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Technical analysis and the stock market

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INTRODUCTION

Over the years there has been a considerable amount of
controversy on the use of technical analysis as a method of
timing the purchase and sale of investments. Academicians
have dismissed the various chartist theories, Eugene F. Fama
in "The Behavior of Stock-Market Prices" said that "chart
reading, though perhaps an interesting pastime, is of no real
value to the stock market investor" (34). However, the
chartists have not been deterred from trying to time the
market in their pursuit of increased gains.

As early as 1900, there was interest in market
forecasting, however, it was limited to a small number of
people, mostly in the east, who used tape-reading and figure
charts. The market during this time period was low volume and
often manipulated by the owners of the few listed companies.
Thus, tape watchers could observe the buys and sells of these
owners and distinguish patterns that gave insight into what to
expect. Figure charting was also popular as a method to
estimate future prices. These charts depicted the intra-day
price moves and were used to study price changes at a trend
reversal.

Around 1920, production statistics became increasingly
important to market forecasting. Colonel Ayres' "Blast
Furnace Index" was one well-known business indicator. The

fundamentals of this index were "when the average rate of blast furnaces in operation crossed 60% on the way up, the market was high enough to be sold, and when it crossed 60% on the way down, the price level was low enough to be bought" (Drew 11). The danger in any forecasting method is that what is valid in one time period may not be valid in another, a case in point being the Blast Furnace Index. It is possible to take almost any series of changing figures and by suiting various statistical adjustments to the known facts, arrive at something approximating what would have been a "forecast" of the stock market.

The various technical indicators rely on the basic assumption that inherent in past price information and trends lies the future. Technicians believe that the "stock market is oligopolistic in nature, and there is thus an unequal distribution of critical information throughout the market place" that produces patterns and trends in prices that indicate the future (Levy 69). Thus, by careful analysis, the chartist can use the past data and extrapolate the patterns to increase expected gains. The stumbling block, however, seems to be that, as always, there are exceptions to the rule. While history tends to repeat itself, it is not one hundred percent reliable, and the patterns are not consistently dependable.

The antithesis of technical analysis is the efficient market hypothesis which is grounded in the Random Walk Theory. This random walk says that past price data is of no value in trying to predict the future course of a stock's price. "In statistical terms the theory says that successive price changes are independent, identically distributed random variables" (Fama, Behavior 34). In other words, a market that is functioning properly will have capital assets that are priced accurately based on all relevant and available information (Fama, Efficient 418).

This paper will review literature on both the efficient market hypothesis and technical analysis and then attempt to empirically test the opposing views by analyzing ten stocks over a four and one-half year period comparing their returns based on a buy-and-hold strategy versus three of the market timing strategies.

CHAPTER I

EFFICIENT MARKET HYPOTHESIS

The Efficient Market Hypothesis (EMH) has been an intensely researched investment topic. An efficient market is one where prices fully reflect all information, an ideal setting for both firms and investors where production, investment, and ownership decisions can be made with a high degree of certainty. While not absolutely necessary, the following conditions are assumptions that Eugene Fama believes assure market efficiency: no transaction costs, all information is costless and available to all market participants, and all participants agree on the implications of information for the current price and for distributions of future prices (Efficient 387). Unfortunately, reality does not provide such a frictionless market; however, as long as investors assimilate the available information, prices will fully reflect that knowledge. Some potential sources of market inefficiency occur when information is not freely available or if some investors consistently display superior interpretive skills (Fama, Efficient 388).

The EMH's general form is that the "size and direction of a stock price change at time t+1 is random with respect to information set S at t" (Sorensen 29). (If S is historical stock prices, then it is the weak form of the EMH. If all publicly available information is S, then we have the semi-

strong form, and if S is equal to all information then we are dealing with the strong form of the EMH.) The random change occurs as a result of new information that is immediately reflected in the stock price. In other words, price changes are the result of perceived earnings changes or changes in the expected return of alternate investments because of the new information.

Weak, Semi-Strong, Strong Forms

Since it is unrealistic to believe that frictionless markets exist, the evidence on EMH has been categorized into three distinct forms, weak, semi-strong, and strong, allowing definite break-points for analysis.

Weak Form   The weak form of the EMH defines the relevant information set as historical prices. There have been a considerable number of tests on the weak form with most results supporting the notion; thus within academic circles, weak form is a decided issue. Many researchers liken weak form EMH testing with technical analysis, they believe that technical analysis is contrary to basic economic logic and that this fact is demonstrated in the weak form testing that has consistently proven that price changes are independent over time. While there is some evidence for dependence in price changes, it does not seem to be sufficient to rule that the market is inefficient, especially if the price change covers a period of at least one day or longer. The dependence

is apparent in the filter tests of Sidney S. Alexander considered later in this paper. However, as will be explained, trading profits are eaten up by the numerous transaction fees that are an integral part of any filter method (Fama, Efficient 414).

Joy and Jones (51) criticize the dismissal of technical analysis based on the weak form testing. They assert:

1. There is not a one-to-one mapping between weak form analysis and technical analysis.
2. Many weak form tests are not direct tests of specific forms of technical analysis.

Joy and Jones contend that while tests of weak form support the EMH, these tests are not conclusive as they relate to technical analysis since technical analysis is broader than just past price changes. Past prices are just one type of data and little study has been done on the volume data which is jointly analyzed with price information as a form of market timing. Thus, it is incorrect to conclude that technical analysis is invalid based on the weak form tests.

Sweeney (New 299) questions the weak form, his studies have found that, at least at floor traders level of transaction costs, the market is weak-form inefficient. He offers three explanations for this phenomenon: 1) the value of a seat on the exchange is equal to the present value of the profits available; 2) opportunity costs of implementing the rules reduce the profits available; 3) Traders, other than

floor traders, move the market against themselves while trying to consummate the trade.

    <u>Semi-Strong</u>   The semi-strong form of the EMH asserts that publicly available information is reflected in price changes. Tests of this form of market efficiency also support the EMH. However, the tests generally only consider one type of information at a time, for example, annual earnings or stock splits; thus, one must accumulate the results of each test to check the validity of the semi-strong form model.

    Fama reports on the results of tests of several different types of information (annual earnings, new issues, stock splits) and concludes that the results indicate market efficiency (Efficient 415). The Fama, Fisher, Jensen, and Roll test on stock splits found that it may not be the splits themselves that motivate price changes but rather the accompanying information. They studied returns around the date of the splits to see what generated the price changes and found that the price appears to adjust when the split is declared, probably in anticipation of an increase in future dividends (Fama, Efficient 407). In conclusion, they found that the stock market is efficient as it adjusts to stock split information.

    Other tests that support the semi-strong efficient markets hypothesis, are Ball and Brown who studied annual earnings announcements. They concluded that eighty-five to

ninety percent of the information content in earnings reports
is incorporated into prices by the month of the announcement.
Discount rate changes by the Federal Reserve Banks were
studied by Waud with findings that the market appears to
anticipate the news since prices tend to adjust in the days
preceding the announcement. By the first trading day after an
announcement the price adjustment is inconsequential (Fama,
Efficient 408).

Scholes also tested the semi-strong form by looking at
large secondary offerings and concluded that the prices appear
to adjust because of the negative information implicit in the
selling of a large block of stock. Prices adjust an even
greater amount if the seller is the company itself, even
though the seller's identity is not public information prior
to the time that the prices adjust (Fama, Efficient 409), a
fact that is indicative of insider information or information
leaks.

Robert A. Schwartz, (Fama, Efficient 422) disagrees
somewhat with Fama's conclusion that the market is efficient
in the semi-strong form. He states that while "anticipatory
price adjustments do indicate that, on average, new
information is quickly gleaned and responded to by the
investment community" there does appear to be some monopoly
position for the trader because the early receipt of
information gives him control. While the monopoly position is

only transitory, persistently early information seems to suggest that the trader has a market advantage which is inconsistent with the semi-strong form. The length of time it requires for the market to adjust may also suggest inefficiency. Schwartz continues that even Fama finds some dependence in prices (although Fama says that it is not sufficient to reject the Efficient Market Hypothesis) and until there are no further tests to be conducted, the question of an efficient market is far from settled (Fama Efficient 423).

Schwartz believes that if a specific stock's price is volatile and appears to behave in a consistent fashion over a period of time, a trader may be able to gain excess profits by utilizing the information contained in the consistency. He might be able to do so "not on the basis of expectations of a specific directional price change, but rather on the expectation that one stock's price is simply more apt to change than another's" (Fama, Efficient 423).

"In all tests cited, stock prices appear to react prior to the event in issue. Therefore, it is observed that prices "incorporate, fully and early, new information of the type considered in these studies" (Fama, Efficient 421), leading to the conclusion that the market is efficient in the semi-strong form.

<u>Strong Form</u>   Finally, strong form market efficiency denies the possibility that certain groups or investors have access to information that is neither publicly available nor reflected in prices (Fama, Efficient 414). Tests of the strong form try to determine if all available information is fully reflected in prices so that no one can have higher expected profits because of monopolistic information. Fama does not believe that the strong-form accurately describes the market although it could be used as a "benchmark against which the importance of deviations from market efficiency can be judged" (Fama, Efficient 414-415). Two such deviations are: 1) Niederhoffer and Osborne's reports that specialists on exchanges have monopolistic information concerning limit orders and use this information to create trading profits, and 2) Scholes reports that corporate insiders have capitalized on information to make excess profits. Fama asserts that:

> corporate insiders and specialists are the only two
> groups whose monopolistic access to information has
> been documented. There is no evidence that
> deviations from the strong form of the efficient
> markets permeate down any further through the
> investment community. For the purposes of most
> investors the efficient markets model seems a good
> first (and second) approximation to reality
> (Efficient 415-416).

Expected Return or Fair Game Models

Most empirical testing of the Efficient Market Hypothesis has been carried out within the context of the Expected Return or Fair Game models. These models are based on the two

following assumptions, 1) market equilibrium can be stated in terms of expected returns and 2) information is fully utilized in forming equilibrium expected returns and thus current prices. There are concerns regarding these assumptions since one must define "true expected value" and "fully reflected," concepts which can be measured by many different criteria. One Expected Return or Fair Game model that has been rigorously studied is the Random Walk.

Random Walk   Around 1890, Louis Bachelier first stated and tested the Random Walk model in his provocative paper "Theory of Speculation." His "'fundamental principle' for the behavior of prices was that speculation should be a 'fair game'; in particular, the expected profits to the speculator should be zero" (Fama, Efficient 389). Under the fair game principle, trading systems that produce greater than normal profits are impossible. A random walk:

> arises within the context of such a model when the
> environment is (fortuitously) such that the
> evolution of investor tastes and the process of
> generating new information combine to produce
> equilibria in which return distributions repeat
> themselves through time. (Fama, Efficient 387)

Early evidence accumulated that pointed to a random walk where prices reflected all information and that successive price changes were identically distributed. This means that the market is efficiently competitive with sufficient sophisticated traders to cause instantaneous price adjustments

that reflect intrinsic security values. Thus, stock price variations are aimless and future prices are unpredictable.

The random walk implication that stock prices do not contain predictive information means that effective analysts are unable to earn extraordinary profits and that technical analysis based on past prices can not succeed in determining future price trends. This hypothesis is not viewed favorably by investment professionals but it is strongly adhered to by academicians.

In 1953, Maurice G. Kendall studied prices and concluded that the price "series looks like a wandering one, almost as if once a week the Demon of Chance drew a random number...and added it to the current price to determine the next week's price" (Fama, Efficient 390). Other tests also concluded that price changes appeared to follow a random walk. Paul Cootner reasoned that investors would force prices up if they bought when they believed the prices were too low.

> Except for appreciation due to earnings retention,
> the conditional expectation of tomorrow's price,
> given today's price, is today's price...since there
> is no reason to expect that information to be non-
> random in appearance, the period-to-period price
> changes of a stock should be random movements.
> (Fama, Efficient 390)

In the broad form, the Random Walk Theory states that "fundamental analysis of publicly available information cannot produce investment recommendations that will enable an investor consistently to outperform a buy-and-hold strategy in

managing a portfolio" (Malkiel 168). Because intelligent investors discount new information so quickly it is extremely difficult to realize excess profits by utilizing fundamental analysis. The narrow form goes even further by asserting that technical analysis is also useless to investors since all knowledge is immediately reflected in prices.

A random walk does not suggest that prices are unaffected by changes in the fundamentals of a company. Just the opposite is true, a random walk signifies that new information is so quickly disseminated that it is virtually impossible for anyone to consistently benefit. In fact, the growing sophistication of investors almost insures that prices will reflect all new information, therefore, random forecasts of the market will provide as accurate an estimate as those reached through either fundamental or technical analysis.

According to Fama (Behavior 35), the Theory of Random Walks is based on two hypotheses. The first is that price changes are independent and the second is that these changes in price follow some probability distribution. Statistically, independence of prices means that "knowledge of the sequence of price changes leading up to time period 't' is of no help in assessing the probability distribution for the price change during time period 't2'" (Behavior 35). Fama continues, however, that the random walk is not a totally accurate

picture of reality since nothing is ever perfect. Thus some dependence will be found, although it should be at a minimum.

The minimum acceptable level of dependence, according to Fama (Behavior 35), depends on the point of view being considered. For the statistician conducting tests on successive price changes, if the dependence can not account for the property being tested, then the assumption of independence can be justified. On the other hand, a technician will use very practical rules in determining dependence, such as can the knowledge of past price changes be used to increase return. The investor would be willing to accept the Random Walk Theory if the degree of dependence could not be used to produce greater expected profits than a buy-and-hold policy (Fama, Filter 226). Thus, what is "important from a trader's point of view need not be important from a statistical point of view, and conversely dependence which is important for statistical purposes need not be important for investment purposes" (Fama, Behavior 35).

There are many views to explain price independence that are consistent with the Random Market Hypothesis. One of the least appealing views regarding independence in price changes is that stock prices are the result of randomly generated noise. Noise meaning the psychological and other factors that cause investors to purchase stocks in different companies. In

other words, prices are unrelated to economic and political
events.

Another view of price independence is that many investors
look for the intrinsic value of a stock in determining its
fair price. The Random Walk Theory can be consistent with this
idea only if it is understood that while prices **usually**
reflect the intrinsic value of the security which depends on
the earning prospects of the company which in turn are
affected by economic and political factors, prices do not have
to **actually** reflect intrinsic value and probably will not
since we live in an uncertain world where individual investors
analyze and reach conclusions that are inconsistent. Another
reason that actual values are in a state of constant flux is
that new information from research, changes in market forces,
governmental factors, etc., is constantly being disseminated
(Fama, Behavior 36).

Fama cites Bachelier as proposing another, simpler
argument for the independence assumption.

> If successive bits of new information
> arise independently across time, and if
> noise or uncertainty concerning intrinsic
> values does not tend to follow any
> consistent pattern, then successive price
> changes in common stock will be
> independent. (Fama, Behavior 37).

In other words, if new information is independent and the
noise concerning intrinsic value is independent then prices
are independent. Fama continues, however, that this is too

simplistic a view because there are opinion leaders that
influence the market and there is a tendency for good news to
follow good news, or bad new to follow bad news, all instances
causing price dependence (Fama, Behavior 1965).

Even if there is dependence in the information or noise
causing price dependence, "sophisticated traders in general
feel that actual prices usually tend to move toward intrinsic
values" or equilibrium (Fama, Behavior 38) thus the market can
over-ride the dependencies and produce independent prices.
For this to occur, there must be many sophisticated traders
that have superior analytical skills who can predict the
effect of new information on price behavior. Therefore, when
noise causes prices to be above or below their intrinsic value
the sophisticated traders evaluate the intrinsic value and
neutralize the noise by trading in the opposite direction and
thereby causing the prices to be independent. Thus, the
sophisticated traders erase the dependencies and bring the
price back to intrinsic value.

Over a period of time new information may arrive that
causes prices to over-adjust or under-adjust and creates a lag
before the new intrinsic value is evident. If the new
information is dependent, the prices tend to be dependent, but
again, sophisticated traders that are able to interpret the
information effect on prices will negate the dependency.
Since intrinsic values are not exactly known, the intrinsic

value and actual security price may be different because the actual value is affected by the noise (disagreement among investors about the intrinsic value). Where there is a lag in reaching intrinsic value chartists may be able to accumulate excess returns; however, this lag is an independent variable (Fama, Behavior 39).

Fama continues that while chartist's may aid in creating independence of prices, once the independence is established then charting becomes ineffective. On the other hand, intrinsic-value analysts who can consistently "predict the appearance of new information and evaluate its effect on intrinsic values will usually make more profits than can people who do not have this talent" (Fama, Behavior 39). Again, however, with enough analysts capable of consistently estimating the impact of new information, the ability becomes useless since prices will always reflect true intrinsic values and because there are no lags, there will be no profits to make, rather prices will instantaneously reflect the new information.

The second hypothesis to the Random Walk Model is less important than the independence hypothesis. This second hypothesis is that price changes conform to some probability distribution. The shape of the distribution does not have to be specified so any distribution is accurate if it describes

the price changing process. To an investor, however, the shape can be helpful in determining the riskiness of a stock.

Different models to explain the probability distributions have been based on the assumption that the price changes have normal or Gaussian distributions. Empirical tests have shown, however, that "most of the distributions of prices changes are leptokurtic; that is, there are too many values near the mean and too many out in the extreme tails" (Fama, Behavior 42). The leptokurtosis does not support the normality hypothesis. Generally, this problem has been explained away by assuming that extreme values are a result of extenuating actions that can be ignored. However, to the investor, this equates to an unassessed risk that needs to be considered before committing funds.

With the advent of the computer, more rigorous testing was possible. Two statistical methods of testing the Random Walk Theory are serial correlation studies which test the relationship of successive security prices and runs analyses that compares the length of actual price runs with a mathematically determined expected length of runs.

Robert A. Levy (70) suggests that tests of the Random Walk Theory using serial correlation or runs analyses are insufficient because of serious methodological deficiencies such as:

    1.   Inability to distinguish nonlinear patterns

2. Difficulty in interpretation
3. Rigidity with regard to the size of the price change
4. Difficulty in measuring risk
5. Nonfiltering of co-movement effects

Joy and Jones also criticize correlation studies as being indirect tests that "do not lend themselves directly to economic inference regarding EMH validity" (51).

Levy (70) proposes using simulation to avoid the statistical tests' weaknesses. However, because of the large amount of data that must be manipulated, a computer is necessary. Simulations put a trading strategy into practice, determine the results of utilizing the strategy, and compare the results with a strategy of random investment selection. Simulation avoids the pitfalls of serial correlation and runs analysis since it can detect non-linear patterns, test for relative strength which filters out co-movements, and it can assimilate the effects of brokerage commissions. The results of simulations are also expressed in dollars and cents and it provides for a measure of risk.

Conclusion of EMH

The numerous tests of market efficiency have concluded that empirical studies produce support for the Random Walk Model. While there is some indication that large price changes may be followed by large prices changes and there is a probability that a positive (negative) change today will result in a positive (negative) change tomorrow, there is no

evidence of any dependence that would aid investors,
especially as one tries to predict further into the future
(Fama and Blume 238). Fama even suggests that this only means
that new information cannot be evaluated immediately thus the
price may over- or under-adjust initially but in the following
days the price changes are random in sign and are, therefore,
impartial price adjustments created by the effects of the
information. He further notes that while this represents a
denial of the random walk it does not negate the Market
Efficiency Hypothesis (Fama, Efficient 396). Thus, past price
changes can not be used to provide greater expected profits.

Malkiel (171) raises some concerns regarding certain
random walk assumptions. He believes that the market has
proven too often that stocks do not always sell at anyone's
evaluation of price especially during periods of speculation
where prices ride wide swings and no one is able to pin down
the true intrinsic value. Also of concern is the presumption
that news travels instantaneously to everyone and that no
investor wields monopolistic power in the market. Malkiel
asserts that there are too many powerful brokerage firms that
are considered market leaders who can, at least for a time,
provide self-fulfilling prophecies.

Robert Ferguson goes beyond questioning the possibility
of an efficient market, he ridicules the concept. Ferguson
states "the fact is that market efficiency is implausible on

the basis of common sense experience" (31) and continues with examples of investors who displayed advantages in information, analysis, judgment, and idiosyncratic behavior and were able to benefit from their abilities at the expense of other less capable traders.

If the market truly follows a random path, then the average investor's decisions are simplified. The investor can add a randomly selected security from a specific risk class and, on the average, any security so chosen will have about the same effect on the expected return and riskiness of his portfolio as one chosen using any other method (Fama, Behavior 40).

In summary, the Random Walk Hypothesis can not be proven by statistics or simulation. The only assertion that can be made is that the technical strategies tested do not yield greater profits than those provided by a random selection (Levy 70).

CHAPTER II

TECHNICAL ANALYSIS

Technical analysis is a category of trading techniques that attempts to forecast prices through the use of past price information and a few other statistics about security trading such as volume. Technicians believe they can detect market supply and demand in the charts. Technical analysis came into use long before financial information was publicly available that allowed fundamental analysis, with the Dow Theory probably being the oldest technique dating back to the late 1800s. Many of the techniques in use today have been around for many years. These techniques look for relationships in stock prices.

The fundamental premise of technical analysis is to identify and predict the movements of market trends, to evaluate market relative strength or weakness, and to profit from the application of that analysis. A pure technical approach disdains the use of fundamental data that contains facts "relating to the market, but external to it," because it is believed that by the time the fundamental data is public, it is already reflected in the stock price (Drew 21).

By applying superior analytical skills to public facts, insights are gained that provide opportunities for profit as long as the investor's analysis is correct on two counts: "first, the estimate of the worth of the information must be

reasonably accurate in terms of its impact on the price of the stock, and second, the investor must make a realistic assessment of the likelihood that the market already has received the information or insight in question" (Treynor and Ferguson 757).

A plot of past unique returns will aid in determining if the market has already received the information. A recent spike in the unique returns will denote that the market has already assimilated the information and the investor will know that this information is valueless. If the unique returns do not display a recent spike, the investor can assume the information still has value and that it is possible to gain from it. Treynor and Ferguson clearly state that "it is the nonprice information that creates the opportunity. The past prices serve only to permit its efficient exploitation" (773).

The attitude of academics towards technical analysis, until recently, is well described by Malkiel:

> Obviously, I am biased against the
> chartist. This is not only a personal
> predilection, but a professional one as
> well. Technical analysis is anathema to
> the academic world. We love to pick on
> it. Our bullying tactics are prompted by
> two considerations: (1) the method is
> patently false; and (2) it's easy to pick
> on. And while it may seem a bit unfair to
> pick on such a sorry target, just
> remember; it is your money we are trying
> to save (116).

Others in the academic world also disagree with technical

analysis based on comparisons of the buy-and-hold strategy and

the whip-saw argument. Glickstein and Wubbels (29) dismiss

the arguments, however, stating that a buy-and-hold strategy

from January 2, 1971, to December 31, 1980, would have had

average capital appreciation of 1.6% per annum compared to the

average capital appreciation of 14.6% per annum if trading had

occurred based on the Dow Theory. For the same ten-year

period the whip-saw argument, which states that "those who

trade based on technical indicators are liable to get in too

late on the upside and to get out too late on the downside,"

did not hold up either. Only two instances were noted where

trading based on the technical indicators would have created a

loss. The greatest loss, which was less than three percent,

was June 14, 1976, to August 20, 1976. Based on these

findings they feel that the whip-saw and buy-and-hold

arguments are not material.

Even with all the controversy, technical analysis has

been enjoying a renaissance on Wall Street. All major

brokerage firms publish technical commentary on the market and

individual securities, and many of the newsletters published

by various "experts" are based on technical analysis.

Indicators

Before the computer age, technical analysis was confined

to drawing charts of prices and analyzing the patterns and

formations on those charts. With the appearance of computers, especially personal computers, technicians began inventing new methods that attempted to measure things that had previously been nonmeasurable, such as how overbought a market was, the strength of its current trend, or the prospect of a change in trend. These studies have evolved into indicators that serve as important technical trading tools.

Alexander Elder (Heeding 36) believes that even "bad" trading signals relay vital information. When a normally reliable indicator does not work, he calls it "The Hound of the Baskervilles" signal that tells you a "major shift is taking place under the surface of the market and it is better to reverse a trading position."

Generally, indicators only work "for a short period of time and probably only for a certain kind of market" (Crim 73). Thus, technicians should use a variety of methods and never rely solely on one. All indicators are either trend-following indicators or oscillators. The first category includes moving averages, filters, and the directional system; oscillators which identify market overbought and oversold areas include rate of change, momentum, moving average convergence-divergence (MACD), Relative Strength Index and stochastic. Some terms used with technical indicators are:

> Overbought - the market is overextended to the upside and ready to turn down.

Oversold - the market is overextended to the downside and ready to turn up.

Divergence - higher price tops with lower indicator tops is bearish divergence. Lower price bottoms with higher indicator bottoms is bullish divergence.

Oscillators - the difference between two moving averages that measures and quantifies momentum. They are usually setup as differences or ratios that move above and below a threshold or signal point of zero or one. When the oscillator crosses the signal point, the two moving averages have crossed. Oscillators are also used to give indications of overbought/oversold conditions, initiating trades at certain extreme positive or negative areas (Stein, Traders' 27).

Momentum - the velocity or speed at which a data series is moving.

<u>Dow Theory</u>   The oldest method of assessing stock market price trends is the Dow Theory. Considered the foundation of technical analysis, the Theory's principles were first laid out by the founder of the <u>Wall Street Journal</u>, Charles Henry Dow. Dow began by studying the industrial and railroad averages and publishing his observations. He did not intend for his theory to be used to predict market prices, rather he viewed it as an indicator of business conditions (Drew 26). The Industrials were considered a measure of the productive aspect of the market while the Rails were known as measuring distributive activity. Although the Rails are not the motivator of the nation today as they were previously, the Transportation Index is still reflective of market speculation and thus is a useful measure. These two averages are representative of the market as a whole since it has been

established that correlations exist among all the major
averages. The Dow Theory has even been blamed for the 1929
stock market crash by investor Gary Bosley. Bosley contends
that the publication of the Dow's bear signal weeks before the
crash was a contributing factor to the sell-off that occurred
(Crim 72).

The Dow Jones Industrial Average is known as the primary
index since it generally is the first to signal a trend
change. The Dow Jones Transportation Average is the
confirming index. The Theory's basic assumption is that the
movement of stock price averages represent "everything
everybody knows, hopes, believes, and anticipates" (words of
Charles Dow as cited in Drew 19) which is saying that the
market is a summation of current business economics. The
seven principles of the Dow Theory are:

1. The two averages are a summation of all
    investors' activities. Everything that is
    known or expected and that could affect
    supply and demand of securities is
    reflected in the averages.

2. The market displays three trends. A
    primary or long-term trend in stock prices
    which is from under a year to several
    years in length. A secondary trend that
    acts in the opposite direction of the
    primary trend and lasts three weeks to
    three months, and finally, a minor trend
    with a length of a few hours to two or
    three weeks that reflects day-to-day
    fluctuations that occur. The Dow Theory
    ignores the minor trend.

3.   An upward primary trend has three up
     moves. The first reflects stock
     accumulation when savvy investors
     anticipate an improvement in prices. The
     second surge reflects buying based on
     improved company earnings. The third
     upward trend occurs when all the market
     news is positive and the general public
     begins to buy.

4.   A downward primary trend has three down
     moves. The first fall occurs when savvy
     investors realize that prices are too high
     and they begin to sell. The next downward
     move is when there are more sellers than
     buyers and investors begin to panic as
     they try to get out of the market. The
     final drop is a result of distress selling
     as buyers try to raise cash.

5.   Confirmations are exhibited when both
     averages reflect the same trend around the
     same time. A bear trend is confirmed when
     the Dow Jones Industrial Average and the
     Dow Jones Transportation Average hit a new
     low from a previous secondary reaction.
     The reverse signals a bull market (the
     averages hit a new high in an upward
     secondary reaction.) Without
     confirmation, it is less likely for a
     trend to continue. As a general rule, the
     sooner the confirmation occurs the
     stronger the move.

6.   Closing prices are used.

7.   A reversal of both averages must occur
     before a trend is broken. To correctly
     interpret the Dow Theory, one must
     distinguish between a new primary trend
     and the secondary movement of an existing
     trend. The price action defines the
     trend.

                              (Colby and Meyers 179)

These principles of the Theory are subject to

erpretation. Martin Pring of "Pring Market Review" feels

that the application of the Theory is an art, "otherwise, a
purely mechanical method would have become discounted in the
market and personal judgment would be useless" (Crim 72).
While the Theory outlines the market trends, it does not
provide practical guidelines for forecasting the trend's
duration or magnitude. Glickstein and Wubbels tested the Dow
Theory by statistically establishing that a relationship
exists between the confirmations and trend continuations.
They found that there is a "strong, nonrandom connection
between confirmations and continuation of trends in the Dow
Jones Industrial Average" (31). Their study supports the
principle of confirmation. As for nonconfirmations, it is
especially interesting to note that during their ten-year
study period the "five major bottoms in the Industrials were
signalled by non-confirmations in the Transports" (31).
Another analyst notes that from 1920 to 1975 the Dow signals
predicted sixty-eight percent of the moves for the Industrial
and Transportation averages and sixty-seven percent of the
Standard and Poors 500 Index (S&P). Even if positions had not
been closed until confirmation, the Theory would have still
predicted thirty-five percent of the Industrial and
Transportation moves and twenty-nine percent of the S&P 500's
moves (Crim 72). Pring, also notes that the averages have
confirmed twenty-three sell signals since 1897 creating an
average gain of thirty-five percent with only two creating

losses. Buy signals have occurred twenty-three times also but their return has only averaged ten and one-half percent with three possible losses (Crim 72).

The Dow Theory has been criticized for giving late signals and thus missing the beginning and ending of major moves. While the Theory cannot provide enough of a lead signal to enable investors to get in or out at the top and bottom of the market, it does "keep the investor on the right side of most extended moves" even though the signal occurs twenty to twenty-five percent after a peak or low (Crim 72). Many technicians feel that the Dow Theory should only be used as a starting point. It will give the overall view of the market but may not be a practical method for trading.

<u>Filter Rules</u>   A simple method of market timing is filter rules. Filtering tests the assumption that new information is gradually incorporated into prices. Fama and Blume analyzed Sidney S. Alexander's filter method that used the rule "if the daily closing price of a particular security moves up at least x per cent, buy and hold the security until its price moves down at least x percent from a subsequent high, at which time simultaneously sell and go short" (227-228). This filter yielded substantial profits using various sizes of filters over different time periods. Before transaction costs, the filter performed better than a naive buy-and-hold strategy for fifteen of the thirty stocks.

Averaged over all the stocks, the filter produced eleven and one-half percent per year compared to ten point four percent for a buy-and-hold. However, when Fama and Blume considered transaction costs, the average rate of return to the filter became -103.59 percent per year.

Aside from the transaction costs that drastically affect the returns generated by a filter rule, Alexander's methodology was questioned because he assumed that an investor could always buy and sell at the exact high and low and because of the bias resulting from the difficulties inherent in adjusting prices for the effect of dividends. Fama and Blume concluded that while Alexander's filter found some dependence in price changes, it was so small that the Random Walk Model was still sufficient to describe price behavior.

Richard Sweeney (New 285) believes that the filter rule tests completed by Fama and Blume understated the returns relative to a buy-and-hold strategy. Sweeney asserts that averaging the filter results masks the success of the filter method on some stocks. Thus, rather than using all stocks in the database, he selected stocks from Fama and Blume's study that had been winners in one period and examined them using statistical confidence bounds. The composition of his trading list changed substantially each year but using past data to generate a new trading list for the year, statistically significant risk-adjusted profits were made in the following

year for the lower levels of transaction costs. Failure to update the list's composition resulted in lower returns as the years progressed.

Assuming that closing prices were unbiased estimates of purchase and sale prices, Sweeney found that profits could be made if transaction costs were low, such as those available to a floor trader. He also considered only long equity positions, a contrast to Fama and Blume's criteria of employing short positions whenever the investor is not long in it. The avoidance of short positions increased returns since these positions usually performed poorly as well as created extra transaction costs.

Sweeney (New 290) also feels that the transaction costs used in the Fama and Blume study were overstated. Since 1976, the clearing house fee has been three dollars per transaction, considerably less than the one-tenth of one percent on each complete transaction used by Fama and Blume. Therefore, for any transaction greater than six-thousand dollars, the one-twentieth of one percent for a one-way exchange was too large.

It should be remembered that filter results are extremely sensitive to transaction costs and to the assumption that the closing price is an unbiased estimate of the purchase or selling price. Transaction costs are extremely important because the substantial number of buys and sells generated by a filter rule drastically reduce profits. In Sweeney's test,

on the average, each stock was bought or sold every three days, creating transaction costs of 0.1333% per day.

The use of closing prices also caused differences in returns between Sweeney's and Fama and Blume's studies. The actual trigger price may occur earlier in the day; thus, by using closing prices in the studies, the results are somewhat skewed since the actual trade price may be above or below the trigger depending if it is a buy or sell. As noted by most studies, the only way to accurately test the strategies and alleviate the concerns is to put them into practice.

Sweeney concluded that utilizing his methodology, fifteen of the thirty securities analyzed by Fama and Blume offered profits at the one-half of one percent filter rule from 1956 to 1962. His subsequent testing for the 1970 to 1982 period with a statistical confidence bound, indicated significant profits for floor traders. Lower profits were available to money managers, while private transactors were unable to earn a profit.

Sweeney attempted to answer the puzzle as to why substantial and significant risk-adjusted excess returns are possible in the face of the EMH, concluding either that: one, since the composition of the trading list varied year to year, winners are transitory and, therefore, the search must be continuous; or two, because the costs of developing the approach and experimenting to find the patterns in past prices

are extremely high and must be implemented by computer, insufficient numbers of investors are willing or able to utilize the system.

CRISMA   Pruitt and White (Pruitt and White, Crisma 55) developed a system of indicators to locate equities. Their multi-component strategy called "CRISMA" involves price, volume, and relative strength indicators on individual security issues. The acronym stands for the elements that are used: cumulative volume, relative strength, and moving average. They assert that the system is being used actively and has outperformed the market even when two percent transaction costs are considered.

CRISMA uses filter graphs to measure upward price momentum. The filters, "based upon a stock's relative strength compared to the S&P 500, cumulative volume, and 50-day and 200-day moving averages of prices, attempt to measure and 'triple confirm' upward momentum" (Pruitt and White, Crisma 55). A fourth "penetration filter" is required before an actual buy recommendation is made.

Three criteria are required to place a stock in a buy position. The first, meaning price is trending up, is "the 50-day price moving average graph must intersect the 200-day price moving average graph from below when the slope of the latter graph is greater than or equal to zero" (Pruitt and White, Crisma 56).

"Second, the relative strength graph, from beginning to ending point over the previous four weeks, must have a slope greater than or equal to zero" (Pruitt and White, Crisma 56). The purpose of this filter is to ensure that the stock's recent price performance has been similar to the market as a whole.

"Finally, the cumulative volume graph from beginning to ending point over the previous four weeks must have a slope greater than zero" (Crisma 56). This filter confirms that trading volume increases are consistent with rising stock prices.

The final "penetration filter" is constructed to help avoid false signals that generate whipsaws. Once the first three criteria have been met, the security is purchased when the "price reaches 110% of the level established by the intersection of the 50- and 200-day moving average graphs" (Pruitt and White, Crisma 56). Sells are signalled either when "prices fall below the 200-day price moving average graph or rise above 120% of the level established by the intersection of the 50-day and 200-day price moving average graphs" (Pruitt and White, Crisma 56).

Pruitt and White contend that this system can be utilized in a minimum of time. The stocks are easily identified by looking at weekly stock graphs to find the three confirmation filters. After the initial identification, one must note the

date of the confirmation, determine the 110% and 120% price levels, and then follow the stock to catch the buy and sell signals.

<u>Elliott Wave</u>   The Elliott Wave Principle, created by Ralph Nelson Elliott, has many proponents and a similar number of opponents. His followers, in particular Robert Prechter, avow that this tool is invaluable in market forecasting. The basic theory is that the stock market trend develops in a pattern of eight waves (five waves up and three waves down) of varying lengths, some as short as a single trade and others that last centuries. The three down waves are "corrections" of the previous five up waves. The first eight-wave cycle is followed by a comparable eight-wave cycle which is then followed by a final five-wave up pattern. This major upward movement is succeeded by a major three-wave down movement that corrects the five major upward waves (Frost and Prechter 20).

By classifying and counting the waves, market trends are determined. Bull and bear markets are distinguished because certain wave combinations are not possible during these trends. The establishment of the various wave combinations is often confusing and the rules of the Elliott Wave Theory are complex (Gehm 51). Elliott's theory stresses the Fibonacci number series in which each number is the sum of the previous two numbers (1,1,2,3,5,8, etc.). At any one time, the market

may be on a short-term downward wave of only an hour in duration and also on an upward wave that lasts centuries.

<u>Moving Averages</u>   One of the simplest trend indicators is a moving average of prices that displays the consensus of the market by eliminating the inconsistent points. This smoothed average, which works best in trending markets, serves as a point of reference for determining the market tendency. With the arrival of computers, simple moving averages have given way to exponential moving averages that smooth out old data and give more weight to the most recent prices during a specified period. Buy and sell signals are generated when the price crosses over one of its moving averages. The general rule is to buy when prices rise up through the moving average line and to sell when prices drop below the line. The critical decision is to determine when the crossover is truly a trend change and not just a minor adjustment. Some technical systems, such as William O'Neill's "CANSLIM", also use volume as a key to trend changes, however, when strictly utilizing moving averages, price is the only issue, volume is not considered.

Some technicians lag the moving average by a few days to make crossovers more discernible or to at least confirm a trend change. The 200-day simple moving average has been used for years and is easy to calculate: add the closing prices for the past two-hundred trading days and divide by two-

hundred (some use the weekly closing prices for the past forty weeks and then divide by forty) (Colby and Meyers 452). Technicians use various lengths for the moving averages; Elder (Moving 32) says to use the length of the market cycle to determine the moving average length. For traders, the best moving average is "half the length of the market's dominant cycle." He continues with some guidelines for trading with moving averages:

> Buy and hold when prices and the moving
> average are headed up.
>
> Sell when the moving average stops rising
> and goes flat.
>
> Go short when prices penetrate below the
> moving average and the moving average
> turns down.
>
> Cover shorts at the first sign the moving
> average is flattening. Tops tend to
> develop over a longer period of time,
> giving you time to sell. Bottoms tend to
> form much faster, and you have to cover
> your shorts quickly to preserve profits.

Some technicians develop an envelope from the moving average in an attempt to filter out minor irregularities. There are a variety of methods to generate the envelope, one of the simplest is to use the price close, high, and low to create a three-point moving average. Another technique is to create the band by widening the moving average on both sides by a percentage. A price must cross the entire envelope to generate a signal. While this method does screen out minor

aberrations, it is also possible that if the band is too wide true trend moves will be ignored (Stein, Traders 27)

<u>Moving Average Convergence/Divergency (MACD)</u>   An increasingly favored price-based momentum oscillator developed by George Appel, the MACD is based on exponential moving averages (EMA) that evaluate bullish and bearish trends. MACD is superior to a simple moving average (SMA) because it utilizes three exponential moving averages and it is their crossovers, not price, that generate trading signals. The MACD attempts to anticipate a crossover since it "reacts when the averages begin to converge (or diverge)" (Seykota 36), resulting in a quicker signal than is generated by an SMA.

The MACD line, also called the fast line, is the difference between a twenty-six week EMA and a twelve-week EMA of closing prices. The third EMA is a nine-week EMA of the MACD line and is called the signal or slow line (while weeks are commonly used, the period can also be a day or a month). When the MACD line crosses above the signal line a buy is indicated and when it drops below, it gives a sell signal (Aspray 44).

Actions that are indicated at the crossovers of the MACD and signal line are similar to those at the crossing of two simple moving averages with long positions flagged on upward crossovers and short positions on downward crossovers. The crossover usually confirms a peak or trough with divergences

between the crossover and price being especially strong
signals. The most important crossovers, according to Elder
(How to 70), are those occurring furthest from the MACD zero
line because these result in the investors rushing with the
emotion of the trend. When crossovers occur near the zero
line, nonproductive moves usually occur since "public emotion
is flat, disinterested" (How to 70). Elder also believes that
MACD works when markets are moving but produce losses when
markets go flat (Moving 36). Stein (Traders' 27) cautions
that crossovers in overbought/oversold zones should be
utilized in trading markets while valid crossovers can occur
in other areas for trending markets.

Use of an MACD histogram can improve the speed and
effectiveness of this indicator. Trading signals are
generated from direction changes in the histogram, sells are
flagged when the "histogram tries to rally and then falls, and
you buy the upturns" (Elder, How to 68). Elder continues that
while the MACD lines signify direction, the MACD histogram
tracks momentum by its height which measures the distance
between the MACD line and the signal line. As the histogram
ascends, bullish forces are building and the growing size
indicates a healthy uptrend (Elder, Using MACD 36). When the
histogram deflates the trend is losing steam and a reversal is
possible (Elder, How to 70). If the MACD line is above the

signal line, the histogram is directed upward and the obverse is true for a downward directed histogram.

"Another powerful signal is given when MACD lines and prices keep moving in the same direction, but the MACD histogram flattens out and diverges from their patterns" (Elder, How to 70). If the MACD histogram shortens while prices expand, the bullish trend is weakening. Elder explains that buys are signalled when "price makes a second bottom, equal to or deeper than the first, but the second bottom of MACD-histogram is higher" with the true signal being the indicator's uptick from its second bottom, the reverse procedure can be used to find the tops (Heeding 36). He believes that this type of divergence is rare and happens only at major trend changes (How to 70).

A summary of Elder's trading rules (Using MACD 36):

1. Buy when MACD-histogram declines below its centerline and its slope turns up. Place a stop-loss order below the low of the price bar corresponding to the lowest bar of MACD-histogram.

2. Sell when MACD-histogram rallies above its centerline and then its slope turns down. Place a stop-loss order above the high of the price bar that corresponds to the highest bar of MACD-histogram. Remember that tops normally take more time to form than bottoms. Buy fast and sell short slowly.

3. The best buy signals are given by bullish divergences between MACD-histogram and price. When prices decline to a lower or equal low but MACD-histogram holds above its previous low, buy as soon as the indicator ticks higher. Place a stop below the price low corresponding to the latest bottom in MACD-histogram.

4.   The best signals to sell short are given by bearish
     divergences between MACD-histogram and price. When
     prices rise to a new high but MACD-histogram makes a
     lower top, sell as soon as the indicator ticks
     lower. Place a stop above the high associated with
     the tallest bar of MACD-histogram at the second
     top."

Not everyone is as enthusiastic about MACD as Stein and

Elder. Seykota (36) cites several studies that have indicated

that MACD is less than accurate and timely. According to The

Encyclopedia of Technical Market Indicators (281), MACD

"substantially underperforms a 40-week simple moving average

crossover rule." The Dow Jones Irwin Guide to Trading

Systems, says Seykota, finds that MACD displayed inferior

results to other moving average methods and combinations and

other tests confirm these findings. The fact that MACD

anticipates is counterproductive since the "whole advantage of

using moving averages is that they are slow and give signals

when a market's trend is well under way." Traders who rely on

the trend believe "the best time to trade is well into the

trend, with momentum" (Seykota 36). The anticipation may pick

a top, but is more likely to pick up on false signals and

create a whipsaw.

Seykota concludes that for long-term trading, MACD under-

performs other systems and that MACD's short-term trading

results are poor. Advocates of MACD counter these accusations

by saying that MACD is not a signal but rather it is an

indicator that should only be used in conjunction with other
indicators.

Relative Strength Index   One of the most popular
technical tools, the Relative Strength Index (RSI), was
developed by technician J. Welles Wilder in 1976. It is
frequently referred to as Wilder's Relative Strength to
distinguish it from another technical tool known as the
Relative Strength Indicator. The RSI is an oscillator that
measures the market's strength and weakness depending on where
prices close during a specified period of time. The
assumption is that the market is stronger when the closing
prices are higher and for a weaker market the closes are
lower.

The formula for RSI is 100 - (100/1 + (average number of
up closes/average number of down closes). The result is often
smoothed using a moving average before being graphed on a
scale of zero to one hundred (Stein, Divergence 32). More
erratic movements and false signals are generated as the time
period is shortened; longer time periods produce an RSI that
gives fewer but more reliable signals (Colby and Meyers 433).
Wilder suggests using a fourteen-day time period because it
generates more precise signals (Elder, RSI 38).

Because RSI depends on ratios, it "is subject to greater
volatility, distortions, and erratic movements than smoothed
indicators that are not dependent on ratios. This results in

a higher number of signals (and thus higher transaction costs)
compared with smoothed momentum indicators that are not
dependent on ratios" (Colby and Meyers 433).

The major application for RSI is as an overbought-
oversold indicator. Welles suggests that an RSI over seventy
is indicative of an overbought market and that an RSI reading
below thirty means the market is oversold (Aan 76). Babcock
(56) says Wilder also believed that if the RSI line crossed
above or below the fifty mark that it was pointing to a trend
change. Some traders have found that during long-term
downtrends the index usually remains below sixty while during
rallies it stays above forty (Stein, Traders 28). Elder
(Explaining 36) cautions that oscillators will often produce
premature signals when a market trend begins.

RSI is actually a way to quantify price momentum or
velocity. A chart of the RSI resembles a price chart and some
investors utilize trendlines and moving averages to decipher
the pattern. A broken RSI trendline very often corresponds to
a broken price trendline (Stein, Twists 24). Elder (RSI 38)
says the RSI often "breaks its trendline one bar earlier than
price."

When RSI enters the overbought-oversold zones, traders
believe a top or bottom price is near. RSI's overbought-
oversold zones are seventy and above and thirty and below,
respectively. Sells should be initiated after the RSI has

been above seventy and then drops back down below it while buys are flagged when the RSI rises above thirty after being below (Stein, Twists 24). According to Elder (RSI 38), there is a danger that the RSI can remain overbought for a considerable length of time during a strong rally and oversold during extended declines. This could result in premature buys and sells that could denigrate returns.

Andrew Cardwell uses a revised overbought-oversold range. He prefers different ranges for uptrends and for downtrends. Uptrends appear to explore the eighty-forty range while downtrends vary between sixty and twenty. Other technicians agree that uptrends usually have higher RSI tops and bottoms while downtrends show lower tops and bottoms. When RSI stays between eighty and forty or sixty and twenty, it is telling you the trend. Even though Cardwell favors the revised ranges, he still believes that most long-term divergences occur at the seventy-thirty level (Stein, Twists 25).

Cardwell also defined the positive and negative reversal patterns in the Relative Strength Index. According to him, a positive reversal occurs when prices top, retreat, rise to a higher top and then again retreat, but to a higher low. The Relative Strength Index traces a similar pattern to the price, however, the second retreat drops to a lower low. The positive reversal pattern is indicative of a market that is preparing to rise to new highs. As Cardwell explains, the

lower RSI creates a "spring effect likely to push the market
even higher, like an athlete who jumps from a crouch" (Elder,
RSI 38). The new projected high is equal to the distance from
the first price low to the second, higher, top plus the
distance from the second top to the second bottom.

A negative reversal is marked by a price peak that is
lower than the previous peak while the RSI's second peak is
higher than the first peak. This pattern is often interpreted
as reflecting a bullish market. In other words, the market is
more overbought at a lower price level. The positive and
negative reversals are frequently used with bullish and
bearish divergences to help interpret the market trend.

One of the most valuable trading signals, according to
Elder (RSI 38), is divergence. A divergence is the opposite
of a confirmation where RSI and price replicate each other's
pattern. While divergences rarely occur, it provides an
opportunity for substantial gains at reduced risk. Bullish
divergence results when prices are at a low, rally, and then
fall even lower. At the same time the RSI pattern is similar
only the second low is higher than the first indicating that
bullish strength is forming even though prices are weak.
Thus, prices should strengthen in the near future.

A bearish divergence pattern is when prices rise, fall,
and then rise even higher while the second RSI top is lower.
This format shows that the market is losing momentum despite

the stronger price (Elder, RSI 38). This pattern is a sell
signal since it is often an advance signal that a top may be
forming (Aan 76).

By plotting RSI beneath a daily price chart, it is
relatively easy to spot divergences. It displays many of the
same formations as prices such as peaks and troughs and
trendlines. Stein (Divergences 33) uses the rule that a
signal is stronger the more time that elapses between peaks or
between lows and the "long-term, larger-scale divergences on
the weekly charts" are a more important indicator. Other
technicians only consider the divergences that occur in the
RSI's buy or sell zone (Stein, Twists 24).

Relative Strength Indicator   Unrelated to the Relative
Strength Index, the Relative Strength Indicator is "simply the
ratio of one data series divided by another" (Colby and Meyers
 431) and is used to describe the stock's performance relative
to the overall market. To calculate the indicator for an
individual stock, the stock's price is divided by a more
general market index (such as the Standard & Poor's 500
Index). The resulting ratio can then be plotted on a line
chart where trendline analysis, moving averages, and other
analytical techniques can be employed.

Strong relative strength trends within a industry group
often endure for years. When major trend changes begin to
occur, the relative strength gradually loses momentum with the

actual trend change taking several months to evolve. Alan
Shaw of Smith Barney, analyzes weekly and monthly relative
strength ratios with raw price data, watching for "tandem
confirmation (suggesting the continuation of an existing
trend) or divergence (suggesting a significant trend change)"
(Colby and Meyers 431).

 Momentum An overbought/oversold indicator, Momentum
measures the rate that prices are rising or falling. The
indicator is computed by "adding or subtracting price
differentials from one period to the next" (Stein, Traders'
28). An overbought/oversold condition is marked when the
indicator, plotted as a histogram, crosses the zero line. The
universal practice is to buy when the indicator passes up
through the line, and to sell when it passes down through it.
When the crossovers follow divergences, the signal is even
more accurate.

 As with moving averages, the time length is very
important with momentum. Many experts counsel using a time
length that matches the cycle of the market under analysis.
Caution is suggested, however, when trying to use the
indicator during strong, long-term trends because of the
possibility of false signals (Stein, Traders' 28).

 Stochastics George Lane is recognized as developing
stochastics, a momentum or price velocity indicator that
signals trends and overbought/oversold conditions. Some

technicians believe that stochastic signals reversals at least one to two weeks before MACD (Elder, Using Stochastics 72). The concept is to detect crossovers for trends but only those in overbought/oversold regions. Closing prices are recorded and tracked to discover if the trend is bullish or bearish. The idea is that during rallies, the daily prices will close near their top, however, if the closing tick begins to fall while prices continue to rise, the trend is thought to be growing weaker and a trend reversal is possible (Elder, Three 36), The obverse is true for downtrends, while closing prices are near the bottom of the range, the trend will continue down, however, when closing prices graduate higher within the range, strength is building for a trend reversal.

Stochastics represent the daily closing price as a percentage of the closing prices for a predetermined time range, normally five to eighteen days. This percentage is then smoothed by several moving averages. Two numbers are generated, %K also called raw stochastic and %D which is called smoothed stochastic and is actually a smoothed moving average of %K. Some technicians calculate an even "slower" version of %D by subjecting it to another layer of averaging. This slower version decreases whipsaws and is better fitted for use with longer-term tactics and for more conservative traders (Elder, Using Stochastics 68).

The stochastic %D is plotted on a chart and oscillates between zero and one-hundred. Zero indicates that today's close is equal to the lowest price in the period tested and one-hundred signifies that the close is equal to the highest price in the period. Signals are generated as it crosses above seventy-five (over-bought) and below twenty-five (over-sold) (Stein, What Divergence 33).

Elder (Three 36 and Using Stochastic 70) and Stein (Traders' 29 and Learning 36) provide guidelines on how to utilize the stochastic signals:

1. The stochastics line direction displays the immediate trend. Bearish trends are displayed when %K crosses below %D and bullish when it crosses above %D. A new trend is being established when %K is initially above 75 and then crosses down below 75 or when %K crosses above 25 when initially below 25. Elder believes that double bottoms and double tops provide particularly strong signals and even more especially when divergence occurs. George Lane adheres to the concept that the trends involve three rallies or three declines.

2. Overbought/oversold analysis uses %D, its readings are reliable for identifying short-term tops and bottoms when a market is in a trading range. When the market begins trending, this method should not be relied upon.

3. Divergence between the indicator and the price provide lucrative signals with %D tending to be more effective than %K. A bearish divergence happens when prices rise, pause, then rise to new highs but the indicator rises, pauses, then rises to a lower high. For a bullish divergence,

> prices drop, pause, and then drop lower
> while the indicator falls, pauses, and
> falls to a higher low.

Stochastics must be interpreted, it is not simply a mechanical tool that replaces judgement since crossovers may occur when trends are not changing or divergence may give false signals. Stein (Learning 36) cautions that one must learn how to utilize stochastics to screen out false signals. One warning that Stein issues is to ignore bullish divergence between the overbought and oversold zones unless it occurs in a powerful bull market. Another caution is that while stochastics is a powerful tool on daily and hourly charts, it should be viewed with caution on weekly charts (Stein, Traders' 29).

The Encyclopedia of Technical Indicators (Colby and Meyers 473) advises that stochastics "can jump around erratically due solely to data for the oldest period being dropped off" creating an inherent weakness for unstable, false signals. It also believes that the best indications for buys are in the ten to fifteen percent range while sells are more reliable when occurring in the eighty-five to ninety percent zones.

Directional Movement   One technical indicator that is time-consuming to calculate is Directional Movement Index (DMI). This trend flag is actually three distinct pointers: a +DI (upward movement, i.e., percent that today's high is

above yesterday's high), -DI (downward movement, i.e., percent today's low is below yesterday's low), and ADX (average directional index, i.e, the +DI and -DI netted to a single plus or minus figure). The daily direction is calculated by averaging the true daily ranges and dividing this figure into an exponential moving average of the up directional movements; the same procedure is performed on the down directional figures. Both of these lines are plotted on a graph to show the trend (Stein, Traders' 30 and Babcock 56).

The +DI attempts to assess the force of upward pressure, -DI the force of downward pressure and ADX the tendency for trending in general. However, DMI is virtually useless in trendless markets. The entire DMI philosophy is based on comparing today's range to yesterday's range. While the ADX by itself is a gauge of bullish or bearish trends, the correlation of the ADX to the other two indexes is also meaningful (Stein, Traders' 30).

Crossovers between -DI and +DI inaugurate trades: "Buy when +DI rises above -DI, sell from the converse" (Stein, Traders' 30). The more elevated the ADX, the more powerful the trend. If the ADX peaks and begins to drop, the market anticipates an important trend change. For assistance in reducing a position, on long positions, Stein (Trader's 30) instructs to "wait for +DI to break below the ADX line and

then ADX itself turns down. The same goes for a short
position but use -DI."

    <u>Price and Volume</u>   Many technicians believe that the
"absolute value of price change is positively and linearly
related to volume" (Rogalski 268), with volume being measured
as the number of shares being bought and/or sold in a given
time period. The theory maintains that with a stock at
equilibrium, an increase or decrease in demand (volume) will
create a price above or below equilibrium. Transactions only
occur as a result of demand, thus a rise or fall in volume
(demand) will cause prices to rise or fall. Rogalski (268)
credits Copeland with testing the direction of the
demand/price correlation. Copeland, using volume as
representative of information dispersal to the market,
concluded that there is a positive and linear relationship if
sequential information is legitimate. An inverse correlation
would occur if the hypothesis of simultaneous information
arrival was valid.

    Rogalski's study suggests that awareness of volume
behavior may enhance price projections. He warns, however,
that causality is not determined by his methodology. Thus,
volume may cause price, price may cause volume, or there may
be price-volume feedback. Nonetheless, all instances are
suggestive of price-volume dependence. Bohan (36) also
theorizes that price and volume analysis may detect trading

pattern changes and assist in creating an above average return. Epps (586) is another who contends that the volume of shares traded is higher in bull markets and lower in bear markets.

The results of Charles Ying's (Epps 586) testing of price and volume found that sizable volume increases are usually attended by large price modifications while meager volumes generally accompany lower prices. This study has been questioned, however, because the effects of dividends and new issues have not be confronted.

Discretion should be used since volume is subject to forces such as seasonal patterns, holidays, arbitrage, etc., that may misrepresent true demand and supply. Another area for caution is when volume is trending up, rather than confirming a trend, it may be a crowd reaction at a pivot point (Colby and Meyers 515). Colby and Meyers continue that volume is a "erratic, unreliable barometer of the market . . . indicators weighted significantly by volume appear to suffer from the instability of the volume data itself."

CHAPTER III

TESTING OF THREE INDICATORS

The only true test of technical indicators is to actually
perform buys and sells based on the indicators being utilized.
This method assures that buy and sell prices, times, and
transaction costs are accurate. Indirect testing makes it
virtually impossible to precisely portray reality. However,
it must be realized that empirical tests are subject to biases
since each indicator requires analysis and interpretation,
resulting in the possibility that one-hundred technicians
could come up with the same number of readings based on a
specific indicator, creating different buy and sell trigger
points and, thus, impacting return considerably. Each
indicator can also be based on different criteria; the
decision to use simple or exponential moving averages or
adjusting the length of the time span used to calculate the
indicator will result in different buy and sell positions.

Study Design

This study is designed to see if the average investor can
use moving averages, MACD, and Wilder's Relative Strength to
determine effective buy and sell signals that create better
returns than a simple buy-and-hold strategy. Ten stocks were
chosen at random, the critera being that they were well-known
and that the data base from which the information was garnered
held sufficient data on which to test the indicators. The

"Telescan System" was utilized to locate the stock data and for computing the indicators and plotting the graphs. The earliest Telescan data available for the stocks chosen was October 3, 1988, and an ending date of March 17, 1993 was used. In an effort to keep the testing simple, the indicators were not combined in any manner, rather each indicator was viewed in a vacuum as it related to the individual stock. Simplistic interpretation methods, as outlined below for each indicator, were utilized in reading the indicators; while this may impact the returns generated, it was a trade-off against the possibility of creating interpretation biases produced by a specific individual's reading of the indicator.

Moving Average

In selecting a moving average, it was decided to test the difference between a twenty-five day and a nine-day exponential moving average. This choice was based on suggestions in the "Telescan System" information as being a starting point for moving average analysis. Both moving averages were plotted on a single graph with the difference displayed at the bottom of the graph. The difference is plotted around a zero line. The zero line indicates the point where the two moving averages cross which is defined as the buy or sell position. When the difference line crosses the zero line upward, a buy signal is indicated. When the

difference line crosses the zero line downward, a sell signal is given (see Figure 1).

MACD

Two MACDs were utilized for this test, one for the buy signal (8-17-9) and a different length for the sell signal (12-25-9.) For the buy, an eight-day fast moving average, a seventeen-day slow moving average, and a nine-day exponential moving average of their difference for the signal line was selected. The sell MACD employed a twelve-day fast MA, a twenty-five day slow MA, and a nine-day difference for the signal line. The MA lengths for both the buy and sell signals were the recommendations of MACD's creator, George Appel. The MACD was plotted as a histogram, which makes reading the indicator easier. A buy signal is given when the MACD histogram moves above the zero line from negative to positive. A sell signal occurs when the histogram moves across the zero line from positive to negative. (See Figure 2.)

Wilder's Relative Strength

The final indicator tested was Wilder's Relative Strength Index. Seventy percent was used as the overbought point and thirty percent was the oversold condition. When the RSI crossed the seventy percent line going downward, a sell signal was generated. When the RSI crossed the thirty percent line going upwards, a buy was indicated. (See Figure 3.)
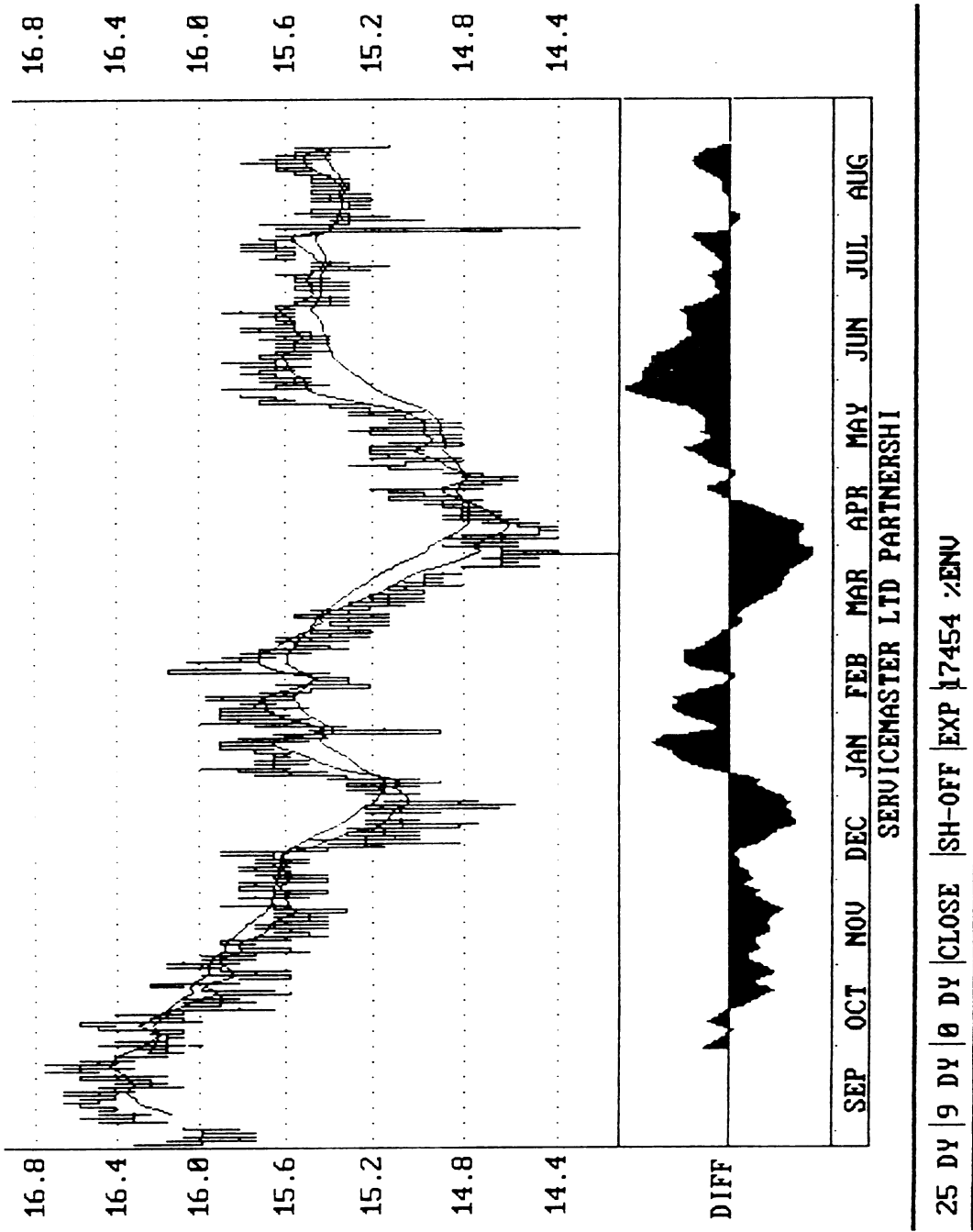
16.8
16.4
16.0
15.6
15.2
14.8
14.4

DIFF

SEP   OCT   NOV   DEC   JAN   FEB   MAR   APR   MAY   JUN   JUL   AUG

SERVICEMASTER LTD PARTNERSHI

25 DY |9 DY |0 DY |CLOSE |SH-OFF |EXP ↓7454 %ENV

Figure 1.   Moving Average - 25-Day and 9-Day Difference
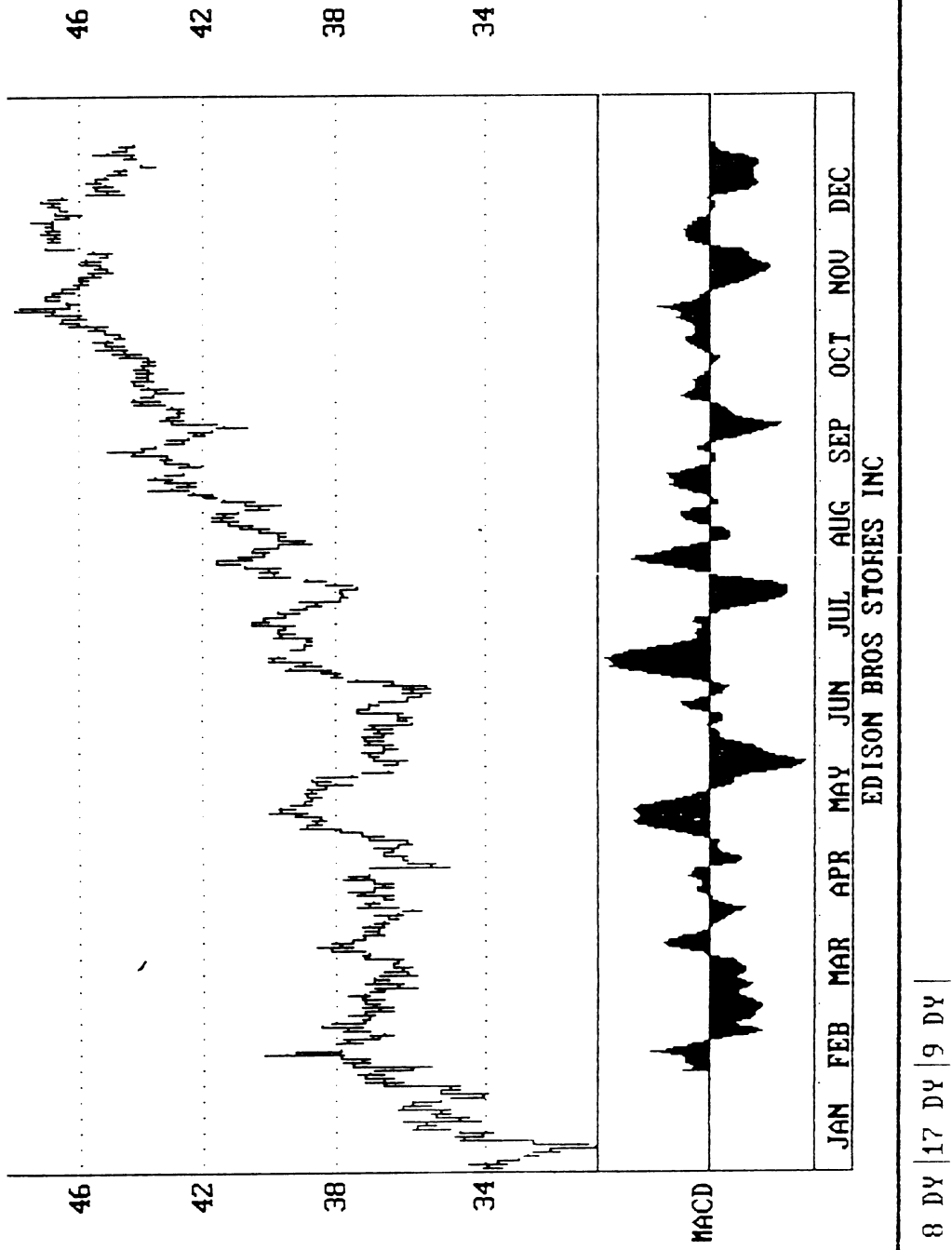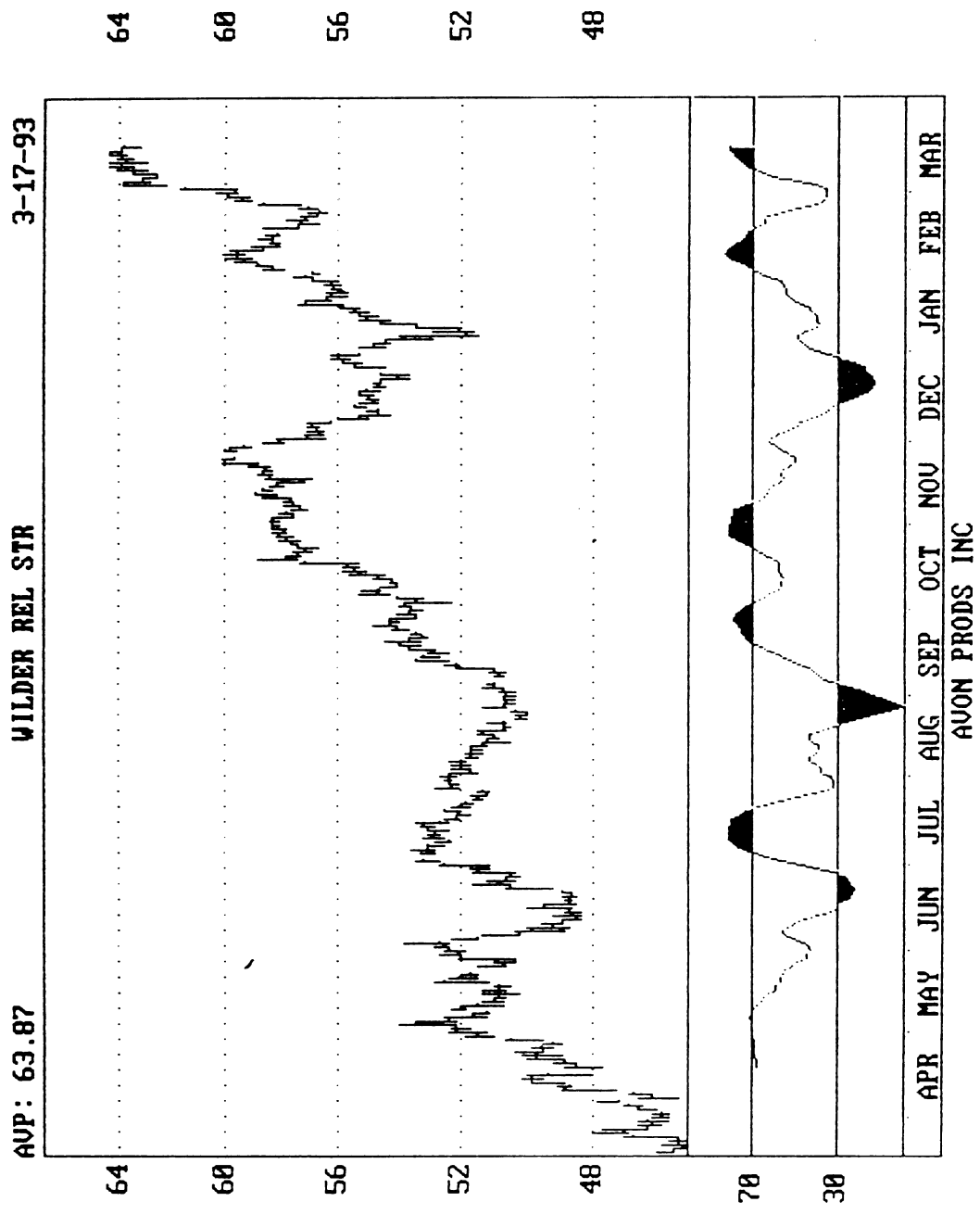
Figure 2. Moving Average Convergence/Divergence

Figure 3. Wilder Relative Strength Index

Test Data

(Appendix A contains detailed information for the stocks in the study). Using the "Telescan System", price and volume information was plotted for each of the ten stocks for the period October 3, 1988, through March 17, 1993. Using this information as a base, each of the three indicators was calculated and plotted by Telescan and the resulting buy and sell prices and dates, as determined utilizing the criteria outlined for each indicator, were logged in a spreadsheet. The profit or loss for each buy and sell was calculated as well as the number of days during which the stock was not being held. For the time periods when the funds were not invested in the stocks, income was calculated as if it were invested at a rate equal to the average prime rate for the October 3, 1988, through March 17, 1993, time span.

An arbitrary decision was made to purchase one-hundred shares of stock at each buy signal. If the indicator was not in a buy position on October 3, 1988, the funds were considered invested at the average prime rate. If the indicator was in a buy position, one-hundred shares were considered purchased on that date. At the end of the time period, (March 17, 1993), if the stocks were currently held, they were deemed sold and the profit or loss was calculated; if the stocks were not held at the ending date, then the investment at the average prime rate was considered terminated

and the resulting income was recorded. Dividends were
included as part of the return if the stocks were held on the
ex-dividend date. The transaction costs were calculated at
twenty-nine dollars per each buy and sell, this is the rate
available to the average investor using a discount broker.
The returns from using the indicators were compared to a buy-
and-hold strategy and also to the results if the funds had
been invested for the entire time period at the average prime
rate. A summary of the results for each strategy is in
Appendix B.

In only one instance did the indicators provide a better
return than a simple buy-and-hold or investing at the average
prime rate. For Edison Brothers, using the difference between
a twenty-five day and nine-day moving average as the trigger,
a return of $4,548 was generated (see Table 1). This was
$1,272 greater than that provided by a buy-and-hold strategy.
In only two cases (Boeing and Loews) did the investment at the
average prime rate provide a greater return than the buy-and-
hold.

The average income per each buy and sell trigger for each
indicator is displayed in Tables one, two and three. The
highest average ($454.76) was for Edison Brothers, based on
the moving average indicator. The lowest average (<$139.16>)
was also for Edison Brothers, utilizing Wilder's Relative
Strength. Over all stocks, the moving average generated a

$1,210 average income with a standard deviation of 2035.7998.

Wilder's Relative Strength produced an average income of $888

with a 1354.8328 standard deviation, and, finally, MACD

provided a $182 average income with a 1451.1796 standard

deviation.

Table 1. Statistics for moving average indicator with a
comparison to buy-and-hold

	No. Sigs.	Indicator Without Div & Costs Income	Indicator With Dividends & Tran Costs			Buy & Hold	Invest Avg Prime
			Income	Buy/Sell Avg Inc.	Standard Deviation		
Avon	28	$4,027	$3,928	$262	479.6186	$4,791	$1,179
Boeing	42	(348)	(1,270	(58)	434.4578	1,003	1,354
Bristol	41	1,113	608	29	329.6135	2,179	2,127
Colgate	28	3,250	2,750	183	354.107	4,766	1,076
Edison	18	4,673	4,547	455	721.6747	3,276	707
Hershey	44	564	(479)	(21)	345.8637	3,204	1,209
Loews	37	1,361	523	28	945.9422	2,980	3,819
P. Morris	35	4,219	2,778	154	691.3597	4,764	1,172
P. Petroleum	44	(498)	(1,474)	(64)	111.242	1,102	882
Serv. Master	36	$ 911	182	10	194.6633	1,807	780

All stocks: Average Income=$1,210   Standard Deviation=2035.7998   t=1.88

Table 2. Statistics for Wilder's relative strength indicator
with a comparison to buy-and-hold

	No. Sigs.	Indicator Without Div & Costs Income	Indicator With Dividends & Tran Costs			Buy & Hold	Invest Avg Prime
			Income	Buy/Sell Avg Inc.	Standard Deviation		
Avon	24	$3,361	$3,156	$263	543.3538	$4,791	$1,179
Boeing	16	275	24	3	543.6745	1,003	1,354
Bristol	19	637	557	70	561.3366	2,179	2,127
Colgate	17	2,387	2,179	272	196.3547	4,766	1,076
Edison	20	(1,051)	(1,391)	(139)	850.9634	3,276	707
Hershey	17	1,301	935	104	203.7656	3,204	1,209
Loews	26	(386)	(934)	(67)	600.9984	2,980	3,819
P. Morris	17	2,363	2,354	262	694.3437	4,764	1,172
P. Petroleum	14	1,112	1,002	143	236.8237	1,102	882
Serv. Master	15	1,099	1,003	125	104.9796	1,807	780

All stocks: Avg Income=$ 888   Standard Deviation=1354.8328   t=2.07

Table 3.   Statistics for Moving Average Convergence/Divergence
          (MACD) indicator with a comparison to buy-and-hold

	No. Sigs.	Indicator Without Div & Costs Income	Indicator With Dividends & Tran Costs				
			Income	Buy/Sell Avg Inc.	Standard Deviation	Buy & Hold	Invest Avg Prime
Avon	32	$2,687	$2,410	$142	728.2565	$4,791	$1,179
Boeing	42	(398)	(1,379)	(63)	295.162	1,003	1,354
Bristol	35	525	258	144	10.9461	2,179	2,127
Colgate	34	2,488	1,826	101	332.3376	4,766	1,076
Edison	27	1,623	1,239	88	721.6651	3,276	707
Hershey	48	850	(312)	(12)	208.7644	3,204	1,209
Loews	38	(488)	(1,334)	67	1024.631	2,980	3,819
P. Morris	39	2,479	753	38	633.1057	4,764	1,172
P. Petroleum	56	1,075	(2,398)	(83)	121.5523	1,102	882
Serv. Master	42	1,713	746	34	266.6917	1,807	780

All stocks: Avg Income=$ 182   Standard Deviation=1451.1796   t=.40

Of the ten stocks chosen for the study, seven were very
large corporations (Boeing, Bristol-Myers, Colgate, Hershey,
Loews, Phillip Morris, and Phillips Petroleum). The remaining
three were smaller, less diversified companies (Avon, Edison
Brothers, and ServiceMaster). Of these three, Edison Brothers
is the least known and more likely to be a "trading" stock
(i.e., less likely to provide a consistent return over time).
I believe this is the reason the moving average indicator was
able to generate a greater return than using a buy-and-hold
strategy.

Thus, for this study, the technical indicators were
unable to generate a consistent improvement to returns from a
buy-and-hold approach. Whether this would have been the case
if the stocks chosen for testing had been less widely held and

known companies should be examined. Perhaps utilizing an
approach similar to Sweeney's (New), wherein the list of
stocks to trade should be revised periodically based on the
results provided by utilizing the indicator, should be
considered.

CHAPTER IV

CONCLUSION

There are conflicting views on whether technical analysis is a valid system for tracing the market and individual stocks. The opposing sides are vehement in the defense of their convictions.

Seykota believes that using technical indicators requires an emotional aptitude. Many traders do not want to deal with their emotions and abandon their systems instead of following the rules. He continues that indicators "do not predict--they either just dict (say what's happening) or postdict (say what's happened)" (37). I disagree with his position that it is the lack of emotion that leads them to forego their systems, rather it is the surplus of emotion that causes them to abandon systems and to rely on their gut instinct.

Brock, Lakonishok, and LeBaron (1733) raise the concern of data snooping that may possibly cause the location of "patterns" to emerge. Individuals who are intensely scrutinizing information, such as stock prices and volumes, are more likely to find patterns, even if they are spurious. They continue with support from cognitive psychology that theorizes that an individual's natural inclination is to focus on the unusual. These proclivities lead to the potentiality for selection bias and significance enhancement on what may otherwise be unrelated information. Epps (590) also

reinforces this point by his observation that people more readily accept information that supports their currently held views.

Recently, there has been more support for technical analysis. The Random Walk, so efficiently supported by Fama, has been challenged from several angles. Fama (Efficient 415-416) felt that the strong form efficient market "for the purposes of most investors. . .seems a good first (and second) approximation to reality" since the only groups who have monopolistic access to information is corporate insiders and specialists. While insider information may not permeate down the market very far, it does make the market inefficient. Non-random price patterns have been one clue to the inefficiency. The price patterns are consistent with the two-hundred year trend in earnings and dividends. Colby and Meyers (413) do not believe this anomaly can be explained away, and concede that it appears that some technical methods may provide excess profits, at least at times.

Brock, Lakonishok, and LeBaron also found irregularities in the Random Walk and cited several studies that found indications that past returns are helpful in predicting future returns. They offer two opposing explanations: "(1) market inefficiency in which prices take swings from their fundamental values, and (2) markets are efficient and the predictable variation can be explained by time-varying

equilibrium returns" (1732). However, they have provided no evidence to support either conclusion.

Pruitt and White (Crisma), Epps, and Rogalski similarly have found positive correlation between price changes and volume changes; Bohan and Brush (Eight) found that relative strength indicators may assist in providing price predictions.

Even though providing support, some researchers caution investors on utilizing technical analysis without thinking. Some traders get carried away using indicators and lose sight of the markets. They forget most indicators deal with only a few numbers: open, high, low, and closing prices plus volume. These numbers can only be explored in a limited number of ways. Technicians who attempt to combine several indicators may only get an illusion of thoroughness and run the risk of amplifying both good and bad findings. Babcock (56), for instance, believes that "common sense suggests there are only so many ways to massage past price data. It should not be surprising that indicators of the same kind tend to give signals at about the same time." One of the canons of using technical analysis successfully is to combine several indicators, choosing ones that cancel out each other's negative features and yet leave the positive features undisturbed. Thus, having access to information itself does not help, one must be able to assess the information's importance and meaning to be able to "cash-in" on its worth.

So, is technical analysis a worthwhile task? Fama, (Behavior 35) helps to answer this question. Although speaking about the minimum acceptable level of dependence, his comment that it depends on the point of view being considered is also valid in relation to the concerns of the overall validity of technical analysis. This is where academicians and technicians understanding falls apart. For a statistician conducting tests on successive price changes, if the dependence can not account for the property being tested, then the assumption of independence can be justified. On the other hand, a technician will use very practical rules in determining dependence, such as can the knowledge of past price changes be used to increase return? The investor would "accept the theory of random walks as the better model if the actual degree of dependence cannot be used to produce greater expected profits than a buy-and-hold policy (Fama and Blume 226). Thus, the trader's assessment of the importance and consequences of dependence is and always will be quite different from that of a statistician.

Pruitt and White (Crisma 55) also note that most tests of specific trading techniques are usually indirect tests in that they do not actually measure the returns that are generated. The only way that a valid test of technical analysis can occur is if it is carried out, which is what I believe many large mutual funds do.

Some of the issues yet to be resolved before the question

echnical analysis can be fully answered are:

1. Does standard statistical testing
    adequately describe the market for
    investors?

2. Do statistical methods adequately measure
    the data that technicians evaluate?

3. Can the price patterns be modeled by
    simple linear relationships?

4. Is equilibrium a range rather than a
    finite value?

5. Does it pay for the average investor to
    expend resources searching out little
    known information?

6. Do only certain types of stocks lend
    themselves to technical analysis?

REFERENCES

Aan, Peter W. "How RSI Behaves." <u>Futures</u> Jan. 1985: 76.

Aspray, Thomas E. "Spicing Up Moving Averages to Get Better
    Trading Signals." <u>Futures</u> April 1989: 44-45.

Babcock, Bruce Jr. "Beware of Too Many Price-Based
    Indicators." <u>Futures</u> Jan. 1985: 56-57.

Bohan, James. "Relative Strength: Further Positive
    Evidence." <u>Journal of Portfolio Management</u> Fall 1981:
    36-39.

Brock, William, Josef Lakonishok, and Blake LeBaron.
    "Simple Technical Trading Rules and the Stochastic
    Properties of Stock Returns." <u>The Journal of Finance</u>
    Dec. 1992: 1731-1764.

Brush, John S. "Eight Relative Strength Models Compared."
    <u>The Journal of Portfolio Management</u> Fall 1986: 21-28.

Brush, John S. and Keith E. Boles. "The Predictive Power
    in Relative Strength and CAPM." <u>Journal of Portfolio
    Management</u> Summer 1983: 20-23.

Colby, Robert W. and Thomas A. Meyers. <u>The Encyclopedia of
    Technical Market Indicators</u>. Homewood, IL: Dow Jones-
    Irwin, 1988.

Crim, Elias. "Does the Dow Theory Work for Index Traders?"
    <u>Futures</u> October. 1984: 72-73.

Drew, Garfield A. <u>New Methods for Profit in the Stock Market.</u>
    Boston: Metcalf, 1948.

Elder, Alexander. "Explaining the Triple Screen System."
    <u>Futures</u> June 1990: 36.

Elder, Alexander. "Heeding 'The Hound of the Baskervilles'."
    <u>Futures</u> July 1990: 36.

Elder, Alexander. "How to Use MACD to Catch Price Trends
    Early." <u>Futures</u> Sept. 1986: 68-70.

Elder, Alexander. "RSI's Variety of Messages." <u>Futures</u>
    April 1990: 38.

Elder, Alexander. "Three Signals from Stochastic." <u>Futures</u> March 1990: 36.

Elder, Alexander. "Using MACD and MACD-Histograms." <u>Futures</u> May 1990: 36.

Elder, Alexander. "Using Moving Averages." <u>Futures</u> Feb. 1990: 32.

Elder, Alexander. "Using Stochastics to Catch Early Trends and Reversals." <u>Futures</u> June 1987: 68-72.

Epps, Thomas W. "Security Price Changes and Transaction Volumes: Theory and Evidence." <u>The American Economic Review</u> Sept. 1975: 586-597.

Fama, Eugene F. "The Behavior of Stock-Market Prices." <u>The Journal of Business</u> Jan. 1965: 34-99.

Fama, Eugene F. "Efficient Capital Markets: A Review of Theory and Empirical Work." <u>The Journal of Finance</u> May 1970: 383-423.

Fama, Eugene F. and Marshall E. Blume. "Filter Rules and Stock-Market Trading." <u>The Journal of Business</u> Jan. 1966: 226-241.

Ferguson, Robert. "An Efficient Stock Market? Ridiculous!" <u>Journal of Portfolio Management</u> Summer 1983: 31-38.

Gehm, Fred. "Who is R.N. Elliott and Why is He Making Waves?" <u>Financial Analysts Journal</u> January/February 1983: 51-58.

Glickstein, David A. and Rolf E. Wubbels. "Dow Theory is Alive and Well!" <u>Journal of Portfolio Management</u> Spring 1983: 28-32.

Joy, O. Maurice and Charles P. Jones. "Should We Believe the Tests of Market Efficiency?" <u>Journal of Portfolio Management</u> Summer 1986: 49-54.

Levy, Robert A. "Random Walks: Reality or Myth." <u>Financial Analysts Journal</u> November/December 1967: 69-92.

Levy, Robert A. <u>The Relative Strength Concept of Common Stock Price Forecasting</u>. New York: Investors Intelligence, Inc., 1968.

Malkiel, Burton G. <u>A Random Walk Down Wall Street</u>. New York:
     Norton, 1973.

Prechter, Robert Rougelot Jr. and Alfred John Frost. <u>Elliott
     Wave Principle Key to Stock Market Profits</u>. 2nd ed. New
     York: Haddon Craftsmen, 1981.

Pruitt, Stephen W. and Richard E. White. "The CRISMA Trading
     System: Who Says Technical Analysis Can;t Beat the
     Market?" <u>Journal of Portfolio Management</u> Spring 1988:
     55-58.

Pruitt, Stephen W. and Richard E. White. "Exchange-Traded
     Options and CRISMA Trading." <u>Journal of Portfolio
     Management</u> Summer 1989: 55-56.

Rogalski, Richard J. "The Dependence of Prices and Volume."
     <u>The Review of Economics and Statistics</u> May 1978: 268-
     274.

Seykota, Ed. "MACD: Sweet Anticipation?" <u>Futures</u> March
     1991: 36-37.

Sorensen, Roy A. "An 'Essential Reservation' About the EMH."
     <u>Journal of Portfolio Management</u> Summer 1983: 29-30.

Stein, Jon. "Learning to Swing to Momentum with Stochastics
     Signals." <u>Futures</u> May 1989: 36-37.

Stein, Jon. "New Twists to RSI: Finding Trends and
     Reversals." <u>Futures</u> Feb. 1990: 24-26.

Stein, Jon. "The Traders Guide to Technical Indicators."
     <u>Futures</u> Aug. 1990: 26-30.

Stein, Jon. "What Divergence Indicates About Real Price
     Value." <u>Futures</u> July 1989: 32-34.

Sweeney, Richard J. "Evidence on Short-Term Trading
     Strategies." <u>The Journal of Portfolio Management</u> Fall
     1990: 20-26.

Sweeney, Richard J. "Some New Filter Rule Tests: Methods and
     Results." <u>Journal of Financial and Quantitative Analysis</u>
     Sept. 1988: 285-300.

<u>Telescan System</u>. Houston: Telescan, Inc., 1992.

Treynor, Jack L. and Robert Ferguson. "In Defense of
     Technical Analysis." <u>The Journal of Finance</u> July
     757-775.

ADDITIONAL READINGS

Arnott, Robert D. and William A. Copeland. "The Business
     Cycle and Security Selection." <u>Financial Analysts
     Journal</u> March/April 1985: 26-32.

Rosenberg, Barr, Kenneth Reid, and Ronald Lanstein.
     "Persuasive Evidence of Market Inefficiency." <u>Journal of
     Portfolio Management</u> Spring 1985: 9-16.

Schutzman, Fred G. "Smoothing Rate of Change: New Twist
     to Old Study." <u>Futures</u> April 1991: 30-32.

APPENDIX A

DATA ON INDIVIDUAL STOCKS

AVON - MOVING AVERAGE

BUY $	BUY DATE	SELL $	SELL DATE	INC MM	DIVID	STK INC
$ 24.38	10/03/88	$23.13	10/24/88			($ 183)
$ 20.00	12/27/88	21.38	03/27/89	$0.20	$25.00	105
$ 23.25	04/03/89	33.63	07/24/89	1.74	25.00	1,007
$ 35.50	08/01/89	34.13	09/15/89		25.00	(170)
$ 31.25	11/09/89	34.25	01/11/90	3.46	25.00	270
$ 32.38	03/01/90	32.00	08/06/90		25.00	(71)
$ 26.00	11/07/90	27.25	01/09/91	.24	110.00	177
$ 29.75	01/18/91	42.88	07/01/91	3.15	220.00	1,478
$ 44.75	07/12/91	44.63	09/05/91		110.00	40
$ 44.88	10/17/91	41.13	10/29/91			(433)
$ 39.50	12/13/91	45.50	03/10/92	2.74	35.00	580
$ 46.25	03/30/92	49.00	06/10/92	1.19	35.00	253
$ 51.50	06/29/92	51.00	08/17/92		40.00	(68)
$ 52.25	09/10/92	55.38	12/09/92	3.00	40.00	298
$ 57.25	01/19/93	63.87	03/17/93		40.00	644

$3,928

AVON - WILDER'S RELATIVE STRENGTH

BUY $	BUY DATE	SELL $	SELL DATE	INC MM	DIVID	STK INC
			10/03/88			
$ 18.88	12/08/88	$ 20.75	01/27/89	$ 3.01		$ 132
24.50	04/05/89	35.75	05/24/89	18.63	$25.00	1,111
36.50	08/02/89	36.00	08/21/89		25.00	(83)
31.88	10/09/89	36.00	11/30/89	6.53	25.00	386
32.88	02/05/90	34.00	03/29/90	1.85		56
36.00	06/07/90	27.38	11/30/90		135.00	(785)
29.50	01/21/91	43.25	03/06/91	42.90	110.00	1,470
44.25	07/15/91	46.50	07/31/91	2.86		170
44.38	09/23/91	47.13	01/20/92	10.56	35.00	263
51.50	06/29/92	52.25	07/22/92	.85		18
50.88	09/08/92	53.50	10/05/92	5.41		209
55.25	12/31/92	57.50	02/16/93	1.51	40.00	209
	03/17/93					

$3,156

AVON - MACD

BUY $	BUY DATE	SELL $	SELL DATE	INC MM	DIVID	STK INC
$ 24.38	10/03/88	$ 23.50	10/19/88			($ 146)
19.63	12/21/88	21.50	03/22/89	$ 4.58	$25.00	159
35.75	07/03/89	34.00	07/17/89			(233)
36.50	08/02/89	35.88	09/11/89		25.00	(95)
31.50	11/07/89	34.25	01/11/90	3.17	25.00	245
32.38	03/01/90	35.25	05/29/90	.90	25.00	255
36.38	06/12/90	34.88	06/18/90			(208)
36.75	06/29/90	33.88	08/03/90			(345)
25.75	11/05/90	27.25	01/07/91	.47	110.00	202
29.50	01/21/91	43.75	05/21/91	4.79	220.00	1,592
45.00	06/05/91	44.75	09/04/91		35.00	(48)
45.13	10/18/91	46.25	02/20/92	.19	70.00	124
48.50	02/28/92	45.63	03/09/92			(345)
46.25	03/30/92	49.00	06/10/92	1.19	35.00	253
51.50	06/29/92	51.25	08/14/92		40.00	(43)
52.25	09/11/92	56.38	12/08/92	4.06	40.00	399
57.25	01/19/93	63.87	03/17/93		40.00	644

$2,410

AVON
BUY AND HOLD

BEGIN PRICE = $ 24.38
END PRICE   = $ 63.87
100 SHARES
TRAN COST   = $ 58
TOTAL DIVID = $900

$4,791

AVON
INVEST $ IN MM

INVEST $2,438
AVG PRIME = .088
MONTHS HELD = 54

$1,179

BOEING - MOVING AVERAGE

BUY $	BUY DATE	SELL $	SELL DATE	INC MM	DIVID	STK INC
$ 28.00	10/03/88	$ 27.25	11/11/88		$19.50	($ 114)
28.00	12/07/88	27.13	12/16/88			(145)
27.13	01/16/89	33.50	06/20/89		39.00	619
34.13	06/27/89	32.38	06/29/89	$ .92		(233)
33.75	07/14/89	36.25	10/30/89		19.50	213
39.63	11/20/89	38.63	01/26/90	1.20		(158)
40.75	02/01/90	56.75	07/24/90		47.60	1,590
59.25	07/27/90	55.75	08/01/90	.77		(408)
46.00	10/17/90	43.63	11/26/90		23.80	(271)
46.13	12/06/90	46.13	02/26/91		25.00	(33)
49.50	03/04/91	47.25	03/20/91		25.00	(258)
48.88	04/05/91	45.88	04/29/91			(358)
46.75	05/10/91	45.38	06/26/91		25.00	(170)
45.50	08/05/91	48.25	10/09/91	.46	25.00	242
50.00	10/17/91	45.13	11/15/91		25.00	(520)
46.88	12/26/91	46.63	02/12/92		25.00	(58)
46.25	04/14/92	43.75	05/01/92			(308)
45.00	06/08/92	42.13	06/18/92			(345)
40.25	08/07/92	38.50	08/21/92		25.00	(208)
37.38	10/13/92	35.25	11/12/92		25.00	(246)
34.75	12/16/92	36.13	01/22/93	1.69		82
35.63	03/15/93	34.38	03/17/93			(183)

($1,270)

BOEING - WILDER'S RELATIVE STRENGTH

BUY $	BUY DATE	SELL $	SELL DATE	INC MM	DIVID	STK INC
$ 28.00	10/03/88	$ 29.13	10/26/88	$ .79		$ 56
27.50	11/25/88	28.75	03/27/89	9.33	$19.50	96
41.38	02/02/90	40.00	02/23/90		23.80	(172)
49.25	05/04/90	59.00	06/21/90	12.40	23.80	953
52.00	08/14/90	46.13	10/29/90		23.80	(621)
49.13	04/04/91	49.38	09/17/91	.52	50.00	18
43.00	12/13/91	50.63	01/29/92	6.41		711
46.63	03/05/92	37.50	01/14/93		75.00	(896)
35.25	02/09/93	34.37	03/17/93		25.00	(121)

$ 24

BOEING - MACD

BUY $	BUY DATE	SELL $	SELL DATE	INC MM	DIVID	STK INC	
$ 28.00	10/03/88	$ 28.00	11/10/88		$19.50	($	39)
28.00	12/07/88	33.38	06/16/89	$ 3.49	39.00		522
33.75	07/14/89	36.38	10/27/89	1.45	19.50		226
39.75	11/20/89	38.88	12/21/89			(	145)
41.00	01/02/90	38.63	01/26/90			(	295)
42.00	02/05/90	46.38	04/30/90	.21	23.80		404
48.88	05/03/90	55.75	08/01/90	12.37	23.80		665
45.38	10/16/90	44.25	11/08/90		25.00	(	146)
46.63	11/15/90	44.25	11/21/90			(	296)
46.13	12/06/90	44.00	01/08/91			(	271)
49.25	01/18/91	46.13	02/26/91		25.00	(	345)
50.25	03/05/91	47.13	03/19/91			(	370)
48.88	04/08/91	47.38	04/10/91			(	208)
47.00	05/10/91	45.38	06/26/91		25.00	(	195)
45.25	08/01/91	48.25	10/09/91	.79	25.00		268
49.88	10/21/91	49.38	10/28/91			(	108)
45.38	12/24/91	46.63	02/12/92	1.86	25.00		94
47.13	04/15/92	44.13	04/30/92			(	358)
45.00	06/08/92	43.75	06/16/92			(	183)
39.75	08/10/92	36.13	10/28/92		25.00	(	395)
35.75	12/18/92	36.13	01/22/93	.47		(	20)
35.63	03/15/93	34.37	03/17/93			(	184)

($1,379)

BOEING
BUY AND HOLD

BEGIN PRICE = $ 28
END PRICE   = $ 34.38
100 SHARES
TRAN COST   = $ 58
TOTAL DIVID = $423

$1,003

BOEING
INV AT PRIME

INVEST $2,800
AVG PRIME = .088
MONTHS HELD = 54

$1,354

BRISTOL MYERS - MOVING AVERAGE

BUY $	BUY DATE	SELL $	SELL DATE	INC MM	DIVID	STK INC
$ 44.00	10/03/88	$ 42.63	10/08/88			($ 195)
42.88	11/25/88	44.00	01/23/89	$ .05	$50.00	104
45.13	01/26/89	44.88	03/07/89			(83)
46.25	03/09/89	47.88	06/15/89	.43	50.00	155
49.75	06/27/89	48.00	07/05/89			(233)
49.38	07/10/89	48.25	08/02/89			(171)
49.38	08/24/89	55.63	01/19/90	4.65	103.00	675
53.00	02/20/90	52.50	02/21/90			(108)
53.00	03/07/90	58.50	08/06/90	3.70	106.00	602
61.50	09/04/90	60.00	09/18/90			(208)
59.50	10/05/90	62.00	01/07/91	.60	60.00	253
67.00	01/18/91	75.25	04/29/91	.20	60.00	827
78.25	05/01/91	77.75	06/28/91		60.00	(48)
80.75	07/02/91	83.00	09/26/91	1.78		169
84.50	10/30/91	81.25	11/20/91			(383)
80.75	12/20/91	82.63	01/24/92	2.48	69.00	201
80.00	03/20/92	77.50	04/01/92		69.00	(239)
75.75	05/06/92	73.00	05/15/92			(333)
66.25	07/09/92	66.50	08/31/92	.02		(33)
68.50	09/04/92	65.50	09/23/92			(358)
65.00	10/21/92	65.00	01/05/93		72.00	14
	03/17/93	56.37				
						$ 608

BRISTOL MYERS - WILDER'S RELATIVE STRENGTH

BUY $	BUY DATE	SELL $	SELL DATE	INC MM	DIVID	STK INC
$ 42.88	11/25/88	$ 45.25	12/27/88	$10.30	$50.00	$ 239
49.75	06/27/89	48.25	08/01/89			(208)
48.88	08/23/89	49.50	09/15/89	2.17		6
52.38	02/09/90	53.38	04/19/90	3.96	53.00	99
60.25	10/02/90	67.13	12/21/90	4.46		634
67.00	01/18/91	74.50	02/26/91	40.14		732
81.50	10/08/91	85.50	01/17/92	1.82	69.00	413
80.50	02/06/92	65.75	08/21/92		138.00	(1,395)
67.50	09/02/92	67.75	12/28/92	.29	141.00	108
56.50	02/16/93	56.37	03/17/93			(71)
						$ 557

BRISTOL MYERS - MACD

BUY $	BUY DATE	SELL $	SELL DATE	INC MM	DIVID	STK INC
$ 44.00	10/03/88	$ 42.63	11/09/88			($ 195)
42.88	11/25/88	44.88	01/11/89	$ .72	$50.00	193
45.63	01/27/89	45.00	03/02/89			(121)
46.25	03/14/89	47.88	06/15/89	.51	50.00	156
48.63	06/29/89	48.25	08/02/89			(96)
49.38	08/24/89	54.88	01/16/90	4.49	103.00	599
53.00	02/20/90	52.38	03/14/90			(120)
53.00	03/20/90	52.63	04/24/90		53.00	(42)
56.13	04/30/90	58.50	08/06/90	1.65	53.00	234
61.00	09/05/90	62.50	01/08/91	.43	113.00	205
67.25	01/21/91	75.50	04/25/91	1.98	60.00	829
79.00	05/06/91	79.00	06/11/91			(58)
80.00	07/03/91	82.75	09/26/91	2.18		219
84.63	10/30/91	81.13	11/19/91			(408)
81.63	12/23/91	82.63	01/24/92	.91	69.00	112
80.13	03/03/92	67.25	08/25/92		138.00	(1,208)
68.50	09/09/92	67.00	09/17/92			(208)
66.00	10/20/92	67.50	12/31/92	2.70	72.00	167

$ 258

BRISTOL MYERS
BUY AND HOLD

BEGIN PRICE = $44
END PRICE   = $56.37
100 SHARES
TRAN COST   = $58
TOTAL DIVID = $1,000

$2,179

BRISTOL MYERS
INVEST $ IN MM

INVEST = $4,400
AVG PRIME = .088
MONTHS HELD = 54

$2,127

COLGATE - MOVING AVERAGE

BUY $	BUY DATE	SELL $	SELL DATE	INC MM	DIVID	STK INC
$ 22.25	10/03/88	$ 22.25	11/11/88		$19.00	($ 39)
22.88	12/06/88	22.25	02/27/89		19.00	(102)
22.88	03/08/89	30.25	11/08/89	$ 1.06	58.00	738
30.75	11/15/89	30.38	01/18/90			(95)
29.38	03/08/90	28.50	04/11/90			(146)
29.63	05/07/90	32.50	08/06/90	4.06	23.00	256
31.75	10/05/90	30.75	10/10/90			(158)
32.50	10/18/90	34.38	01/08/91	.54	23.00	154
35.63	01/21/91	34.13	01/29/91		23.00	(185)
36.25	02/04/91	37.75	05/16/91	.22	23.00	115
39.75	05/23/91	38.50	06/21/91			(183)
39.25	07/18/91	46.38	03/11/92	1.20	80.00	736
46.88	03/19/92	50.13	06/17/92	.86	27.00	295
52.25	06/29/92	57.50	12/18/92	4.91	62.00	534
56.75	01/27/93	65.63	03/17/93			830
						$2,750

COLGATE - WILDER'S RELATIVE STRENGTH

BUY $	BUY DATE	SELL $	SELL DATE	INC MM	DIVID	STK INC
$ 21.63	11/28/88	$ 22.75	12/27/88	$ 1.85		$ 56
22.63	03/07/89	25.63	05/24/89	18.94	$19.00	280
28.63	02/12/90	32.25	06/12/90	5.47	19.50	329
34.63	08/15/90	34.63	11/14/90		22.50	(36)
35.25	01/23/91	40.00	04/26/91	9.12	22.50	449
38.00	07/16/91	43.75	10/15/91	35.60	26.50	579
51.75	06/30/92	55.88	09/03/92	13.08	31.00	399
56.13	01/14/93	57.63	02/18/93		31.00	123
						$2,179

COLGATE - MACD

BUY $	BUY DATE	SELL $	SELL DATE	INC MM	DIVID	STK INC	
$ 22.25	10/03/88	$ 22.25	11/11/88		$19.00	($	39)
22.88	12/06/88	22.88	02/16/89		19.50	(	39)
23.00	03/10/89	30.00	11/06/89	$ 2.86	58.00		703
31.50	11/24/89	30.75	12/26/89			(	133)
31.88	01/02/90	30.75	01/09/90			(	171)
29.00	03/09/90	28.50	04/11/90			(	108)
29.50	05/08/90	32.50	08/06/90	4.25	22.50		269
31.75	10/05/90	34.38	01/08/91	1.70	22.50		229
36.75	02/05/91	38.25	05/15/91	.43	26.50		119
40.50	05/28/91	38.75	06/10/91			(	233)
39.50	07/19/91	40.25	10/25/91	.32	53.00		70
42.38	11/13/91	40.25	11/20/91			(	271)
42.25	11/29/91	46.63	02/18/92	.84	26.50		407
48.25	02/27/92	46.13	03/05/92			(	270)
48.00	03/23/92	49.25	06/18/92	.33	31.00		98
51.75	06/30/92	57.25	11/10/92	.66	62.00		555
59.13	11/16/92	57.50	12/11/92			(	221)
56.75	01/28/93	65.63	03/17/93		31.00		861

$1,826

COLGATE
BUY AND HOLD

BEGIN PRICE = $22.25
END PRICE   = $65.63
100 SHARES
TRAN COST = $58
TOTAL DIVID = $486

$4,766

COLGATE
INVEST $ IN MM

INVEST = $2,225
AVG PRIME = .088
MONTHS HELD = 54

$1,076

EDISON - MOVING AVERAGE

BUY $	BUY DATE	SELL $	SELL DATE	INC MM	DIVID	STK INC
$ 14.63	10/03/88	$ 30.75	10/24/89	$ 7.35	$90.00	$1,651
31.38	11/13/89	30.38	12/19/89		26.00	(132)
32.13	12/27/89	29.50	01/25/90			(321)
32.50	02/12/90	40.00	07/31/90	21.42	52.00	765
21.25	11/28/90	37.75	07/25/91	60.59	78.00	1,731
31.88	12/26/91	37.00	06/08/92	.74	56.00	511
37.13	06/15/92	36.13	06/17/92			(158)
37.50	06/24/92	44.75	12/22/92	3.48	59.00	729
45.00	01/12/93	44.00	02/12/93			(158)
43.38	03/12/93	43.25	03/17/93			(71)
						$4,547

EDISON - WILDER'S RELATIVE STRENGTH

BUY $	BUY DATE	SELL $	SELL DATE	INC MM	DIVID	STK INC
$ 14.63	10/03/88	$ 15.75	11/17/88	$ .65		$ 55
16.13	12/12/88	18.88	02/15/89	17.56	$22.50	257
30.75	11/09/89	33.25	12/13/89	1.26		193
32.25	01/04/90	31.25	02/27/90		26.00	(132)
38.25	05/15/90	44.00	06/18/90	3.73	26.00	547
47.50	07/16/90	22.25	12/27/90		52.00	(2,531)
24.00	01/17/91	29.75	02/14/91	24.84		542
39.75	08/14/91	34.63	01/14/92		54.00	(516)
36.38	06/11/92	39.00	07/20/92	10.63		215
44.38	01/06/93	44.75	02/11/93	.22		(21)
43.38	03/09/93	43.25	03/17/93			
						($1,391)

EDISON - MACD

BUY $	BUY DATE	SELL $	SELL DATE	INC MM	DIVID	STK INC
$ 16.00	12/12/88	$ 32.00	10/20/89	$10.37	$90.00	$1,642
32.63	11/17/89	30.38	12/19/89		26.00	(257)
32.00	01/10/90	30.75	01/24/90			(183)
32.13	02/13/90	35.13	05/07/90		26.00	269
38.25	05/15/90	25.50	07/06/90	.50	26.00	(1,307)
47.25	07/16/90	43.00	07/24/90			(483)
21.25	11/28/90	22.25	01/10/91	.17	26.00	68
24.00	01/18/91	37.75	07/25/91	22.77	52.00	1,392
36.00	10/03/91	36.50	03/17/92	.34	56.00	48
37.63	04/15/92	36.00	04/21/92			(221)
38.00	05/01/92	37.00	05/27/92		28.00	(130)
38.38	06/26/92	45.50	12/18/92	4.61	59.00	718
45.88	01/15/93	44.00	02/12/93			(246)
43.38	03/12/93	43.25	03/17/93			(71)

$1,239

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EDISON                        EDISON
BUY AND HOLD                  INVEST $ IN MM

BEGIN PRICE = $ 14.63         INVEST $1,463
END PRICE   = $ 43.25         AVG PRIME = .088
100 SHARES                    MONTHS HELD = 54
TRAN COST   = $ 58
TOTAL DIVID = $472
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$3,276

$707

HERSHEY - MOVING AVERAGE

BUY $	BUY DATE	SELL $	SELL DATE	INC MM	DIVID	STK INC
$ 25.00	10/03/88	$ 25.75	11/10/88	$ .49		$ 17
25.25	12/08/88	25.00	02/27/89		$19.00	(64)
26.13	03/06/89	31.75	08/17/89	1.48	19.00	524
33.00	08/29/89	31.88	09/13/89			(170)
33.00	09/20/89	33.88	01/12/90	1.16	25.00	56
31.50	03/09/90	31.25	04/27/90			(83)
32.25	04/30/90	35.25	08/06/90	.50	25.00	268
37.50	08/14/90	35.00	08/17/90			(308)
38.00	08/31/90	35.38	09/20/90			(320)
37.88	10/01/90	35.38	10/16/90			(308)
36.75	10/19/90	35.13	10/23/90			(220)
35.75	11/12/90	34.63	11/23/90		23.00	(147)
34.88	11/30/90	36.00	01/08/91	.22		54
38.38	01/17/91	41.50	06/18/91	1.42	45.00	300
42.00	07/08/91	40.50	07/11/91			(208)
42.13	07/18/91	40.88	07/24/91			(183)
41.88	07/31/91	40.75	08/19/91			(171)
41.75	08/22/91	40.38	09/05/91			(195)
39.75	10/14/91	37.25	11/21/91		25.00	(283)
40.00	12/16/91	41.13	01/31/92	.11		55
43.88	02/05/92	42.13	02/27/92		25.00	(208)
40.75	04/22/92	39.75	05/14/92			(158)
40.88	06/01/92	53.38	03/17/93		81.00	1,273

($ 479)

HERSHEY - WILDER'S RELATIVE STRENGTH

BUY $	BUY DATE	SELL $	SELL DATE	INC MM	DIVID	STK INC
$ 25.00	10/03/88	$ 26.88	11/01/88	$ 1.58		$ 132
25.50	12/07/88	28.13	05/01/89	7.64	$18.50	231
33.00	08/31/89	34.00	10/16/89	2.76		45
31.75	02/09/90	31.25	03/27/90		24.80	(83)
37.88	10/01/90	38.25	12/26/90	.20	22.50	2
39.38	01/18/91	40.38	02/13/91	3.38		45
42.00	07/05/91	40.25	10/25/91		24.50	(209)
37.75	12/02/91	43.63	01/14/92	10.58		541
40.25	03/30/92	42.75	07/23/92	14.16	24.50	231

$ 935

HERSHEY - MACD

BUY $	BUY DATE	SELL $	SELL DATE	INC MM	DIVID	STK INC
$ 25.00	10/03/88	$ 25.38	11/11/88	$ .27		($ 20)
25.63	12/12/88	25.25	01/24/89			(96)
26.13	02/02/89	25.00	02/27/89		$18.50	(153)
26.38	03/09/89	25.38	03/21/89			(158)
26.50	03/31/89	32.38	08/16/89	2.12	18.50	551
33.25	09/01/89	32.63	09/06/89			(120)
32.50	09/25/89	34.38	01/11/90	2.48	24.80	157
31.63	03/08/90	31.75	04/26/90	.02		(46)
33.00	05/04/90	36.00	08/07/90	1.94	24.80	269
37.00	09/04/90	36.50	09/07/90			(108)
36.75	10/02/90	35.75	10/12/90			(158)
35.63	11/13/90	34.63	11/21/90		22.50	(136)
36.38	12/04/90	35.13	01/01/91			(183)
39.38	01/18/91	38.88	03/18/91		22.50	(86)
40.13	03/21/91	40.13	04/30/91			(58)
41.88	05/03/91	41.50	06/18/91		22.50	(74)
41.75	07/01/91	41.25	08/13/91			(108)
41.88	08/26/91	40.38	09/05/91			(208)
39.75	10/14/91	37.25	11/21/91		24.50	(284)
40.00	12/16/91	41.13	01/31/92	.16		55
43.63	02/07/92	42.13	02/27/92		24.50	(184)
40.38	04/20/92	40.25	05/12/92			(71)
40.13	06/02/92	42.50	08/26/92	.34	27.00	206
43.50	09/02/92	45.75	12/16/92	.05	27.00	194
48.00	12/18/92	53.38	03/17/93		27.00	507

($ 312)

HERSHEY
BUY AND HOLD

BEGIN PRICE = $ 25.00
END PRICE   = $ 53.38
100 SHARES
TRAN COST   = $ 58
TOTAL DIVID = $423.50

$3,204

HERSHEY
INVEST $ IN MM

INVEST - $2,500
AVG PRIME = .088
MONTHS HELD = 54

$1,209

LOEWS - MOVING AVERAGE

BUY $	BUY DATE	SELL $	SELL DATE	INC MM	DIVID	STK INC
$ 79.00	10/03/88	$ 74.75	11/11/88		$25.00	($ 458)
77.00	11/30/88	115.00	12/20/89	$11.86	100.00	3,854
126.25	01/03/90	118.25	01/09/90			(858)
105.75	03/16/90	106.75	05/07/90	.14	25.00	67
111.25	05/14/90	110.00	06/28/90			(183)
87.50	11/09/90	88.50	01/09/91	.19		42
96.00	01/18/91	101.75	04/10/91	.83	25.00	542
107.75	04/17/91	104.00	05/07/91		25.00	(408)
101.63	06/03/91	100.13	06/19/91			(208)
100.88	07/10/91	100.25	08/02/91			(121)
103.13	08/07/91	104.00	10/09/91	.54		30
106.38	11/05/91	104.13	12/13/91			(283)
108.38	12/26/91	106.75	01/30/92			(221)
109.25	02/12/92	106.88	02/18/92			(295)
107.88	03/04/92	106.63	04/07/92			(183)
108.50	04/14/92	109.00	06/26/92	.11	25.00	17
114.13	07/06/92	115.25	08/28/92	.70	25.00	80
117.50	09/24/92	113.13	10/16/92			(495)
117.38	11/09/92	114.00	01/07/93			(396)
						$ 523

LOEWS - WILDER'S RELATIVE STRENGTH

BUY $	BUY DATE	SELL $	SELL DATE	INC MM	DIVID	STK INC
$ 79.00	10/03/88	$ 79.00	10/17/88			($ 58)
76.00	12/02/88	78.50	02/10/89	$13.62	$25.00	231
121.75	09/26/89	121.75	10/17/89			(58)
124.75	01/02/90	108.25	04/24/90		25.00	(1,683)
113.00	05/15/90	118.00	06/04/90	10.92		453
93.75	09/04/90	93.25	12/07/90		25.00	(83)
96.75	01/22/91	102.50	02/21/91	6.49	25.00	548
101.75	04/10/91	105.88	10/08/91	2.58	50.00	408
105.75	11/04/91	103.88	11/21/91		25.00	(220)
109.00	12/30/91	109.50	01/20/92	.20		(8)
107.25	02/07/92	112.00	06/18/92	1.94	25.00	444
114.00	07/06/92	114.50	07/27/92	.66		(7)
115.00	09/21/92	117.75	10/09/92	1.72		219
115.50	11/05/92	104.63	03/17/93		25.00	(1,120)
						($ 934)

LOEWS - MACD

BUY $	BUY DATE	SELL $	SELL DATE	INC MM	DIVID	STK INC
$ 79.00	10/03/88	$ 74.75	11/11/88		$25.00	($ 458)
75.50	12/08/88	114.50	09/15/89	$9.36	75.00	3,926
122.00	09/26/89	115.00	12/20/89		25.00	(733)
124.50	01/04/90	107.25	05/04/90		50.00	(1,733)
113.00	05/15/90	110.75	06/26/90			(283)
84.50	11/08/90	88.50	01/09/91	1.15		343
96.75	01/22/91	103.75	03/28/91	3.36	25.00	670
108.00	04/18/91	102.00	05/07/91		25.00	(633)
102.50	05/31/91	101.63	06/14/91			(145)
102.38	07/15/91	100.75	07/26/91			(221)
102.13	08/08/91	104.13	10/11/91	1.15	25.00	168
106.38	11/05/91	105.25	11/22/91			(171)
106.50	11/29/91	104.00	12/13/91			(308)
107.75	12/27/91	106.75	01/30/92			(158)
107.88	03/04/92	107.13	03/17/92			(133)
111.75	04/16/92	109.25	06/25/92		25.00	(283)
115.25	07/07/92	115.25	08/28/92		25.00	(33)
120.25	09/25/92	115.00	10/19/92			(583)
117.38	11/09/92	114.00	01/07/93			(396)
105.75	03/12/93	104.63	03/17/93			(170)

                                                      _____
                                                      ($1,334)

LOEWS
BUY AND HOLD

BEGIN PRICE = $ 79.00
END PRICE   = $104.63
100 SHARES
TRAN COST   = $ 58
TOTAL DIVID = $475

_____
          $2,980

LOEWS
INVEST $ IN MM

INVEST = $7,900
AVG PRIME = .088
MONTHS HELD = 54

_____
          $3,819

PHILLIP MORRIS - MOVING AVERAGE

BUY $	BUY DATE	SELL $	SELL DATE	INC MM	DIVID	STK INC
$ 24.25	10/03/88	$ 23.25	11/10/88			($ 158)
24.00	11/23/88	38.88	09/25/89	$ .36	126.00	1,556
40.13	09/27/89	40.75	11/07/89	.07		4
42.13	11/13/89	40.75	11/14/89			(196)
42.13	11/29/89	40.13	12/20/89		37.00	(221)
42.75	01/02/90	40.00	01/11/90			(333)
39.25	02/15/90	37.75	02/20/90			(208)
38.00	03/15/90	46.50	08/03/90	9.18	37.00	838
45.13	09/18/90	44.63	09/26/90			(108)
45.25	09/28/90	65.75	05/16/91	3.44	91.00	2,086
67.50	05/24/91	63.00	06/25/91		46.00	(462)
65.50	07/05/91	69.00	10/23/91	3.28	53.00	348
69.00	12/02/91	74.38	02/11/92	2.07	53.00	535
76.50	02/28/92	74.25	05/26/92		53.00	(230)
77.75	07/02/92	81.50	10/07/92	3.51	65.00	386
79.38	11/16/92	77.13	12/15/92		65.00	(218)
78.25	12/28/92	76.25	01/04/93			(258)
75.75	02/01/93	70.50	02/16/93			(583)

$2,778

PHILLIP MORRIS - WILDER'S RELATIVE STRENGTH

BUY $	BUY DATE	SELL $	SELL DATE	INC MM	DIVID	STK INC
$ 24.00	11/23/88	$ 24.25	12/13/88	$ 1.73	$29.80	($ 1)
41.13	09/29/89	44.38	10/20/89	5.85		273
41.88	01/04/90	42.13	04/25/90	.67	36.50	4
47.25	08/15/90	50.88	12/28/90	1.74	45.50	352
52.50	01/18/91	67.00	03/08/91	40.37	45.50	1,478
65.25	07/03/91	73.50	08/27/91	15.25		782
70.50	11/13/91	77.25	01/20/92	2.59	52.50	672
78.00	02/06/92	77.75	07/23/92		105.00	22
77.25	10/29/92	64.25	03/17/93		130.00	(1,228)

$2,354

PHILLIP MORRIS - MACD

BUY $	BUY DATE	SELL $	SELL DATE	INC MM	DIVID	STK INC
$ 24.25	10/21/88	$ 23.75	10/28/88			($ 108)
23.88	11/25/88	39.50	09/20/89	$3.00	125.80	1,633
41.13	09/29/89	40.88	11/07/89			(83)
42.75	12/01/89	40.13	12/20/89		36.50	(284)
43.38	01/03/90	39.75	01/10/90			(421)
38.63	02/12/90	44.00	08/06/90	5.67		558
45.00	09/20/90	48.50	10/18/90		73.00	292
48.38	10/19/90	46.80	01/09/91			(171)
52.50	01/18/91	66.50	05/14/91	4.37	45.50	1,392
69.00	05/28/91	66.25	06/06/91		45.50	(333)
65.63	07/09/91	71.25	10/07/91	1.08		558
73.63	10/16/91	68.75	10/23/91		52.50	(546)
70.96	12/13/91	74.38	02/11/92	1.31		285
76.75	02/28/92	74.38	03/05/92	.		(295)
76.63	03/11/92	75.75	04/09/92			(146)
78.88	04/14/92	75.75	04/24/92			(371)
78.25	04/29/92	76.00	05/22/92			(283)
77.75	07/02/92	82.75	10/08/92	4.56	65.00	512
79.50	11/16/92	76.25	12/16/92		65.00	(318)
75.50	02/02/93	64.25	03/17/93		65.00	(1,118)

$ 753

PHILLIP MORRIS
BUY AND HOLD

BEGIN PRICE = $ 24.25
END PRICE   = $ 64.25
100 SHARES
TRAN COST   = $ 58
TOTAL DIVID = $822.25

$4,764

PHILLIP MORRIS
INVEST $ IN MM

INVEST - $2,425
AVG PRIME = .088
MONTHS HELD = 54

$1,172

PHILLIP'S PETROLEUM - MOVING AVERAGE

BUY $	BUY DATE	SELL $	SELL DATE	MM INC	DIVID	STK INC
$ 18.25	10/03/88	$ 19.00	11/08/88	$ .29	$26.00	$ 43
20.13	11/25/88	22.25	07/05/89	.20	51.00	205
23.13	07/10/89	22.38	08/02/89			(133)
23.13	08/08/89	23.25	10/13/89	.14		(46)
23.50	11/30/89	23.88	01/15/90	.15		(20)
25.63	02/01/90	24.75	03/22/90		28.00	(118)
25.75	03/27/90	24.75	04/19/90			(158)
25.35	05/02/90	25.63	06/18/90	.09	28.00	(2)
26.00	07/02/90	27.38	08/27/90	.26	28.00	108
28.75	09/05/90	27.25	09/26/90			(208)
26.63	11/05/90	25.50	11/07/90			(171)
26.50	11/09/90	25.13	12/11/90			(195)
26.13	12/19/90	24.88	01/04/91			(183)
26.25	01/25/91	27.13	04/09/91	.02	28.00	58
28.25	04/11/91	27.38	05/03/91			(145)
26.88	06/05/91	26.25	06/18/91			(121)
26.63	07/17/91	25.38	08/13/91		28.00	(155)
26.00	08/27/91	26.00	11/06/91		28.00	(30)
24.00	12/31/91	22.75	02/05/92		28.00	(155)
23.50	03/12/92	22.50	04/02/92			(158)
23.88	04/03/92	25.00	06/29/92	.22	28.00	82
26.63	07/08/92	27.00	10/06/92	.58	28.00	8
24.38	12/11/92	24.88	03/17/93		28.00	20

($1,474)

PHILLIP'S PETROLEUM - WILDER'S RELATIVE STRENGTH

BUY $	BUY DATE	SELL $	SELL DATE	INC MM	DIVID	STK INC
$ 19.50	11/23/88	$ 20.50	01/30/89	$ 2.66		$ 45
23.13	05/22/89	27.50	09/07/89	24.86	$28.00	432
25.38	05/03/90	26.38	05/30/90	3.46	28.00	73
25.50	10/22/90	26.00	02/22/91	1.16	56.00	49
27.50	05/31/91	25.63	09/12/91		28.00	(217)
22.25	12/17/91	27.50	07/29/92	11.09	56.00	534
25.63	10/26/92	26.50	02/17/93	.56	56.00	86

$1,002

PHILLIP'S PETROLEUM - MACD

BUY $	BUY DATE	SELL $	SELL DATE	INC MM	DIVID	STK INC	
$ 18.25	10/03/88	$ 19.00	11/08/88	$ .34	$25.60	$	43
19.75	11/28/88	19.38	12/27/88			(	95)
20.63	01/06/89	22.63	05/11/89	.53	51.20		194
22.88	05/23/89	22.88	06/12/89			(	58)
23.63	07/12/89	22.50	08/01/89			(	171)
23.88	08/11/89	25.00	10/16/89	1.21			55
23.88	12/01/89	23.88	01/15/90			(	58)
25.63	02/01/90	25.38	03/20/90		28.00	(	55)
26.38	04/02/90	24.75	04/19/90			(	221)
26.13	05/08/90	25.63	06/18/90			(	108)
26.00	07/05/90	27.88	08/28/90	.41	28.00		158
28.88	09/07/90	28.25	09/12/90			(	121)
29.25	09/17/90	26.00	09/27/90			(	383)
26.00	11/06/90	25.38	12/10/90		28.00	(	92)
26.25	12/24/90	24.88	01/04/91			(	195)
26.25	01/25/91	27.50	04/08/91	.24	28.00		95
28.88	04/17/91	27.25	05/02/91			(	221)
26.63	06/04/91	26.25	06/12/91			(	96)
26.63	07/18/91	25.38	08/12/91		28.00	(	155)
26.50	08/29/91	25.63	09/16/91			(	145)
25.88	09/26/91	25.88	10/08/91			(	58)
27.13	10/14/91	25.63	11/07/91		28.00	(	180)
23.50	12/30/91	22.75	01/10/92			(	133)
24.38	01/15/92	22.75	02/05/92		28.00	(	193)
23.75	03/13/92	22.50	04/02/92			(	183)
24.75	04/06/92	25.00	06/29/92	.05	28.00	(	5)
26.50	07/09/92	27.13	09/21/92	.12	28.00		33
27.50	09/30/92	27.38	10/05/92			(	70)
24.38	12/11/92	24.88	03/17/93		28.00		20

($2,398)

PHILLIP'S PETROLEUM
BUY AND HOLD

BEGIN PRICE = $ 18.25
END PRICE   = $ 24.88
100 SHARES
TRAN COST   = $ 58
TOTAL DIVID = $ 496.80

$1,102

PHILLIP'S PETROLEUM
INVEST $ IN MM

INVEST = $1,825
AVG PRIME = .088
MONTHS HELD = 54

$ 882

SERVICE MASTER - MOVING AVERAGE

BUY $	BUY DATE	SELL $	SELL DATE	INC MM	DIVID	STK INC
$ 16.13	10/03/88	$ 16.25	10/07/88	$ .01		($ 46)
16.50	10/10/88	15.75	10/17/88			(133)
15.63	01/10/89	15.25	02/14/89			(96)
16.13	02/16/89	15.25	03/03/89			(146)
15.13	04/19/89	14.63	04/26/89			(108)
15.13	05/01/89	15.38	07/27/89	.07	$29.00	(4)
15.50	08/09/89	15.25	08/28/89			(83)
14.88	11/24/89	14.25	12/19/89			(121)
14.75	01/05/90	14.13	01/19/90		30.00	(90)
14.50	02/09/90	13.75	03/23/90			(133)
13.63	05/15/90	14.63	08/17/90	.62	30.00	73
14.63	09/13/90	14.63	10/12/90		30.00	(28)
14.25	11/13/90	18.63	06/12/91	2.31	96.00	478
19.75	07/05/91	25.13	03/04/92	7.88	80.00	568
24.00	05/05/92	24.00	06/24/92			(58)
25.13	06/29/92	27.38	09/21/92	1.62	32.00	201
27.25	10/22/92	27.38	12/22/92	.05		(45)
27.88	01/08/93	27.25	02/16/93		33.00	(88)
27.88	03/04/93	28.87	03/17/93			41
						$ 182

SERVICE MASTER - WILDER'S RELATIVE STRENGTH

BUY $	BUY DATE	SELL $	SELL DATE	INC MM	DIVID	STK INC
$ 15.38	01 05 89	$ 15.50	06 14 89	$ .58	$58.60	$ 13
14.63	01 04 90	14.75	06 12 90	.25	60.60	15
14.00	09 07 90	15.25	12 20 90	5.61	30.30	103
18.13	06 26 91	21.25	09 30 91	13.33	96.00	363
23.38	03 27 92	24.88	05 27 92	.47	32.00	124
24.63	06 10 92	26.75	07 31 92	4.07	32.00	190
27.00	10 20 92	28.38	11 11 92	1.82		82
27.50	01 06 93	28.88	03 17 93		33.00	113
						$1,003

SERVICE MASTER - MACD

BUY $	BUY DATE	SELL $	SELL DATE	INC MM	DIVID	STK INC
$ 16.13	10/03/88	$ 16.13	10/07/88			($ 58)
16.13	10/12/88	16.13	10/14/88			(58)
15.75	01/11/89	15.25	02/14/89			(108)
16.00	02/17/89	15.50	03/02/89			(108)
16.00	04/19/89	14.75	04/25/89			(183)
15.00	05/02/89	15.38	07/13/89	$ .05	$29.30	9
15.63	07/20/89	15.38	07/27/89			(83)
15.63	08/17/89	15.25	08/28/89			(96)
14.88	11/24/89	14.25	12/19/89			(121)
14.75	01/05/90	14.38	01/12/90		30.30	(65)
14.50	02/09/90	13.75	03/23/90			(133)
13.88	05/16/90	14.38	08/20/90	.29	30.30	23
9.88	09/14/90	9.25	09/28/90			(121)
9.75	10/05/90	9.25	10/10/90			(108)
9.63	11/14/90	9.75	01/16/91	.03	48.00	2
10.50	01/28/91	18.63	06/12/91	4.29	48.00	807
13.25	07/05/91	16.25	03/05/92	3.82	80.00	326
15.50	04/28/92	24.25	06/25/92	.84		818
26.00	06/30/92	27.38	09/21/92	.99		81
27.25	10/22/92	27.88	12/18/92	.30		5
27.88	01/08/93	27.00	02/17/93		33.00	(113)
28.00	03/05/93	28.88	03/17/93			30

$ 746

SERVICE MASTER
BUY AND HOLD

BEGIN PRICE = $ 16.13
END PRICE   = $ 28.87
100 SHARES
TRAN COST   = $ 58
TOTAL DIVID = $ 591.40

$1,807

SERVICE MASTER
INVEST $ IN MM

INVEST = $1,613
AVG PRIME = .088
MONTHS HELD = 54

$ 780

Formulas

INC MM = Income on stock gain invested at average prime rate

$$\text{Stock Gain} \ * \ \frac{.088}{365} \ * \ \text{\# days invested at avg prime rate}$$

\# DAYS INVESTED AT AVG PRIME = Buy Date - Last Sell date - 1

STOCK INCOME = Gain or Loss, including dividends, less
     transaction costs, plus income (using average prime rate)
     on gain figured for time period not in market.

(Sell$ - Buy$)*100 + Inc MM + Dividends - Tran Cost

BUY AND HOLD INCOME = Income for full time period, including
     dividends, less transaction costs.

(Price Mar. 17, 1993 - Price Oct. 3, 1988) * 100 -
Transaction Cost + Dividends

INCOME IF INVESTED AT AVG PRIME FOR FULL TIME PERIOD =
     Income if invested amount required to buy 100 shares of
     stock on October 3, 1988. Used average prime rate,
     compounded monthly.

(Beginning Price * 100) * (1.00733^54)

APPENDIX B

RESULTS BY INDICATOR

	Moving Average	Wilder's Index	MACD	Buy & Hold	Invest Avg Prime
Avon	$3,928	$3,156	$2,410	$4,791	$1,179
Boeing	(1,270)	24	(1,379)	1,003	1,354
Bristol-Myers	608	557	258	2,179	2,127
Colgate	2,750	2,179	1,826	4,766	1,076
Edison Brothers	4,547	(1,391)	1,239	3,276	707
Hershey	(479)	935	312	3,204	1,209
Loews	523	(934)	(1,134)	2,980	3,819
Phillip Morris	2,778	2,354	753	4,764	1,172
Phil. Petroleum	(1,474)	1,003	(2,398)	1,102	882
Service Master	182	1,004	746	1,807	780

760-538

BRISTOL MYERS - MACD

BUY $	BUY DATE	SELL $	SELL DATE	INC MM	DIVID	STK INC
$ 44.00	10/03/88	$ 42.63	11/09/88			($ 195)
42.88	11/25/88	44.88	01/11/89	$ .72	$50.00	193
45.63	01/27/89	45.00	03/02/89			(121)
46.25	03/14/89	47.88	06/15/89	.51	50.00	156
48.63	06/29/89	48.25	08/02/89			(96)
49.38	08/24/89	54.88	01/16/90	4.49	103.00	599
53.00	02/20/90	52.38	03/14/90			(120)
53.00	03/20/90	52.63	04/24/90		53.00	(42)
56.13	04/30/90	58.50	08/06/90	1.65	53.00	234
61.00	09/05/90	62.50	01/08/91	.43	113.00	205
67.25	01/21/91	75.50	04/25/91	1.98	60.00	829
79.00	05/06/91	79.00	06/11/91			(58)
80.00	07/03/91	82.75	09/26/91	2.18		219
84.63	10/30/91	81.13	11/19/91			(408)
81.63	12/23/91	82.63	01/24/92	.91	69.00	112
80.13	03/03/92	67.25	08/25/92		138.00	(1,208)
68.50	09/09/92	67.00	09/17/92			(208)
66.00	10/20/92	67.50	12/31/92	2.70	72.00	167

$ 258

BRISTOL MYERS
BUY AND HOLD

BEGIN PRICE = $44
END PRICE   = $56.37
100 SHARES
TRAN COST   = $58
TOTAL DIVID = $1,000

$2,179

BRISTOL MYERS
INVEST $ IN MM

INVEST = $4,400
AVG PRIME = .088
MONTHS HELD = 54

$2,127