

AN EVALUATION OF METHODOLOGY INVOLVED IN A SELECTED
STOCK MARKET TIMING TECHNIQUE

By

JAMES R. NEWLIN

Bachelor of Science

Southwestern State College

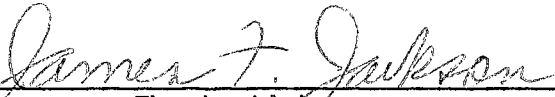
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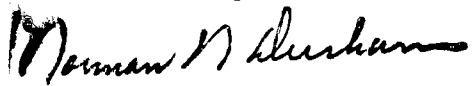
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Thesis Adviser





Dean of the Graduate College

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CHAPTER I

INTRODUCTION

Recent literature has contained much about the theory of "random walks" in stock market prices. This theory in essence maintains that successive price changes in individual stocks are independent of past changes in price, at least to the extent that any existing dependence cannot be utilized to increase expected profits from stock transactions. To date, the independence assumption of the random walk model has been tested, primarily, by academicians via standard statistical tools such as serial correlation tests, analysis of runs of successive price changes of the same sign, and spectral analysis. The results in each instance seem to uphold the model. If indeed it does exist, this indicated independence would seem to undermine the very foundation upon which the numerous technical theories, abounding in Wall Street, are built.

Generally speaking, the theories of the Wall Street technicians seem to suggest that it is best to buy stocks that recently have been stronger than the market as a whole and sell stocks that have been weaker. Detection of such stocks and general trends is attempted, for the most part, by reliance on various charting techniques. However, it is often difficult, if not impossible, to establish the specific system involved in such approaches due to a lack of information.

It can be stated with certainty that the technicians are in oppo-

sition to the random walk hypothesis. Yet while their chartist methodology is based on the very dependence assumption which the random walk proponents claim to have refuted, they have made no serious attempt at empirical validation of their own views.

Thus, two diametrically opposed groups with widely divergent views exist. Although each group attests to the validity of their particular viewpoint, little has been done by either faction to test their views by direct empirical comparison. This situation is largely due to the fact that the random walk school has developed its case in academic journals in language couched in terms of mathematical reasoning not easily understandable to the Wall Street technician. At the same time, the chartists have made no public attempt to rigorously formulate their own beliefs.

Purpose of the Study

The basic purpose of this study is to provide an empirical test of a specific technical trading theory. Concurrently, through direct comparison of the results evolving from use of these technical trading rules with the results of a naive buy-and-hold policy applied to the same stocks, a test will be provided to a limited degree with regard to the random nature of stock market prices.

The results derived from testing one specific technical theory will admittedly not provide a conclusive basis for broad generalizations about chartist techniques in the aggregate. It has been suggested that a systematic validation or invalidation of all the various types of chartists theories will in all likelihood be necessary before any broad conclusions may be drawn, and the intent of this study is to

provide a step in that direction.¹

Scope of the Study

This study basically encompasses three periods: Period One-- July 1, 1965 through June 30, 1966; Period Two--June 16, 1964 through June 15, 1965; and Period Three--July 1, 1963 through June 30, 1966. These particular periods of time were chosen for the following respective reasons:

Period One includes two spans of time which exhibit definite and differing trends, i.e., over-all upward price movement and over-all downward price movement. This was deemed beneficial for test purposes by providing a measure of the ability of the trading technique to cope with both types of situations. Also, inclusion of a period exhibiting both these characteristics was considered a means of reducing bias in the experiment.

The Period Two starting date was chosen at random from the three-year period ending June 30, 1966. The period of one year was deemed lengthy enough to provide worthwhile inferences in addition to being expedient for computing rates of return.

Period Three was, likewise, considered lengthy enough to provide meaningful implications and yet current enough to be truly representative of the nature of the market as it presently exists. The relative brevity of the time periods used was not considered a limitation of this study. On the contrary, the sacrifice of lengthiness for the sake of currency was deemed advantageous. The stock market is a dynamic

¹Eugene F. Fama, "The Behavior of Stock Market Prices," Journal of Business, XXXVIII (January 1965), p. 99.

system, constantly changing in nature just as the environment in which it is encompassed is ever changing. A test that covers a period of several preceding months or years would appear to lose validity due to the averaging effect of taking into account environmental phenomena which are not currently applicable.

During the above periods, two separate and distinct approaches were utilized and the results of each compared.

One approach is a variation of technical theory as conceived and depicted by Mr. E. S. C. Coppock of the Trendex Research Group, San Antonio, Texas, a well-known investment advisory service. This approach has been labeled by its author as a "Timing Technique for Traders." Basic timing devices employed in this technique are market breadth data such as the daily number of stocks advancing and declining, the total issues traded, and a weighted thirty-day moving average based on this data. Selection criteria are based on recent strength or weakness of specific stocks relative to the market as a whole.

The alternative method utilizes application of a naive buy-and-hold policy to the same stocks selected for use in the timing technique. The date of purchase and sale for each of these stocks coincides with the first and last trading dates indicated by the timing technique during the above-mentioned periods in order to provide an equitable comparative base with regard to rate of return. Comparison of buy-and-hold results with those generated through use of the "timing technique" should determine whether the trading rules are an efficient means of increasing expected profits from stock transactions.

Historical background information with regard to both technical theory and the theory of random walks is furnished in Chapter II.

Chapter III provides a measure of the present state of the controversy, pointed out heretofore by presenting certain of the more pertinent and timely published research works in this area. Methodology with respect to each of the specific approaches utilized is described in Chapter IV. Contained in Chapter V are all statistical results as illustrated by tables giving stocks selected, dates of purchase and sale, quantities and amounts purchased and sold, brokerage costs, and net gain or loss and rate of return for each stock or group of stocks. Chapter V, also, contains the comparative summary and analysis. Chapter VI, the final chapter, includes a summarization of conclusions generated by the study findings, as well as suggestions for future approaches to related research.

CHAPTER II

HISTORICAL BACKGROUND

Technical Theory

Two groups of conditions are always present in the stock market to affect the course of prices. The first of these relates to the monetary structure of the market itself and is characterized as "technical." The second relates to the adjustment of prices to economic conditions and is referred to as "fundamental."² Individuals basing their market strategies on the former condition, as regards both selection and timing, are known as technicians. For the purposes of this paper, the views of the fundamentalist will be circumvented and discussion confined to technical theory and its evolution.

Generally speaking, most technicians, or technical traders, may be categorized as either "bar chartists," "point-and-figure chartists," or "tape readers."³ There are many variations of these basic strategies, as well as several other strategies which do not specifically require the use of charts or tapes. No matter which tool is employed, however, its proponents undoubtedly feel that with proper interpretation it will provide a guide to either selection or timing, or both. Even though

²Charles A. Dice, David K. Eiteman, and William J. Eiteman, The Stock Market (New York, 1966), p. 403.

³Ibid., p. 215.

there is some divergence among the approaches used by technicians, basically all technical strategies are founded upon a common set of assumptions.

The foundation for technical theory was erected around the turn of this century by Charles H. Dow, cofounder and editor of the Wall Street Journal. In various editorials during the period 1900-1902, Dow attempted to demonstrate that beneath the fluctuations in individual stocks there was an ever present trend with regard to the market as a whole. In order to show the movements of these trends he devised the now famous Dow-Jones averages.

This was the beginning of what later came to be known as the Dow Theory. Actually, this theory was in effect a combination of Dow's market wisdom with that of William Peter Hamilton, Dow's successor as editor of the Wall Street Journal. In addition to his highly regarded book, The Stock Market Barometer, published in 1922, Hamilton used Dow's observations in his editorials as a basis for making forecasts of future stock movements. Although Dow originated the theory and Hamilton made practical applications of it, neither attempted to provide concrete definitions of the Dow Theory, as such.

Even though the theory has gained fairly wide acceptance, it was not until 1932 that a definitive approach was attempted. After ten years of successful trading based on the theory and an intensive study of both authors' writings, Rhea, in his book, The Dow Theory, extracted and presented what he felt were the basic Dow hypotheses.⁴

The popularity of technical trading grew rapidly after the pub-

⁴Robert Rhea, The Dow Theory (Abridged Edition), (New York, 1932), pp. 12-15.

lishing of the Rhea book. Many new specific trading theories were evolved, all of which were descendents of the Dow Theory in that they were based on the detection of trends. This growth in popularity has continued undiminished up to the present day, with the number of variations applied to the technical theme showing a marked increase in recent times due to the advent of computerized techniques. The number of investment advisory services and mutual funds has increased enormously in the past decade, and many of them rely to some extent on technical analysis, particularly for timing.

According to the Dow Theory, the market at any given moment is the composite resultant of three movements: (1) a major trend up or down; (2) an intermediate movement toward or away from this trend; and (3) more or less patternless day-to-day fluctuations.⁵

A major movement of the market is one that lasts from approximately nine months to two years and may be either an upward or a downward trend. It is primarily with reference to the major movements that the Dow Theory makes any positive claims. It may or may not be effective in predicting the secondary moves. The primary usage is for interpretation of the averages for indications as to whether an upward or downward turn in prices has occurred or is imminent.

After every primary movement has gone on for some time, a secondary movement will appear and for a short time, perhaps a week to two months, will carry an upward moving market down or a downward moving market up. These actions and reactions are deemed a regular part of the market program and may be expected to produce countermoves of almost half the

⁵Dice, p. 349.

previous rise or decline of the market.

Current fluctuations arise from the fact that the market is a dynamic system, with rapid, but temporary, changes ever present. The averages indicate these changes from day to day, but they cannot be predicted, nor can they be used to predict anything fundamental in business.

The Dow Theory holds that the stock market is a barometer of business. The original purpose of the theory was not to predict movements of security prices for traders but rather to forecast business cycles or the larger movements of depression and prosperity. In reality, the Dow Theory is simply a crude tool with the practical purpose of indicating the relative strength of supply and demand of stocks converging upon the market.

A trend may be defined as "an inclination in a particular direction," and the very core of the Dow Theory maintains that the past trend in stock prices reveals this future inclination. This proposition was almost unanimously accepted as fact until recently when a contradictory school of thought began to gather followers.

The Random Walk Theory

Ironically, the first complete development of a theory of random walks in security prices is due to Bachelier, whose original work appeared, as did Dow's, around the turn of the century. Unfortunately, his work failed to receive attention from economists, and in fact was independently derived by Osborne over fifty years later.⁶ In contrast

⁶Milton F. M. Osborne, "Brownian Motion in the Stock Market," Operations Research, VII, No. 2 (March-April, 1959), pp. 145-173.

to technical theory, the theory of random walks says the future path of the price level of a security is no more predictable than the path of a series of cumulated random numbers. In statistical terms, the theory says that successive price changes are independent, identically distributed random variables.⁷ This implies, of course, that the series of price changes has no memory; that is, the past cannot be used to predict the future in any meaningful way.

The bulk of recent work in support of the random walk theory has been carried out by the Graduate School of Business of the University of Chicago. This research has been in conjunction with the Center for Research in Security Prices at the school and has been published periodically in the Journal of Business. Through numerous tests of the random walk model's empirical validity, a voluminous amount of empirical evidence in support of the model has been accumulated.

The theory of random walks in stock prices actually involves two separate hypotheses: (1) successive price changes are independent, and (2) the price changes conform to some probability distribution.⁸ It is the first of these two hypotheses that so directly conflicts with the beliefs of the technicians. The random walk theory of independence is admittedly not a completely accurate description of the real world since perfect independence is not likely to be found. However, for the stock market trader the independence assumption is an adequate description of reality so long as the actual degree of dependence cannot be used to increase expected gains.

⁷Fama, p. 34.

⁸Ibid., p. 35.

Stated another way, the theory of random walks makes the assumption that the stock exchange is not only well organized and highly competitive, but is a perfect market. Taken in the aggregate, the prices established in the marketplace thoroughly reflect the best evaluation of currently available knowledge, even though, individually, buyers or sellers may act with far less than perfect knowledge. If any substantial group of buyers felt prices were too low, their buying would force prices up, and the reverse would be true if prices were deemed too high. Except for appreciation due to earnings retention, the conditional expectation of tomorrow's price, given today's price, is today's price.

As stated by Cootner:

In such a world, the only price changes that would occur are those which result from new information. Since there is no reason to expect that information to be nonrandom in its appearance, the period-to-period price changes of a stock should be random movements, statistically independent of one another. The level of stock prices will, under these conditions, describe what statisticians call a random walk, the physicists call Brownian motion. In the normal course of events, the level of prices, i.e., the summation of these random movements, will show movements that look like cycles but in fact are not. Nothing can be learned about the future from looking at these price series. Buying a stock based on signals from such a chart will produce results no better than those from repeated flipping of a fair coin.⁹

Random walk proponents, of course, do not claim that the stock exchange represents the "perfect" market no more than they claim perfect independence in stock prices. Practically speaking, their assertion is that the investor should accept the theory of random walks as

⁹Paul H. Cootner, "Stock Prices: Random vs. Systematic Changes," Industrial Management Review, III, No. 2 (Spring, 1962), p. 25.

the better model if the actual degree of dependence in successive price changes cannot be used to produce greater expected profits than those derived from use of a naive buy-and-hold policy.

CHAPTER III

STATE OF THE CONTROVERSY - PERTINENT EMPIRICAL RESEARCH

Alexandrian Filter Rules

The complete lack of direct empirical testing of technical trading methods and the reasons for this shortcoming have been discussed in Chapter I. In order to better clarify the present state of the controversy at hand, however, brief mention should be made of certain of the more important recent findings contained in published empirical tests of independence.

Not all these published tests have employed standard statistical models. A notable exception is the work of Sidney S. Alexander.¹⁰ Professor Alexander devised a mechanical trading rule which attempted to apply more sophisticated criteria to identify movements in stock prices through the use of what he terms as "filters." An "x" percent filter is defined as follows: If the daily closing price of a particular security moves up at least "x" percent, buy and hold the security until its price moves down at least "x" percent from a subsequent high, at which time simultaneously sell the amount on hand and sell "short" an equal amount. The short position is maintained until the daily closing price rises at least "x" percent above a subsequent low

¹⁰Sidney S. Alexander, "Price Movements in Speculative Markets: Trends or Random Walks," Industrial Management Review, II, No. 2 (May, 1961), pp. 7-26.

at which time one covers the amount sold "short" and buys an equivalent amount "long." Moves of less than "x" percent in either direction are ignored.

Alexander tested his technique for filters ranging in size from five to fifty percent. The tests covered different time periods from 1897 to 1959 and involved closing prices for two indexes: Dow-Jones Industrial Averages from 1897 to 1929 and Standard and Poor's Composite Averages from 1929 to 1959. In general, filters of all different sizes and for different periods of time yielded substantial profits, significantly greater than a buy-and-hold policy. This led Alexander to conclude that the independence assumption was not upheld.¹¹

Several shortcomings were later pointed out with regard to Alexander's test, however. Mandelbrot pointed out biases leading to overstatement of profits, i.e., buying at prices exactly equal to the low plus "x" percent and selling at the high minus "x" percent was deemed unrealistic due to the frequency of large price fluctuations.¹² In a later article, Alexander took account of discontinuities in the price series, drastically reducing his profit.¹³

This study was not the end of the criticism of the filter rules test. In a subsequent article, Fama and Blume made further allowances for the effect of dividends accruing to the buy-and-hold approach which resulted in an even less favorable comparison for the Alexandrian filter

¹¹Ibid., p. 26.

¹²Benoit Mandelbrot, "The Variation of Certain Speculative Prices," The Journal of Business, XXXVI, No. 4 (October, 1963), pp. 384-419.

¹³Sidney S. Alexander, "Price Movements in Speculative Markets: Trends or Random Walks - No. 2," Industrial Management Review, II, No. 2 (Spring, 1964), pp. 25-46.

rules.¹⁴ At the same time brokerage commissions arising from the frequent transactions initiated by the mechanical trading rules were shown to produce disastrous effects.

This latter test showed that although on the small filters of one-half to one-and-one-half percent there was evidence of persistence or positive dependence in very small movements of stock prices, unless one did not have to pay the usual brokerage fees, the technique was not profitable. Even then, due to out-of-pocket transaction costs, the buy-and-hold policy was not outperformed by any significant margin.

All filters below twelve percent and above twenty-five percent were found to produce negative average returns per security after commissions. Filters between twelve and twenty-five percent produced positive returns, ranging from roughly one and one-half percent for the fourteen percent filter to three percent via the twenty percent filter. These returns were scant when compared to the average return of just under ten percent produced by the buy-and-hold policy during the test period. As a result, the authors concluded that even though standard statistical tools such as serial correlation cannot provide exact estimates of the expected profits from mechanical trading rules, they can measure direction and degree of dependence in price changes as well, at least, as the Alexandrian filter rules.¹⁵

Levy's Simulation Models

While the technicians of Wall Street have failed to respond seri-

¹⁴Eugene F. Fama and Marshall E. Blume, "Filter Rules and Stock Market Trading," Journal of Business, XXXIX, No. 1, Part II (January, 1966), pp. 226-241.

¹⁵Ibid., pp. 239-241.

ously to the issues raised by the academicians, they have recently received support from a scholarly source. In his doctoral dissertation at American University in Washington, D.C., Levy has developed and tested "simulation models" of various portfolio-management strategies by computer. Of special significance is the fact that Levy's basic findings uphold the concept of "relative strength continuation," i.e., stocks strong in the recent past are better than stocks weak in the recent past.¹⁶ Examining the weekly closing prices of two-hundred New York Stock Exchange stocks during the two-hundred-sixty weeks between October, 1960 and October, 1965, Levy found that stocks strong during previous twenty-six-week periods do far better than other stocks in the subsequent twenty-six-week period. Furthermore, there appeared to be a close relationship between the degrees of past and future strength over such periods.

The results of the twenty-six-week studies suggested that the optimal investment strategy is one of continuously upgrading a portfolio by selling the weakest stocks and using the proceeds to buy more of the strongest. Levy experimented with several formulas designed to accomplish this. One formula, suitable for an investor willing to accept high risks in order to maximize profits, called for buying all stocks that in the latest twenty-six-week period has been (a) in the top five percent as to market gain and (b) in the top twelve and one-half percent as to price volatility. After the initial investment, no purchases were made unless funds became available because of sales.

¹⁶Robert A. Levy, "An Evaluation of Selected Applications of Stock Market Timing Techniques, Trading Tactics, and Trend Analysis" (unpub. Ph.D. dissertation, American University, 1966), p. 346.

The stocks were sold whenever their strength deteriorated to a point at which they were among the lowest 30 percent of the two-hundred stock group as to market gain over the latest twenty-six-week period. Any such continuous operation, taking place in the period examined, would have yielded an average annual return, after commissions, of 29 percent. Stocks bought at random and held throughout this period would have gained 10 6/10 percent annually.¹⁷

Major conclusions developed in the Levy study were as follows: First, several applications of technical stock analysis are useful in forecasting future price movements. Second, stock prices do follow predictable trends and patterns--thus denying the validity of the theory of random walks. Third, there is conceptual as well as empirical evidence that technical analysis is a desirable supplement to fundamental analysis. Fourth, computer capabilities are invaluable in evaluation of technical principles of portfolio management. The fifth, and final, major conclusion was that simulation models may be devised which are both academically reliable and mathematically uncomplex.¹⁸

The findings of Levy are of considerable interest inasmuch as he is the first academic student of the stock market to apply sophisticated statistical methods to examinations of price fluctuations and arrive at conclusions which generally support the basic views of the Wall Street technicians and refute the postulates of the random walk theorists.

The Cootner Model

A third study of interest was performed by Cootner who used statis-

¹⁷Ibid., pp. 286-287.

¹⁸Ibid., pp. 354-355.

tical methods such as autocorrelation and mean-square successive difference tests as well as transition matrices to develop a model of stock market behavior.¹⁹ The hypothesis which he presented substantially differed from the random walk hypothesis, also.

The model presented by Cootner began with the perfect market concept held by random walk theorists but suggested that this perfection was achieved without a high degree of sophistication on the part of participants. Due to their being engaged in other occupations, it was assumed that opportunity costs per relevant unit of information were very high. As a result, prices are accepted by participants as representative of true differences in value. Choice of stocks is based largely on attitude toward risk. Demand for stocks is primarily dependent upon income level and its distribution. The stockholders in this model will be confronted with various surprises as time passes, but the majority of the surprises arising this week will not be systematically related to surprises appearing next week.²⁰

Cootner's model also takes into account the professional investors or stock market specialists. Their profits were hypothesized to generate from observing the random walk of the stock market prices produced by nonprofessionals until the price deviates far enough from the expected price to warrant prospects of an adequate return. For simplicity, if one assumes that every professional has the same expectations and opportunity costs, then prices will behave as a random walk with reflecting barriers. Prices within these upper and lower limits will tend to move

¹⁹Cootner, p. 27.

²⁰Ibid., p. 26.

like a random walk. Furthermore, there will probably also be random changes in the trends around which the random walk takes place since changes in the price expectations of professionals will likely occur in a random manner.²¹ There is much random behavior in the price series defined by Cootner, but while it has some implications which are quite similar to a random walk, the differences are significant.

Prediction of Advances and Declines

Of particular significance for purposes of this study are two articles which appeared in the July 1965 edition of the Journal of Business. The first article, by Theil and Leenders, utilized information theory to test for dependence on time series data for the proportion of total securities advancing, declining and remaining unchanged each day on the Amsterdam Stock Exchange.

The Dutch authors hoped to establish the predictability of the percentage of advances, declines and those stock prices remaining unchanged for the next trading day, given the time series of such fractions up to and including today. Working with the 1,007 trading days between November 2, 1959 and October 31, 1963, the authors were able to conclude that the Amsterdam Exchange has a memory of one day as regards the fraction of stocks advancing, declining and remaining unchanged in price.²² They found that the best prediction for tomorrow was half way between the long-run averages of forty, forty and twenty percent, respectively, and the observed fractions of today.

²¹Ibid., p. 27.

²²H. Theil and C. T. Leenders, "Tomorrow on the Amsterdam Stock Exchange," Journal of Business, XXXVIII, No. 3 (July, 1965), pp. 277-284.

The second article, by Fama, made reference to the Amsterdam study and applied the same approach to New York Stock Exchange data. Also, the results derived from use of the information theory approach were confirmed by regression analysis. Although there appeared to be some dependence in successive values of the proportion of securities advancing, declining and unchanged on the New York Stock Exchange, the degree of dependence was not strong. As a result, Fama stated:

Thus it seems safe to conclude that the proportion of securities advancing, declining today on the New York Stock Exchange do not provide much help in predicting the proportions advancing and declining tomorrow.²³

Fama's conclusion is especially pertinent to the study at hand since, as will be shown in Chapter IV, the trading technique to be tested is based almost exclusively upon manipulation of the daily advance, decline and unchanged data emanating from the New York Stock Exchange.

It is not contended that the above-mentioned research efforts are exhaustive of those published; however, they seem truly representative of those most pertinent. As well as reflecting the differing approaches taken, they also point up the fact that the conflict is far from being resolved at this particular point in time.

The two types of approaches which have been utilized are: (1) purely statistical tests, and (2) direct tests of mechanical trading rules to see whether or not they provide profits greater than buy and hold. Since there has been little effort on the part of academic people to apply the latter approach to the various chartist theories, one of

²³Eugene F. Fama, "Tomorrow on the New York Stock Exchange," Journal of Business, XXXVIII, No. 3 (July, 1965), p. 299.

the more prolific researchers and authors in this area has suggested that systematic validation or invalidation of these theories would represent a real contribution.²⁴

This suggestion, undoubtedly, points up a fruitful avenue for future research since the purely statistical tests have failed to either alter the technical traders' beliefs or stimulate them into a rigorous public formulation of their own views. The primary barrier to implementing such a systematic process is the aforementioned reluctance of the chartists to divulge their specific methodologies. The process of validating or invalidating becomes fairly straightforward once this barrier is passed, as the succeeding chapters will attempt to demonstrate.

²⁴Fama, "The Behavior of Stock Market Prices," p. 98.

CHAPTER IV

A MECHANICAL TRADING TECHNIQUE VERSUS A RANDOM APPROACH

A Timing Technique for Traders

As mentioned in Chapter I, the mechanical trading rules to be tested in this study were evolved by Coppock, founder of the Trendex Research Group. This group was formed in the mid-forties based upon several econometric techniques created by its founder during some fifteen years of market operations. His weekly Stock Market Trendex, originally circulated to subscribers in the investment business only, now goes to both professionals and amateurs in several countries. Of interest is the fact that the "Trendex" primarily utilizes the principle of "relative strength continuation," vindicated in the Levy study.

The specific technique of interest for purposes of this report was devised by its author as a means of exposing short-term highs and lows in stock market trends. Published in typewritten form in June 1966, it was furnished, free of charge, to all regular "Trendex" subscribers. The method was reputedly designed for the trader desiring to take advantage of trends persisting for more than a very few weeks. Due to the high costs of trading, price movements of sufficient duration were sought which would make the potential reward more than offset the risks involved.

Since raw data representing a great mass of stocks was deemed necessary, the Dow-Jones Industrial Average was immediately eliminated

as a potential price index. The Standard and Poor's five-hundred stock index was also discarded since it is not available in all communities. The process of elimination brought the choice of an index down to market breadth data. It was felt that such data was truly representative because it covers the direction of price change for every stock traded on the New York Stock Exchange. Also, its availability on both a daily and weekly basis supported its choice as a basic price index.

Further decided was that although simple moving averages may be helpful in trend analysis their timing is often late and they may produce false signals which cause frequent trades without gain. Elimination of false signals is obviously not possible without losing sensitivity in the index or timing guide. A compromise method was therefore deemed necessary which gives fairly sensitive trend change signals while reducing the number of invalid signals. One such method is use of a weighted moving average. There are various ways of computing weighted moving averages; however, some that produce superior results are too complex for use by a trader not having access to an electronic computer. The simplest system for weighting a moving average gives maximum weight to the most recent figure, less to yesterday's figure, still less to the figure for the day before, etc. This very simple weighting plan makes current and recent price action exert a relatively strong influence on the level of the moving average data, and in that way assumed a more timely pattern. Concurrently, it was felt to provide the mathematical simplification necessary for the average trader in stocks.

The time span to be used in a weighted moving average should rely on a timing technique which functions for market trends that persist

long enough to permit worthwhile movements by active stocks. Since observation reveals that many short-term market movements persist for six to fifteen weeks, and six weeks cover thirty market days, the shortest acceptable time span would appear to be thirty market days.

Based upon the above-mentioned restrictions, criteria decided upon were as follows: (1) the technique should not be very sensitive to insignificant market fluctuations; (2) basic data should reflect the price trend direction of most listed stocks rather than a small number of high-grade stocks; (3) basic daily data should be taken from breadth-of-market reports and include the number of issues traded, the number of advances and the number of declines; (4) a weighted moving average should be used instead of a simple moving average; and (5) the time span for the weighted moving average should be thirty market days.

An example of manipulation of the data in the form of a "data sheet" may be seen in Table I. Column headings on this sheet are self-explanatory; however, the reasoning behind certain of the manipulations is not so readily apparent.

For instance, the reason for dividing the net advances or declines by the number of issues traded is to discover the percentage of issues traded which advanced or declined, and, thus, to take into account the number of unchanged prices. The signal to "buy" or "sell" occurs when there is a penetration of the weighted moving average by the refined daily datum. An example of each type of signal may be seen on April 4 and February 11, respectively, by reference to Table I.

At the time of an upward penetration, Coppock recommends buying three stocks that have recently been clearly stronger than the general

TABLE I

SAMPLE DATA SHEET REPRODUCED FROM COPPOCK'S "TIMING TECHNIQUE FOR TRADERS"

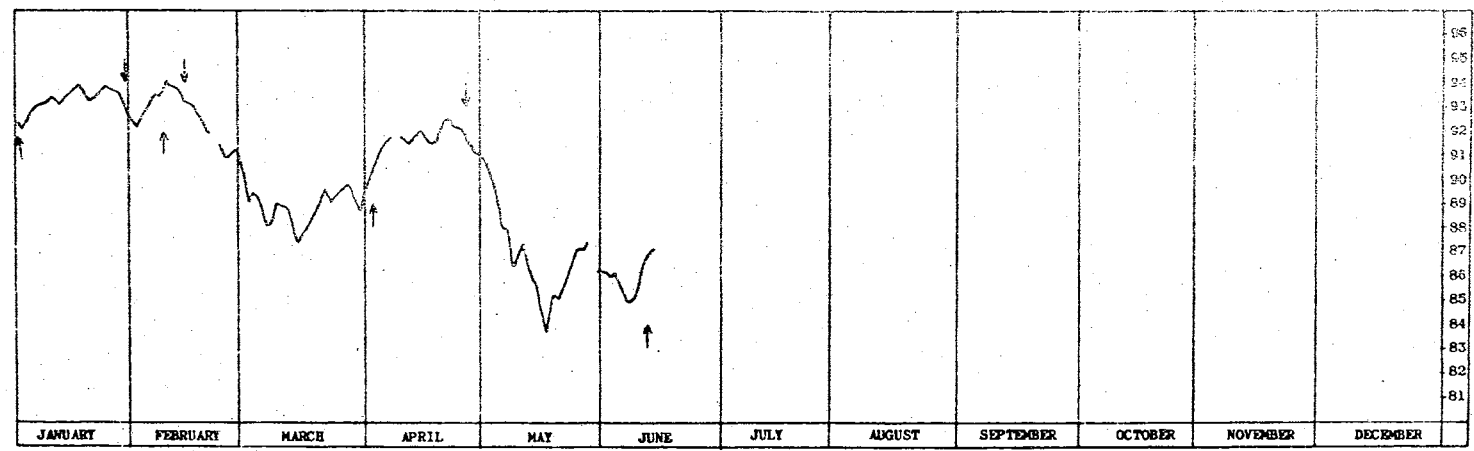
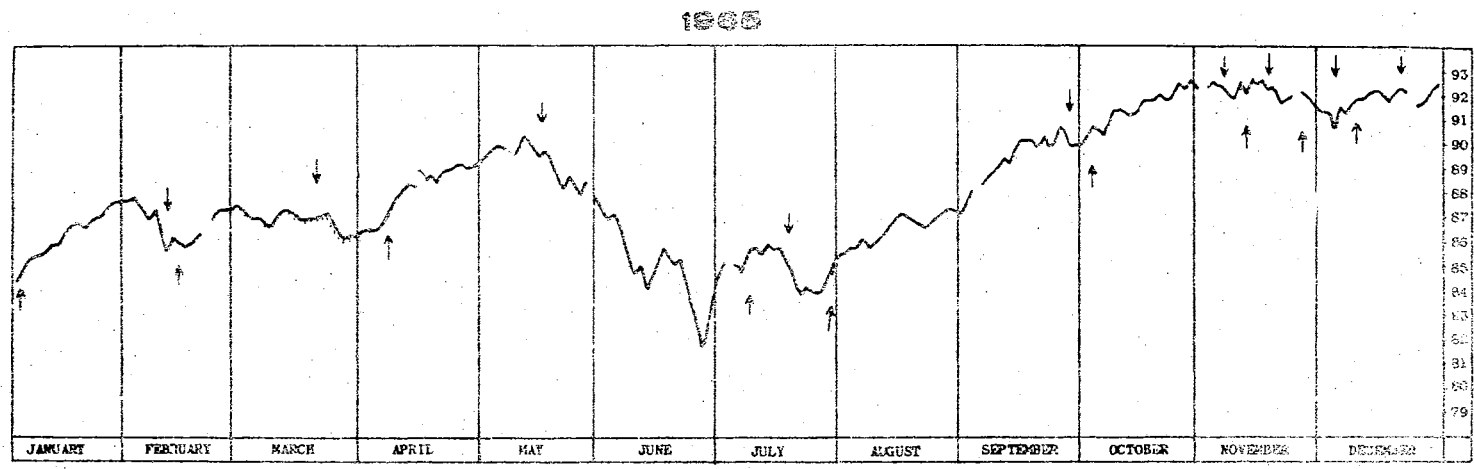
DATA SHEET										
A	B	C	D		E	F	G	H	I	J
CALENDAR DATE	NET ADVANCES OR DECLINES DIVIDED BY ISSUES TRADED WITH SIGN + OR -	CUMULATIVE TOTAL OF ENTRIES IN COLUMN 'B'	FIGURE FROM COLUMN 'C' ROUNDED TO ELIMINATE LAST 2 DIGITS	30-DAY CHECK OFF	30 MARKET DAY TOTAL OF FIGURES IN COLUMN 'D'	CURRENT FIGURE IN COL. 'D' MULTIPLIED BY 30	DIFFERENCE BETWEEN CURRENT FIG. IN COL. 'F' AND YESTERDAY'S FIG. IN COL. 'E' WITH + OR - SIGN	ORIGINAL WEIGHTING PLUS CUMULATIVE TOTAL OF COL. 'G'	FIGURE IN COL. 'H' MULTIPLIED BY .00215 ROUNDED TO NEAREST 10TH	ACTION SIGNAL: PENETRATION OF 'D' BY 'D'
2/11/66	+.067	15.020	15.0	✓	447.7	450.0	+ 3.1	6948.5	14.9	
14	-.038	14.982	15.0	✓	448.4	450.0	+ 2.3	6950.8	14.9	
15	-.205	14.777	14.8	✓	448.8	444.0	- 4.4	6946.4	14.9	SELL
16	-.086	14.691	14.7	✓	448.9	441.0	- 7.8	6938.6	14.9	
17	-.273	14.418	14.4	✓	448.6	432.0	-16.9	6921.7	14.9	
18	-.131	14.287	14.3	✓	448.2	429.0	-19.6	6902.1	14.8	
21	-.252	14.035	14.0	✓	447.3	420.0	-28.2	6873.9	14.8	
22		M A R K E T				H O L I D A Y				
23	-.279	13.756	13.8	✓	446.2	414.0	-33.3	6840.6	14.7	
24	-.254	13.502	13.5	✓	444.8	405.0	-41.2	6799.4	14.6	
25	+.147	13.649	13.6	✓	443.3	408.0	-36.8	6762.6	14.5	
28	+.090	13.739	13.7	✓	441.8	411.0	-32.3	6730.3	14.5	
3/ 1/66	-.510	13.229	13.2	✓	439.6	396.0	-45.8	6684.5	14.4	
2	-.497	12.732	12.7	✓	436.9	381.0	-58.6	6625.9	14.2	
3	+.072	12.804	12.8	✓	434.4	384.0	-52.9	6573.0	14.1	
4	-.119	12.685	12.7	✓	432.0	381.0	-53.4	6519.6	14.0	
7	-.554	12.131	12.1	✓	429.0	363.0	-69.0	6450.6	13.9	
8	-.216	11.915	11.9	✓	425.7	357.0	-72.0	6378.6	13.7	
9	+.404	12.319	12.3	✓	422.7	369.0	-56.7	6321.9	13.6	
10	-.069	12.250	12.3	✓	419.7	369.0	-53.7	6268.2	13.5	
11	-.045	12.205	12.2	✓	416.7	366.0	-53.7	6214.5	13.4	
14	-.545	11.660	11.7	✓	413.3	351.0	-65.7	6148.8	13.2	
15	-.544	11.116	11.1	✓	409.5	333.0	-80.3	6068.5	13.1	
16	+.193	11.309	11.3	✓	406.4	339.0	-70.5	5998.0	12.9	
17	+.161	11.470	11.5	✓	403.4	345.0	-61.4	5936.6	12.8	
18	+.297	11.767	11.8	✓	400.7	354.0	-49.4	5887.2	12.7	
21	+.351	12.118	12.1	✓	398.1	363.0	-37.7	5849.5	12.6	
22	+.182	12.300	12.3	✓	395.5	369.0	-29.1	5820.4	12.5	
23	-.164	12.136	12.1	✓	392.9	363.0	-32.5	5787.9	12.4	
24	-.036	12.100	12.1	✓	390.0	363.0	-29.9	5758.0	12.4	
25	+.106	12.206	12.2	✓	387.2	366.0	-24.0	5734.0	12.3	
28	+.129	12.335	12.3	✓	384.5	369.0	-18.2	5715.8	12.3	
29	-.251	12.084	12.1	✓	381.6	363.0	-21.5	5694.3	12.2	
30	-.478	11.606	11.6	✓	378.4	348.0	-33.6	5660.7	12.2	
31	+.117	11.723	11.7	✓	375.4	351.0	-27.4	5663.3	12.1	
4/ 1/66	+.248	11.971	12.0	✓	373.0	360.0	-15.4	5617.9	12.1	
4	+.316	12.287	12.3	✓	371.0	369.0	- 4.0	5613.9	12.1 B	
5	+.262	12.549	12.5	✓	369.5	375.0	+ 4.0	5617.9	12.1	
6	+.069	12.618	12.6	✓	368.3	378.0	+ 8.5	5626.4	12.1	
7	+.156	12.774	12.8	✓	367.6	384.0	+15.7	5642.1	12.1	
8		M A R K E T				H O L I D A Y				
11	+.026	12.800	12.8	✓	366.8	384.0	+16.4	5658.5	12.2	
12	-.068	12.732	12.7	✓	365.8	381.0	+14.2	5672.7	12.2	

market. A downward penetration is a signal to sell those three stocks and to make short sales of three different stocks that have been clearly weaker than the general market. He emphasizes that these purchases and sales should be made with stocks stronger and weaker than the market and not those considered as either a bargain or overpriced. It is also recommended that these three stocks be chosen from three different industries for purposes of diversification.

To illustrate the efficacy of this technique with regard to timing, "buy" and "sell" signals have been applied to Standard and Poor's 500-stock index for the period January 1, 1965 through June 15, 1966, and are graphically portrayed in Figure 1. Although this portrayal indicates that the technique places the trader on the "right" side of the market in most instances, the net profitability of the method in comparison with a simple policy of buying and holding is, of course, yet to be demonstrated.

Selection Methodology

For the test of specific stocks, twelve separate stocks listed on the New York Stock Exchange were chosen. Six of these common stocks were clearly stronger than the aggregate market for the entire duration of the test period and the preceding six months, or more, as well, and thus met the previously mentioned selection prerequisites established by Coppock. By the same token, the other six stocks were noticeably weaker than the market as a whole during the same period. The obvious reason for selection of stocks listed on the New York Exchange only is that the signal-producing data being used originated from this exchange and can only be considered representative of stocks listed thereupon.



1966

Figure 1. Application of "Timing Technique" Buy (↑) and Sell (↓) Signals to Standard and Poor's 500-Stock Index for Period January 1, 1965 - June 15, 1966.

The basis for determination of the relative strength of the chosen stocks was provided by the April, 1966 edition of "Cycli-Graphs," a quarterly publication of the Securities Research Company of Boston, Massachusetts.²⁵ The particular trend indicator used was the monthly "ratio-cator" curve appearing on the individual "cycli-graphs." This curve is based on the monthly closing price of each stock and its percentage relationship to the monthly closing price of the Dow Jones Industrial Average. The choice of this basis for relative strength determination was made at the suggestion of the author of the timing technique under study.

The six stocks selected by the above method as being notably stronger than the market were: Delta Airlines, Magnavox, McGraw-Hill, National Airlines, Polaroid, and Texas Instruments. The stocks chosen for weakness in price were: C.I.T. Financial Corporation, First National Stores, National Gypsum, Procter and Gamble, South Puerto Rico Sugar, and United States Gypsum. Confirmation that each of these stocks fairly met the selection criteria may be seen by reference to Figures 2, 3 and 4 which contain reproductions of the twelve pertinent "cycli-graphs." Each graph contains four different trend lines which depict the monthly price range, cumulated twelve month's earnings, and the annual dividend rate, in addition to the "ratio-cator" curve. Each trend line is individually labeled for purposes of clarification on the U. S. Gypsum graph which may be seen in Figure 2. It should be noted that these graphs have been arranged according to dictates of size, rather than alphabetically or by test.

²⁵Three-Trend Cycli-Graphs, Securities Research Company, (April 1966), pp. 1-128.

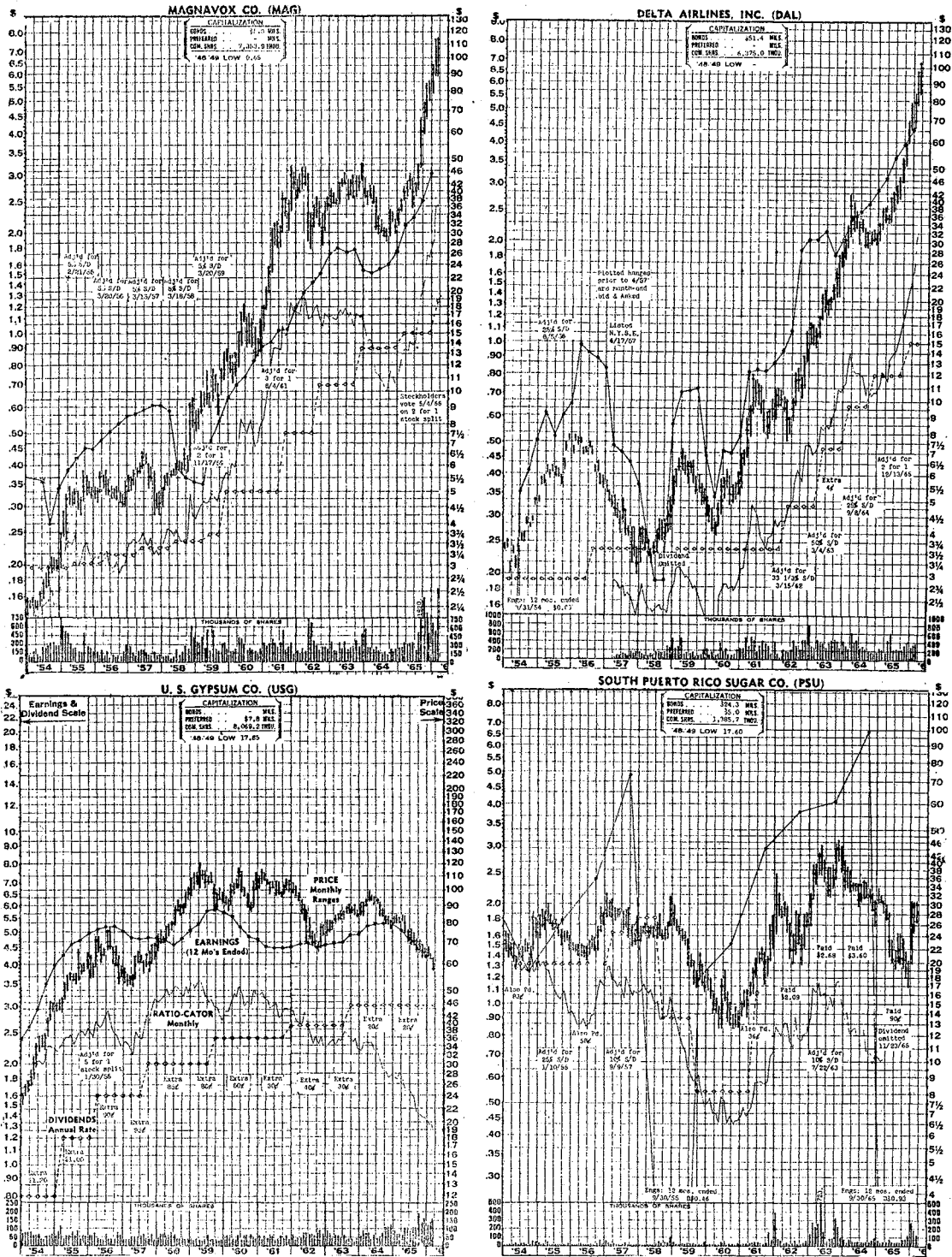


Figure 2. Specimen "Cycli-graphs" Used in Tests 1 and 2. (Reproduced from the April, 1966 edition of Three-Trend Cycli-Graphs published by Securities Research Company, Boston, Massachusetts.)

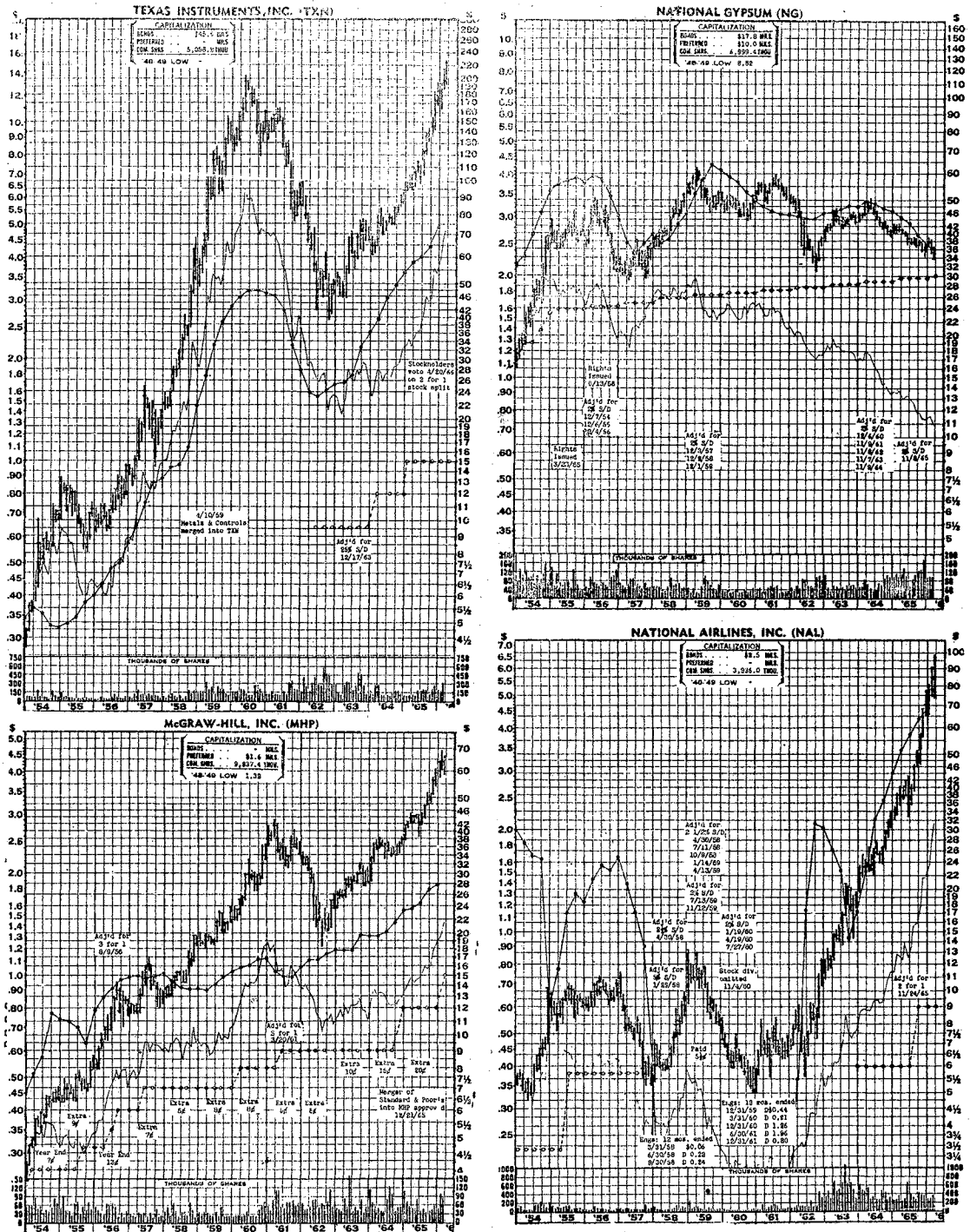


Figure 3. Specimen "Cycli-graphs" Used in Tests 1 and 2. (Reproduced from the April, 1966 edition of Three-Trend Cycli-Graphs published by Securities Research Company, Boston, Massachusetts.)

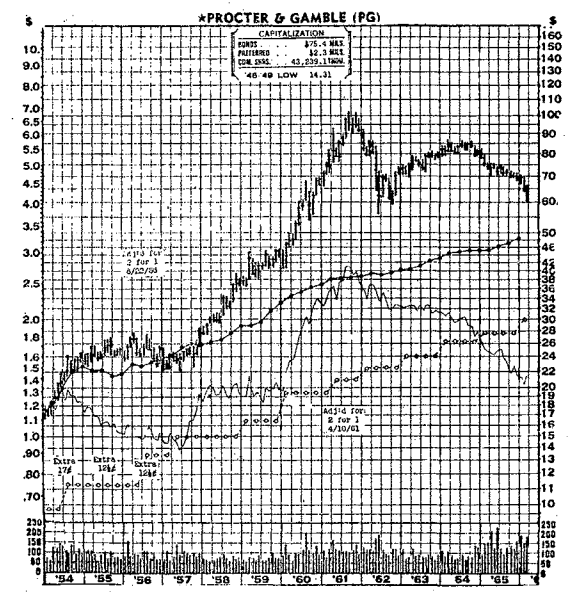
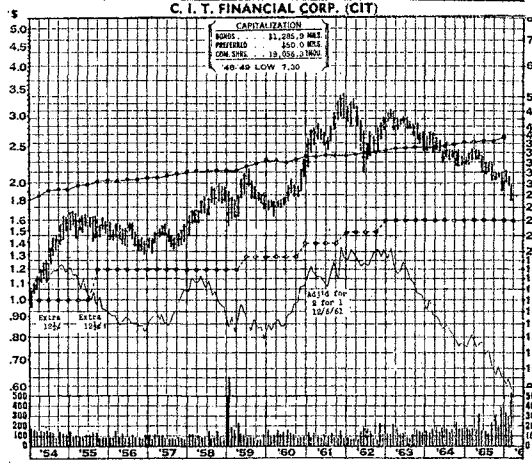
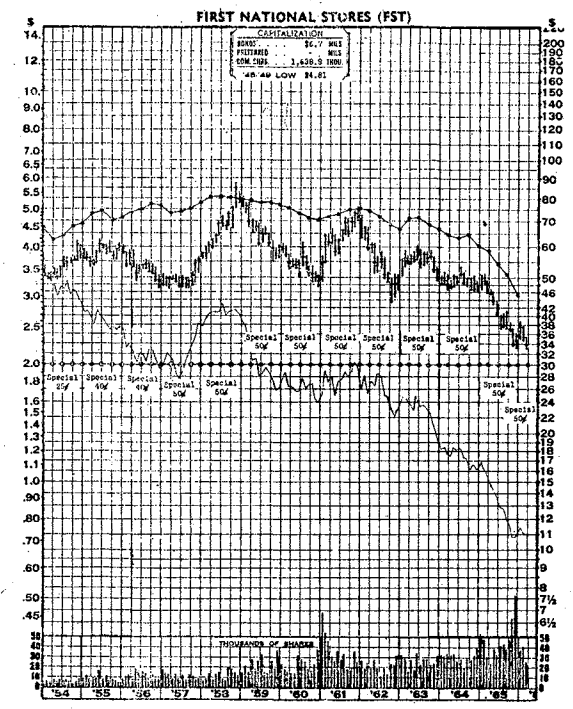
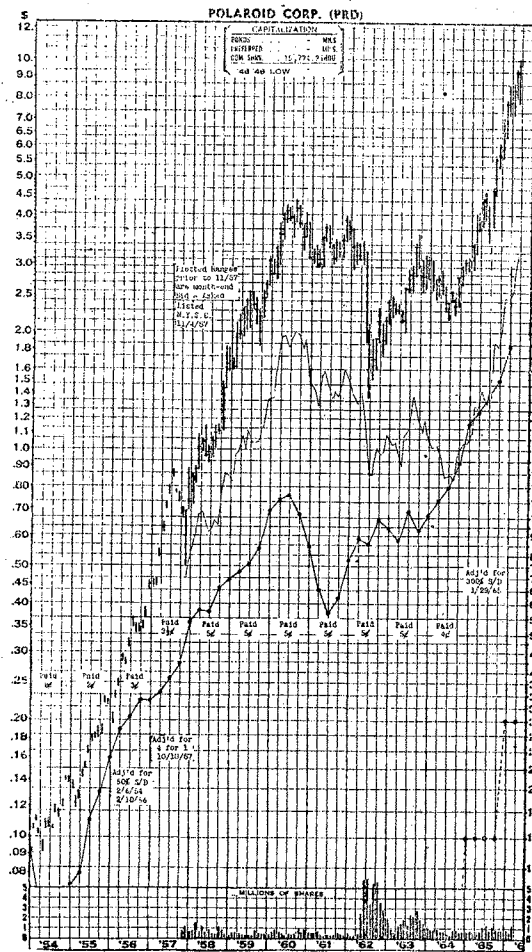


Figure 4. Specimen "Cycli-graphs" Used in Tests 1 and 2. (Reproduced from the April, 1966 edition of Three-Trend Cycli-Graphs published by Securities Research Company, Boston, Massachusetts.)

As mentioned earlier, a supplemental test of the timing technique was also made with regard to Standard and Poor's five-hundred stock composite average. Selection criteria were not needed for this test, of course. The applicable purchase or sale price used was simply the closing price on the day subsequent to a buy or sell signal.

The Alternate Technique

The frame of reference utilized to provide a comparative basis for judging the efficacy of the timing strategy may be referred to as a naive buy-and-hold policy. This policy was applied to the same stocks used for application of the mechanical trading rules. It should be intuitively apparent that in order for the technical trading method to refute the independence assumptions of the random-walk model it should provide greater profits after allowances for broker fees than those garnered by simply buying and holding. In order to provide an equitable comparative base and to eliminate bias resulting from the use of differing time spans, the first and last trading dates for each approach have been made to coincide.

CHAPTER V

ANALYSIS OF SELECTED GROUPS

The statistical findings summarized in this chapter result from the three separate examinations conducted as a part of this study. These tests represent what is, hopefully, an unbiased effort aimed at validation, or invalidation, of the effectiveness of previously described trading rules. In accordance with similar investigations conducted in this area, results emanating from application of this mechanical trading process have been directly compared to those yielded by a straightforward buy-and-hold (or sell-and-hold) policy.

The basic assumption inherent in this study is that the timing strategy, if found to issue profits greater than buy-and-hold, will provide a step toward refutation of the theory of random walks. On the other hand, superior buy-and-hold results should provide an indication that the random-walk model more accurately describes the movement of stock prices than does breadth of market data manipulated in the manner prescribed by the specific trading technique in question.

All test findings in this chapter have been adjusted to include deductions for brokerage commissions at a rate of 1 percent per transaction, either purchase or sale. This rate is consistent with that used in tests of a similar nature published elsewhere and closely approximates actual fees incurred in a normal "round lot" (one-hundred share) transaction.

The three separate tests conducted are depicted in Table II, Table III, and Table IV. All three tables include the dates of purchase and sale for stocks bought long and the dates of sale and covering purchase for stocks sold short. Each individual stock used in the first two tests is shown in a separate column denoting the pertinent opening price for the dates dictated by the mechanical trading rules. Each column is summarized for both the "timing technique" and the buy-and-hold technique with regard to gross profit or loss, brokerage fees, and net profit or loss.

Table II contains the data yielded by Test 1 covering the period July 1, 1965 through June 30, 1966. Table III represents the Test 2 results for the period June 16, 1964 through June 15, 1965. Test 3 is depicted in Table IV and illustrates the application of both approaches to Standard and Poor's Composite 500-Stock Index for the period July 1, 1963 through June 30, 1966. The selection basis for each time period has previously been discussed in Chapter I, and selection criteria for stocks tested was explained in Chapter IV.

Statistical Results

In all tests the net profit accruing to all stocks, both individually and in the aggregate, proved greater through use of the simple buy-and-hold approach than through use of the trading rules in question. The "timing technique" on all buy long transactions combined yielded thirty-three net gains in seventy-one transactions, and on all short sales a combined total of sixteen net gains were produced in sixty-seven transactions. The breakdown by test was as follows on a subsequent page.

TABLE II

TEST 1 - COPPOCK'S TIMING TECHNIQUE APPLIED

DATE		<u>Three Stocks Consistently Stronger Than The Market</u>					
BUY	SELL	MAGNAVOX		DELTA		POLAROID	
7 / 9/65	7/19/65	\$ 41.00	\$ 41.13	\$ 86.00	\$ 88.50	\$ 65.38	\$ 67.13
7 /30/65	9/29/65	41.50	64.87	82.50	106.50	69.87	90.75
10/5 /65	11/ 9/65	64.75	71.87	104.00	124.25	89.87	102.75
11/15/65	11/19/65	82.25	78.63	127.00	129.50	106.87	113.75
11/29/65	12/ 7/65	83.75	78.00	135.75	136.87	116.25	115.25
12/13/65	12/27/65	81.50	76.63	145.00	146.50	117.25	115.75
1/ 4/66	2/ 1/66	80.87	92.38	140.00	158.25	114.50	125.25
2/10/66	2/16/66	100.00	98.00	184.00	179.50	132.87	132.38
4/ 4/66	4/28/66	118.00	116.13	212.50	219.75	150.38	145.50
6/14/66	6/28/66	107.25	100.25	235.50	218.00	143.00	141.50
	Gross Profit(Loss)	\$ 17.02		\$ 55.37		\$ 43.77	
	Less Commission	-16.19		-29.60		-27.56	
	Net Profit (Loss)	\$ 0.83		\$ 25.77		\$ 21.21	
BUY-AND-HOLD Net Profit		\$ 57.84		\$128.96		\$ 74.06	

Three Stocks Consistently Weaker Than The Market

SELL	COVER	U.S. GYPSUM		C.I.T. FINANCE		PROCTER & GAMBLE	
7/19/65	7/30/65	\$ 75.00	\$ 70.50	\$ 32.38	\$ 31.75	\$ 73.13	\$ 73.75
9/29/65	10/ 5/65	66.13	66.50	31.25	31.63	72.00	71.38
11/ 9/65	11/15/65	65.87	66.13	31.50	31.13	70.25	70.38
11/19/65	11/29/65	63.00	65.25	31.87	31.75	71.00	70.75
12/ 7/65	12/13/65	63.75	64.00	31.25	30.00	70.75	70.38
12/27/65	1/ 4/66	63.50	65.63	30.25	31.00	69.00	69.00
2/ 1/66	2/10/66	64.38	64.25	30.25	30.75	68.63	66.87
2/16/66	4/ 4/66	63.87	57.63	30.75	27.50	66.87	66.00
4/28/66	6/14/66	57.00	55.50	27.13	29.00	61.50	65.63
	Gross Profit(Loss)	\$ 7.11		\$ 2.12		\$ (1.01)	
	Less Commission	-11.58		-5.52		-12.47	
	Net Profit (Loss)	\$ (4.47)		\$ (3.40)		\$ (13.48)	
SELL-AND-HOLD Net Profit		\$ 19.32		\$ 4.14		\$ 7.74	

TABLE III

COPPOCK'S TIMING TECHNIQUE APPLIED - Test 2

DATE		NATIONAL AIRLINES		Three Strong Stocks TEXAS INSTRUMENTS		McGRAW-HILL	
BUY	SELL						
6/16/64	8/5/64	\$ 47.38	\$ 50.00	\$ 71.87	\$ 75.00	\$ 35.38	\$ 34.88
9/ 2/64	10/15/64	51.00	56.00	75.00	84.75	34.50	34.13
10/19/64	10/28/64	57.00	59.38	83.25	83.88	34.63	36.25
11/12/64	11/27/64	59.38	64.00	87.63	88.63	36.25	36.25
1/ 6/65	2/11/65	64.75	69.38	94.63	98.00	37.50	41.00
2/15/65	3/18/65	70.00	79.50	97.25	100.25	42.00	44.75
4/ 9/65	5/17/65	77.38	81.63	101.38	115.13	43.62	44.00
Gross Profit(Loss)		\$ 33.00		\$ 34.63		\$ 7.38	
Less Commission		- 8.85		-12.56		- 5.35	
Net Profit (Loss)		\$ 24.15		\$ 22.07		\$ 2.03	

BUY-AND-HOLD Net Profit:

\$ 32.96\$ 41.39\$ 7.84

Three Weak Stocks

SELL	COVER	NATIONAL GYPSUM		FIRST NATIONAL STORES		SO. PUERTO RICO SUGAR	
8/ 5/64	9/2/64	\$ 45.13	\$ 44.75	\$ 51.00	\$ 48.00	\$ 31.50	\$ 34.50
10/15/64	10/19/64	43.62	44.25	48.25	48.12	32.25	32.25
10/28/64	11/12/64	43.38	42.13	47.62	47.00	31.50	31.13
11/27/64	1/ 6/65	41.37	42.00	49.13	47.75	29.25	32.12
2/11/65	2/15/65	42.25	41.88	50.00	48.63	31.50	31.12
3/18/65	4/ 9/65	43.38	41.50	47.75	46.25	29.25	28.75
5/17/65	6/15/65	40.13	39.75	47.88	41.38	27.38	22.13
Gross Profit(Loss)		\$ 3.00		\$ 10.50		\$ 0.63	
Less Commission		-5.95		- 6.65		-4.24	
Net Profit (Loss)		\$ (2.95)		\$ 3.85		\$ (3.61)	

SELL-AND-HOLD Net Profit:

\$ 4.53\$ 8.71\$ 8.84

TABLE IV

APPLICATION OF THE "TIMING TECHNIQUE" TO
STANDARD AND POOR'S 500-STOCK INDEX
JULY 1, 1963 - JUNE 30, 1966

BUY		SELL		COVER		GROSS GAIN (LOSS)		NET GAIN (LOSS)	
DATE	OPENING QUOTE	DATE	OPENING QUOTE	DATE	OPENING QUOTE	BUY LONG	SELL SHORT	BUY LONG	SELL SHORT
8/ 7/63	\$ 69.96	9/19/63	\$ 73.22	1/ 2/64	\$ 75.43	\$ 3.26	\$ (2.21)	\$ 1.83	\$ (3.69)
1/ 2/64	75.43	1/30/64	76.70	2/10/64	77.05	1.27	(0.35)	(0.25)	(1.89)
2/10/64	77.05	4/23/64	80.38	6/16/64	80.40	3.33	(0.02)	1.76	(1.62)
6/16/64	80.40	8/ 5/64	82.09	9/ 2/64	82.31	1.59	(0.22)	0.07	(1.86)
9/ 2/64	82.31	10/15/64	84.25	10/19/64	84.93	1.94	(0.68)	0.28	(2.37)
10/19/64	84.93	10/28/64	84.69	11/12/64	85.19	(0.24)	(0.50)	(1.94)	(2.20)
11/12/64	85.19	11/27/64	85.16	1/ 6/65	84.89	(0.03)	0.27	(1.73)	(1.43)
1/ 6/65	84.89	2/11/65	85.54	2/15/65	86.07	0.65	(0.53)	(1.05)	(2.25)
2/15/65	86.07	3/18/65	86.81	4/ 9/65	87.56	0.74	(0.75)	(0.99)	(2.50)
4/ 9/65	87.56	5/17/65	89.54	7/ 9/65	85.71	1.98	3.83	0.21	2.07
7/ 9/65	85.71	7/19/65	85.63	7/30/65	85.25	(0.08)	0.38	(1.80)	(1.33)
7/30/65	85.25	9/29/65	90.02	10/ 5/65	90.63	4.77	(0.61)	3.02	(2.42)
10/ 5/65	90.63	11/ 9/65	91.93	11/15/65	92.63	1.30	(0.70)	(0.53)	(2.55)
1/15/65	92.63	11/19/65	92.24	11/29/65	91.80	(0.39)	0.44	(2.34)	(1.40)
1/29/65	91.80	12/7/65	91.39	12/13/65	91.83	(0.41)	(0.44)	(2.24)	(2.27)
12/13/65	91.83	12/27/65	91.52	1/ 4/66	92.26	(0.31)	(0.74)	(2.15)	(2.58)
1/ 4/66	92.26	2/ 1/66	92.16	2/10/66	93.83	(0.10)	(1.67)	(1.94)	(3.53)
2/10/66	93.83	2/16/66	93.16	4/ 4/66	90.76	(0.67)	2.40	(2.54)	0.56
4/ 4/66	90.76	4/28/66	91.13	6/14/66	87.07	0.37	4.06	(1.45)	2.28
6/14/66	87.07	6/28/66	85.67	6/30/66	-----	(1.40)	-----	(3.13)	-----
TOTALS						<u>\$17.57</u>	<u>\$ 2.89</u>	<u>\$(16.91)</u>	<u>\$(31.76)</u>

BUY-AND-HOLD:

\$ 69.96

\$ 85.67

\$15.71\$ 14.15

Net Gains/Transactions

	<u>Test 1</u>	<u>Test 2</u>	<u>Test 3</u>	<u>Total</u>
Buy Long	13/30	14/21	6/20	33/71
Sell Short	5/27	8/21	3/19	16/67

The annualized percent of net return on initial investment by test was as follows:

	<u>Test 1</u>	<u>Test 2</u>	<u>Test 3</u>
<u>Timing Technique:</u>			
Buy Long	24.9%	31.2%	Negative
Sell Short	Negative	Negative	Negative
Combined	7.0%	16.1%	Negative
Buy-and-Hold	135.6%	53.1%	6.3%
Sell-and-Hold	17.3%	17.3%	N/A
Combined	78.3%	36.9%	N/A

N.B. N/A in Test 3 denotes "not applicable." The sell-and-hold technique was not used in this test.

The final statistic derived from the tests is perhaps the most important. The timing strategy in order to prove superior to a policy of buying or selling and holding should cause sales of long purchases to be made at a higher price on each transaction than the price repurchased at on the succeeding transaction. By the same token, the strategy should cause short sales to be covered at a lower price than the price it is sold short at on the subsequent transaction. The number of times per total number of transactions the "timing technique" proved efficient in accomplishing this feat may be summarized as follows:

	<u>Test 1</u>	<u>Test 2</u>	<u>Test 3</u>	<u>Total</u>
Buy Long	4/30	2/21	3/20	9/71
Sell Short	1/27	3/21	5/19	9/67

The latter computations which have made allowance for broker's fees yield an over-all percentage of efficiency, for both buy-long and

sell-short transactions of approximately 13 percent. These ratios represent the percentage of the time, considering brokerage costs, that it proved advantageous, profitwise, to heed the signals generated by the mechanical trading rules.

Particularly noteworthy with regard to the statistical revelations is the fact that the implications of each test were consistent both from test to test and for individual stocks within the tests. Inasmuch, as these tests encompassed different stocks over differing periods this consistency provides an important testimony in behalf of their validity.

Also notable is the comparative superiority of buy-long over short sale applications on the timing technique. Admittedly, this is at least partly attributable to the general strength of the market during the over-all test period.

Analysis of the results produced by a policy of buying long only yields some interesting implications, however. The timing technique, used on this basis only, produced approximately 25 and 31 percent net annual returns when applied to stocks consistently stronger than the market in the first two tests. Even though the "long purchase only" approach was substantially inferior to buy-and-hold in the first two tests, such returns would undoubtedly appear attractively sufficient to the average investor. On the other hand, when applied to average stocks, represented by Standard and Poor's composite index in Test 3, a negative net return ensued from use of the buy-long approach.

Quite clearly, when the latter test is taken into consideration, the handsome returns produced by the first two tests can hardly be attributed to the efficiency of the trading rules. Rather, the impetus for these gains appears to lie in the repeated purchase of stocks

stronger than the general market during a period of sustained over-all upward price movement.

Summarization of the statistical implications and conclusions derived therefrom appear in the final chapter. The succeeding section also makes suggestions for further research in this area, as engendered by this and other related studies, previously mentioned.

CHAPTER VI

SUMMARY AND CONCLUSIONS

The major problem in this study consisted of a critical appraisal of a single method of technical analysis, reputed to provide a timing technique for stock market traders. Two major conclusions were indicated by the results of this appraisal. A statement of these conclusions, accompanied by respective summarizations of pertinent findings, is as follows:

(1) Coppock's "Timing Technique for Traders" does not produce net profits equal to those yielded by a simple buy-and-hold (or sell-and-hold) policy applied to the same stocks. In none of the tests, nor for none of the individual stocks tested, did the mechanical trading rules produce net profits equal to those generated by a policy of simply buying (or selling) and holding. The validity of the tests was upheld by the fact that all three test conclusions were in agreement. The twelve stocks used in Tests 1 and 2 seemed to yield the sought after implications in a consistent manner. These stocks, admittedly, appeared to be extremely advantageous for the buy-and-hold policy; however, this in no way invalidates the test implications for it seems to be an accurate description of the "real world" situation with regard to the stock market during the periods covered. Leaving the net profit criterion aside, the efficiency of the "timing technique" would have been refuted by the fact that in only (approximately) thirteen out of each one-

hundred transactions did it produce an advantageous trade.

(2) It appears more profitable to buy stocks that pricewise have recently been stronger than the market as a whole and to sell stocks that have recently been weaker. Since the stocks contained in Standard and Poor's 500-Stock Index comprise approximately 75 percent of the total value of all stocks listed on the New York Exchange, it was used supplementarily as an indication of the performance of average stocks. Based upon this premise, the results of Test 1 and Test 2 were compared with those of Test 3. Since both the "timing technique" and the buy-and-hold approach produced substantially greater net returns in the first two tests than they did in the latter, the implications point strongly to the above conclusion. Further testing along these lines is certainly indicated as this finding is in agreement with the conclusions of Levy mentioned in Chapter III.

As natural extensions of the above-mentioned major conclusions several other implications of the test results seem worthy of mention:

- The random walk model more accurately describes the movement of stock prices than does Coppock's "Timing Technique for Traders."

- The negative results of Fama's statistical tests with regard to use of the proportion of stocks advancing and declining today for prediction of the percentage advancing and declining tomorrow (see Chapter III) were upheld by the empirical tests contained herein.

- Use of the "timing technique" on a buy-long basis only for purchase of relatively strong stocks is apparently superior to a process of buying stocks strictly at random. According to the findings of Levy,²⁶

²⁶Levy, p. 112.

the latter approach yielded an annual net return of slightly more than $10\frac{1}{2}$ percent during the period October, 1960 to October, 1965. This compares unfavorably with yields from the timing technique of 25 and 31 percent, respectively, for Test 1 and Test 2 of this study. As previously stressed, however, these high yields seem to result from the purchase of stocks consistently stronger than the market, and not from the efficiency of the "timing technique."

In no instance did short sales of weak stocks produce a net profit for the mechanical trading rules. This was due, in part, to what technicians would designate as a general upward market trend during the period tested. Random walk theorists would prefer this phenomenon be called "random positive drift." No matter which characterization is used, however, any timing strategy must take such a "trend" or "drift" into account in order to prove worthwhile. Coppock's technique apparently does not.

Concluding Comments

The way in which stock prices behave and the reasons for their behavior pose fascinating questions. If there is more to price behavior than the random-walk model admits, a universally acceptable answer has not yet been found. Only through direct tests of the various technical trading approaches, or further study along the lines initiated by Levy will this conflict ever be resolved.

The strong indication that there may be merit in the long-time credo of Wall Street technicians which calls for buying stocks that recently have been rising and selling those that have been falling is most interesting. Some scholarly sources have suspected for some time

that these claims do possess merit. The statement by Cootner in this respect seems especially appropo:

Like the Indian folk doctors who discovered tranquilizers, the Wall Street witch doctors, without the benefit of scientific method, have produced something with their magic, even if they cannot tell you what it is or how it works.²⁷

Further study of the timing technique presented herein might most fruitfully be directed toward extending the length of time used in the weighted average of refined daily advance and decline data from thirty days to, perhaps, six months. This should serve to eliminate many of the false signals which proved so costly during this study. An apt example of such false signals may be most clearly seen by reference to Figure 1 for the latter part of 1965. Although it remains to be proven, there would appear to be a substantial amount of face validity in the choice of market breadth data as truly representative of all stocks traded on the exchange.

The basic purpose of this study as outlined in Chapter I has been to provide a critical evaluation of a specific technical trading method. It was also proposed that to a limited degree this appraisal would provide a test of the random character of stock price behavior.

The results of the study have led to two major conclusions which in actuality are somewhat paradoxical. While the first conclusion is definitely negative with respect to the mechanical efficiency of the timing technique, concurrent attestation as to the randomness of stock price behavior has not been forthcoming.

The original contention was that proof or disproof of the timing

²⁷Cootner, p. 26.

technique should yield one step toward systematic validation or invalidation of the theory of random walks. Instead, it may only be conclusively stated that manipulation of daily advance, decline data in the manner prescribed by Coppock does not provide efficient buy and sell timing. The portion of the over-all technique which calls for buying stocks stronger than the general market has apparent merit. A trader using the timing technique as used in this study on a buy-long basis only would have reaped rewards substantially greater than those achieved by the average investor even though the timing device was completely inefficient.

The optimal strategy uncovered in this study is a buy-and-hold policy applied to stocks consistently stronger than the market. Obviously, no one stock can be expected to eternally display such strength. Some method of continuous upgrading is therefore needed which rids the investor's portfolio of stocks which have fallen from favor and adds to it other stocks exhibiting recent strength. Some interesting methods of such continuous portfolio upgrading have been advanced in the Levy study. This is another area which, seemingly, is worthy of extended research efforts.

The findings of this study have in no way been damaged by the above-mentioned paradox. On the contrary, this would appear to lend to both their strength and credence. It was not desired that the study yield an entity providing the beginning and the end of research in this specific area. It was entirely successful insofar as it provided a basis for judging the worth of Coppock's timing technique which was the major aim. Perhaps, as is the case in many research efforts, the major success will prove to lie in those areas where implications for future

research were generated, rather than in those where concrete conclusions were reached.

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VITA

James Russell Newlin

Candidate for the Degree of
Master of Business Administration

Thesis: AN EVALUATION OF METHODOLOGY INVOLVED IN A SELECTED STOCK
MARKET TIMING TECHNIQUE

Major Field: Business Administration

Biographical:

Personal Data: Born in Ponca City, Oklahoma, September 22, 1935
the son of Russell and Beatrice Newlin.

Education: Attended grade school in Tulsa, Red Oak, and Red Rock,
Oklahoma; graduated from Red Rock High School in 1952;
received the Associate in Commerce degree from Northern Okla-
home Junior College, Tonkawa, in May 1954; received the
Bachelor of Science degree from Southwestern State College,
Weatherford, Oklahoma in May 1957; completed requirements
for the Master of Business Administration degree in July
1967.

Professional experience: Served in the U. S. Army from September
1957 until September 1959; employed as an accountant by
Continental Oil Company in Ponca City, Oklahoma from Septem-
ber 1959 until March 1962; transferred to Oasis Oil Company
of Libya, Tripoli, Libya in March 1962 employed as an analyst
and later an internal auditor through December 1965; enrolled
in the MBA program at Oklahoma State University from January
1966 to present, during which time employed as a graduate
research assistant from September 1966 through January 1967.

Name: James Russell Newlin

Date of Degree: July 1967

Institution: Oklahoma State University Location: Stillwater, Oklahoma

Title of Study: AN EVALUATION OF A SELECTED STOCK MARKET TIMING
TECHNIQUE

Pages in Study: 48

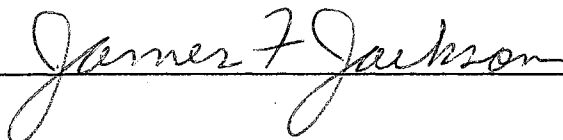
Candidate for Degree of Master of Business
Administration

Major Field: Business Administration

Scope and Method of Study: An empirical study to determine the efficiency of a selected timing technique for stock market traders was conducted. The subject technique was devised by the founder of a well-known investment advisory service and utilized manipulations involving daily price advances and declines on the New York Stock Exchange. The technique was applied to twelve stocks meeting the prescribed selection criteria as well as Standard and Poor's five-hundred stock composite index for varying time periods during the three years ended June 30, 1966. The results of these tests were compared to those evolving through use of a simple buy-and-hold policy applied to the same stocks during the same periods.

Findings and Conclusions: The findings in all tests indicated that the subject technique was inefficient and substantially inferior to a naive buy-and-hold policy. Extremely interesting implications for further study were generated by certain of the test results. These results indicated that superior yields might be obtained by purchase of stocks which, pricewise, have recently outperformed the market as a whole. In addition to suggesting approaches to further research in this area, the pertinent findings were related to past research efforts.

ADVISER'S APPROVAL

A handwritten signature in cursive script, reading "James F. Jackson", is written over a horizontal line.