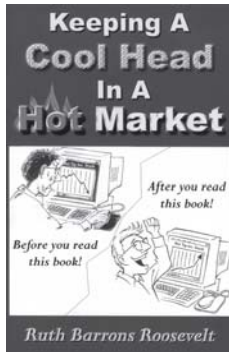
- (P. 214-216) Gives a very brief description of MACD, but includes a wonderful glossary of key terms for beginners.

Schwager, Jack D. Technical Analysis.  
New York: John Wiley & Sons, 1996.

- (P. 538) Another very brief spread on MACD, but slights the MACD histogram as “overly sensitive and ill-suited for most analytical purposes.”

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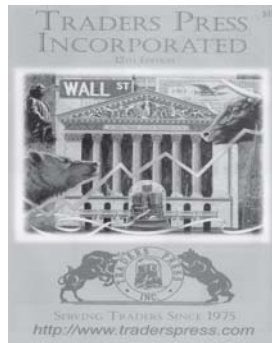


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**Edward Dobson** was born in California and raised in South Carolina. At age 12, his father instilled in him an interest in stock investment. This became a life-long passion, which came to encompass trading in securities, options and futures. After college and military duty, he was a broker with Smith Barney and Paine Webber for 23 years, specializing in options and futures. In 1992, he left the brokerage business to devote full time to his publishing business, Traders Press, Inc (founded in 1975), and to trading. He is currently an active trader and still active to his business.



**Gerald Appel** has published the leading technical analysis publication *Systems and Forecasts* since 1973. He is legendary for his work in technical analysis and market timing, including the creation of Moving Average Convergence-Divergence (MACD), one of the field's most widely used tools. His books include *Winning Market Systems: 83 Ways to Beat the Market* and many others.

Appel's company, Signalert Corporation, together with its affiliates, currently manages over \$550,000,000 in private capital. He has trained thousands of traders through his renowned tapes, seminars and workbooks. He recently taught a series of four-day international master classes on investing and trading strategy.

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