# THE DOW THEORY AND THE MANAGEMENT OF INVESTMENTS

By

BURTON M. WOODWARD

UNIVERSITY OF FLORIDA
1968

ACKNOWLEDGMENTS

The writer wishes to express his appreciation for the assistance given him by Dr. William V. Wilmot, chairman of the supervisory committee. Appreciation is also expressed to Dr. Harvey Deinzer, Dr. John James, Dr.Alan Sievers, and Dr. Ralph Blodgett, who served on the committee.

Special thanks go to Dr. A. E. Brandt for equal measures of advice and enthusiasm that made the research seem exciting.

Special appreciation is expressed to my wife, Joanne, whose devotion and encouragement contributed immeasurably.

TABLE OF CONTENTS

Table of Contents - continued

Table of Contents - continued

CHAPTER I

## Introduction

It appears that the study of stock market fluctuations, and particularly the statistical analysis of them, has progressed to such a fine point of abstraction that headway has been lost and analysts are trying to find a new direction for their research by applying more sophisticated methods of analysis rather than by trying to discover some new basic principles.

The main objective of this study is to investigate the methods of forecasting or, to be more exact, following the major trends in the stock market. There is no reason to believe, from a statistical point of view, that anything can be stated with a high degree of probability about the future action of the stock market other than it will fluctuate. How high will it go? How far will it fall? How long will the trend last? These are all questions that there is at present no proven method of ascertaining. The major question that this study will investigate is one that should be simpler than those previously posed. What is the trend? It would not seem to be too difficult a problem to be able to tell at any point in time the general direction of the market. Just how difficult it is and how successful one may be in determining it will be areas of primary interest.

More specifically, this research is interested in the benefit
that may accrue to an investor by using the Dow theory or some
other method of trend following for managing his investments.
While it is a common criticism that "no one buys the averages" it
is true that all stocks tend to move together. This has been proved
by statistical analysis[1] and may be accepted subject to the usual
restrictions. This means that the majority of individual stock
price changes are controlled by dominant general market and industry
tendencies. Price changes in an individual stock are correlated
with simultaneous changes in all other stocks and even more closely
correlated with those in the same industry. For this reason changes
in the Dow-Jones averages may be used to signal optimum points to
buy and sell all stocks. The investor will want to buy at the
start of a rise and sell at the start of a decline, thus following
the old precept of "buying cheap and selling dear."

For the purpose of this study, two primary assumptions are
necessary. The first is that the Dow-Jones average is representa-
tive of the action on the New York Stock Exchange. A better analysis
might be made of present day market action by using the Standard
and Poor's average or the Value Line average. Unfortunately,
these averages do not have a history dating back past the last ten

<hr>

[1] Benjamin F. King, Jr., "The Latent Statistical Structure of
Security Price Changes." (Unpublished Ph. D. dissertation, Univer-
sity of Chicago, 1964).

years so they cannot be considered as a basis for long-term analysis.

The second necessary assumption is that the price action of any average on the New York Stock Exchange would be similar to that of an equally representative average on any other major exchange. As market analysts in all European countries use the same techniques as are used in the United States, this may be a valid assumption. Problems dealing with the Dow-Jones averages and especially the manner in which they are used in this study will be discussed in a later section.

It is common practice at the present time to divide the work of financial analysts into two general schools--fundamental and technical. Fundamental analysis usually involves consideration of the economic outlook for a given company, strength of management, projection of the earnings of the company, and capitalization of these earnings at some rate of return in order to arrive at a projected value which is then compared to the market price. This approach is the one generally used in textbooks and used as the basis of instruction in college courses.

The technical approach to stock market forecasting is a study of stock market action rather than a study of the stocks themselves. For the purposes of this research interest will be in the action of the averages rather than individual stocks. The usual method of operation of the technical analyst is to chart the record of some stock or average and then try to deduce from this

pictorial record the probable future trend.

The case for the technical approach as opposed to the funda-
mental approach is best voiced by John Magee in his definitive
text on the subject, Technical Analysis of Stock Trends:

> The technical student argues thus: It is futile to
> assign an intrinsic value to a stock certificate.
> One share of United States Steel, for example, was
> worth $261 in the early fall of 1929, but you could
> buy it for only $22 in June of 1932. By March of 1937,
> it was selling for $126 and just one year later for $38.
> In May of 1946 it had climbed back up to $97 and ten
> months later in 1947 had dropped below $70, although
> the company's earnings on this last date were reputed
> to be nearing an all-time high and interest rates in
> general were near an all-time low. The book value
> of this share of U. S. Steel, according to the corpor-
> ation's balance sheet, was about $204 in 1929 (end
> of the year), $187 in 1932, $151 in 1937, $117 in 1938,
> and $142 in 1946. This sort of thing, this wide di-
> vergence between presumed value and actual price, is
> not the exception; it is the rule; it is going on
> all the time. The fact is that the real value of a
> share of U. S. Steel common is determined at any
> given time solely, definitely and inexorably by
> supply and demand, which are accurately reflected
> in the transactions consummated on the floor of
> the New York Stock Exchange.[2]

Further evidence as to the weakness of the fundamental analysts'
position is found in many recent Ph. D. dissertations. Of
especial interest is that of Robert Zimmer, who proves that there
is little correlation between price on the one hand and Central
Value or Cash Flow on the other. He found out that there appears
to be some degree of correlation between dividends and price

---

[2]Robert D. Edwards and John Magee, Technical Analysis of
Stock Trends (4th ed.; Springfield, Mass.: John Magee Co., 1957),
p. 5.

but not a highly significant level.[3]

The literature on the technical approach dates back to the late 1890's. In addition to Dow's writings, there were publications by Samuel Nelson,[4] William Hamilton,[5] and Robert Rhea.[6] Robert W. Schabacher[7] in 1930 applied this approach to individual stocks. Garfied A. Drew[8] analyzed many of the various technical approaches in his book first published in 1941. This book and the recently published <u>Encyclopedia of Stock Market Techniques</u>[9] gives an explanation of most of the technical approaches to stock market forecasting used during the past thirty years. The original work of Schabacher has been brought up to date by Edwards and Magee.[10] Another book worthy of special attention is the book by

---

[3]Robert Keith Zimmer, <u>An Empirical Analysis of Stock Market Price Determinants</u> (Unpublished Ph. D. dissertation, Ohio State University, 1964).

[4]Samuel Nelson, <u>ABC of Stock Speculation</u> (New York: Taylor, 1934).

[5]William P. Hamilton, <u>Stock Market Barometer</u> (New York: Richard Russell Associates, 1960, reissued).

[6]Robert Rhea, <u>Dow Theory</u> (New York: Barron's, 1932), <u>Dow's Theory Applied to Business and Banking</u> (New York: Simon and Schuster, 1938).

[7]R. W. Schabacher, <u>Stock Market Theory and Practice</u> (New York: Forbes Publishing Co., 1930).

[8]Garfield A. Drew, <u>New Methods for Profit in the Stock Market</u> (2nd ed.; Boston: The Metcalf Press, 1948).

[9]Investors' Intelligence, <u>Encyclopedia of Stock Market Techniques</u> (2nd ed.; New York: Investors' Intelligence, 1965).

[10]Robert D. Edwards and John Magee, <u>ibid</u>.

Curtiss Dahl,[11] who has become the chief advocate of the moving average approach.

Another book that should be mentioned, although it is not properly part of the fundamental or technical approaches, is Paul Cootner's The Random Character of Stock Market Prices.[12] In this book the editor has gathered together many articles that have applied statistical analysis to various stock market theories and have succeeded in proving that most are fallacious if it may be assumed that the investigator was successful in arriving at the correct hypothesis to test.

It is interesting to note that in addition to the generally available literature on the technical approach there is a considerable volume of privately published books and papers which are written by successful speculators or analysts. The idea behind this underground literature was that the method involved constituted a trade secret and would lose its effectiveness if allowed to become public knowledge. An excellent example of this type of literature is The Richard D. Wyckoff Method of Trading and Investing in Stocks.[13] This study

_____

[11]Curtiss Dahl, Constant Profits in the Stock Market (Cincinnati: Tri-State Offset Co., 1962).

[12]Paul Cootner (ed.). The Random Character of Stock Market Prices (Cambridge, M. I. T. Press, 1964).

[13]Richard D. Wyckoff, The Richard D. Wyckoff Method of Trading and Investing in Stock (New York: Wyckoff Associates, Inc., 1944).

runs almost 400 pages and sold as a correspondence course for $500 when first published in 1933. Another book that deserves comment is William Dunnigan's <u>New Blueprints for Gains in Stocks and</u>[14] <u>Grains</u>. Dunnigan will be mentioned in a later chapter as the man who hired a Stanford graduate student to analyze the Dow theory in 1932. Even though the amount of technical literature on the stock market is voluminous, the interest in this study will center on those that use the Dow-Jones industrial and rail averages and total volume on the New York Stock Exchange in attempting to forecast market action.

Although he is not considered as such today, Dow was very much part of the fundamental school. Most of his articles were of a fundamental rather than technical nature. A good example is his article in the October 17, 1901 issue of <u>The Wall Street Journal</u> in which he said in part,

> Value will always work out in the course
> of time. A stock intrinsically cheap and a
> stock intrinsically dear may be selling at
> the same price at a given time. As a result
> of six months' trading they may have presented
> the appearance of moving together in most of
> the fluctuations but at the end of the period
> the good stock will be ten points higher than
> the poor one. . . .

---

[14] William Dunnigan, <u>New Blueprints for Gains in Stocks and</u> <u>Grains</u> (San Francisco: William Dunnigan Economic Research, 1956).

Note: These books and others may be bought or rented
from Allan C. Davis, 1811 York Avenue North,
Minneapolis, 22, Minnesota.

> The practical lesson is that a stock opera-
> tor should not deal in stocks unless he thinks
> he knows their value, nor unless he can watch
> conditions so as to recognize changes in value
> as they come along.

The book value approach was used by fundamentalists until
it became unsupportable in the early thirties. How could they
explain the fall of the industrial averages from 364 to 42 while
book value remained relatively unchanged? Since then they have
looked for a better guide than book value. Today the average
fundamentalist has added four other factors: reported earnings
per share, cash-flow per share, financial leverage, and dividend
yield. These lead variables are used by the analysts in project-
ing prices from two to five years into the future. Because of
the general upward movement of the averages in the past twenty
years they have not been forced to stand the test of a declining
market. As indicated previously, there seems to be some doubt on
the part of the investment community as to their reliability, but
as long as they are forecasting profits there does not seem to be
much demand for accuracy.

One who is familiar with the problems faced by accountants
realizes that they have a continuing controversy about the var-
ious methods that a firm may use to arrive at an earnings figure.[15]
Basic information is often published too late to do the investor

---

[15]Paul Grady, "Inventory of Generally Accepted Accounting
Principles for Business Enterprises," <u>Accounting Research Study #7</u>
(New York: American Institute of Certified Public Accountants, 1965).

any real good. Before the figures become public, insiders will
have passed the news to close friends and most of the price action,
especially if it is good, will have taken place before the informa-
tion is published. For this reason, the fundamental trader is
forced to operate on the basis of information that frequently is
too little and too late. An additional problem that is of major
importance in itself is that the stock market has a record of both
leading and lagging business conditions;[16] so the general expecta-
tions for business cannot be used as a guide.

The technical approach to price forecasting does not suffer
from the problem of information lag. All transactions take place
on the floor of the New York Stock Exchange between two brokers
representing the buyer and seller. Brokers may, and often do, buy and
sell for their own account as well. All transactions taking place
on the floor are reported on the ticker within seconds after the
trade has been made. During periods of high volume, the ticker
may run an hour or more late but this is the exception rather than
the rule and it is an extremely rare occasion when all transactions
are not reported by six p. m.

Information on the previous day's activity is generally
available in the morning press. The Wall Street Journal, appear-
ing each morning, carries the following information on each stock:

---

[16] C. S. Cottle and W. T. Whitman, Investment Timing: The Formula
Plan Approach (New York: McGraw-Hill Book Co., Inc., 1953), p. 54.

daily volume, highest price, lowest price, opening price, closing price, high for the year, low for the year, change from previous close, and dividend rate. Weekly data is available in <u>Barron's</u> which is the best known and most widely used source for this information.

This information is generally reduced by the technical analyst to the form of a chart. The two most common forms are point-and-figure and bar charts. This study will only be concerned with the latter. Bar charts may take the form of daily, weekly, or monthly charts. Most show the high, low, and close for the period.

Both bar charts and point-and-figure charts are analyzed in much the same way. The analyst attempts to find recurring patterns upon which he can set up rules of operation. Both types of chart indicate patterns of varying length which are assigned short term, secondary, or primary classifications.

As the fundamental analyst was forced to face the fact that market price had fled from value in the early 1930's, so the technical analyst must reappraise his rules for market operation each time the market gives him misleading or false signals. His position is very much like that of the statistician worrying about alpha and beta errors. Should he accept a false signal to sell and lose his market position and commission, or should he reject a valid signal to sell and suffer a greater financial loss? As he gains experience, the technician tinkers with his original set of

simple rules of operation until it eventually becomes an involved if not contradictory patchwork. The best example of this is the present status of Dahl's Moving Average theory.[17] At first it was simply a question of taking a 200-day moving average. The decision rules were to sell when the daily average fell one and one-half percent below it or to buy when the daily average rose two points above it. There were also four price zones obtained by dividing the difference between the historical high and low for the stock into four equal zones. Seven rules of operation were sufficient to detail when stocks were to be bought or sold. These rules were developed during the period 1936 to 1951 and should have been sufficient had the market continued to behave in a historical manner. During the next eleven years it became necessary to add seven additional rules to "fine tune" the theory and overcome false signals as the market developed new patterns.

This study will examine only the technical method of stock market forecasting. All matters relating to the fundamental approach will be considered as extraneous to the argument to be advanced. The fluctuations of the stock market as a whole, especially as indicated by the Dow-Jones averages, will be the primary interest of the discussions to follow. The problems of individual stock selections and the establishment of criteria for evaluating specific securities by technical methods are excluded. The question to be answered by this analyst is whether the Dow theory may be successfully used as a method for managing investment and whether

---

[17]Curtiss Dahl, *op. cit.*

there may be other methods that are more efficient.

This research will, in addition to the Dow theory, examine several other methods of forecasting market fluctuations. In addition, a new method of determining the future direction of the market will be proposed. Chapter II will present a short history and outline of the Dow theory. In Chapter III certain technical points will be discussed to set the frame of reference for the investigation. Chapter IV will deal with the Dow theory. First the principles are tested for validity and then its operation from 1932 to 1967 is analyzed. In Chapter V four other methods of trend forecasting are analyzed.

In Chapter VI a new concept of trend forecasting is introduced and analyzed. This method has a probabilistic basis and several statistical techniques are used in analyzing the structure of market prices. The question of the stock market as a random walk is only introduced as a minor point.

The final chapter of this research is a summary in which the main advantages and disadvantages of each of the six methods are evaluated and compared. This section offers the conclusion that the new method of trend following is superior to any other basic system studied and, therefore, has the greatest likelihood of performing well in the future.

CHAPTER II

## History of the Dow Theory

Much might be written on the history of the Dow theory. Those interested in an article by article statement of writings by various authors associated with the theory will find Charles H. Dow and the Dow Theory by Dr. George W. Bishop[1] an excellent source of information.

Four people are important to the evolution of the Dow theory. Charles H. Dow wrote a series of articles as editor of The Wall Street Journal between 1889 and his death in 1902 that serve as a basis of the theory. It should be noted that Dow never thought of his work in terms of a theory but only made general observations as to the behavior of the market. One of Dow's reporters, S. A. Nelson, was impressed with Dow's logical approach to the market and urged Dow to write a book on his views. Dow never did this but in 1902 Nelson published a book, the ABC of Stock Speculation,[2] of which fifteen chapters are designated in footnotes as "Dow's theory." Each chapter represents an article from Dow's column in

---

[1] Benjamin H. Bishop, Jr., Charles H. Dow and the Dow Theory (New York: Appleton-Century-Crofts, Inc., 1960).

[2] Nelson, Ibid.

The Wall Street Journal. Although Nelson added nothing to and subtracted little from Dow's writings, he must be given credit for recognizing to a greater extent than Dow himself that there was a unifying idea running through the articles.

After Dow's death in 1902 there followed in quick succession two editors of The Wall Street Journal who were not interested in Dow's theories of market action. Only a year after Dow's death, William Peter Hamilton, who had served as a reporter under Dow from 1899 to 1902, became an editorial writer and, in January, 1908, became editor. While this gives continuity, it should not be thought that Hamilton was an avid disciple of Dow's. In the period 1903 to 1918, he mentioned the Dow theory in four editorials. It was not until he became interested in publishing a book of his own in 1922 that Hamilton began frequent reference to Dow's theory. He mentioned Dow's theory in four out of eight articles in 1921 and seven out of eleven articles in 1922. In the seven years following, he mentioned the theory in eleven out of forty-three editorials.[3]

Hamilton's own estimate of his book[4] may be found in his Wall Street Journal article dated September 19, 1922,

> Past experience has shown that the method of reading the stock market averages embodied in Dow's theory of the price movement, recently set forth in "The Stock Market Barometer" and used in these columns for twenty years or more,

[3] Bishop, op. cit.
[4] Hamilton, op. cit.

has attained a high degree of dependabil-
ity and usefulness. The market barometer
does not pretend to do the impossible. It
forecasts, defines and confirms the major
swings, like the bull market which has been
in operation since August, 1921. It does
not pretend to forecast the secondary re-
actions any more than it clearly foretells
the corresponding rallies in a major bear
market. This is because the secondary re-
action as distinguished from the major
movement, is governed by the unexpected.

Hamilton has set forth at the start of his book what he

thought Dow's theory should be recognized as consisting of:

Dow's theory is fundamentally simple.
He showed that there are, simultaneously,
three movements in progress in the market.
The major is the primary movement. . . .
It will be shown that the primary movement
tends to run over a period of at least a
year and is generally much longer. Coin-
cident with it, or, in the course of it,
is Dow's secondary movement, represented by
sharp rallies in a primary bear market and
sharp reactions in a primary bull market.
. . . Concurrently with the primary and
secondary movements of the market and con-
sistent throughout, there obviously was,
as Dow pointed out, the underlying fluc-
tuations from day to day.[5]

Hamilton then adds to the theory by stating,

Dow's theory in practice develops many
implications. One of the best tested of
them is that the two averages corroborate
each other, and there is never a primary
movement, rarely a secondary movement,
where they do not agree.[6]

Scrutiny of the averages will show that there are periods where

---

[5]Hamilton, _Ibid_., pp. 4-6.

[6]_Ibid_.

the fluctuations are for a number of weeks within a narrow range; as, for instance, where the industrials do not sell below 70 or above 74, and the rails above 77 or below 73. This is technically called "making a line" and experience shows that it indicates a period either of distribution or accumulation. When the two averages rise above the high point of the line, the indication is strongly bullish. If, however, the two averages break through the lower level, it is obvious that the market for stocks has reached what the meteorologists call a "saturation point."

> The Dow Jones Average is still standard, although it has been extensively imitated. There have been various ways of reading it but nothing has stood the test which has been applied to Dow's theory. The weakness of every other method is that extraneous matters are taken in, from their tempting relevance. There have been unnecessary attempts to combine the volume of sales and to read the average with reference to commodity index numbers. But it must be obvious that the averages have already taken those things into account, just as the barometer considers everything which affects the weather. The price movement represents the aggregate knowledge of Wall Street and, above all, it's aggregate knowledge of coming events.[7]

It would be a simple matter discussing Hamilton's embellishment of the various points of the theory as presented in The Stock Market Barometer and his writings for The Wall Street Journal and Barron's. This would lead to unnecessary duplication because in the writings of Robert Rhea we will find a complete and more incisive statement of the Dow theory. One part of the

---

[7]Hamilton, ibid., pp. 6-8

theory should be especially recognized as being a contribution of
Hamilton's. This is the use of the so-called "dual indicators"
where both industrial and rail averages are required to move in a
similar pattern before any estimate can be made of market action.
He also called attention to the fact that the extent and duration
of a primary move cannot be calculated. The market does not work
on any basis of action and reaction.[8]

It would be unfair to leave Hamilton without mentioning his
finest hour when, on October 25, 1929, he wrote an editorial appear-
ing in The Wall Street Journal entitled "A Turn in the Tide." 
The first two paragraphs of this editorial are:

> On the late Charles H. Dow's well known
> method of reading the stock market movement
> from the Dow-Jones averages, the twenty rail-
> road stocks on Wednesday, October 23 confirmed
> a bearish indication given by the industrials
> two days before. Together the averages gave
> the signal for a bear market in stocks after
> a major bull market with the unprecedented dur-
> ation of almost six years. It is noteworthy
> that Barron's and the Dow-Jones NEWS service
> on October 21 pointed out the significance of
> the industrial signal, given subsequent con-
> firmation by the railroad average. The com-
> ment was as follows:

> "If, however, the market broke again, after
> a failure to pass the old highs, and the de-
> cline carried the price of the industrials be-
> low 168.26, the bearish indication would be
> strong, and might well represent something
> more than a secondary reaction, however severe.
> It has often been said in these studies of the
> price movement that the barometer never indi-
> cates duration. There was a genuine major bear

---

[8] Ibid., p. 123.

market in 1923, but it lasted only eight months.
One good reason for not taking the present in-
dications too seriously is that they have all
been recorded in a more unusually short space
of time. The severest reaction from the high
point of the year had just one month's dura-
tion. In view of the nationwide character of
the speculation, this seems a dangerously
short period to infer anything like complete
reversal in public sentiment."

There was a striking consistency about the
market movement since the high figure of
September 3. There were at least four rallies
in the course of the decline in the industrials
before the definite new low point was estab-
lished and each of these was weaker than the last.
Dow always considered this a danger signal, but for
the past thirty years it has been the custom in
discussing the stock market as a barometer of
business to require that one average should con-
firm the other. Failure to agree has been
found deceptive.

There are people trading in Wall Street, and
many all over the country who have never seen
a real bear market, as for instance that which
began in October, 1919, and lasted for two years,
or that from 1912 to 1914 which predicted the
Great War if the world had then been able to
interpret the signs. What is more material is
that the stock market does forecast the general
business of the country. The big bull market
was confirmed by six years of prosperity and if
the stock market takes the other direction there
will be contraction in business later, although
on present indications only in moderate volume.

Some time ago it was said in a <u>Wall Street
Journal</u> editorial that if the stock market was
compelled to deflate, as politicians seemed so
earnestly to wish they would shortly after
experience a deflation elsewhere which would be
much less to their liking.

The last and perhaps the greatest of the Dow theorists

was Robert Rhea, who became interested in the theory in the early

1920's. In 1932 he started an advisory service entitled Dow Theory Comment, which has been continued up to the present time. Since Rhea's death in 1939, the service has been carried on by his partner, Perry Greiner, and this record of 36 years affords the best source of data for evaluating the Dow theory. Greiner has not tried to make any innovations; thus there is an uninterrupted record of the application of Hamilton's version of the Dow theory as codified by Rhea.

In 1932, Rhea published a book, The Dow Theory,[9] which remains the standard text on this subject. Rhea had received several years of college education, taking courses leading to a degree in engineering, so he used a more quantitative approach than his predecessors. He states in his first chapter: "This book represents an effort to reduce the Dow Theory to a manual for those wishing to use it as an aid in speculation; only a relatively small part of the subject matter represents original work or the ideas of the author."[10]

In 1931 he published Graphic Charts[11] which consisted of yearly charts covering the daily movement of the Dow-Jones industrial and railroad averages from 1897 on a yearly basis. This service is available up to the present time. In 1934, he published The Story of the

---

[9]Robert Rhea, The Dow Theory (New York: Barron's, 1932).

[10]Rhea, ibid., p. 3.

[11]Robert Rhea, Graphic Charts (Colorado Springs, Colorado: Rhea, Greiner and Co., 1931).

Averages[12] which showed in retrospect how the Dow theory would have worked for the period 1896 to 1932. In 1938, he published Dow's Theory Applied to Business and Banking.[13] This last book adds little to Rhea's exposition of the theory. It is interesting to note that the jacket of this last book claims that 96,000 copies of The Dow Theory had been sold and that there were 6,000 subscribers to the Dow Theory Comment service.

Rhea's version of the Dow theory appears without change at the beginning of both his book The Dow Theory and his mimeograph manuscript The Theory of the Averages. He says:

> The successful use of the theory as an aid in stock speculation must be predicated upon the acceptance, without any reservations whatsoever, of a few hypotheses, viz:
>
> Manipulation:--Manipulation is possible in the day to day movement of the averages, and secondary reactions are subject to such an influence to a more limited degree, but the primary trend can never be manipulated.
>
> The Averages Discount Everything:--The fluctuations of the daily closing prices of the Dow-Jones rail and industrial averages afford a composite index of all the hopes, disappointments, and knowledge of everyone who knows anything of financial matters, and for that reason the effects of coming events (excluding acts of God) are always properly anticipated in their movement. The averages quickly appraise such calamities as fires

---

[12] Robert Rhea, The Story of the Averages (Colorado Springs, Colorado: Robert Rhea, 1934).

[13] Rhea, Dow's Theory Applied to Business and Banking, op. cit.

and earthquakes.

The Theory is Not Infallible:--The Dow theory
is not an infallible system for beating the
market. Its successful use as an aid in spec-
ulation requires serious study, and the sum-
ming up of evidence must be impartial. The
wish must never be allowed to father the
thought.

If these essential elements, around which
the theory has been built up, cannot be ac-
cepted as axioms, then further study of the
subject will prove to be confusing, if not
actually misleading.

Reducing the theory to definite theorems
proved to be a difficult task, but this was
done in 1925. Subsequent study, together with
application of these theorems to trading operations,
has not indicated the advisability of altering
them now.

Dow's Three Movements:--There are three move-
ments of the averages, all of which may be in
progress at one and the same time. The first,
and most important, is the primary trend: the
broad upward or downward movements known as bull
or bear markets, which may be of several years
duration. The second, and most deceptive move-
ment, is the secondary reaction: an important
decline in a primary bull market or a rally in
a primary bear market. These reactions usually
last from three weeks to as many months. The
third, and usually unimportant, movement is the
daily fluctuation.

Primary Movement:--The primary movement is the
broad basic trend generally known as a bull or
bear market extending over periods which have var-
ied from less than a year to several years. The cor-
rect determination of the direction of this movement
is the most important factor in successful specula-
tion. There is no known method of forecasting the
extent or duration of a primary movement.

Primary Bear Markets:--A primary bear market is
the long downward movement interrupted by important

rallies. It is caused by various economic
ills and does not terminate until stock prices
have thoroughly discounted the worst that is
apt to occur. There are three principal
phases of a bear market: the first represents
the abandonment of the hopes upon which stocks
were purchased at inflated prices; the second
reflects selling due to decreased business and
earnings, and the third is caused by distress
selling of sound securities, regardless of
their value, by those who must find a cash
market for at least a portion of their assets.

Primary Bull Markets:--A primary bull market
is a broad upward movement, interrupted by sec-
ondary reactions, and averaging longer than two
years. During this time, stock prices advance
because of a demand created by both investment
and speculative buying caused by improving busi-
ness conditions and increased speculative activ-
ity. There are three phases of a bull period:
the first is represented by reviving confidence
in the future of business; the second is the
response of stock prices to the known improve-
ment in corporation earnings, and the third is
the period when speculation is rampant and in-
flation apparent--a period when stocks are ad-
vanced on hopes and expectations.

Secondary Reactions:--For the purpose of this
discussion, a secondary reaction is considered
to be an important decline in a bull market or
advance in a bear market, usually lasting from
three weeks to as many months, during which in-
tervals the price movement generally retraces from
33 percent to 66 percent of the primary price
change since the termination of the last preced-
ing secondary reaction. These reactions are fre-
quently erroneously assumed to represent a change
of primary trend, because obviously the first stage
of a bull market must always coincide with a move-
ment which might have proved to have been merely a
secondary reaction in a bear market, the contra
being true after the peak has been attained in a
bull market.

Daily Fluctuations:--Inferences drawn from one
day's movement of the averages are almost certain
to be misleading and are of but little value ex-
cept when "lines" are being formed. The day to

day movement must be recorded and studied, how-
ever, because a series of charted daily move-
ments always eventually develop into a pattern
easily recognized as having a forecasting value.

Both Averages Must Confirm:--The movements of
both the railroad and industrial stock averages
should always be considered together. The move-
ment of one price average must be confirmed by
the other before reliable inferences may be
drawn. Conclusions based upon the movement of
one average, unconfirmed by the other, are almost
certain to prove misleading.

Determining the Trend:--Successive rallies
penetrating preceding high points, with ensuing
declines terminating above preceding low points,
offer a bullish indication. Conversely, failure
of the rallies to penetrate previous high points,
with ensuing declines carrying below former low
points, is bearish. Inferences so drawn are use-
ful in appraising secondary reactions and are of
major importance in forecasting the resumption,
continuation, or change of the primary trend.
For the purpose of this discussion, a rally or
a decline is defined as one or more daily movements
resulting in a net reversal of direction exceed-
ing three percent of the price of either average.
Such movements have but little authority unless
confirmed in direction by both averages, but the
confirmation need not occur on the same day.

Lines:--A "line" is a price movement extending
two to three weeks or longer, during which period
the price variation of both averages move within
a range of approximately five percent. Such a
movement indicates either accumulation or distrib-
ution. Simultaneous advances above the limits of
the "line" indicate accumulation and predict
higher prices; conversely, simultaneous declines
below the "line" imply distribution and lower
prices are sure to follow. Conclusions drawn
from the movement of one average, not confirmed
by the other, generally prove to be incorrect.

The Relation of Volume to Price Movements:--A
market which has been overbought becomes dull on
rallies and develops activity on declines; conversely,
when a market is oversold, the tendency is to be-
come dull on declines and active on rallies. Bull

> markets terminate in a period of excessive
> activity and begin with comparatively light
> transactions.
>
> . . . . . . . . . . . . . . . . . . . . . . .
>
> Individual Stocks:--All active and well dis-
> tributed stocks of great American corporations
> generally rally and decline with the averages,
> but any individual stock may reflect conditions
> not applicable to the average price of any diver-
> sified list of stocks.

Rhea's statement of the Dow theory and the accompanying

definitions furnish a good basis for this study; however a few

comments are in order that the area of investigation may be nar-

rowed somewhat.

    1.  <u>Manipulation</u>.-- Manipulation is certainly less

prevalent than it was fifty years ago.  Recent disclos-

ures of stock fraud show that it is still being practiced

to some extent.  This area is not important to this paper.

    2.  <u>The Averages Discount Everything</u>.-- This axiom can

neither be proved nor disproved.  It will not be investi-

gated because there is no acceptable method of scientific-

ally testing it.

    3.  <u>The Theory is Not Infallible</u>.-- There is little

question at the present time that the Dow theory is fall-

ible.  The purpose of this paper is to estimate the proba-

bility of its correctness in predicting the trend.

    4.  <u>Dow's Three Movements</u>.-- We are interested in the

primary and only incidentally in the secondary movements.

These movements formed the basis of Dow's theory.

5. <u>Both Averages Must Confirm.</u>-- A prominent part of the theory that will be examined for validity.

6. <u>Lines</u>.-- A part of the theory that lends itself to statistical testing.

7. <u>The Relation of Volume to Price Movements</u>.-- The relationship will be tested statistically.

8. <u>Individual Stocks</u>.-- As neither Dow, Hamilton, nor Rhea evaluated individual stocks, this will not be within the limits of this study.

CHAPTER III

## Technical and Logical Problems

The primary method used in this study to investigate the
value of various methods of investment management common to the
technical analyst was to program the method and test it against
the action of the market for the period 1932 to 1967. The vari-
ous methods were then judged as to their relative and absolute
performance.

The time period that is taken for analysis is of major
importance. There is no method used by the technician that will
not prove superior to a program of holding stocks if the period
1928 to 1932 is included. The rise from 1924 to 1929 was suffic-
iently sharp that all methods of trend forecasting offered advice
permitting the investor to benefit from a majority of the upward
movement. The action and reaction around the top in 1929 was such
that liquidation would have been signaled above the 300 level of
the Dow-Jones industrial averages. The individual who held his
stocks through the long decline into 1932 would have to include a
loss of 79.23 percent while the technician would have had a profit
of 50.40 percent. For this reason, it does not seem reasonable to
bias heavily the investigation with events that happened almost

40 years ago. Adequate investigation has proved beyond doubt that all technical methods will show superior efficiency if used over any time period starting in 1928 or before.

The choice to start the time period used for the investigation in 1932 was a combination of two factors. In order to evaluate the record of the Dow theory, it was important to know the actual as against the theoretical actions taken by technicians using this method. Robert Rhea started issuing his Dow Theory Comment Letters in 1932 and Perry Greiner has continued the service up to the present time. This affords almost weekly commentary on the Dow theory for the past 36 years.

If the technical method is to be given a severe test, it must prove to be superior to the simple expedient of buy-and-hold. If a period is chosen in which the general trend of the averages has been up, the buy-and-hold method will operate with maximum efficiency. The 1932-1967 period meets this requirement and biases the results to some extent against the technical analyst. The time period would be biased in favor of the technical approach if, for example, the period 1922 to 1967 were chosen. During this period those who held stocks had a 440.66 percent gain while the Dow trader would have had a 2201.69 percent gain, both profits being less commissions.

The concluding year of 1967 was chosen because it is the last full year for which data were available. As some financial

commentators[1] believe that the market has changed or is changing, the inclusion of the latest data is important.

The Dow-Jones average was picked principally because it appears that the Dow theory and the Dow-Jones averages should go together. The practical reason for the choice is that we have a consecutive record of the averages from 1915 and data available back to 1897. Although there are many valid criticisms of the Dow-Jones averages as well as many others[2] it is not believed that these deficiencies will seriously bias the findings as the tests are to be on an empirical rather than a technical basis. In technical analysis, as in statistics, the least significant figure will control the level of accuracy. In financial model building the majority of numbers used are approximate rather than exact. If it is postulated that the market will rise by 10 percent, the actual expectation is that the market will rise by an amount of approximately 10 percent and it may be expected that the actual or exact number will differ only slightly from its approximation.[3] This study will not suffer if the units' position is reasonably accurate.

For the purpose of the calculations, heroic liberties were taken with the data. The daily closing averages were "packed" on

---

[1] George L. Leffler and Loring C. Farwell, The Stock Market (3rd ed.; New York: The Ronald Press Company, 1963), p. 549.

[2] Ibid.

[3] J. B. Scarborough, Numerical Mathematical Analysis (4th ed.; Baltimore: The John Hopkins Press, 1958).

two standard I. B. M. cards. All Sundays, holidays, and Saturdays
when the market did not operate were dropped. The resulting data
are arbitrarily grouped into five-day weeks and averaged by week.
This method frequently resulted in an extra "week" during the
1930's and 1940's when the market normally operated on a six-day
basis. Operation of the various trend following models on the
weekly data showed no discrepancies arising because of this seeming
inaccuracy. As a further precaution, a simple linear correlation
was run with actual weekly values for 44 weeks during 1942 as the
independent variable and the corresponding computed weeks as the
dependent variable. Extra weeks occurring in any month were dis-
carded after the actual weeks had been paired. The resulting co-
efficient of correlation was 0.9904 and the standard error of
the estimate is 0.9348. Thus, we may say that empirically and
statistically the calculated week does not appear to differ sig-
nificantly from the actual week.

As in many of the recent investigations of technical analy-
sis,[4] the method for the calculation of an advance or decline is
the geometric rather than the arithmetic difference. This is cal-
culated by taking the antilog of the absolute difference between
the logs of the two numbers. The result of this method of calcu-
lation is that any two changes in value, regardless of the scale,
may be compared. Over the period used for this investigation the

---

[4] Robert A. Levy, The Relative Strength Concept of Common
Stock Price Forecasting (New York: Investors' Intelligence, 1968).

Dow-Jones averages varied from 4.22 to 995.15; so this is a ratio method that allows direct comparison of the magnitude of various moves.

There is one difference in methodology that should be discussed. Alexander, whose filter method is described in Chapter IV, made a major point of the fact that he used a geometric filter so that the total point rise or fall above or below the previous low or high would amount to an equal logarithmic move. This is entirely unnecessary as there is no magic formula of 10.00 percent up and 9.09 percent down that will be meaningful either for future prediction or best fit to historical data. In programming and running various strategies all parameters were made variable in 1/10 of 1 percent increments so that an optimum fit to the data could be obtained.

The use of the geometric gain is called by the financial analyst the multipler or ratchet effect and is considered to be a strong point of the technical approach. The idea is that a stock is bought and held until a sale is called for at some higher point. The market declines for a period of time and a new buy point is reached at a point lower than the previous selling point. Stocks are purchased at this point but because the base is lower or the funds available for purchase are higher than they were originally, more shares may be purchased. It is scarcely worth mentioning that this effect works equally well in reverse.

Although the various methods of fundamental and technical investment strategies vary in method, they all have one aim--to

maximize their gain. There is no problem of varying rates of investment, as there is only one hypothetical stock being traded in as represented by the Dow-Jones average. In order to rate the six technical approaches to forecasting, used in this paper, relative to the performance of one other, it will be necessary to have an absolute scale on which to judge them. This is not a difficult assignment.

The simplest of all strategies is to buy at the first day of the period and sell at the last. Although the technical analysts do not consider that this should be a technical approach and the fundamentalist moves from stock to stock as values increase or decrease, the buy-and-hold approach offers a valuable model for comparison because the period chosen has been especially biased in its favor. If, with the gift of hindsight, all investors could be guaranteed to do as well as an investor who has participated in the rise from 1932, how many would choose another method? It is interesting to note that, although the cumulative effect is large, it results from compounding at slightly less than 7 percent per year. Probably the words of Dow might be quoted in this context, for he says, "If people with either large or small capital would look on trading in stocks as an attempt to get 12 percent per annum on their money instead of 50 percent weekly, they would come out a good deal better off in the long run."[5]

_____

[5] Charles Dow, _The Wall Street Journal_, July 11, 1901.

The buy-and-hold strategy runs from January 2, 1932 when the market was 74.62 to December 31, 1967, when the market was 905.11. This results in a 1100.98 percent gain and will be used as being 100 percent efficient.

Because of the cumulative effect of commission on profits, all trades have been charged a 1 percent commission, calculated as 1/2 percent taken at the purchase and 1/2 taken at the sale. Over the 36-year period this amounted to a difference of over 300 percent in one method and reduced its effectiveness to a substantial degree. The question of dividends and investment of idle funds has not been considered. The buy-and-hold method would have had an advantage from dividends and the technical investor would have had some substantial interest rates at which to invest his idle money.

The question of short sales has been avoided for several reasons. In the first place, Dow traders worked only on the long side of the market. Recent investigations of the profitability of short sales as part of investment algorithms has shown it to be consistently negative. Problems of interest payments and negative dividends complicate the necessary calculations.

One of the thorniest problems that arises from investigation of the Dow theory is decision of on what basis the Dow theory should be evaluated. With benefit of hindsight, there are some official versions of the action of the Dow theory during 59 years

that show only one loss.[6] A second possibility is to use the record

of an investor who would have been guided by the Dow Theory Comment

Letters for the past 36 years. A third alternative is to mechan-

ize the theory by requiring a confirmation before any purchase or

sale was made. It appears that the second alternative would be

the best because it would be readily verifiable. There are prob-

ably no two Dow theorists that would accept the same timing of

moves or even the same number of primary moves, if choice of the

first method were made. As a case in point, E. G. Schaefer[7] has

called only one bull market from 1949 to 1966. This leaves out

three moves or rather incorporates four moves generally recognized

by fundamentalist and technician. The record of Schaefer is, at

the time of writing, good, but there is no way of determining what

his actions would have been prior to 1949. His letters carry two

model investment accounts that show profits of 1489 percent and

1054 percent for the 18-year period. His book is of interest to

anyone desiring a statement of "the modern Dow theory which com-

bines many of the current technical approaches." It is interest-

ing to note that Schaefer requires a retraction of more than 50

percent of the entire primary move before a secondary reaction

will be considered significant.

---

[6]Richard Durant, *What Is The Dow Theory?* (Detroit: Durant
& Co., 1956).

[7]E. George Schaefer, *How I Helped More Than 10,000 Investors
to Profit in Stocks* (Englewood Cliffs, N. J.: Prentice Hall,
1960), and Schaefer, "The Dow Theory Trader" (Indianapolis,
Indiana: E. George Schaefer, 1960).

Rhea and Greiner, like most human beings, would like to over-
look their mistakes when putting their record before the public.
It will be necessary when finally evaluating the Dow record to
calculate how a trader would have done on a day to day basis if he
had been guided by the latest information available from the Dow
Theory Comment. Although this will result in some additional
losses for the hypothetical trader, it will also result in some
extra gains because the Dow trader in many cases does not wait for
a Dow "confirmation" before making his purchase. There is no case
in which the service advised selling before the averages confirmed
the downward turn from bull to bear. Until it becomes necessary to
make a final evaluation, the accompanying record (Appendix A) of
the Dow theory will be used. This differs from the record that is
accepted by most as the record of the bull markets between 1932
and 1967 because it includes one small bear market in 1953 that
many feel was only a secondary reaction. It was included because a
change of trend was confirmed and the Dow Theory Comment Letters
urged their subscribers to sell.

CHAPTER IV

Analysis of the Dow Theory

At the end of his chapter on the Dow theory, Leffler writes
as follows:

> The space devoted to the study of the
> Dow theory is perhaps excessive in view of
> its importance as a trading method. The
> rather extended analysis, however, seems
> justified in that it indicates the thorough-
> ness that should be used to examine any
> trading system or formula plan before its
> acceptance or rejection.[1]

In common with most of the analysts who have written on the
Dow theory, he fails to point out specifically how efficient or
inefficient the theory is. He refers to a _Fortune_ article which
states that:

> From 1938 to 1948 the theory fared badly.
> If one had placed $10,000 in stocks in 1938
> and followed the Dow theory signals in this
> period his fund would have grown to $11,903.
> If he had invested the $10,000, however, on
> a buy-and-hold policy, his fund would have
> grown to $13,653.[2]

This and a reference to the Cowles study,[3] which will be
discussed later in this chapter, are the only comparative

---

[1] Op. cit., p. 550.

[2] A. W. Jones, "Fashions in Forecasting," _Fortune_, March,
1949, p. 91.

[3] _Econometrica_, Vol. I, No. 3, (July, 1933).

statistics that he gives in his thorough investigation of the
Dow theory. Unless a comparison is made, the reader has no basis
on which to judge the effectiveness of some particular strategy.
A statement that between January 1, 1956, and December 31, 1958, a
Dow theorist would have lost 10.8 percent of the value of his
investment is perfectly true. It is also true that during the
same period he only lost 82.6 percent as much as a person who
remained invested.

It is because of a lack of accurate statistical testing when
possible that the general public and many of the financial analysts
do not know the true effectiveness of the Dow theory. One of the
objects of this study is to overcome this lack of rigor.

## The Form of the Market

Dow's great discovery was that the market was what would
be called a stationary time series. He recognized certain recur-
ring patterns in the movement of his published averages that he
considered formed a fundamental principle. It is interesting to
note that at the present time there is a major controversy over
this same point[4]--does the market move in trends or is it random
in character? In order that there be any meaning to this study,
it must be assumed that the market does move in trends. It is not
believed that the pursuit of this argument is necessary to this

---

[4]Cootner, op. cit.

research. Dow did, however, say that the daily movements that
go to make up secondary reactions are unpredictable so there
would be no argument on this point.

Dow says most specifically that the market behaves in a
predictable and orderly manner. It would move either up or down
over a period of time on a primary trend. It would then change
and move in the opposite direction for several weeks until it
had retraced between 30 and 60 percent of its primary move. This
contra move is called a secondary reaction. At this point, it
would turn again and move past its previous high or low point.
This gives the stock market a specific form which he expects it
to follow. How closely has the market performed to these speci-
fications?

The table in Appendix B shows that since 1932 there have
been nine major moves in the Dow sense. In this period there is
one move that does not have a secondary reaction that would qualify
under Dow's rules. This is the almost linear move that takes place
from October of 1957 to January of 1960. During this primary move
the largest secondary reaction is a retracement of 19.1 percent
of the previous primary advance. As this was the only time during
the 70 years of Dow history that the market failed to conform to
its usual pattern, it appears that in this respect the market
behaves in a predictable manner.

## Trend Change and Confirmation

Dow further said that the market behaved in a predictable manner when it changed primary direction. After a primary move, the market would have its usual secondary reaction, but would then fail to pass its previous primary high or low and then move past its previous secondary turning point. This is called confirmation, by Dow theorists, of a change of major trend. There has been only one failure of the market to signal this change and that came in the 1957 to 1959 rise because of the failure of the rails to fluctuate normally during the rise. Is it significant that this failure has come within the past ten years? Does it signify, as some believe, that the market is changing its form because of the "new economics" and the major role now played by investment trusts, insurance companies, and trust funds? Only time will give an answer to this question.

In addition to the failure to confirm a trend change, there was a confirmation of a bear market on June 9, 1953, with a second confirmation on August 31, 1953.[5] The Letter of December 30, 1953, carries this statement, "All angles considered, present levels may prove to be a good selling area for those who, in whole or in part, hope to sidestep the next decline of more than minor proportions.[6] After almost six months, and a rise instead

[5] "Dow Theory Comment," September 16, 1953.

[6] Ibid., December 30, 1953.

of the promised decline, the Letter carries this paragraph,

> In a strictly technical, mechanical sense there are but faint grounds for saying that the market turned bearish last September. As a practical matter, however, with the dual indicators both in new high territory for more than 20 years, it would be somewhat less than realistic, in this observer's opinion, to insist on technical grounds alone, that the major trend continues to be classified as bear. Under the accumulated evidence, therefore, it would probably be proper to designate the primary trend as being up.[7]

This resulted in a problem of bookkeeping, for the market had made no confirmation of a trend change. What should be done with the pair of unwanted confirmations? On January 26, 1955, the Letter carried this sentence under conclusions, "The primary trend continues to point up as has been the case for over 5½ years."[8] This seems to have balanced the books.

In order that an estimate of the effectiveness of the Dow theory as an indicator of change, a weighted probability was calculated. As there were 20 possibilities of a correct signal and as recent performance is more important than earlier action, it was decided to weight the latest opportunity at 20 times the original. Failures were recorded on the false signal in 1953, and lack of confirmation on the 1957 and 1960 bull markets. This results in 155 points out of a possible 199, or a rating of 77.9 percent reliability. A method that is correct only

---

[7] *Ibid.*, July 7, 1954.

[8] *Ibid.*, January 26, 1955.

approximately three out of four times cannot be considered as a reliable means of determining the trend.

One feature of the Dow theory that its detractors were quick to seize was the lateness of confirmation in relation to the total move. For the period under investigation, the signal to buy came after 46.7 percent of the move had taken place. The followers of Dow answer their critics by saying that they don't want a weathervane that shifts with every breeze. Alexander's[9] investigations indicate that if the speculator must pay commission his best size of filter will be 45.6 percent. The use of the term filter in this investigation follows the definition of Alexander, who says:

> Suppose that we tentatively assume the existence of trends in the stock market prices but believe them to be masked by the jiggling of the market. We might filter out all the movements smaller than a specified size and examine the remaining movements. The most vivid way to illustrate the operation of the filter is to translate it into a rule of speculative market action. Thus corresponding to a 5% filter we might have the rule: if the market moves up 5% go long until it moves down 5% at which time sell and go short until it again moves up 5%. Ignore moves less than 5%.[10]

Another use of the filter is to require the daily average to

[9]Sidney S. Alexander, "Price Movements in Speculation Markets: Trends or Random Walks" in Paul H. Cootner (ed.), The Random Character of Stock Market Prices, loc. cit. p. 355.

[10]Ibid., p. 214.

exceed some base such as a moving average by the size of the filter before buying or drop below the moving average by the size of the filter before selling. The use of the short sale is optional in both cases. Thus, it would seem that the Dow theory had somehow arrived at a similar solution to the problem. That this is not an efficient answer can be found in the range of the total move left after Dow confirmation--from 16.6 to 84.6 percent, as shown in Appendix A.

In order, perhaps, to overcome the lateness of the Dow confirmation, the Dow theorist has an unwritten principle that he employs. This was explained by Rhea in his Letters to subscribers in this way,

> Many who profess an understanding of
> Dow's theory claim that long-pull buying
> cannot be justified by that theory until
> the averages go through the peaks of the
> first quarters of '32. Hamilton did not
> wait for such confirmation as a general
> thing. He weighed the action of the aver-
> ages and the volume of trading; he con-
> sidered the past movements and then ex-
> pressed his opinions. In The Dow Theory,
> pages 187-8, will be found editorials which
> give clearly reasoned predictions of the end
> of the 1921 bear market while the averages
> were within a very few points of the low.[11]

It is fortunate that the stock market is sufficiently random in its action so that most Dow theorists wait for confirmation before calling for a purchase or sale. It would require a multiple

---

[11]Robert Rhea. "Dow Theory Comment," No. 2, November 22, 1932.

of the number of primary changes times the number of analysts to

find what was done and what should have been done if each analyst

had tried to anticipate each turn.

Rhea anticipated confirmation of the start of the 1932 bull

market by almost a year.  He wrote in "Dow Theory Comment" on

November 22, 1932,

> In Mailing No. 1, I explained why, under
> a strict interpretation of Dow's theory, we
> must call this a bear market.  Both bull and
> bear arguments on the subject were summarized.
> Personal convictions were not injected into
> the discussion, but several subscribers have
> insisted that it be done.  I believe July 8,
> 1932 was the end of the great bear market.
> On July 21 when the Industrials closed at
> 48.50 and the Rails at 18.78, I asked my
> broker to tell my friends trading in his var-
> ious offices that I thought the Dow theory
> implied heavy buying for the first time in
> over three years.  On July 25, 1932, the
> opinion below was sent to perhaps fifty
> correspondents.
>
> The declines of both Rail and Industrial
> averages between early March and midsummer
> were without precedent.  The thirty-five year
> record of the averages shows a fairly uniform
> recovery after every major primary action, and
> such recoveries average around 50% of the
> ground lost on the decline; are seldom less
> than a third and more than two thirds.  Such
> recovery periods tend to run to about 40 days
> but are sometimes only three weeks - and
> occasionally three months.
>
> The time element is in favor of a normal
> reaction at this time - because the slide-
> off was normal (the normal time interval of
> major declines being about 100 days).
>
> The market gave the unusual picture of
> hovering near the lows for more than seven
> weeks, and might be said to have made a

> "line" during the latter weeks of that
> period.
>
> Because of all these things, and be-
> cause the volume tended to diminish on re-
> cessions and increase on rallies during the
> ten days preceding July 21, almost any one
> trading on the Dow theory would have bought
> stocks on July 19th. Those who did not, had
> a clean cut signal again on the 21st. Since
> that date the implications of the averages
> have been uniformly bullish, and it is
> reasonable to expect that a normal secondary
> will be completed, even though the primary
> trend may not have changed to "bull." So
> much for the speculative viewpoint.[12]

With this element of anticipating the change in trend added,

this method must be classed as more an art than a science. There

can be no definition as to how some of the buy points were chosen.

The best example is in 1942, when Dow Theory Comment advised that

the time had come for a buy. This advice was given on March 4, 1942,

and preceded the actual low point by about eight weeks. The market

continued to move down by 15 percent after the buy was called which

might have caused some consternation.

Having pointed out the weakness and failures of the operation

of Rhea and Greiner, it is interesting to calculate how they would

have fared. Their geometric gain less commissions for the 1932-

1967 period was 913.82 percent, or an efficiency of 83.00 percent

that of buy-and-hold. Analysis shows that they were able to

---

[12] Rhea, "Dow Theory Comment," November 22, 1932.

re-enter the market eight out of nine times at a point lower than that at which they had previously sold.  If they could have caught any part of the 1957 bull market they could have gained a very efficient rating.  This version of the Dow theory will not be considered official because of its lack of requiring confirmation before buying.

Lines

A line in the language of the Dow theory is a sidewise movement in both of the averages which lasts from two or three weeks to many months.  During this period both averages will remain within a 5 percent range.  Although Dow did not ever mention that the market was making a line as such, he did on many occasions write about the market being narrow and dull.  In his Wall Street Journal article of October 13, 1899, he comments, "The longer time, moreover, that the market remains dull the more important the movement is likely to be."

Hamilton wrote extensively about the market making a line. In his book he writes:

> Scrutiny of the averages will show that
> there are periods where the fluctuations for
> a number of weeks are within a narrow range;
> as, for instance, where the industrials do
> not sell below seventy or above seventy-four,
> and the railroads above seventy-seven or below
> seventy-three.  This is technically called
> "making a line," and experience shows that it
> indicates a period either of distribution or
> of accumulation.  When the two averages rise
> above the high point of the line, the indi-
> cation is strongly bullish.  It may mean a

secondary rally in a bear market; it meant,
in 1921, the inauguration of a primary bull
movement, extending into 1922.[13]

Rhea devoted an entire chapter (Chapter XIV) of The Dow
Theory to a discussion of lines which he obviously considered to
be of primary importance.  Unfortunately his discussion tends to
dull rather than sharpen his definition.  A quotation of the first
two paragraphs will serve to outline his views,

> The portion of the Dow theory which per-
> tains to "lines" has proved to be so dependa-
> ble as almost to deserve the designation of
> axiom instead of theorem.  However, "lines"
> do not occur frequently enough to satisfy
> most traders, with the result that many en-
> deavor to see "lines" that do not exist.
> Moreover, many traders insist on forming
> conclusions from a "line" in one average
> not confirmed by the other--a very dangerous
> practice.  There are others who, seeing a
> line forming, try to guess the direction in
> which the averages will break through, putting
> out their stocks and hanging on to them re-
> gardless of the fact that their judgment may
> be proved wrong by subsequent movements of
> the averages.  "As a matter of fact, when a
> 'line' is in process of formation it is the
> hardest thing in the world to tell either the
> nature of the selling or that of the buying.
> Both accumulation and distribution are at
> work, and no one can say which will ultimately
> exercise the greatest pressure."  (May 22, 1922) [14]

In order to test the hypothesis that "lines" may be consid-
ered significant, it will be desirable to locate those periods
that conform to the restrictions of both averages remaining

---

[13] The Dow Theory, pp. 6-7.

[14] Ibid., pp. 79-80.

within a 5 percent range. It seemed logical to investigate a
period about double that set by Hamilton and Rhea as a minimum.
To further strengthen the test, it was felt that if the averages
did not exceed some percentage less than 5 percent for the basic
period, then this lesser percentage should be used as the range
rather than the 5 percent.

When the position of the lines had been determined, two
questions were asked: (1) Did the market change direction after
making the line? and (2) Having broken out of the line, did it
continue in the same direction for at least 20 additional days?
If at any time during the 20 days it fell below or rose above the
point of emergence, it would be counted as having failed to
maintain the trend.

The answers to these two questions were tabulated (see
Appendix B) and a Chi square test was applied to see if any sig-
nificance could be placed on the formation of a "line."

The period taken for the test started in January, 1915, and
ran until 40 consecutive lines had been identified. This period
extended until June 11, 1940. It must be pointed out that the
selection of lines is not as trivial a task as might be expected.
The difficulty arises out of the use of dual rather than a single
indicator. If both indicators form a line at approximately the
same time and both continue to remain within the 5 percent range
for 25 days, we now have the basic conditions for a line. Let
us assume that after 29 days the rail average breaks out on the

topside for two days then falls back into the range. After another
seven trading days the industrials break sharply up followed in
two days by the rails. Can a "line" now be claimed or would it
be disqualified because the rails anticipated the real point of
emergence? These and other problems of similar type make sharp
definitions difficult for the financial analyst. It is, however,
not necessary to consider these marginal situations as there is
sufficient information to study without taking them into account.

The first investigation was whether the daily averages after
making a line tended to continue in the same direction or make a
reversal. Out of the 40 chances there were 27 continuations and
13 reversals. If the emergence from the line was random it could
be expected that there would be as many reversals as continuations.
It would be highly significant if there were more reversals than
continuations. Thus we wish to test for the $H_1$ $\mu$ =.50.

The proportion of reversals for the sample is 32.50. This
proportion was compared with sample sizes on the Brandt chart.[15]
(Appendix BB) With the permission of the author of this chart,
Dr. A. E. Brandt, a lower confidence limit ($Q_0$) was added to simplify
calculations. The chart shows that this proportion would be sig-
nificant for samples of size 30, but would only be highly signi-
ficant for samples of size 53. This decision of accepting or

---

15
    A. E. Brandt, "A Test of Significance in a Unique Sample,"
Journal of the American Statistical Association, 28: 434 (1933).

rejecting the hypothesis depends on the chance to be taken of accepting a false hypothesis. In this instance, the safest decision appears to be to accept the hypothesis that lines are not a significant point of reversal.

The second point to be investigated was whether the direction of breakout from a line would be continued for four weeks without either the industrial or rail average recrossing its point of emergence. The results of this investigation showed that in only 15 out of 40 cases were both trends persistent. If we were to have significant results, the sample proportion should be at least 66.66 percent. Our sample proportion is only 37.50, therefore, it may be stated without further investigation that at the .95 confidence bound there is no significance to the direction of the breakout.

The third and most important test will be of the persistence of a reversal of the trend--did or didn't the average recross the breakout point within the next four weeks? The results show that out of 13 reversals only 4 were persistent. The sample proportion for persistence after a reversal should be greater than 80 percent to have significance at the .95 confidence level. The sample proportion is only 30.76 percent so that it may be said without further investigation that there is no significance to the reversals.

The three tests that were made of the significance of lines gives one doubtful result and two negative results. On

the basis of these findings, it may be said that the formation of a line and the consequent break out from its confines cannot be relied upon as a predictor of price action.

## Volume

The one factor that all three major Dow theorists--Dow, Hamilton, and Rhea-recognized in addition to the Dow-Jones averages was the daily volume of transactions on the New York Stock Exchange. Why Dow chose to report the total volume rather than the volume of the stocks making up the average will never be known, but it may be conjectured that it was easier to obtain these figures than those of the stocks constituting the averages alone. As all references in their writings are to the total volume, it is along these lines that the problem must be approached.

There were at least five articles in which Dow discussed volume in his editorials. In his editorial of March 19, 1901, in The Wall Street Journal, he writes:

> A market moves by its momentum. The momentum represented by transactions from 700,000 shares to 1,500,000 shares a day is obviously greater than the momentum represented by transactions only half as large. The bull markets twenty years ago very rarely reached 700,000 shares a day. Transactions now rarely fall below that figure, which means that the forces which have produced this market are broader and stronger and may be expected to last longer than the forces which have carried prices up hitherto.

Unlike Dow, Hamilton realized that he could not maintain "that the averages discount everything" and still keep writing about volume. In his editorial of January 5, 1911, he renounced his previous error in these words:

> We prefer to neglect volume and the character of the trading in these studies, believing that the average itself, being absolutely impartial, makes allowances for these factors as well as for the chapter of accidents, the conditions of trade, the tone of the money market, and the temper of the speculating public and even the character of the investment demand.

Hamilton's archaic reference to "the chapter of accidents" was in regard to acts of God such as the San Francisco earthquake and the Galveston tidal wave.

He further reinforced his stand in his March 27, 1911, _Journal_ article which contains the following:

> The averages have looked as if they wanted to go up, although some students might argue that the small volume of business detracted from the importance of such changes as there were. Nevertheless the tendency has been distinctly bullish. So far as volume is concerned, we prefer to neglect it in these studies, arguing that this, as well as all other considerations, may be eliminated in the comparison of extended price movements over any considerable period of time. Such volume of trading, like even the chapter of accidents itself, tends in such periods to average itself. Dullness and activity have alternated in stock markets throughout their existence.

His last article in which he mentioned volume occurred almost two years later on June 4, 1913, in the _Journal_. It

must be remembered that he continued to write editorials for another 16 years and wrote The Stock Market Barometer in 1922. It cannot be said that he lacked opportunity to talk about volume if he thought that it was important. In this article he says:

> Dullness and inactivity are but symptoms, and for these the average allows, as it does likewise for activity, unexpected news, dividends and everything else contributing to make up the fluctuating market price. This is why the volume of trading is ignored in these studies. In the quarter of a century of the price movement recorded in the Dow, Jones & Co. averages, the volume has borne little perceptible relation to the tendency of prices.

Hamilton did not again deviate from the stand that "the averages discount everything." It is interesting, therefore, to see that Rhea accepts volume as being useful. He states:

> When this book was planned, the writer determined not to digress from Hamilton's interpretation of the Dow theory, but the volume of trading proved to be such a useful guide in attaining proficiency in the art of forecasting market trends that it is necessary to urge all students to study intently the relation of volume to price movement. Justification for offering this advice lies in Hamilton's casual but successful use of the relation of market activity to price movement when forming his conclusions.[16]

Rhea is misleading in the way he presents Hamilton's views on volume by making it appear that Hamilton changed his mind from time to time. Although his quotations from Hamilton's editorials

---

[16] Rhea, Ibid., p. 88.

are properly footnoted, the fact that he has altered their time
sequence is likely to escape the attention of any but the most
diligent reader. Even with Rhea's statement:

> At the risk of confusing the reader, it
> seems best to quote Hamilton wherein he de-
> nied the usefulness of volume, and then to
> show that he repeatedly used this datum in
> summing up his case before reaching some sort
> of conclusion. . . . In this connection, it
> is interesting to note that his book, The
> Stock Market Barometer, contained both the
> monthly price range and the monthly daily
> average of sales. If Hamilton really thought
> that students should ignore volume, why was
> the volume included in the chart?[17]

Despite the case that Rhea has made that Hamilton used the
volume figures, the simple truth is that Hamilton did not mention
volume after his 1913 article. For this reason we can trace the
use of volume back to Dow but it cannot be claimed that Hamilton
held it as one of his principles. Rhea states his views on the
subject in his book, The Dow Theory, in a chapter entitled "The
Relation of Volume to Price Movements":

> A market which has been overbought be-
> comes dull on rallies and develops activity
> on declines; conversely, when a market is
> oversold, the tendency is to be dull on de-
> clines and active on rallies. Bull markets
> terminate in a period of excess activity and
> begin with comparatively light transactions.[18]

Later in the same chapter he writes:

---

[17] Ibid., p. 86 and p. 88.

[18] Ibid., p. 86.

> A systematic study of the charted move-
> ment of the averages and daily trading dis-
> closes that trading is heavier in bull mar-
> kets than in bear markets and that in second-
> ary reactions in bull markets one is gener-
> ally safe in assuming that the market is at
> least temporarily oversold when volume de-
> creases after a decline. Very often a rally
> is likely to be imminent. On the other hand
> when a secondary rally has occurred in a bear
> market, with activity dying out after the ad-
> vance, it is reasonable to conclude that the
> market is overbought and that a further down-
> ward trend is near if a tendency toward in-
> creased activity is noticeable on declines.[19]

The first analysis of volume data was made by inspection.

(See Appendix C) Twenty-six major turning points of the market

in the period 1914 to 1966 were identified and the volume for the

turning point was ascertained. If the market was ending a bull

move, the highest volume of the week containing the turning point

was chosen. If the market was ending a bear move, the lowest

volume of the week containing the turning point was chosen ex-

cluding Saturday's volume, because the market was open for only

one-half a day on Saturday. The one exception to this rule

occurred on October 22, 1957, when the turn was made on a selling

climax so the maximum rather than the minimum volume was taken.

The period between turning points was scanned and the maxi-

mum and minimum values of the volume were noted. Saturdays and

days preceding or following national holidays were not used as it

---

[19] Ibid., pp. 91-92

was generally true that brokers and traders tended not to go to
work on these days.

Observation of the data shows that there are only two turn-
ing points: September 12, 1939, and October 22, 1957, when the
volume of the turning point was not in the period since the per-
iod's turning point was preceded by volume both higher and lower
than the volume at the turning point. If the high or low volume
of the move came at the turning point, it would be a simple matter
to reject all changes in direction that were not accompanied by
unusually high or low volume. As might be expected, volume is
relatively high at the end of a bull market when all traders, both
old and new, are anxious to either enter the market with its
prospect of immediate gain or leave the market in order to pro-
tect their profits. At the end of a bear market, it is the gen-
eral rule that only the old traders are left and even they are
not aggressive, with a result that there is relatively low
volume.

With only one turning point out of 26 occurring in a way
that could be used as a predictor of a change in primary trend,
it is unlikely that changes in volume are an aid in interpreting
the major trend of the averages. Further studies were made with
five-week and ten-week moving averages of the volume without any
indication that the volume is useful as a predictor of the trend
or that it is an aid in following the trend.

A test was made of the first differences of two two-year

groups, to try to determine if the volume moved with the trend giving more positive than negative first differences when the trend was up as in 1928-29, and more minus than plus when the trend was down, as in 1930-31. This four-year period was chosen rather than the usual 1932-67 period because it would give the most severe test of any four-year period. The years 1928-29 showed 24 and 27 negative differences, respectively. The 1930-31 period yielded counts of 29 and 30 negative differences. Testing the hypothesis $H_1: \pi_1 = \pi_2$

$$\hat{\pi} = \frac{51 + 59}{115 + 118} = \frac{110}{233} = 47.21$$

$$Z = \frac{P_1 - P_2}{\sqrt{\hat{\pi}(1 - \hat{\pi})(\frac{1}{n_1} + \frac{1}{n_2})}}$$

$$= \frac{.4434 - .5000}{\sqrt{.4721 \times .5279 (\frac{1}{115} + \frac{1}{118})}}$$

$$= \frac{.0566}{\sqrt{.0042}} = 0.88$$

From the normal area table we find that there are about 18.94 chances in 100 of finding a difference $P_1 - P_2$ =.056. Thus, it may be concluded that the difference is not significant and that it is due to chance. The null hypothesis $\hat{\pi}_1 = \hat{\pi}_2$ is accepted.

A test was made of the first differences between the weekly industrial average and the weekly volume average. Four runs of 40 consecutive figures were chosen, the tables being entered by a table of random numbers. Of the 160 possibilities of the movement being the same in sign, both first differences positive or negative, there were 24, 18, 25, and 16 pairs in the four groups.

If the industrial averages and volume move together in a meaningful way, they would be expected to have a high proportion of matches, but if they move randomly in regard to each other they would have a proportion of matches not to differ significantly from .50. Thus, the hypothesis that the sample differs from .50 of $H_1$ = .50 $\alpha$ = 5 percent will be tested. The porportion for the sample of 160 is 83/160 - .519. Using the Brandt chart[20] with 95 percent confidence limit, we find that for $P_0$ as small as .519 to be significant the sample size would have to be larger than 400; .42 to .58 fall within the range. As the sample in question is 40, we may accept the null hypothesis and say that there is no indication of the industrial averages and volume moving together.

The one significant fact that emerged from the study of volume is that on all of the nine turning points studied when price reached a minimum there was a negative correlation between price and volume. This action could be attributed to either despair of those that held too long expecting better prices

---

20
Brandt, op. cit.

or the arrival of the point where buyers were more willing than they had previously been to buy.

Granger and Morgenstern, in their article on stock prices touch on the problem of volume. They say,

> The coherence (of weekly price series and weekly volume of sales) is seen to be extremely low. Only at the third frequency point could one reject the hypothesis that the true coherence is zero with any worthwhile confidence. The exceptional frequency appears to correspond to no known phenomena and we suggest on the basis of our present knowledge that it is spurious. . . . The results seem to indicate that, at least in the short run, and for the normal day-to-day or week-to-week workings of the stock exchange the movements in the amount of stock sold are unconnected with the movements in price.[21]

The authors then say that it might be argued that the first difference of price should have been correlated with the volume sold. They did not feel that this was necessary because of the low coherence values obtained. This problem was investigated in this study and first differences in price were correlated with first differences in volume for the nine major turning points between 1932 and 1967. (See Appendix D) The questionable Dow turning point of 1953 was not included. As each move had two turning points and each turning point had to be evaluated as to both entrance and exit, a total of 36 linear correlations were run.

---

[21]C. W. J. Granger and O. Morgenstern, "Spectral Analysis of New York Stock Exchange Prices," Kyklos, 16, 1-27 (1963).

The method was to take 11 weeks ending with the critical week on entry and the 11 weeks beginning with the critical week on exit.

The first finding on observation of the results is that there are 19 negative correlations and 17 positive correlations. This leads to the question of whether the "volume goes with the trend," which means that it will increase in the direction of the primary move. Observation of the data shows that in 25 out of the 36 periods the trend followed the price. This means that if price was increasing volume was increasing and vice versa. At the .95 confidence level a proportion of 69.44 is not sufficient for us to say that the movements of volume and price are correlated but they do not fall far short. This is logical as with increasing prices new buyers enter the market and old buyers are willing to take some profits, so volume increases. With declining prices, new buyers are hesitant to enter the market and old buyers will wish to hold their stocks in expectation of a rise.

On the basis of these investigations, it does not appear that volume action can be used as a confirmation of price action.

Dual Confirmation

Today there are many financial commentators who feel that the rail averages have outlived their usefulness as a dual indicator. The logic on their part is most convincing. The Dow theory started at a time when the rail average was the only average. In 1889 the Dow-Jones average consisted of 20 rails:

| | |
|---|---|
| Canadian Pacific | Mo. Kansas & Texas |
| Central R. R. of N. J. | Missouri Pacific |
| Chic.Mil. & St. Paul | N. Y. Central |
| Chic. North West | No. Pacific pfd. |
| C. St. Paul M. & O. | Ore. & Transcontinental |
| Delaware & Hudson | Pacific Mail |
| Del. Lack. & Western | Richmond Terminal |
| Erie | Texas & Pacific |
| Lake Shore | Union Pacific |
| Louisville and Nashville | Western Union |

In 1896, Dow-Jones for the first time computed an average consisting entirely of industrial stocks. This list consisted of:

| | |
|---|---|
| American Cotton Oil | Laclede Gas |
| American Sugar | National Lead |
| American Tobacco | North American |
| Chicago Gas | Tenn. Coal and Iron |
| Distilling and Cattle Feeding | U. S. Leather pfd. |
| General Electric | U. S. Rubber |

It was natural for Dow to think of the averages in terms of the rails, and it was only reasonable that Hamilton should recognize a partnership between the rails and the industrials. Rhea should have been the one to announce that the rails are no longer necessary.

In today's stock market, the railroad stocks account for much less than 10 percent of the trading. With aircraft, trucks, and automobiles providing transportation, the railroads have lost their preeminent position. Statistics show that in 1932 the railroads carried 61.65 percent of the freight while in 1965 their share had fallen to 43.43. Because of their changed status, it can no longer be assumed that the rails are bound to profit from any increase in national productivity. They now have their own special problems resulting from government control and unionism. For these reasons, there is no longer any logical reason to make the rails as important an indicator as the industrials.

Although Dow did not write on the subject, both Hamilton and Rhea insisted that confirmation by both averages was necessary for an official change in the trend. Hamilton in his <u>Wall Street Journal</u> editorial of May 10, 1921, writes:

> Indeed it may be said that a new high or a new low by one of the averages unconfirmed by the other has invariably been deceptive. New high or new low points for both have preceded every major movement since the averages were established.

At about the same time that Rhea started his financial service, a young graduate student at Stanford wrote an article for <u>Dunnigan's Forecast Reports</u>. His article was titled "The Dow Theory--A Test of Its Value and a Suggested Improvement." Samuel Moment's improvement to the Dow theory was simply to drop the necessity of rail confirmation. He writes:

In addition to a test of the Dow theory, this study offers a modified theory which eliminates the essential feature of that theory. The second test is based on forecasts of the industrial average without the requirement that the railroad average confirm the industrial. This second method shows a slightly greater profit than the former. This itself is not significant because of its size. What is significant is that one can do just as well as the Dow theory without depending on the railroad average.[22]

Analysis of confirmations in the period 1932-67 confirms the Moment hypothesis. All confirmations by the industrials alone have been as soon as or earlier than the confirmation by both averages. There have been no false confirmations by the industrials that have been avoided by the use of the rails. Of major importance to Dow theorists is the fact that the industrial averages confirmed the change in primary trend for the 1957 to 1959 bull market. It would appear that the use of the railroad averages is only detrimental to this strategy.

## The Dow Theory in Operation

In the ten primary bull markets during the period in question the Dow theory had geometric gains of 523.63 percent. As was mentioned previously, the technician hopes to be able to invest larger amounts on each trade because of accumulated profits.

---

[22] Samuel Moment, "The Dow Theory--A Test of Its Value and a Suggested Improvement," Dunnigan's Forecast Reports. (One Eleven Sutton Building, San Francisco, May 10, 1933).

In this series of trades, the Dow theorist sold and rebought nine times. Four of these trades averaged a profit of 8.48 percent and five of them averaged a loss of 18.42 percent, so even with profits on most of the periods when his funds were invested, he was able to purchase fewer shares of stock on a majority of the times that he re-entered the market. The resulting gains amount to only 47.56 percent of the gain available with the buy-and-hold strategy, so the Dow theory cannot be rated as successful. Action of the Dow theory during the period under investigation may be followed in the charts found in Appendices E through I.

1. <u>August, 1932, to March, 1937</u>.-- During this bull market, confirmation was made of both changes in trend. The market had moved up 27.9 percent before the first confirmation and had moved down 31 percent before the sell signal was given for a 93.08 percent gain. This might be considered an ideal Dow transaction.

2. <u>March, 1938, to November, 1938</u>.-- For a primary move this was much shorter than usual. The Dow buy confirmation caught the last 52.2 percent of the rise and the sell signal came after 71.9 percent of the downward move. The result of the tardiness of both signals resulted in a 3.98 percent gain.

3. <u>April, 1939, to September, 1939</u>.-- Another short bull market, and the Dow theorists after missing the greater part of the upward move, 61.3 percent, then lost 29 percent

of the downward move. This resulted in a small loss of
3.47 percent.

4. <u>April, 1942, to June, 1946</u>.-- After two and one-
half years out of the market, the confirmation came after
44.3 percent of the move had taken place and the following
sell signal came after 43.5 percent of the down move, but
because of the magnitude of the move--119.58 points--the
Dow trader enjoyed a 30.97 percent gain. This is the first
sizeable gain in 14 years of trading.

5. <u>May, 1947, to June, 1948</u>.-- Another short bull
market and in this case the Dow trader was late in and
late out. Notice on Appendix G how late the buy signal was
given--actually after 84.8 percent of the rise. Then 60.9
percent of the downside move was lost. The result was a
trading loss of 7.77 percent.

6. <u>June, 1949, to January, 1953</u>.-- This move marks
the first of the Dow traders' difficulties. After a bear
market confirmation in August 31, 1953, the industrial
averages worked about five points lower. The industrial
average then started to rise and the Dow theorist was in
a quandary as to the direction of the primary trend. On
August 7, 1954, the <u>Dow Theory Comment</u>[23] admitted that the

---

23
Greiner, <u>Dow Theory Comment</u>, August 7, 1954.

trend had been up since 1949 and subscribers should rein-
vest their funds.  In the interim the market had moved into
new high ground and 32.81 points had been lost.

7.  September, 1953, to April, 1956.-- After the "con-
venience" signal to buy in 1954, the market worked higher to
521.05.  For a period of over a year it went through a series
of long fluctuations between the top and the 460 area.  On
October 1, 1956, the averages confirmed a change in trend
after 51.7 percent of the downward move.  As the upward
move had signaled after only 32.2 percent of the total had
occurred, a 41.72 percent gain was netted.

8.  October, 1957, to January, 1960.-- If the previous
period was disappointing to the Dow theorist, this one turned
out to be even more disappointing.  The rails simply refused
to confirm that a bull market was underway.  The industrials
confirmed an uptrend on May 2, 1958, and this has been
accepted as a confirmation but the strict follower of Dow
did not participate in this 27-month rise.

9.  October, 1960, to December, 1961.-- This period
was even more disappointing to the Dow theorist than the
previous one.  The confirmation of the uptrend came on
October 10, 1962, a short 64 days before the end of the move
and after 83.4 percent had taken place.  Sell confirmation
came after 28.13 percent of the following downward move re-
sulting in a 3.94 percent loss.

10. <u>June, 1962, to February, 1966</u>.-- After almost
ten years of frustration, the Dow theorists once again found
the market fluctuating in the expected manner. The signal
to buy came after only 19.0 percent of the upward movement
and the bear market was confirmed after 26.23 percent of
the primary move down. This resulted in a 46.08 percent
gain.

The history of the Dow trader ends in February, 1966, because
since that date the major Dow theorists have maintained that the
market has been in a primary bear market. In the interim, the
market has moved up to 943.08. Although this is higher than the
point of bear confirmation at 910.30, it will not force the Dow
theorist to make another agonizing reappraisal until it exceeds
its historic highs. If, however, the market drops below the low
point of 744.32 again, all will be well with this chapter of the
Dow theory.

If the record of the Dow trader is interpreted on a liberal
basis, the geometric gain for the past 36 years will be 523.63
percent after commission or 47.18 percent of the gain available
from buy-and-hold. If confirmation is required for all trans-
actions, the gain will be only 373.04 percent.

## Cowles Report on Forecasting

The first and best known of the Dow critics was Alfred
Cowles. His study, appearing in 1933, led many people to reject
the Dow theory at a time when there was little reason for rejection.

Alfred Cowles, III reported on the Dow theory in two articles in
Econometrica. Unfortunately he does not seem to have been thorough-
ly familiar with the Dow theory before he analyzed it. As will be
seen, conflicting definitions of goals rob his study of much of its
validity.

In his first report[24] Cowles studied the editorials of Ham-
ilton from 1903 to 1929, and found 255 which presented forecasts
for the stock market based on the Dow theory. Cowles had five
readers study the respective editorials and by a majority vote
decided whether they were bullish, bearish, or doubtful. If
doubtful, it was assumed that Hamilton abstained from trading.
If bullish, it was assumed that stocks were purchased and held
until Hamilton next became bearish or doubtful. If Hamilton was
bearish, it was assumed that stocks were sold short and covered
when he became bullish or doubtful. The stocks traded in were equal
dollar amounts of the stocks included in the Dow-Jones industrial
averages.

Under these conditions the results from December, 1903, to
December, 1929, showed a return, including dividends plus interest
income when the funds were not in the market, of 12 percent per
annum. For the same period, a continuous position in the stocks

---

[24]Alfred Cowles, III. "Can Stock Market Forecasters Fore-
cast?" Econometrica I, 1933, pp. 309-324.

comprising the industrial average would have returned 15.5 percent per annum. On the basis of his analysis, Cowles concluded that the Dow theory was not an effective method of investment.

It is almost unnecessary to remark that the closing date of the analysis was most significant in this case. The major error that Cowles made in his study is that Hamilton's forecasts were used in a manner which Hamilton repeatedly said was wrong. Hamilton only tried to trade the major moves. He said "beating the market," or trading the swings, was not possible. There were only seven major reversals in this 23-year period so that would allow seven purchases and seven sales. Cowles said that according to his analysis there were 90 changes in market position of which 45 were successful and 45 were unsuccessful.

In 1944, Cowles again published in _Econometrica_[25] the results of his analysis of the success of 24 financial publications in forecasting. His method this time was to have two readers grade the forecasts independently according to the degree of bullishness or bearishness they contained. The average of the two interpretations was used as the basis for computing the record. It was assumed that the reader, if 100 percent bullish, would invest all his funds in the stock market; if the forecast was 50 percent bullish, he would invest three-quarters of his funds in

[25] Alfred Cowles, III "Stock Market Forecasting," _Econometrica_ 12, 1944, pp. 206-214.

stocks; if doubtful, he would invest 50 percent in stocks; if 50 percent bearish he would invest one-quarter in stocks, and if 100 percent bearish, he would invest nothing in stocks. On the basis of this type of analysis, he found that, for the period 1903 to 1934, the Dow theory was the most successful. With corrections made to include dividends, brokerage charges, and interest charges, the rate of gain on investing under the Dow theory was 14.2 percent per year. In the same period a continuous investment in Dow-Jones industrial average would have shown a return, including dividends, of 10.9 percent a year. Following the forecasts would have resulted in a gain of 3.3 percent per year over the result from a continuous investment program.

A more meaningful approach would be to analyze the success of the Dow theory in determining the trend of the market. It must be assumed that if an investor is to follow the Dow theory he will be interested only in the primary moves and will not be interested in secondary trading. It should be realized that Dow and Hamilton had an obligation to write a certain number of editorials each year whether or not there was a major change in direction. For this reason, it would be an improper approach to use remarks about the secondary trend as advice to enter or leave the market. Both Dow and Hamilton were major trend traders in spirit.

Comment

An analysis of Dow's editorials does not leave much to analyze.

His articles in The Wall Street Journal start from April 21, 1899,
to October 25, 1902, cover one part of August, 1896,- March, 1899,
bull market and the June, 1900, to September, 1902, rise. Dow
failed to call the intervening bear market. In his editorial of
December 29, 1900, he calls attention to the bull period inaugur-
ated in 1896 and still in progress at the time of the article.
He died too soon after the September, 1902, highs of the second
rise to have expected him to call the turn on the basis of his
system as confirmation did not occur until June of 1903. On the
basis of inconclusive evidence, I do not feel that we can make
any estimate of Dow's ability as a prognosticator.

Hamilton had the opportunity to call 13 turns of the market.
He called nine of these correctly. As he didn't recognize the
bear market from November, 1916, to December, 1917, he might be
credited with nine out of eleven. If an investor had followed
his advice, the results would have been:

| Date Bought | Price Bought | Date Sold | Price Sold | % Gain | Geomet- ric Gain | Buy- Hold |
|---|---|---|---|---|---|---|
| 12/7/03 | 47.40 | 8/8/07 | 75.29 | 58.83 | 58.83 | 58.83 |
| 7/11/08 | 75.24 | 1/18/10 | 93.92 | 24.82 | 98.25 | 98.14 |
| 6/1/11 | 85.79 | 12/16/12 | 86.22 | .50 | 99.24 | 81.89 |
| 4/9/15 | 65.02 | 6/7/20 | 91.13 | 40.15 | 179.23 | 92.25 |
| 12/30/21 | 81.10 | 10/25/29 | 301.22 | 271.41 | 937.09 | 535.48 |

Data from: The Wall Street Journal.

There can be little doubt that Hamilton went to his death with the feeling that he had found the most efficient strategy for market operations. Because of the timing of his death, the period 1929-32, which was the most effective one for the Dow theorists, is not included. In a matter of a little more than two years the buy-and-hold investor would have seen his gains for the previous 25 years disappear. The Dow theorist would have sold out after only 12 percent of the total move down.

## Conclusions on the Dow Theory

The analysis of the Dow theory shows that Dow defined a non-random manner in which the market behaves. He defined a sequence of actions and reactions that would signal a change in the primary trend. This was rated as being about 75 percent reliable under present conditions.

The actions of both lines and volume are of no significance as a leading or coincident indicator of the price action of the averages. The use of both the industrial and rail averages is a detriment rather than an aid in determining changes in the trend. The Dow theory, using industrial confirmations only, can be rated as less than 50 percent as effective a strategy as buy-and-hold.

CHAPTER V

## Other Methods of Trend Following

### The Ten Percent Rule

There are, in addition to the Dow theory, several other
methods of trend following that should be investigated. One of
the simplest methods is the "Ten Percent Rule" which was first pub-
licized in the London Financial News. The article told of a
Mr. Cyrus Hatch, a mythical American, who was able, through the
application of the "Ten Percent Rule" to increase $100,000 left
to him in 1882 to $14,400,000 in December, 1936.[1] This plan of
market operation had a sound logical basis. The idea was that no
system could be expected to call the turning points of the market
with great precision. Would it not be reasonable, therefore, to
accept a certain delay of the signal to buy or sell if the major
part of the move were captured each time. The idea was that the
phantom operator, Mr. Hatch, would calculate the market value of
his holdings at the end of each week and then average the weekly
figures once a month. When the monthly average had retreated by
at best 10 percent from a monthly high, holdings should be sold
and not repurchased until the monthly average would have risen

---

[1] G. A. Drew, New Methods for Profit in the Stock Market.
(Boston: The Metcalf Press, 1948).

10 percent above the intervening monthly low.

The major drawback to making an analysis of the operation from 1882 to 1936 is that Hatch was not supposed to have bought an average but rather individual stocks. Furthermore, there was no explanation of what method he used to buy stocks; so we may assume that he had the advantage of retrospection and picked only stocks that had performed well.

During Hatch's period of operation he bought and sold 44 times. The longest period of holding was six years (1923-29) and the shortest was for only three months. The longest period out of the market was a little over two years.

The "Ten Percent Rule" was evaluated over the standard period of 1932 to 1967. During this period stocks held by the investor appreciated in value only by 244.48 percent as against 1100.98 percent under the buy-and-hold.

Obviously the "Ten Percent Rule" has not operated as well during this period as it had previously. How much of this is due to requiring all transactions to be made on the Dow averages instead of the unspecified stocks cannot be calculated. Its deficiencies as a trend follower, however, can be pointed out. Most of these poor performances arise from the relatively limited amount of reaction necessary to signal a turn in the trend. Smoothing the average by averaging the weekly closing prices minimizes sharp "catastrophy" fluctuations. It is, however, the nature of the market that secondary reactions of approximately 50 percent of the major moves are to be expected. Robert Rhea in his analysis

of the market from 1896 to 1932 found that there had been 27
secondary reactions and that these averaged a 51 percent retrace-
ment of the previous primary move.  He also calculated that each
primary bull move had a 23.45 point upward range.[2]  If it is
assumed that the average will signal a buy within 15 percent of
the bottom, it is almost inevitable that the first secondary re-
action will fall below the sell point, thus closing out the posi-
tion prematurely.

     During the 1932-1967 period the longest period of investment
was 96 months, from October, 1949, to October, 1957.  The longest
period out of the market, 20 months, was from September, 1946,
to May, 1948.  Over the entire period, funds were invested 65.5
percent of the time.

     A good example of why the "Ten Percent Rule" has not oper-
ated with acceptable efficiency during the 1932-1967 period is
its first transaction which was closed out on October 31, 1932.
The market hit its daily closing low of 41.22 on July 8, 1932.
The "Ten Percent Rule" picked the turn at the end of August, less
than 60 days later and bought at 74.42.  This resulted in a sell
signal  only two months later when the monthly industrial average
moved below the sell point.  This problem is typical of technical
strategies.  The market must continue to rise after the buy is
signaled in order to afford some protection by raising the sell

---

[2]Rhea, <u>The Story of the Averages</u>, <u>op. cit</u>.

point above the point which will result in a loss.

This transaction resulted in a loss of 18.14 percent. Why did the loss run more than 10 percent? Although the turn in the major trend was called as soon or sooner than could be expected, the market had moved up from 41.22 to 71.11 before the purchase had been made which represented a gain of 72.46 percent in two months. The correcting secondary reaction was timed to catch the "Ten Percent Rule" at its most vulnerable period--before it had risen to a full 10 percent above its sell point. If losses are to be restricted to 10 percent, plus commissions, then the sell point must be calculated on the basis of the weekly average rather than the monthly average.

With only three months of a five-year bull market passed, it was natural that a second buy point was signaled on April 29, 1933, at 73.51 when the monthly average was at 64.57 and the daily average was 77.66. The average worked higher over the next ten months until a sharp decline in June signaled a sell at 94.26. This transaction resulted in a 28.22 percent profit and a net profit of 6.01 percent for two trades.

The third trade in this bull market came on December 31, 1934, at 100.18 when the monthly average at 101.49 rose above the buy point of 99.11 The monthly average continued and reached its peak at 188.61 in March of 1937. The sell signal came in September with the monthly average at 162.07, the weekly average at 152.38, and the September 30th closing average at 154.57. Profit on this

transaction was 52.10 percent.

There is no advantage to be gained from a transaction by transaction account of all the trades. Each trade appears on the graphs in Appendices J through N and a summation is included in Appendix O. Those desiring to follow the remaining 11 trades may do so by reference to these appendices.

The "Ten Percent Rule" would have to be criticized primarily on the ground that it is an unprofitable strategy. Geometric gains for the 36-year period amounted, as mentioned previously, to 244.48 percent. This is only 22.21 percent of the gain that could have been obtained from buy-and-hold. It would amount to a gain equal to an investment compounded at an annual rate of 2½ percent.

This lack of profitability results from its extreme time lag. The daily average has accomplished a greater portion of any moderate move before the buy or sell signal is reached by the monthly averages. As the "Ten Percent Rule" was investigated as a matter of historic interest, there appears to be no need to explore this strategy further.

There is one final matter that needs investigation and that is the amount of bias that was introduced into the experiment by using the average of the last week of the month rather than the last day of the month. All trades were recalculated using daily close instead of weekly close. The table in Appendix P shows that on this basis the gain would have been 221.50 or 9.40 percent less than the geometric gain on the weekly average. Further examination of the trade to trade comparisons shows that the daily average

led at the end of six trades and the weekly average at the end of
eight, so it is possible that the differences are random.

## The Filter Strategy

The second strategy to be analyzed is the filter technique.
The introduction of the method has become somewhat of a landmark
in financial analysis. The technique is explained by the author
as follows:

> One final test may be reported that should
> give great comfort to the analyst and encour-
> agement to those who would use statistical
> studies to guide their speculative efforts,
> for it furnishes evidence that stock price
> changes could not have been generated by a
> random walk. Suppose we tentatively assume
> the existence of trends in stock market prices
> but believe them to be masked by the jiggling
> of the market. We might filter out all move-
> ments smaller than a specified size and examine
> the remaining movements. The most vivid way to
> illustrate the operation of the filter is to
> translate it into a rule of speculative market
> action. Thus, corresponding to a 5% filter we
> might have the rule: if the market moves up 5%
> go long and stay long until it moves down 5% at
> which time sell and go short until it again moves
> up 5%. Ignore moves of less than 5%. The more
> stringent the filter, the fewer losses are made,
> but also the smaller the gain from any move
> that exceeds the filter size. Thus with a 5%
> filter there will be a loss on any move be-
> tween 5% and 10.53% and a gain on any move
> larger than 10.53%. For if the move is just
> a 10.53% move, say from 100 to 110.53, then
> we would go long at 105 (100 plus 5%) and sell
> at 105 (110.53 minus 5%) and so just break even.
> With a 10% filter most of the moves which en-
> tailed a loss with the 5% filter would be filtered
> out. But a 20% move, which would yield a 9%
> profit with a 5% filter (computed on the lower
> vertex of the move, actually about 8.5% of the
> purchase price), would yield a 2% loss on a
> 10% filter.

> Thus, as the filter size is increased, the number of transactions is reduced, and losses on small moves are eliminated, gains on large moves are reduced, and some moves which would yield gains with a small filter will yield losses with a large. This example illustrates the familiar tradeoff between reliability of the information and the cost of the information. The more stringent the filter, the higher the reliability, but the more of the move that is sacrificed in identifying it both in getting in and in getting out.
>
> . . . . . . . . . . . . . . . . . . . . . . . .
>
> . . . The results uniformly favor the smaller filters over the buy and hold method. Thus, the filter method derives its success from a characteristic of stock price behavior other than that implied by the upward long term trend alone.[3]

Alexander ran his tests of his theory without charging commissions. He found very small filters of about the one percent level were the most profitable. He included a paragraph about commissions in which he says, "From a practical standpoint these profits would be substantially reduced, but by no means eliminated by the payment of commissions. I leave to the interested reader the computations of allowance for commissions."

It was not long before interested readers did run Alexander's strategy and figured comissions. Their conclusion was that small filters of less than 5 percent were unprofitable because of the payment of an excessive number of commissions and that large

---

[3] Sidney S. Alexander, "Price Movements in Speculative Markets: Trends or Random Walks," <u>Industrial Management Review</u>, 2 (1961), p. 7-26.

filters lost too much of the move in both directions. The optimum strategy appears to be the use of a filter of 5 percent up and 5 percent down.

Using this strategy a run was made over the standard 1932-1967 period using the daily closing averages on the Dow-Jones industrials. The result was a geometric gain of 484.49 percent after commissions. Because there were 106 transactions, the commissions were appreciable. Further runs were made with 4, 6, and 10 percent filters to verify that 5 percent was still the point that maximized the profit. This was found to be true.

The use of the filter technique resulted in a gain of 44.01 percent as large as buy-and-hold. The strong point of this technique is that it is easy to understand and apply. Its great weakness is that it is not able to filter out the unprofitable ripples from the profitable waves. Filters approaching 25 percent are necessary to have this strategy run with the tide.[4] As 62 of the 106 transactions were unprofitable, we may assume that a strategy must have a much smaller number of total transactions and a higher ratio of success to failures before it can hope to approach the efficiency of buy-and-hold during this test period.

The Moving Average

One of those taking note of Alexander's filter technique

---

[4] Alexander, ibid., p. 25.

was Paul Cootner. After noting the difficulties experienced by
the filter technique and remarking that only very substantial
market declines would make it more profitable than buy-and-hold,
he writes:

> On the other hand, it is easy to improve
> upon Alexander's original and imaginative
> beginnings, if a model like mine proves to
> be true. Alexander's rule requires that the
> company's stock prices actually fall substan-
> tially before the stock can be sold. A rule
> based on a fall _relative_ to some trend would
> permit much more rapid response to changes of
> direction. One such procedure involving the
> use of the probability of the range of fluctu-
> ation around the trend seems extremely promis-
> ing. This involves buying (selling) the stock
> when its recent behavior has a low probability
> of arising from a random walk and selling
> (buying) it when that probability rises above
> a previously specified level. This particu-
> lar strategy is very difficult to implement
> computationally, but short-cuts are being
> developed and may soon prove feasible. It
> has the advantage of being conceptually
> similar to the methods actually suggested by
> stock market "technicians" and thus is a fairer
> test of their hypotheses. From a practical
> point of view, it would have several advantages
> over the "filter" rule. First, it would en-
> able a follower to sell (buy) a stock when it
> stopped rising (falling) along the previously
> defined trend, rather than waiting for a sub-
> stantial reversal. Second, it would permit an
> investor the alternative of holding cash rather
> than adopting a position in either direction -
> as the filter rule requires.
>
> While the rule I have suggested is diffi-   .
> cult to implement, there are other simpler
> rules which also possess the properties I
> have described. One such simple decision rule
> is a modification of a rule actually suggested by
> some investment services. The rule is usually
> stated as follows: Compare the price today with
> an average of the price in the last 200 days.
> If the current price is higher than the moving

*average, sell short. If the current price
rises above the moving average, cover short
positions. If the price falls below the
moving average, eliminate long positions.*

Since the data in this study are weekly
closing prices, I substituted a forty-week
average for the suggested 200-day average,
and compared the result of this strategy with
the results of buying each stock on the 40th
observed week, and holding it to the end of
the period of observation. The indicated
strategy is much superior to simple buying and
holding if only gross profits are considered.
While this is strongly suggestive of random-
ness, it is _not_ necessarily indicative of a
non-randomness noticeable enough to leave to
a remunerative strategy, since the moving
average procedures lead to much more frequent
trading than simple investment. In fact,
after allowing for commissions, the moving
average strategy is much inferior.

Most of the excessive transactions occur
when the actual stock price remains in a
narrow range. As a crude rule-of-thumb to
reduce the number of transactions, the deci-
sion rule was modified to allow for trans-
actions only when the moving average and the
current price diverged by more than a certain
percentage. Under this new strategy, the
stock was to be bought only when the price
rose above the moving average by more than
5% and would be sold whenever the price fell
below the moving average by any amount.[5]

Cootner used his method with a list of stocks chosen at

random from the New York Stock Exchange. This may reduce its

effectiveness when used on the Dow-Jones industrial averages.

Cootner's strategy, however, is not too different from the moving

---

[5] Paul H. Cootner, "Stock Prices: Random vs. Systematic
Changes," _Industrial Management Review_, 3 (1962), p. 24-45.

average used by Dahl on the Dow-Jones averages; so it may be presumed that it will be an effective strategy when used on the averages during the test period.

The results of this investigation show that in the 1932-1967 period the moving average with a 5 percent topside penetration requirement had a geometric gain of 212.20 percent, and an efficiency rating of 19.27 of buy-and-hold. As Cootner did not have his strategy set specifically for trading the averages, it would be a waste of time to analyze his operations in detail. It would be hard to believe that over this 36-year span he could modify his basic strategy, by varying his threshold amounts, enough to improve on Alexander's method. Cootner was successful in reducing the amount of trades to 38 from Alexander's 106. He had 24 losing trades that steadily reduced his profitability.

There is a method by which Cootner's moving average strategy can be improved. Joseph Grenville,[6] in his rules for trading with the 200-day moving average price line, has a rule that stocks may only be bought when the 40-week moving average line has turned up and only sold when the line has turned down. This is logical as the investor does not want to buy in a falling market nor sell in a rising one. If Cootner's moving average strategy is modified to include this rule, there is an increase in geometric gain from

[6] Joseph E. Grenville, A Strategy of Daily Stock Market Timing for Maximum Profit (Englewood Cliffs, N. J., Prentice-Hall, 1960), p. 237.

the previous 212.20 to 1056.08, and a reduction in the number of trades from 38 to 17. This modification of the strategy increased the efficiency of the moving average technique to 95.92 percent of the efficiency of buy-and-hold, and resulted in an increase of 497.68 percent over the unmodified result.

Because of its low efficiency, Cootner's original strategy was not charted. The far more efficient modified version appears as the top line of trades in Appendices Q through U. This is quite a superior strategy and was well ahead of buy-and-hold until it failed to catch the downturn quickly enough at the end of trade 16 in 1962. This action once again emphasizes that a strategy must do well on each chance that it is given for there is little opportunity to catch up in a climbing market once the major part of the move is missed.

The failure of Cootner's original strategy to perform efficiently raises a question which is outside the scope and resources of this study to answer. Does each industrial group have its own unique strategy? Will it be necessary to discover a separate strategy for trading bank, utility, steel, variety stores, and railroad stocks? It is possible that the answer will be in the affirmative. If such is the case, the strategies investigated in this study could be expected to perform equally well with investment trusts whose portfolio closely resembles the stocks in the Dow-Jones industrial averages. In order to maintain maximum profitability, stocks of the "no load" funds would have to be selected.

CHAPTER VI

## A New Technical Strategy

The idea for this strategy grew out of a desire to test the
weekly averages to see if they were normally distributed. A simple
method of making this test was found in a monograph by H. A. Wallis.
In his introduction he writes,

> Analysis of time series would be greatly
> facilitated by simple significance tests of
> general applicability. Simplicity is essen-
> tial if tests are to be practicable; for time
> series usually contain many observations, and
> investigations using them often involve numer-
> ous series. . . . A test of significance is,
> of course, a test of randomness, in that it
> shows whether the discrepancies between a set
> of data (a sample) and expectations based on
> some null hypothesis can reasonably be as-
> cribed to chance. . . .

> On the other hand, the difficulties of
> specifying the population of which the data
> may be regarded as a random sample are, in
> the social sciences at least, usually consid-
> erable and frequently insuperable. And even
> when it is possible to specify the form of the
> population it may be difficult or impossible to
> obtain necessary estimates of parameters. In
> regression analyses, for example, the usual
> hypothesis is that the residuals are normally
> distributed about a mean of zero with a vari-
> ance to be estimated from the data. But when
> there is only one observation for each value
> of the independent variate (which with econ-
> omic time series is virtually always) there
> is no satisfactory way to estimate what vari-
> ance the observations would have if the

independent variate were constant, since the
validity of the estimate depends upon the
adequacy of the fitted regression and the test
of its adequacy is the variance of the resi-
duals (i. e., the standard error of estimate).

For these reasons there has been a great
deal of interest recently in tests that are
independent of the form of distribution. A
test of this nature, especially relevant to
certain problems of time series analysis and
to other problems involving ordered observa-
tions, is set forth in this paper. It is
based upon sequences in direction of move-
ment, that is, upon sequences of like sign
in the differences between successive obser-
vations.[1]

Wallis then proceeds to derive the probability of phase

durations in a sample taken from a normal population. A phase

duration or run is determined by the differences between consecu-

tive closing averages. If consecutive closing averages are

97.67, 97.77, 98.02, 98.18, 98.14, 98.22, and 98.27, the first

differences are +0.10, +0.25, +0.16, -0.04, +0.08. This would

yield a run of three, a run of one, and a run of one. His

probability for runs of various lengths for a sample larger than

100 is:

| Length of Run (wks) | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Probability (E) | .265 | .275 | .079 | .017 | .0031 | .0005 |

The probability of getting runs of more than six weeks is

.0028. This means that there are less than three chances out of

1,000 for getting a run of six or more weeks.

---

[1] W. Allen Wallis and Geoffrey W. Moore, "A Significance Test
for Time Series and Other Ordered Observations," Technical Paper #1
(New York: National Bureau of Economic Research, 1941).

The first step was to compute the first differences between the weekly Dow-Jones averages. The computer was programmed to count consecutive first differences of like sign and print out the total accumulated when the sign changed. The period 1932-1967 produced 801 runs which were divided into 400 positive and 401 negative. It is obvious from inspection that the frequency of signs is normal because each positive run must have a compensating negative run.

As the next step, a table (Appendix W) was made to show expected and actual values for the frequency of runs of all phase durations in the sample. The sample is skewed to the left and is more widely dispersed than a normal distribution. It was previously mentioned that the expectation would be for less than three runs of six weeks or over out of a sample of size 1,000. On the basis of this difference, it may safely be concluded that the sample taken did not come from a normal population. The present sample contains 37 runs of six weeks or more. See Appendix X for graph of frequency of duration.

After much deliberation, the hypothesis was made that the sampling had taken place at random from two populations rather than one. The two populations will be called "Trend Up" and "Trend Down," or simply Up and Down. These two new samples that form subsets of the original sample are shown in Appendix Y.

In order to make use of these two distributions, an analogy

was made to the urn problem that is connected with the study of probabilities. The usual procedure is to draw a ball or number of balls out of an urn and on the basis of one or several samples to be able to estimate information about the balls in the urn. In this problem we have two urns instead of only one. The experimenter will draw a ball from an unidentified urn and try to determine whether it is urn Up or urn Down.

The first step is to construct a table from which to calculate the proportion of each length of run that comes from each of the two distributions. (Appendix Z) With this information, it should be possible for the experimenter to make his decision as to whether the ball had a greater likelihood of coming from one urn or the other.

When forming the two hypothetical distributions, the number of runs allocated to each class was made equal to the total number in the original. The proportion of interest to this experiment (P) is calculated by dividing the higher of the two numbers in each class by the total for the class. Having found the proportions, reference is made to the Brandt chart to find out which of these proportions are highly significant as one must be as certain as possible that the correct urn will be chosen. It is found that all but three of the central values (-1, +1, and +2) are significant at the 1 percent confidence limit. If the actual stock market is close to the hypothetical model, a reasonable strategy would be to buy after a rise of two weeks or after the decline of one week.

It should be noted that the two hypothetical distributions that will be investigated are only two out of many combinations that could have been chosen. All that was done was to choose two subsets that included all of the original distribution of 801 runs. It would have been just as logical to pick three distributions and call them Trend Up, Trend Down, and Trend Neutral.

The investigation now closely approximates the usual urn problem. There are two urns labelled Up and Down that contain red and black balls. The red balls are numbered from -13 to -1 and the black balls are numbered from +1 to +18. The player will pay a small fee (commission) and after being blindfolded will draw from one urn without knowing which one it is. After removing the blindfold he will look at the ball and try to tell by its color and number from which urn it was drawn. It is hoped that identification of the correct urn will result in a prize (profit).

The player hopes to be able to identify the urn (market trend) by drawing a ball with a highly significant proportion-- the higher the better. If he draws a +4 he may expect to be right in choosing the Up urn approximately nine times out of ten. If, however, he draws a -2, although the proportion is highly significant, his odds are only two to one in his favor. For this reason, the player might be unwilling to make a wager that he has picked the right urn if his proportion of possible success to failure is not sufficiently high. The investor will only want to invest if

he is sure that he is investing when the major trend is up or sell if he is sure the trend is down.

The first experiment using the length of run or phase duration as the method of ascertaining buy and sell points was not too encouraging. The results showed that 75 trades were made and that the geometric profit after commissions amounted to 589.23 or 53.52 percent of buy-and-hold. Several positive results were achieved from these runs, however, which could be used in later investigations. One point was that the optimum length of run was three weeks up and three weeks down. A slightly lower profit was obtained from three weeks up and two weeks down. Although the geometric profit before commissions was close to buy-and-hold, the fact that there were 75 trades during this period indicated that too many false starts were being made. The main finding of interest was that prediction on the basis of runs had sufficient possibilities for further study as it was more efficient than the Dow theory.

On the basis of the first experiment, it was decided to modify the requirements for purchase and sale of stock. The new strategy required that in addition to a run there also had to be an accumulated geometric move to accompany it. If a move of 1 percent is required for each week of the run, then a run of three weeks would have had to average 1 percent gain for three weeks or 3 percent. If the magnitude of the move was not sufficient at the end of three weeks and the run continued for another week, the test would be for 4 percent. This would be continued until either the move

averaged 1 percent for each week of the run which signaled a buy
or the run was broken.

Computer runs on the improved version proved to be more pro-
fitable. Using minimum runs of three up and three down, with a
requirement of a 2 percent move on the upside and 3 percent move
on the downside, a gain before commissions of 1,419.52 on 40 trades
seemed to be excellent. This left only the matter of commissions
to take into account. Refiguring the gain with commission charged
on both purchase and sale reduced the geometric gain to 928.91 or
84.37 percent as efficient as buy-and-hold.

Analysis of the trades showed that many purchases had been
made on the high week of an intermediate move and the market then
moved down for many weeks before a sell point was signaled, but
the logic on which this strategy is based assumes that a major
rise has been signaled. It would, therefore, be equally logical
to further assume that, if the weekly average fell below the pur-
chase price rather than continuing to move up, an error had been
made in picking the proper distribution and the trade should be
closed out. At the same time, it was discovered that several
trades showed losses after having had a gain of 10 percent or
more. In order to minimize these losses a rule was made that all
trades showing a loss should be closed out and any trade that showed
a gain of 3 percent would be stopped out if the averages fell below
cost plus 3 percent. The calculation for the combined strategy
plus trading rule increased the geometric gain to 1017.03 after

commissions or a result that was 92.37 percent as efficient as buy-and-hold. The return on this strategy was equal to compounding interest at 6-7/8 percent per annum as against 7-1/8 percent for the buy-and-hold. Because of the additional safety over buy-and-hold in periods of large declines this strategy appeared to be superior considering the small premium of one-quarter of 1 percent necessary to use it.

This strategy, called LD1D for log of the differences of the first differences, was tried in combination with other variables such as volume and rail averages without success. Finally LD1D was run first with the 40-week moving average and then with the 40-week moving average as improved by Grenville's rule of not buying if the moving average was not increasing and not selling unless the 40-week moving average was in a down trend. The improvement with this last method was at once apparent. (See Appendices Q through U, bottom line.) Geometric gain amounted to 1187.98 after commissions or 107.90 percent as efficient as buy-and-hold. Trades had been reduced to 14 which amounted to only four more than the Dow theory. Of the 14 trades, four lost an average of 6.70 percent and the remaining ten gained an average of 36.55 percent.

Why is this final strategy able to do what none of the others has done? It is simply the only one that has been able to make use of the ratchet effect. Of the 13 moves between investments, six lost ground but seven gained. (See Appendix AA) It is true that the average gain amounted to only four-tenths of 1 percent

but this was sufficient to make this strategy more efficient than buy-and-hold. Because of the question of whether technical analysis is applicable in todays' managed economy, it should be noted that for the past 11 years or three trades this strategy has gained between each trade.

# CHAPTER VII

## Summary and Conclusions

The purpose of this study was to investigate the Dow theory and other methods of technical analysis as a means of managing investments. It was specified at the start of the investigation that interest would center on investment strategies that use the Dow-Jones industrial and rail averages as their chief indicators of past, present, and future market action. In addition to investigating the Dow theory, the question of the correlation between the price action of the industrials and the volume of transactions needed to be tested.

On the basis of the several tests made on the various principles of the Dow theory, it is held that Dow was successful in defining a non-random manner in which the market advanced, declined, and signaled changes in primary trend. This principle is rated as being expected to be about 75 percent effective in today's market. Lines and volume were tested and found not to be highly significant as a means of determining the trend in conjunction with the industrial averages. The validity of requiring the rails to confirm a signal of the industrial averages that a change in primary trend has occurred was found to be without basis.

-92-

An overall evaluation indicates that the Dow theory has out-
lived its usefulness.  Unlike some of its derivations such as the
Filter and the Moving Average, the Dow cannot be improved without
changing some of its basic principles.  It seems best to recognize
the Dow theory as being the original technical strategy and expect
that better strategies have been found in the intervening years.

The Ten Percent Rule was analyzed to ascertain how it would
perform under test conditions.  Its original performance left so
many areas undefined that there was no way of duplicating these
original conditions, if, in fact, there were any.  The result of
this analysis showed that it performed with the next to least
efficiency of all the strategies tested.  Its main failure was,
like the Dow theory, lateness in calling turns in the primary
trend so too much of the rise was lost on the move up and much of
the possible profit was lost before the trade was completed on the
move down.  If the lag in timing was improved by using weekly or
daily averages, the result would be a filter technique such as used
by Alexander.

A test of Alexander's filter technique was the next logical
area of investigation as it followed the Ten Percent Rule in method
and the Dow theory in spirit.  The fact that Alexander was able to
show gains of approximately twice that of the Ten Percent Rule
indicated that there might be strategies that would prove equal or

superior to any method that was based on a selection of stocks alone without regard to the primary direction of the market.

Cootner stated in the introduction to his use of the moving average technique that Alexander's results could easily be improved. As he did not use the Dow-Jones and Standard and Poor's averages, he did not make a direct comparison of his strategy with that of Alexander. Using the Dow-Jones averages as a basis for the test showed that he had not improved on Alexander's strategy. Further investigation of the moving average strategy incorporating Granville's modification of only buying when the moving average was increasing and only selling when the moving average was decreasing resulted in gains which were very close to those obtained by the simple strategy of buy-and-hold. This indicated that the technical approach to investing might be able to turn in outstanding results if the proper strategy were chosen.

The strategy finally chosen, LD1D-MA, proved that there are algorithms of investment strategy based on simple and logical rules of operation that could be expected to provide returns greater than the simple strategy of buy-and-hold even in periods when the price action was heavily biased against them. While LD1D-MA is not as simple a strategy as might be desired, each of its three parts is logical and follows general methods used by both stock and commodity traders:

1. The requirement of a run of several time periods combined with a definite gain over the period has been used

by traders as a signal to buy. The stipulation as to exact
length of time and amount of move is peculiar to this study.
In addition, the trader has not been interested in determin-
ing a hypothetical basis for his decisions.

  2. The use of the stop loss usually placed just below
the point of purchase is common. As most traders are inter-
ested in the daily rather than the weekly averages, they
require some protection against large interday    fluctua-
tions which is not necessary with weekly averages.

  3. The use of the moving average is common among
financial analysts. Using the moving average in conjunc-
tion with runs rather than with the daily average is unique
to this study.

Profits from the Various Technical Strategies Compared to
  Buy-and-Hold (1931-1967) after Commissions

| Name | Number of Trades | Geometric Gain | Equivalent Compound Interest |
|---|---|---|---|
| Moving Average | 38 | 212.20 | 2-1/8% |
| Ten Percent Rule | 14 | 244.48 | 2-1/2% |
| Five Percent Filter | 106 | 489.49 | 4-5/8% |
| Dow Theory | 10 | 523.63 | 4-3/4% |
| LD1D | 40 | 1,017.03 | 6-3/4% |
| Imp. Mrg. Avg. | 17 | 1,056.08 | 6-3/4% |
| Buy-and-Hold | 2 | 1,100.98 | 7 % |
| LD1D-MA | 14 | 1,287.98 | 7-1/4% |

The summary indicates that the best strategies have a yearly compounded growth equal to or better than an investor would find in other areas where a high degree of personal skill and knowledge is not required for investing, such as deposits in a savings and loan association. It also indicates that a strategy to be highly successful must keep the number of trades to a minimum.

Reviewing the history of the technical approach to financial analysis should result in the opinion that the market will manage to develop a new pattern that will confound any strategy. It would be foolhardy to believe that there will not be periods during which LD1D-MA will lose its effectiveness. Logically these periods should belong to one of the following types:

1. Consistent advances or declines of two weeks followed by a one-week reaction. If this pattern develops the stock market will have no random character at all.

2. Linear advance or decline with first differences of less than 1 percent. This may be possible under a controlled economy with guaranteed returns on investment. It is hardly likely under our present version of a free economy.

3. A market that consistently moves up for three weeks or more only to fall abruptly past the sell point. This may be expected on occasion but not as a regular occurrence.

4. Markets that gyrate so wildly that the moving average does not have a chance to get in phase with the

move. A prolonged period of this type of action would probably bring about government intervention which would reduce the uncertainty.

If none of the four types of markets develops, it may be expected that LD1D-MA will continue to be an efficient strategy and an investor timing his purchases of individual stocks by this indicator should receive more than normal profits. Although it is perhaps still inefficient compared to some other strategy, the old proverb, "Among the blind, the one-eyed man is king,"[1] still holds true.

---

[1] Erasmus, _Adagia: Excellentia et Inequalitias_ (c 1500).

APPENDICES


All tables and charts in these
Appendices contain data obtained
from the  Dow Theory Comment
and  The Wall Street Journal

APPENDIX A

Major Bull Movements and Dow Trades 1932-1967

| Start of Move | | Dow Confirmation | | End of Move | | Dow Confirmation | | Total Move Points | Dow Move Points | % After Dow Confirm | Geom. Gain |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Price | Date | Price | Date | Price | Date | Price | | | | |
| 7/8/32 | 41.22 | 5/24/33 | 84.29 | 3/10/37 | 194.40 | 9/7/37 | 164.39 | 153.18 | 80.10 | 72.1 | 93.08 |
| 3/31/38 | 98.95 | 6/23/38 | 127.40 | 11/12/38 | 158.41 | 3/31/39 | 131.48 | 59.46 | 4.44 | 52.2 | 97.81 |
| 4/8/39 | 121.44 | 7/17/39 | 142.58 | 9/12/39 | 155.92 | 5/13/40 | 137.63 | 34.48 | - 4.95 | 38.7 | 89.04 |
| 4/28/42 | 92.92 | 6/15/44 | 145.86 | 5/29/46 | 212.50 | 8/27/46 | 191.04 | 119.58 | 45.18 | 55.7 | 145.13 |
| 5/17/47 | 163.21 | 6/14/48 | 188.60 | 6/15/48 | 193.16 | 11/9/48 | 173.94 | 29.95 | -14.55 | 15.2 | 123.82 |
| 6/13/49 | 161.60 | 10/2/50 | 228.94 | 1/5/53 | 293.79 | 8/31/53 | 261.22 | 132.19 | 32.28 | 49.1 | 152.83 |
| 9/14/53 | 255.49 | 7/7/54 | 341.12 | 4/6/56 | 521.05 | 10/1/56 | 468.70 | 265.56 | 127.58 | 67.8 | 243.93 |
| 10/22/51 | 419.79 | 5/2/58 | 459.56 | 1/6/60 | 685.47 | 3/3/60 | 612.05 | 265.68 | 152.49 | 84.6 | 353.48 |
| 10/26/60 | 566.05 | 10/10/61 | 706.87 | 12/31/61 | 734.91 | 4/26/62 | 678.88 | 168.86 | -27.89 | 16.6 | 331.18 |
| 6/26/62 | 535.78 | 11/13/62 | 623.11 | 2/9/66 | 995.15 | 5/4/66 | 910.30 | 459.37 | 287.19 | 81.0 | 523.63 |
| | | | | | | | Average | | | 53.3 | |

APPENDIX B

Lines

| Date Start | Date End | Days | Trend | Persistence | Reversal |
|---|---|---|---|---|---|
| 3/7/16 | 4/13/16 | 34 | 1 | 0 | |
| 5/6/16 | 6/8/16 | 26 | 1 | 0 | |
| 1/2/17 | 1/31/17 | 26 | 1 | 0 | |
| 4/7/17 | 5/4/17 | 25 | 1 | 0 | |
| 5/31/17 | 8/18/17 | 41 | 1 | 1 | |
| 5/16/18 | 8/12/18 | 70 | 1 | 0 | |
| 9/14/18 | 10/11/18 | 25 | 1 | 1 | |
| 11/25/19 | 1/2/20 | 30 | 1 | 0 | |
| 5/26/20 | 7/6/20 | 35 | 1 | 0 | |
| 9/23/20 | 11/6/20 | 29 | 0 | 1 | 1 |
| 6/27/21 | 8/2/21 | 25 | 0 | 0 | 0 |
| 8/17/22 | 9/27/22 | 36 | 0 | 0 | 0 |
| 12/20/22 | 2/3/23 | 35 | 1 | 1 | |
| 3/16/23 | 4/20/23 | 30 | 1 | 0 | |
| 7/5/23 | 7/31/23 | 25 | 0 | 0 | 0 |
| 9/16/23 | 10/17/23 | 26 | 0 | 0 | 0 |
| 11/3/23 | 12/17/23 | 29 | 1 | 0 | |
| 5/13/24 | 6/12/24 | 25 | 0 | 1 | 1 |
| 9/5/24 | 10/11/24 | 32 | 1 | 0 | |
| 11/12/24 | 12/14/24 | 27 | 1 | 0 | |
| 12/31/24 | 2/14/25 | 38 | 0 | 0 | 0 |
| 3/30/25 | 5/2/25 | 29 | 0 | 1 | 1 |
| 6/29/25 | 7/7/25 | 33 | 1 | 1 | |
| 8/7/25 | 9/18/25 | 29 | 1 | 0 | |
| 9/19/25 | 10/19/25 | 26 | 1 | 1 | |
| 7/31/26 | 9/11/26 | 26 | 0 | 0 | 0 |
| 1/3/27 | 2/11/27 | 27 | 1 | 0 | |
| 3/2/27 | 4/4/27 | 30 | 1 | 1 | |
| 4/5/27 | 5/6/27 | 25 | 1 | 1 | |
| 5/10/27 | 7/11/27 | 45 | 0 | 1 | 1 |
| 8/30/27 | 10/3/27 | 30 | 0 | 0 | 0 |
| 5/4/28 | 6/8/28 | 26 | 0 | 0 | 0 |
| 8/25/28 | 10/9/28 | 39 | 1 | 0 | |
| 5/5/30 | 6/6/30 | 27 | 0 | 0 | 0 |
| 6/10/35 | 7/10/35 | 25 | 1 | 1 | |
| 6/10/36 | 7/11/36 | 25 | 1 | 1 | |
| 8/21/36 | 10/2/36 | 30 | 1 | 0 | |
| 11/18/36 | 12/18/36 | 26 | 1 | 0 | |
| 1/5/37 | 2/2/37 | 25 | 1 | 1 | |
| 4/8/40 | 5/11/40 | 28 | 1 | 1 | |

APPENDIX B - continued . . .

| 1 = 27 | 1 = 15 | 1 = 4 |
| 0 = 13 | 0 = 25 | 0 = 9 |
| P = 67.5 | P = 62.5 | P = 30.76 |

Trend -          Given 1 if averages break out on opposite side

                 from which it entered.  This is not a reversal.


Persistence -    Given 1 if average continues for four weeks with-

                 out recrossing point of emergence.


Change of
Trend -          Given 1 if change in trend continues for four

                 weeks.

APPENDIX C

## Action Between Turning Points

| Turning Point | | High Between Points | | Low Between Points | |
|---|---|---|---|---|---|
| Date | Volume | Date | Volume | Date | Volume |
| 12/24/14 | 0.109 | | | | |
| 11/21/16 | 2.176 | 9/25/16 | 2.393 | 1/16/15 | 0.100 |
| 12/19/17 | 0.322 | 2/1/17 | 2.058 | 12/3/17 | 0.272 |
| 11/3/19 | 1.767 | 10/23/19 | 2.235 | 8/2/18 | 0.137 |
| 8/24/21 | 0.463 | 11/13/19 | 2.504 | 8/8/21 | 0.275 |
| 10/14/22 | 1.513 | 4/17/22 | 2.129 | 10/18/21 | 0.434 |
| 7/31/23 | 0.529 | 4/19/23 | 1.797 | 7/16/23 | 0.298 |
| 9/3/29 | 5.564 | 11/23/23 | 6.943 | 8/13/23 | 0.322 |
| 7/8/32 | 0.613 | 10/29/28 | 16.410 | 6/23/32 | 0.472 |
| 3/10/37 | 3.175 | 7/13/33 | 7.451 | 7/9/34 | 0.316 |
| 3/31/38 | 1.250 | 10/19/37 | 7.290 | 3/2/38 | 0.407 |
| 4/12/38 | 3.100 | 7/19/38 | 2.942 | 6/8/38 | 0.278 |
| 4/8/39 | 0.881 | 3/31/39 | 2.888 | 2/10/39 | 0.449 |
| 9/12/39 | 5.934 | 7/18/39 | 1.888 | 5/5/39 | 0.328 |
| 4/28/42 | 0.299 | 5/21/40 | 3.940 | 8/19/40 | 0.130 |
| 5/29/46 | 2.215 | 1/18/46 | 3.232 | 6/23/42 | 0.208 |
| 5/17/47 | 0.771 | 9/4/46 | 3.624 | 8/15/46 | 0.621 |
| 6/15/48 | 1.747 | 5/14/48 | 3.837 | 8/27/47 | 0.476 |
| 6/13/49 | 0.945 | 11/3/48 | 3.237 | 8/16/48 | 0.465 |
| 4/6/56 | 2.761 | 9/26/55 | 7.717 | 7/30/49 | 0.593 |
| 10/22/57 | 5.093 | 10/11/57 | 4.459 | 10/9/56 | 1.223 |
| 8/3/59 | 2.631 | 10/17/58 | 5.368 | 11/11/57 | 1.539 |
| 10/25/60 | 4.427 | 5/18/60 | 5.243 | 10/12/59 | 1.745 |
| 12/13/61 | 3.707 | 4/4/61 | 7.077 | 11/17/60 | 2.460 |
| 6/26/62 | 3.894 | 6/29/62 | 14.746 | 5/21/62 | 2.259 |
| 2/9/66 | 10.560 | 12/6/65 | 11.434 | 10/8/62 | 1.946 |

APPENDIX D

## Volume Correlation

Coefficients of Correlation

|        |   | Lows     | Highs    |
|--------|---|----------|----------|
| Down   | 1 | -.11779  | -.06014  |
|        | 2 | -.41891  | .75696   |
|        | 3 | -.42048  | .26058   |
|        | 4 | -.35973  | -.08985  |
|        | 5 | -.12865  | -.02784  |
|        | 6 | -.05214  | .13201   |
|        | 7 | -.79893  | -.62216  |
|        | 8 | -.02768  | .05442   |
|        | 9 | -.26707  | .05318   |
| Up     | 1 | .89892   | .71617   |
|        | 2 | -.14389  | -.03155  |
|        | 3 | -.12965  | .13398   |
|        | 4 | .24772·  | .50791   |
|        | 5 | -.22512  | .65822   |
|        | 6 | .45361   | .27421   |
|        | 7 | -.15772  | .39382   |
|        | 8 | .39805   | .62339   |
|        | 9 | .20633   | -.07812  |

APENDIX E



MONTHLY CLOSING AVERAGE - DJI

190 175 160 145 130 115 100 85 70 55 40

YEARS
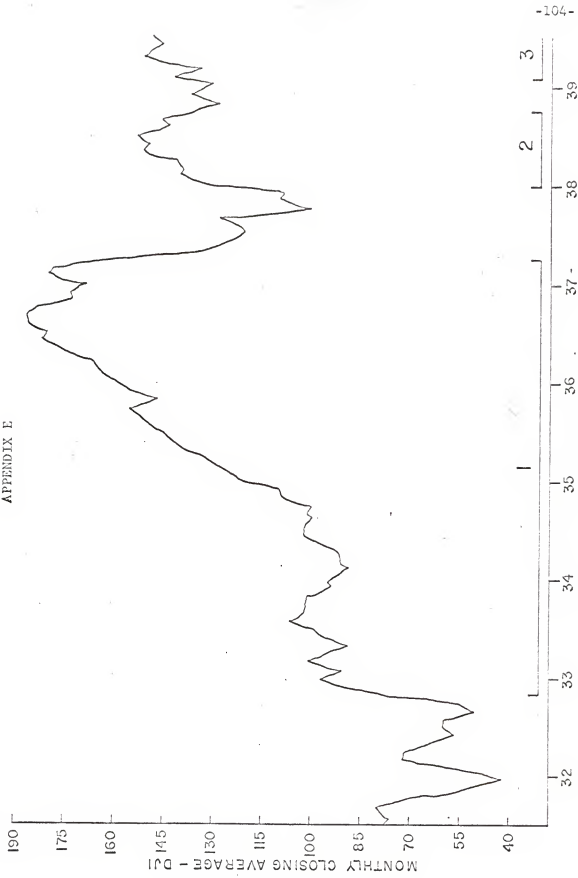
Trade on the Dow Theory 1932-1939

APPENDIX F

MONTHLY CLOSING AVERAGE - DJI

300   250   200   150   100

40   41   42   43   44   45   46   47

YEARS

3   4
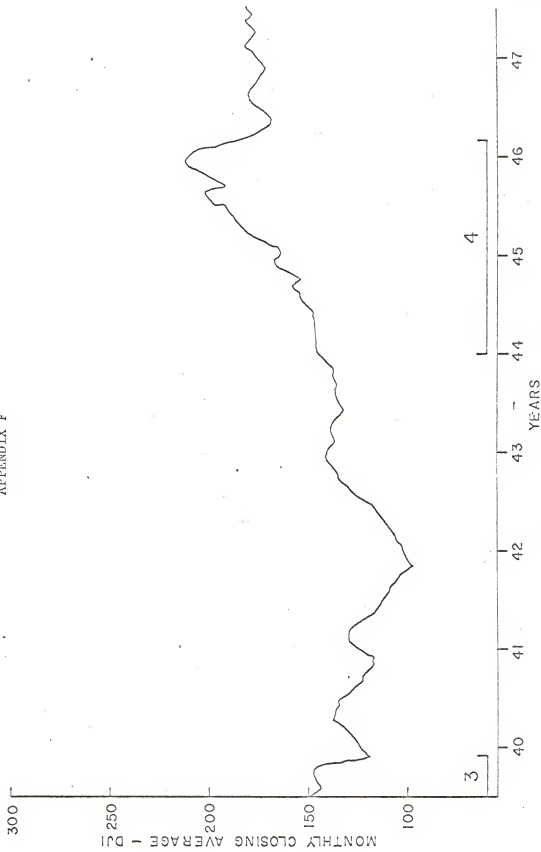
Trade on the Dow Theory 1940-1947
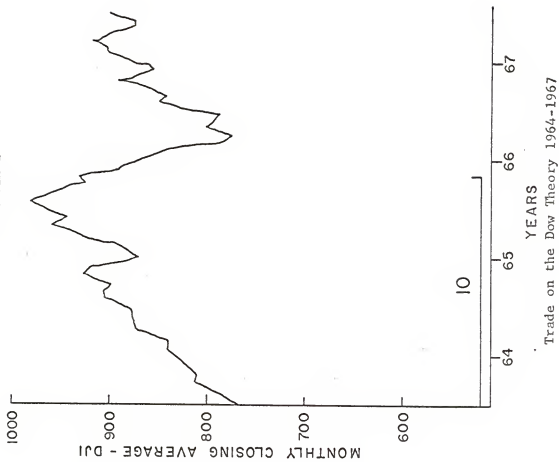
APPENDIX G

Trade on the Dow Theory 1948-1955
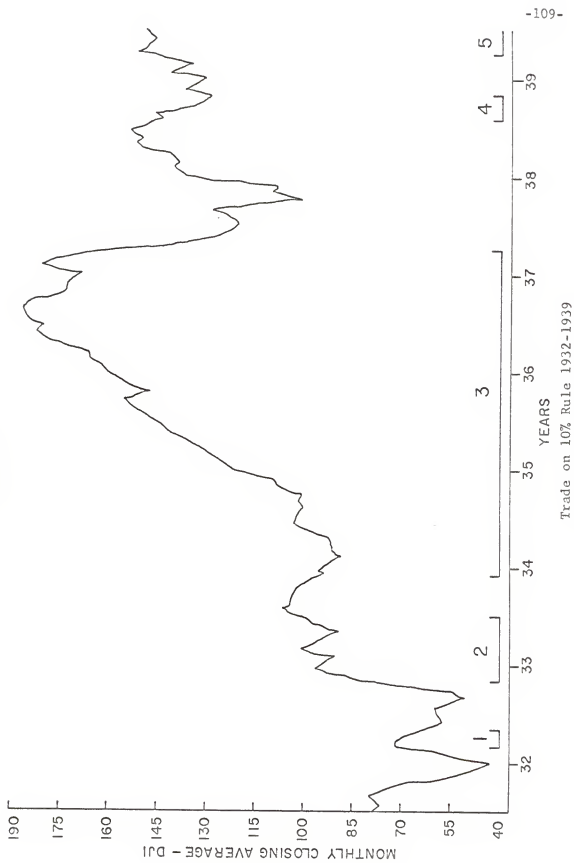
MONTHLY CLOSING AVERAGE — DJI

YEARS
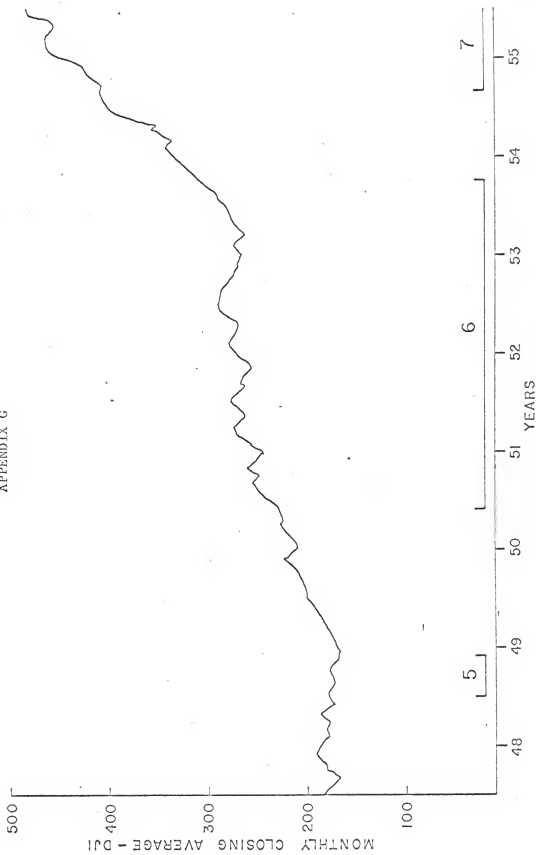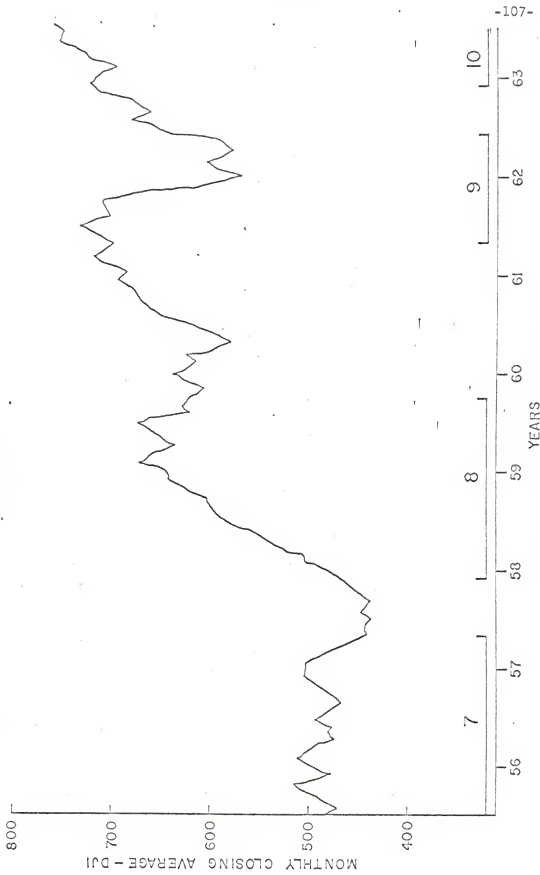
APPENDIX H

Trade on the Dow Theory 1956-1963

APPENDIX I

Trade on the Dow Theory 1964-1967

APPENDIX J



Trade on 10% Rule 1932-1939

APPENDIX K



APPENDIX K
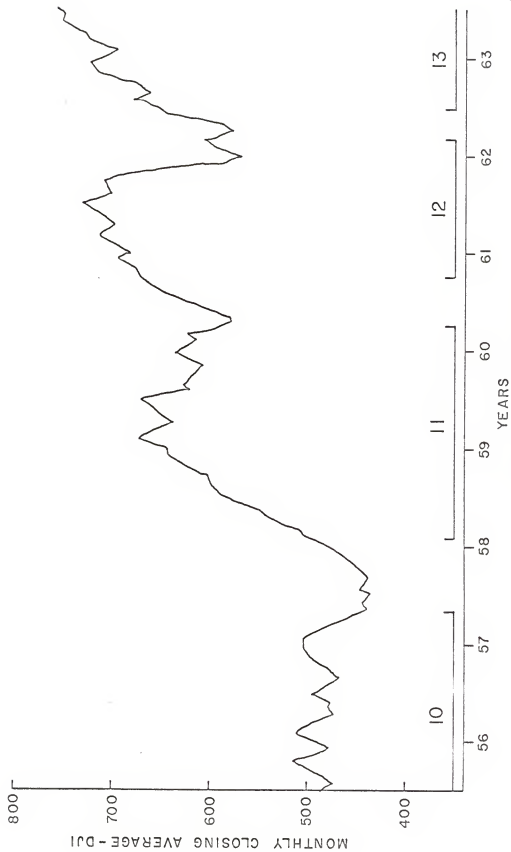
MONTHLY CLOSING AVERAGE – DJI

300
250
200
150
100

YEARS

Trade on 10% Rule 1940-1947

5    6    7    8

40  41  42  43  44  45  46  47

-110-

APPENDIX L

MONTHLY CLOSING AVERAGE-DJI

500  400  300  200  100

48    49    50    51    52    53    54    55

9                    10

YEARS

Trade on 10% Rule 1948-1955

APPENDIX M

APPENDIX N



MONTHLY CLOSING AVERAGE - DJI

1000 900 800 700 600

64    13    65    66    14    67

YEARS
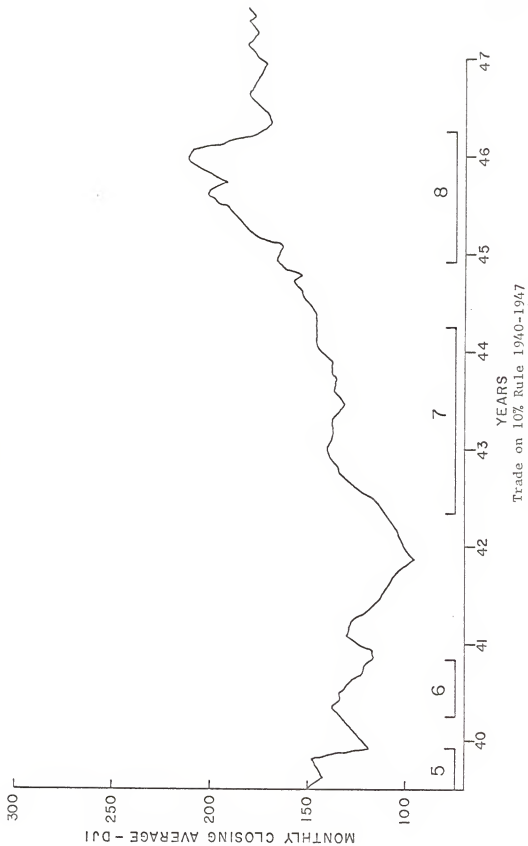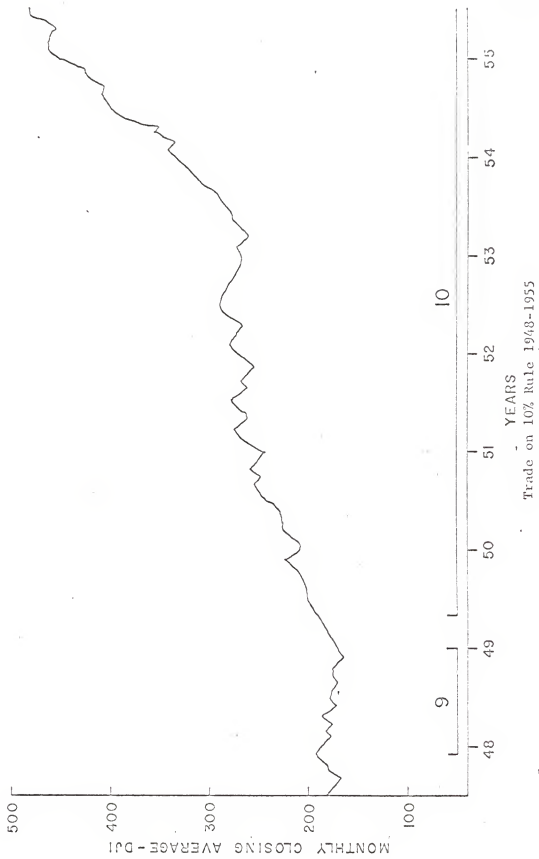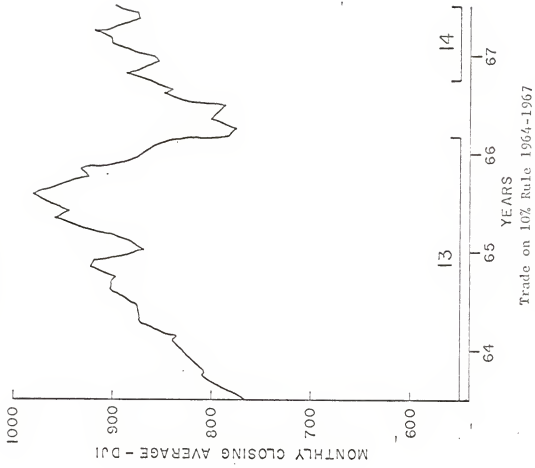
Trade on 10% Rule 1964-1967

APPENDIX O

Trades on Ten Percent Rule
Gains Less Commission

| Date Buy | Price | Date Sell | Price | Percent Gain | Geometric Gain |
|------|--------|------|--------|--------|--------|
| 8/32 | 72.42 | 10/32 | 61.53 | -18.14 | -18.14 |
| 4/33 | 73.51 | 5/34 | 94.26 | 26.95 | 3.91 |
| 12/34 | 100.18 | 9/37 | 152.38 | 50.59 | 56.48 |
| 7/38 | 143.33 | 4/39 | 128.10 | -11.51 | 38.45 |
| 9/39 | 152.67 | 5/40 | 114.90 | -25.48 | 3.16 |
| 9/40 | 133.92 | 4/41 | 116.74 | -13.69 | -10.96 |
| 10/42 | 113.77 | 9/44 | 146.39 | 27.39 | 13.41 |
| 5/45 | 165.72 | 9/46 | 171.49 | 2.45 | 16.19 |
| 5/48 | 190.31 | 6/49 | 166.61 | -13.32 | .71 |
| 10/49 | 189.90 | 10/57 | 435.94 | 127.27 | 128.89 |
| 7/58 | 496.23 | 9/60 | 575.36 | 14.79 | 162.74 |
| 2/61 | 652.80 | 5/62 | 629.17 | - 4.57 | 150.70 |
| 12/62 | 650.68 | 7/66 | 870.90 | 32.51 | 232.20 |
| 2/67 | 842.84 | 12/67 | 882.79 | 3.69 | 244.48 |

APPENDIX P

## Trades on the Ten Percent Rule
## Using Daily Closings
## Gains Less Commissions

| Date Buy | Price | Date Sell | Price | Percent Gain | Geometric Gain |
|---|---|---|---|---|---|
| 8/32 | 73.16 | 10/32 | 61.90 | -16.33 | -16.33 |
| 4/33 | 77.66 | 5/34 | 95.72 | 22.03 | 2.21 |
| 12/34 | 104.04 | 9/37 | 154.57 | 47.08 | 50.33 |
| 7/38 | 139.27 | 4/39 | 128.45 | - 8.69 | 37.27 |
| 9/39 | 152.54 | 5/40 | 116.22 | -24.57 | 3.54 |
| 9/40 | 132.64 | 4/41 | 115.54 | -13.76 | -10.71 |
| 10/42 | 114.07 | 9/44 | 146.99 | 27.57 | 13.91 |
| 5/45 | 168.30 | 9/46 | 172.92 | 1.42 | 15.53 |
| 5/48 | 190.74 | 6/49 | 167.42 | -13.10 | .39 |
| 10/49 | 182.51 | 10/57 | 441.04 | 139.23 | 140.17 |
| 7/58 | 502.99 | 9/60 | 580.14 | 95.65 | 174.24 |
| 2/61 | 662.08 | 5/62 | 597.93 | -10.60 | 145.18 |
| 12/62 | 652.10 | 7/66 | 847.38 | 28.65 | 215.42 |
| 2/67 | 897.05 | 12/67 | 905.11 | 1.93 | 221.50 |

APPENDIX Q



Trade on Improved Moving Average and IDID-MA
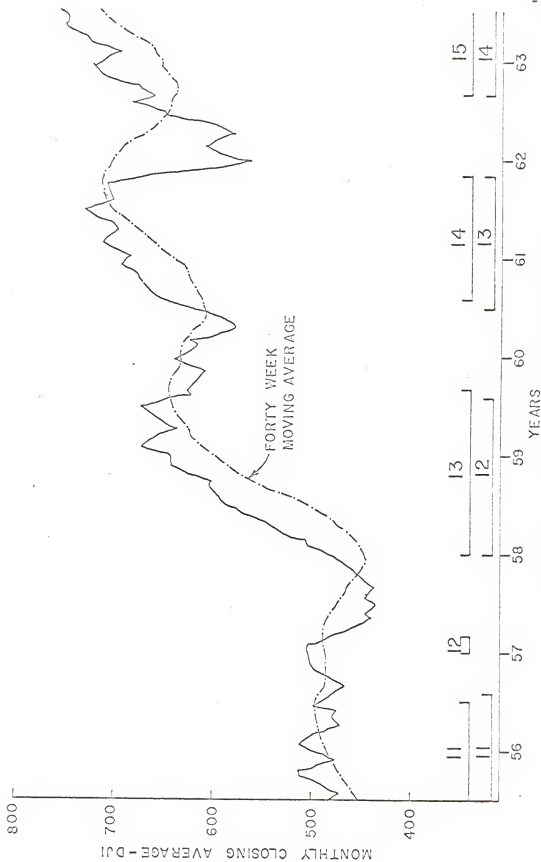1932-1939

APPENDIX R:
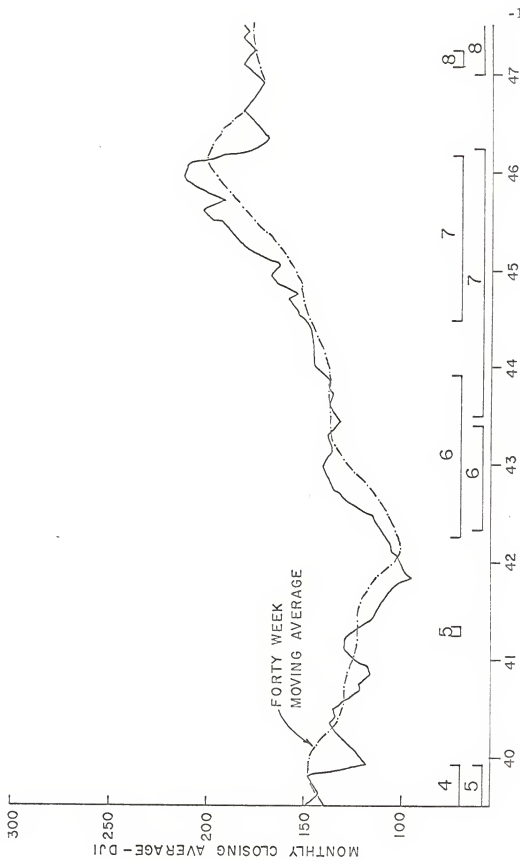


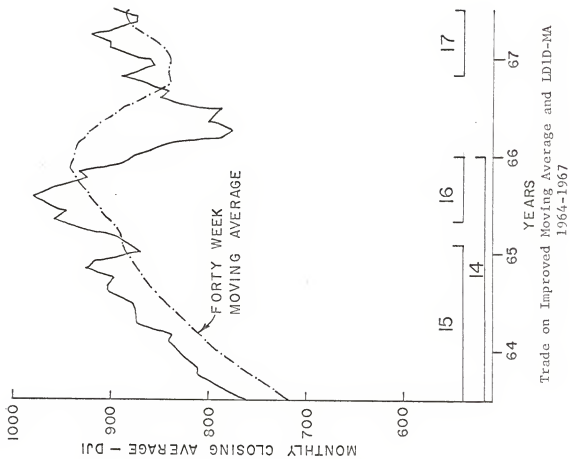Trade on Improved Moving Average and LD1D-NA
1940-1947

APPENDIX S



Trade on Improved Moving Average and LD1D-MA
1948-1955

APPENDIX T



-119-
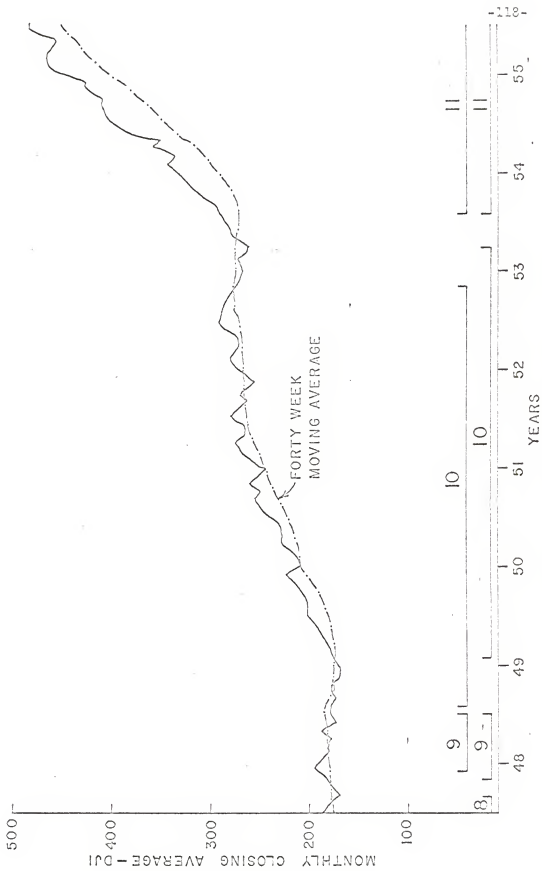
Trade on Improved Moving Average and LDID-MA
1956-1963

-120-

APPENDIX U



FORTY WEEK
MOVING AVERAGE

MONTHLY CLOSING AVERAGE - DJI

Trade on Improved Moving Average and LD1D-MA
1964-1967

YEARS

APPENDIX V

Trades with Improved Moving Average
Gains  Less Commissions

| Date Buy | Price | Date Sell | Price | Percent Gain | Geometric Gain |
|---|---|---|---|---|---|
| 12/32 | 60.11 | 5/34 | 98.82 | 62.76 | 62.76 |
| 11/34 | 99.90 | 5/37 | 173.08 | 71.53 | 179.18 |
| 7/38 | 136.53 | 3/39 | 132.83 | - 9.84 | 167.94 |
| 10/39 | 150.04 | 5/40 | 124.20 | -18.05 | 119.59 |
| 9/41 | 129.32 | 10/41 | 122.53 | - 6.21 | 105.96 |
| 9/42 | 109.56 | 11/43 | 130.79 | 18.19 | 143.42 |
| 6/44 | 144.08 | 8/46 | 200.00 | 37.43 | 234.52 |
| 7/47 | 184.77 | 9/47 | 175.14 | - 6.16 | 213.92 |
| 5/48 | 188.60 | 12/48 | 175.92 | - 7.65 | 189.90 |
| 10/49 | 184.80 | 5/53 | 275.66 | 47.68 | 328.13 |
| 1/54 | 286.72 | 12/56 | 494.38 | 70.70 | 630.83 |
| 6/57 | 511.58 | 8/57 | 485.93 | - 5.96 | 587.25 |
| 6/58 | 476.56 | 2/60 | 626.20 | 32.59 | 811.24 |
| 1/61 | 650.64 | 4/62 | 694.61 | 5.69 | 863.10 |
| 2/63 | 674.74 | 7/65 | 861.77 | 26.44 | 1,117.76 |
| 10/65 | 945.84 | 6/66 | 883.63 | - 7.51 | 1,026.27 |
| 4/67 | 873.00 | 12/67 | 905.11 | 2.64 | 1,056.08 |

APPENDIX W

Distribution of Length of Run Compared to Normal

| Runs | Expected Value | Actual Positive | Actual Negative |
|---|---|---|---|
| 1 | 250.31 | 143 | 185 |
| 2 | 110.14 | 90 | 111 |
| 3 | 31.72 | 56 | 51 |
| 4 | 6.97 | 37 | 31 |
| 5 | 0.24 | 22 | 13 |
| 6 | 0.20 | 19 | 6 |
| 7 | 0.17 | 15 | 1 |
| 8 | 0.15 | 7 | 0 |
| 9 | 0.13 | 4 | 1 |
| 10 | 0.11 | 2 | 1 |
| 11 | 0.09 | 2 | 0 |
| 12 | 0.07 | 0 | 0 |
| 13 | 0.05 | 1 | 1 |
| 14 | 0.05 | 0 | 0 |
| 15 | 0.03 | 0 | 0 |
| 16 | 0.03 | 1 | 0 |
| 17 | 0.02 | 0 | 0 |
| 18 | 0.02 | 1 | 0 |
| Total: | 400.50 | 400 | 401 |

APPENDIX X
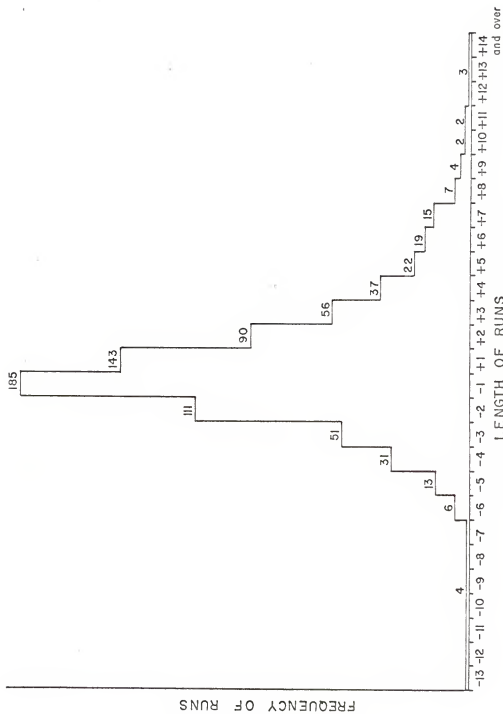


Distribution of 801 Runs 1932-1967
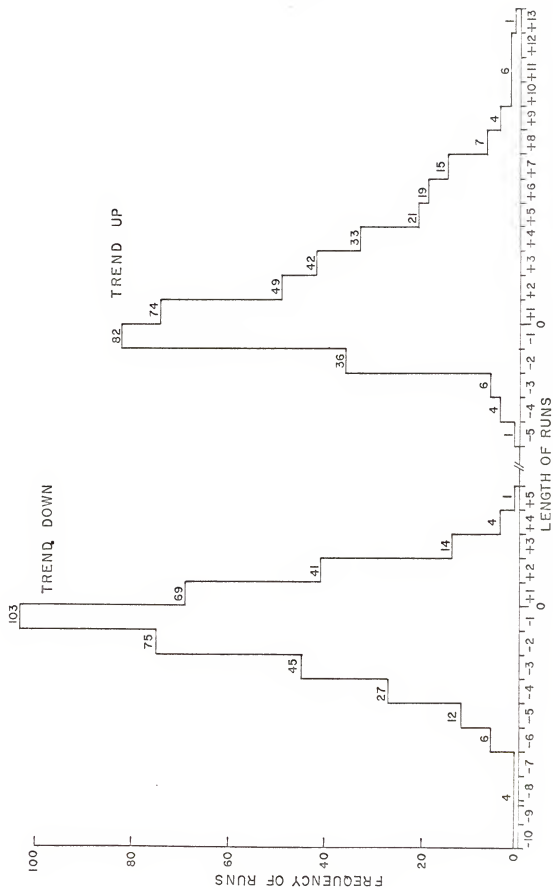
APPENDIX Y



Two Hypothetical Distributions

APPENDIX Z

## Significance of Runs in Two Hypothetical Distributions

| Length of Runs | -5 and under | -4 | -3 | -2 | -1 | +1 | +2 | +3 | +4 | +5 and over |
|---|---|---|---|---|---|---|---|---|---|---|
| Trend Up | 1 | 4 | 6 | 36 | 82 | 74 | 49 | 42 | 33 | 52 |
| Trend Down | 22 | 27 | 45 | 75 | 103 | 69 | 41 | 14 | 4 | 1 |
| $P_o$ | .957 | .871 | .882 | .676 | .557 | .517 | .544 | .75 | .892 | .981 |
| Necessary for oc = .01 | 8.5 | 12.5 | 12 | 52 | 510 | 600+ | 600+ | 27 | 11 | 7.5 |
| Actual | 23 | 31 | 51 | 111 | 185 | 143 | 90 | 56 | 37 | 53 |
| Significant | yes | yes | yes | yes | no | no | no | yes | yes | yes |

APPENDIX AA

## Trades with LD1D-MA Strategy
### Profits Less Commissions

| Date Bought | Price | Date Sold | Price | Percent Gain | Geometric Gain |
|---|---|---|---|---|---|
| 4/33 | 71.25 | 5/34 | 96.09 | 33.52 | 33.52 |
| 6/34 | 99.00 | 8/34 | 89.27 | -10.73 | 19.19 |
| 4/35 | 100.84 | 9/37 | 170.60 | 67.48 | 99.62 |
| 6/38 | 126.74 | 4/39 | 136.08 | 6.29 | 112.18 |
| 10/39 | 151.59 | 5/40 | 129.92 | -15.15 | 80.03 |
| 10/42 | 113.86 | 11/43 | 131.10 | 13.99 | 105.22 |
| 12/43 | 134.97 | 9/46 | 181.14 | 32.86 | 172.66 |
| 6/49 | 169/89 | 2/48 | 166.43 | - 3.01 | 164.44 |
| 4/48 | 177.50 | 12/48 | 176.35 | - 1.64 | 160.11 |
| 7/49 | 169.24 | 9/53 | 263.41 | 54.08 | 300.79 |
| 1/54 | 289.36 | 1/57 | 478.95 | 63.87 | 556.79 |
| 6/58 | 469.32 | 1/60 | 638.45 | 34.69 | 784.60 |
| 12/60 | 614.03 | 4/62 | 693.72 | 11/85 | 889.41 |
| 3/63 | 679.33 | 6/66 | 893.22 | 30.18 | 1,187.98 |

APPENDIX BB

Number of Observations Necessary for
a Significant ($N_5$) or Highly Significant
($N_1$) Mean Difference for Various
Values of $P_O$ and $Q_O$
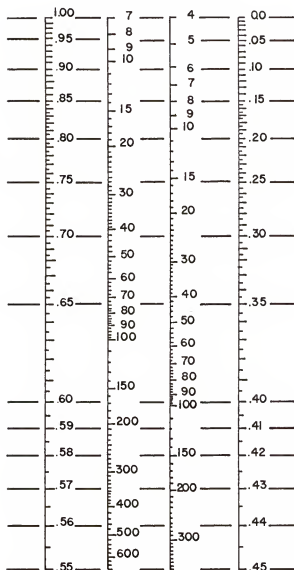


$P_O = \dfrac{\text{number of positive or negative differences whichever is larger} + \text{plus one-half the number of ties}}{\text{total number of differences}}$

$Q_O = \dfrac{\text{number of positive or negative differences whichever is smaller} + \text{plus one-half the number of ties}}{\text{total number of differences}}$

BIBLIOGRAPHY


Alexander, Sidney S. "Price Movements in Speculation Markets:
     Trends or Random Walks," No. 2, in Paul H. Cootner (ed.)
     The Random Character of Stock Market Prices.

Bishop, Dr. George H. Charles H. Dow and the Dow Theory. New
     York: Appleton-Century-Crofts, Inc., 1960.

Brandt, A. E. "A Test of Significance in a Unique Sample,"
     Journal of the American Statistical Association. 28: 434
     (1933).

Cootner, Paul H. (ed.). The Random Character of Stock Market
     Prices. Cambridge, Mass.: M. I. T. Press, 1964.

Cottle, C. S. and Whitman, W. T. Investment Timing: The Formula
     Plan Approach. New York: McGraw-Hill Book Co., Inc., 1953.

Cowles, Alfred, III. "Can Stock Market Forecasters Forecast?"
     Econometrica I (July, 1933), pp. 309-324.

_____. "Stock Market Forecasting," Econometrica XII
     (July, 1944), pp. 206-214.

Dahl, Curtiss. Constant Profits in the Stock Market. Cincinnati:
     Tri-State Offset Co., 1962.

Dow, Charles. The Wall Street Journal. New York. (1932-1967)

The Dow-Jones Averages. Barron's, New York (1931).

Drew, Garfield A. New Methods for Profit in the Stock Market.
     (2nd ed.). Boston: The Metcalf Press, 1948.

Dunnigan, William. New Blueprints for Gains in Stocks and Grains.
     San Francisco: William Dunnigan Economic Research, 1956.

Durant, Richard. What is the Dow Theory? Detroit: Durant & Co.,
     1956.

Edwards, Robert D., and Magee, John. Technical Analysis of Stock
     Trends. (4th ed.). Springfield, Mass.: John Magee Co., 1957.

Encyclopedia of Stock Market Techniques. (2nd ed.). New York:
     Investors' Intelligence, 1965.

-128-

Granville, Joseph E., A Strategy of Daily Stock Market Timing for Maximum Profit (Englewood Cliffs, N.J., 1960)

Grady, Paul. "Inventory of Generally Accepted Accounting Principles," Accounting Research Study #7. New York: American Institute of Certified Public Accountants, 1965.

Granger, C. W. J., and Morgenstern, O. "Spectral Analysis of New York Stock Exchange Prices." Kyklos. XVI 1-27 (Jan. 1963).

Greiner, Perry. Dow Theory Comment.

Jones, A. W. "Fashions in Forecasting," Fortune. New York (March, 1949).

Hamilton, William P. Stock Market Barometer. New York: Richard Russell Associates, 1960. Reissued.

King, Benjamin F., Jr. "The Latent Statistical Structure of Security Price Changes." Unpublished Ph. D. Dissertation, University of Chicago, 1964.

Leffler George L., and Farwell, Loring C. The Stock Market. (3rd ed.). New York: The Ronald Press Co., 1963.

Levy, Robert A. The Relative Strength Concept of Common Stock Price Forecasting. New York: Investors' Intelligence, 1968.

Moment, Samuel. "The Dow Theory--A Test of its Values and a Suggested Improvement," Dunnigan's Forecast Reports. One Eleven Sutton Building, San Francisco. (May 10, 1933).

Nelson, S. A. The ABC of Stock Speculation. New York: S. A. Nelson, 1902.

Rhea, Robert. Dow Theory Comment. No. 2, November 22, 1932.

_____. Dow's Theory Applied to Business and Banking. New York: Simon and Schuster, 1938.

_____. Graphic Charts. Colorado Springs, Colorado: Rhea, Greiner and Co., 1931.

_____. The Story of the Averages. Colorado Springs, Colorado: Robert Rhea, 1934.

_____. The Dow Theory. New York: Barron's, 1932.

Scarborough, J. B. Numerical Mathematical Analysis. (4th ed.). Baltimore: The John Hopkins Press, 1958.

Schabacher, R. W.  Stock Market Theory and Practice.  New York:
    Forbes Publishing Co., 1930.

Schaefer, E. George.  How I Helped More Than 10,000 Investors To
    Profit in Stocks.  Englewood Cliffs, N. J. : Prentice Hall,
    Inc., 1960.

_____.  "The Dow Theory Trader," Indianapolis:  E. George
    Schaefer, 1960.

Wyckoff, Richard D.  The Richard D. Wyckoff Method of Trading and
    Investing in Stock.  New York:  Wyckoff Associates, Inc., 1944.

Zimmer, Robert Keith.  "An Empirical Analysis of Stock Market Price
    Determinants."  Unpublished Ph. D. Dissertation, Ohio State
    University, 1964.

## BIOGRAPHICAL SKETCH

Burton M. Woodward was born December 8, 1915, at Springfield, Mass. In June, 1936, he graduated from Newton High School. He attended the University of Virginia for two years. From 1939 to 1946, he served in the Air Corps of the United States Army. He entered the University of Florida in 1947 and left in 1949 to enter business. He entered the University of Florida again in 1958 and received the degree of Bachelor of Arts in Economics in 1959.

He managed the University of Florida Computing Center from 1959 to 1965. While working at the Computing Center, he enrolled in the Graduate School of the University of Florida. He received the degree of Master of Business Administration in August of 1965. He left the Computing Center in 1965 in order to complete his doctoral residency requirements. While pursuing work toward the degree of Doctor of Philosophy, he has been Manager of the College of Business Administration's Computer Laboratory from January, 1967 until the present time.

Burton M. Woodward is married to the former Joanne Freeman and is the father of two daughters. He is a member of Alpha Kappa Psi, Omacron Delta Epsilon, American Economic Association, Econometric Society, and Association for Computing Machinery.

This dissertation was prepared under the direction of the chairman of the candidate's supervisory committee and has been approved by all members of that committee. It was submitted to the Dean of the College of Business Administration and to the Graduate Council, and was approved as partial fulfillment of the requirements for the degree of Doctor of Philosophy in Economics and Business Administration.

August, 1968

_____
Dean, College of Business Administration

_____
Dean, Graduate School

Supervisory Committee

_____
Chairman

_____

_____

_____