A STATISTICAL ANALYSIS OF WEEKLY CHANGES IN THE MARKET PRICE OF NATIONAL DAIRY COMMON STOCK FOR THE PERIOD, 1950 - 1960

by

Charles Richard Cryer

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF BACHELOR OF SCIENCE

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Signature of Author. . Signature redacted

School of Industrial Management

Certified by. . Signature redacted

Faculty Advisor of Thesis

Accepted by. . . . . .

May 19, 1961

Professor Philip Franklin
Secretary of the Faculty
Massachusetts Institute of Technology
Cambridge 39, Massachusetts

Dear Professor Franklin:

In accordance with the requirements for graduation, I herewith submit a thesis entitled "A Statistical Analysis of Weekly Changes in the Market Price of National Dairy Common Stock for the Period, 1950 - 1960."

I would like to express my sincere appreciation to not only my thesis advisor, Professor Paul H. Cootner, whose helpful criticism and endless patience made this thesis possible, but also to Professor Sidney S. Alexander and Professor David Durand who gave so generously of their time.

Sincerely yours,

Signature redacted

C. Richard Cryer

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Submitted to the School of Industrial Management on May 19, 1961, in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science

-Abstract-

The time-series of National Dairy stock prices, from the period 1950-1960, was selected for statistical analysis. Two fundamental hypotheses are tested in this study; first that National Dairy stock prices are influenced by the internal financial position of the Corporation, and second that its stock prices reflect conditions external to the Corporation, such as random influences, the state of the national economy and the state of the market in general. In the first case, the question of what affect quarterly dividend payments, sales or earnings are likely to have on National Dairy's stock price is statistically answered by examining the manner in which stock price and the quarterly variables fluctuated in reference to one another. By the method of least squares, an IBM 709 computer calculated the coefficients of correlation between different sets of variables with varying time lags. No significant results were obtained from these tests.

In the second case, the external influences were studied by analysing the frequency distribution of absolute price movements, relative price movements and the distribution of the signs of first order differences between successive observations during the period 1950 -1960. Several null hypotheses, based on the two different assumptions of randomness, on normality and on log-normality were used to evaluate the various observed frequency distributions.

The statistical investigation begins with a study of the history and business of National Dairy, its position in the dairy industry and the general nature of its stock issues. The stock is then statistically evaluated using the methods outlined in the preceding paragraph, and results in the findings that the observed distributions are not compatible with the null hypotheses. Finally, the filter developed by Sidney Alexander is examined and applied to the National Dairy price movement to smooth out small, random fluctuations and signal theoretically profitable stock transactions. Although Alexander found that the filter technique, when applied to the Dow Jones and Standard and Poor's averages, produced an higher average percent profit per year than buy and hold, no such profitable results were found in this investigation.

Thesis Advisor: Paul H. Cootner

Title: Assistant Professor of Industrial Management

-Acknowledgement-

The regression equations and the coefficients of correlation in Chapter III were computed on the facilities of the Computation Center of the Massachusetts Institute of Technology

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CHAPTER I

Introduction

The techniques used by the present-day Wall Street speculator in his never ending search for higher profits, greater yield and less risk are perhaps as numerous as the number of stocks in which he deals. Successful investment requires knowledge; and, in general, the traditional approach to the problem of investment is insufficient. Intuitive gimmicks do not lend themselves to the advancement of knowledge of stock price movements, however the techniques of modern statistics do. In their most significant aspects, modern statistical procedures are methods for making what Dewey has termed warrented assertions; such assertions about stock price movements, when based on statistics, are estimates or generalizations that go beyond the sample of observations studied from historical data. These generalizations can be derived from either the random or systematic tendencies of stock price movements by simple significance tests of general applicability. The warrented assertions of price movement characteristics are developed either from the acceptance or rejection of a particular hypothesis or from the role that chance plays in the observed discrepancies between a set of price movement data and expectations based on some null hypothesis.

The time series of National Dairy stock prices was selected for statistical analysis. Aside from the fact that detailed stock market data and Corporate financial information are readily available, the movement of National Dairy stock price is representative of the industrial averages. Moreover, National Dairy has growth tendencies,

dividend policies and seasonal sales fluctuations that make its stock ideal for a comprehensive statistical analysis. The complete set of data used for this investigation is tabulated in Appendix I. The data covers the period from January 1, 1950 to December 31, 1960.

Two fundamental hypotheses are tested; first that National Dairy stock prices are influenced by the internal financial position and policies of the Corporation, and second that its stock prices reflect conditions external to the Corporation, such as random influences, the state of the national economy or the state of the market in general. In the first case, the question of what affect dividend policy and quarterly sales or earnings are likely to have on National Dairy's stock price is statistically answered by correlating such data. Since the market usually foreshadows current events, varying time leads and lags were used to make the correlation more realistic and informative. In the second case, the external influences were studied by correlating the National Dairy stock price with the Dow Jones industrial average, and by analysing the frequency distribution of absolute price movements, relative (percentage) price movements and the distribution of the signs of first order differences between successive observations. Several null hypotheses, based on the assumption of randomness, normality and log-normality, were used to evaluate the various frequency distributions. These evaluations are a test for significance, and, of course, a test for randomness. The characteristics with respect to which randomness is tested and which are particularly relevant to time-series analysis include both the order of appearance of the observations and the fre-

quency distribution by certain stated intervals; these characteristics from which randomness is to be judged, moreover, are necessarily chosen entirely without reference to the sample so as to minimize spurious findings in the statistical investigation. Needless to say, the availability of established methods and tables and economy in calculation limit the selection of the characteristics to be calculated, however these considerations do not pose a great deal of difficulty.

The statistical investigation begins with the study of the history and business of National Dairy Products Corporation, its position in the dairy industry, and the general nature of its stock issues so as to provide a background and foundation for the ensuing analysis. The analysis itself follows in Chapters III and IV, and results in the findings that the price change distributions are not, in fact, compatible with the null hypothesis which assumes coincidence with a theoretical distribution and that the distribution of signs of the first order differences is not compatible with the null hypothesis which assumes randomness. The later distribution contains a preponderance of relatively long upward and downward trends, a fact that suggests the use of the Alexander filter which smooths small, random fluctuations and signals theoretically profitable transactions of the stock in question. This filter theory is discussed at length in Chapter V.

Although National Dairy price movement, like all stock movement, is largely unpredictable, this fact does not imply that nothing can be done to improve the speculator's chances of success. Even though the actual distribution of stock prices can not be rigor-

ously matched to theoretical distributions, the distributions can be uniquely defined by determining such values as its mean, standard deviation, kurtosis and skew. With such knowledge of the National Dairy time-series, the investor could more confidently predict future price expectations than he could if he applied his own intuition or the superficial reasonings which are frequently advanced by financial commentators.

CHAPTER II

History and Business of National Dairy Products

National Dairy Products Corporation was incorporated under the laws of Delaware on December 8, 1923. The Corporation is primarily an holding company engaged principally in the purchase, manufacture, processing and distribution of diversified lines of dairy and other food products. During 1956 and 1957, National Dairy converted from an holding company to an operating company by taking over and operating its former principal domestic subsidiaries as seven divisions. These divisions are coordinated and controlled from National Dairy headquarters in New York City; the large majority of the divisions operate, manufacture and market in the area east of the Mississippi.

The largest and most international division through which the Corporation operates is the Kraft Foods Division, formerly Kraft Cheese Company, with headquarters in Chicago, Illinois. Kraft manufactures and distributes consumer goods products including cheese and cheese products, salad dressings, margarine, confections, cooking oils and shortening, jellies and preserves, fruit salads and segments, and other products. An extensive program to expand and further diversify its products has been initiated in the last few years, with the result that many products and by-products found their way into the hotel and restaurant trade and into industrial use. The industrial products group includes food nutrients and a line of animal and poultry feeds and related products. Kraft also purchases from other manufacturers and distributes packaged macaroni and spaghetti products and "Pillsbury" biscuits and other dough products. Such pro-

ducts, the most important of which are nationally advertised, are distributed to retail stores and institutional purchasers throughout the United States, to a major extent in packaged form, by means of the Division's own sale and delivery system and through wholesalers. National Dairy, incidentally, operates the largest fleet of delivery trucks in the United States, owning or leasing over 16,000 vehicles. Among the trademarks under which the Division's products are sold are "Kraft", "Velveeta", "Parkay", "Miracle Whip", "Philadelphia Brand" and "Cracker Barrel". Kraft Foods Division also supervises subsidiaries of the Corporation which manufacture, package and distribute cheese and other products in a number of markets outside the United States, principally in Canada, Australia, England, West Germany and Denmark.

Sealtest Foods Division processes and distributes fluid milk and cream, ice cream and fluid milk specialties, including butter milk, skim milk, cottage cheese and sour cream. Its fluid milk line is distributed at retail (i.e., to homes) in markets ranging from the Rocky Mountains to the Atlantic Coast; and although Sealtest has abandoned many low-profit milk distribution routes in recent years, these retail markets are still a significant outlet of Sealtest products. The Division markets most of its products under the nationally advertised trademark "Sealtest". Ice cream is also sold under the "Bryer" trademark. The fluid milk and cream used in its operations are purchased from the producers of these commodities and from producer's cooperative associations.

At the end of 1960, Sealtest Foods Division entered the Cana-

dian market with the acquisition of Dominion Dairies Limited. Side by side with Dominion products, the Sealtest brand was introduced into this market in order to expand its international program.

The third division, Humko Products, with plants located in the mid-west, refines and produces edible oils and shortenings which are distributed both for consumer use and for food processor's use, including the Kraft Foods Division. Humko also produces a line of industrial chemicals derived from fats.

Breakstone Foods Division processes and distributes dairy specialty products under the trademark "Breakstone", including cottage cheese, cream cheese, sour cream and butter. It operates in New York, Philadelphia, Boston, Miami and other sections of the various Atlantic Coast states.

The Sugar Creamery Division, with headquarters in Chicago, is an important producer of butter, ice cream mix and certain other miscellaneous products. The butter churned and packaged by this Division enters many distribution channels and is delivered across the country under a wide variety of brand names, some of which are marketed by the subsidiaries of National Dairy Products.

The sixth division, Metro Glass, has plants in New Jersey, Pennsylvania and Illinois and has its headquarters in Jersey City, New Jersey. This Division is a manufacturer of glass containers which are used not only in National Dairy operations, but also by numerous other companies in the food, beverage, chemical, drug,

cosmetic and household products industries. Through enlarged and improved production facilities, Metro has become one of the largest suppliers of amber glass containers to the brewing, distilled spirits and chemical industries.

The Research and Development Division is the seventh Division of National Dairy Products. With headquarters in Glenview, Illinois, it is responsible for coordinating the Corporation's applied and fundamental research and for the conduct of all laboratory activities. It cooperates with the other divisions of the Corporation in the development of new products, processes and uses of by-products. The research center operates an experimental farm in Danville, Illinois, to support the animal feeds program. The Division also staffs experimental production facilities and special equipment for complex chemical and bacteriological research.

During the last few years, fluid milk, fluid milk specialties and cream accounted for approximately 25% of the consolidated net sales of the Corporation and its domestic and foreign subsidiaries; while cheese, ice cream, and butter accounted for 30%, 10% and 5%, respectively, of the consolidated net sales. The remaining 30% represents other than principal product lines and includes the wide variety of miscellaneous products mentioned earlier.

National Dairy operates its various milk and ice cream plants chiefly in the locations which they serve; however due to improvements in transportation facilities, ice cream is being marketed at increasingly greater distances from the plants in which manufactured. Cheese and butter manufacturing plants are located in or near milk producing

areas. Plants processing and packaging cheese and cheese products and manufacturing margarine, salad dressing, confections and other products are located so as to serve the market area efficiently. Most of the plants and properties are owned by the Corporation or its subsidiaries, although certain warehousing and sales supply branches and certain offices are located on leased property.

National Dairy and the Food Industry

High competitive conditions prevail among those businesses engaged in the manufacturing and marketing of food and dairy products, and because of the rigid stipulations of such Congressional acts as the Agricultural Marketing Agreement Act of 1937, National Dairy must compete in the market with new and improved products and processes rather than with price competition. In certain areas of the United States, state control boards or commissions regulate resale prices of fluid milk, cream and other products as well as trade practices involved in the distribution and sale of dairy products.

As a compensating factor in favor of National Dairy growth and profitability is that the sale of dairy products, and other food products, are an extremely stable source of revenue. The stability of dairy products is enhanced by the fact that they are essential foods of high per capita use in an era of expanding population. Americans each year consume billions of pounds of milk, ice cream, and other dairy products for which they pay over one-fifth of their food dollar. In this growing market, National Dairy Products, princi-

pally the Sealtest Division and the Kraft Foods Division, have significant brand superiority and maintain a superlative position of leadership. A variety of developments in products and processes during the past five years have strengthened National Dairy's operational position in the food industry, particularly in the dairy industry. To counter-act the effects of the narrow margins on fluid milk and of such moves as the abandonment of low-profit distribution routes as a source of revenue, National Dairy, through aggressive research and promotion, has enlargened its sales of specialty foods and miscellaneous non-dairy products to close to 30% of total revenue in 1960. Furthermore it has stimulated export sales and foreign operations through heavy capital outlays and other means so that foreign sales totaled well over $100 million in 1960.

Attention is called to the chart in Table I which presents some basic statistics for 17 leading food suppliers. According to Moody's long term ranking scores[1], National Dairy has a dividend stability of 115.5, well above the 100.0 average, and a price growth constant of 92.2, somewhat below the 100.00 average. The data in Table I gives a good comparative indication of National Dairy's position in the food industry, with particular emphasis on its stock position. A more comprehensive study of National Dairy stock will be presented later in this paper.

In general, the dairy industry is highly recession-resistent.

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[1] For a detailed explanation of the long term ranking scores, the reader is referred to any issue of Moody's Stock Survey, New York, N. Y.

Basic Statistics for Leading Food Suppliers*
1959 and 1960

Company	1959 Sales	Net Income to Sales	Per Share Earnings 1960	Per Share Earnings 1959	Current Yield	Price-Earn. Ratio 1959	Price-Earn. Ratio 1955
Beatrice Foods	$ 443.1	2.3%	$3.15	$3.04	3.1%	16.5	11.8
Borden	941.3	2.7	2.70	2.61	2.6	21.5	13.8
California Packing	352.5	4.1	3.10	2.96	3.0	13.2	7.1
Campbell Soup	516.2	7.7	4.00	3.71	2.4	20.5	13.1
Consolidated Foods	424.9	1.7	2.40	2.26	3.0	16.7	10.2
Continental Baking	385.9	2.4	4.15	4.60	4.8	11.1	7.2
Corn Products	676.4	4.9	3.40	3.04	3.0	23.2	11.6
General Foods	1,087.1	5.6	2.75	2.48	2.0	25.5	13.0
General Mills	538.8	2.1	2.00	1.46	3.6	16.5	12.7
H. J. Heinz	340.2	3.6	8.00	7.08	2.2	17.3	8.2
Hunt Foods	308.0	2.8	2.25	1.81	1.3	17.8	8.0
National Biscuit	429.0	5.7	4.25	3.57	3.8	17.2	16.0
NATIONAL DAIRY	1,605.7	3.1	3.60	3.51	3.2	17.5	13.6
Penick and Ford	56.9	8.2	3.25	3.18	4.0	16.9	9.1
Pillsbury	373.8	1.7	3.50	3.03	3.0	13.4	12.1
Standard Brands	521.8	3.0	2.50	2.30	3.0	21.2	12.8
Sunshine Biscuit	197.9	4.0	6.75	6.58	4.2	15.6	13.6

* Data taken in part from Moody's Stock Survey, Volume 53, No. 3, January 16, 1961, New York, N.Y.

Table I

Aided by government price supports of some products, the major co-panies continue to chalk up annual sales increases despite any fluctu-ation in general business conditions. National Dairy sales increase is significantly higher, percentage-wise, than its competitors, and although its net income to sales ratio is somewhat lower than the comparable figures of its field competitors (e.g., Borden), its over-seas ventures, high capital outlays, new product development and its new sales and marketing programs should increase National Dairy's net income to sales ratio within the near future.

The Common Stock of National Dairy Products

National Dairy Products Corporation has an authorized issue of 16 million shares of $5 par common stock. No preferred stock has been issued by the Corporation. Slightly over 14 million shares of common stock has been issued to shareholders as of December 31, 1960. Over 700,000 shares are reserved for employee purchase. Directors own 1.2% of the outstanding common stock. A 1952 Em-ployees' Stock Option Plan and a 1958 Employees' Stock Option Plan as Amended provide for the granting of common stock options to key employees, including officers, who have not attained age 60. The options are "restricted stock options" under Section 421 of the Internal Revenue Code of 1954. The terms of each option is to a date ten years from the date it is granted or to a date three months after the normal retirement age of 65 of the employee to whom granted, which ever is the shorter period. Under the 1952 Plan, the option prices were fixed by the board of directors and could not

be less than 95% of the average of the fair market value of the common stock on the days the respective options were granted or 95% of the average of the fair market value of the stock during the 30 preceding calendar days under the 1958 Plan.

The holders of the common stock of the Corporation are entitled to receive such dividends as are declared by the board of directors, subject to the restrictions in the Indentures and Supplemental Indentures under which the Corporation's debentures are outstanding. Moreover, holders of National Dairy common stock are entitled to one vote on all matters voted upon by stockholders, and upon liquidation, to share ratably in assets available for distribution.

The Corporation's Certificate of Incorporation, as amended in Article 4, provides that stockholders of the Corporation shall not have any preemptive right to purchase or subscribe to any of the common stock reserved for issuance under the forementioned Employees' Stock Option Plan. The Certificate of Incorporation contains no other express provisions with respect to preemptive rights as to any other shares of common stock which the Corporation may issue hereafter. Accordingly, the holders of the common stock, under the laws of the State of Delaware, are entitled, except with respect to shares referred to in the preceding sentence, to purchase pro rata shares of unissued common stock offered or sold for cash.

The Corporation covenants that it will not declare or pay any dividends, except stock dividends, or acquire any shares of its capital stock unless, after such payments or aquisitions, certain financial tests involving the relationship between the consolidated net tangible

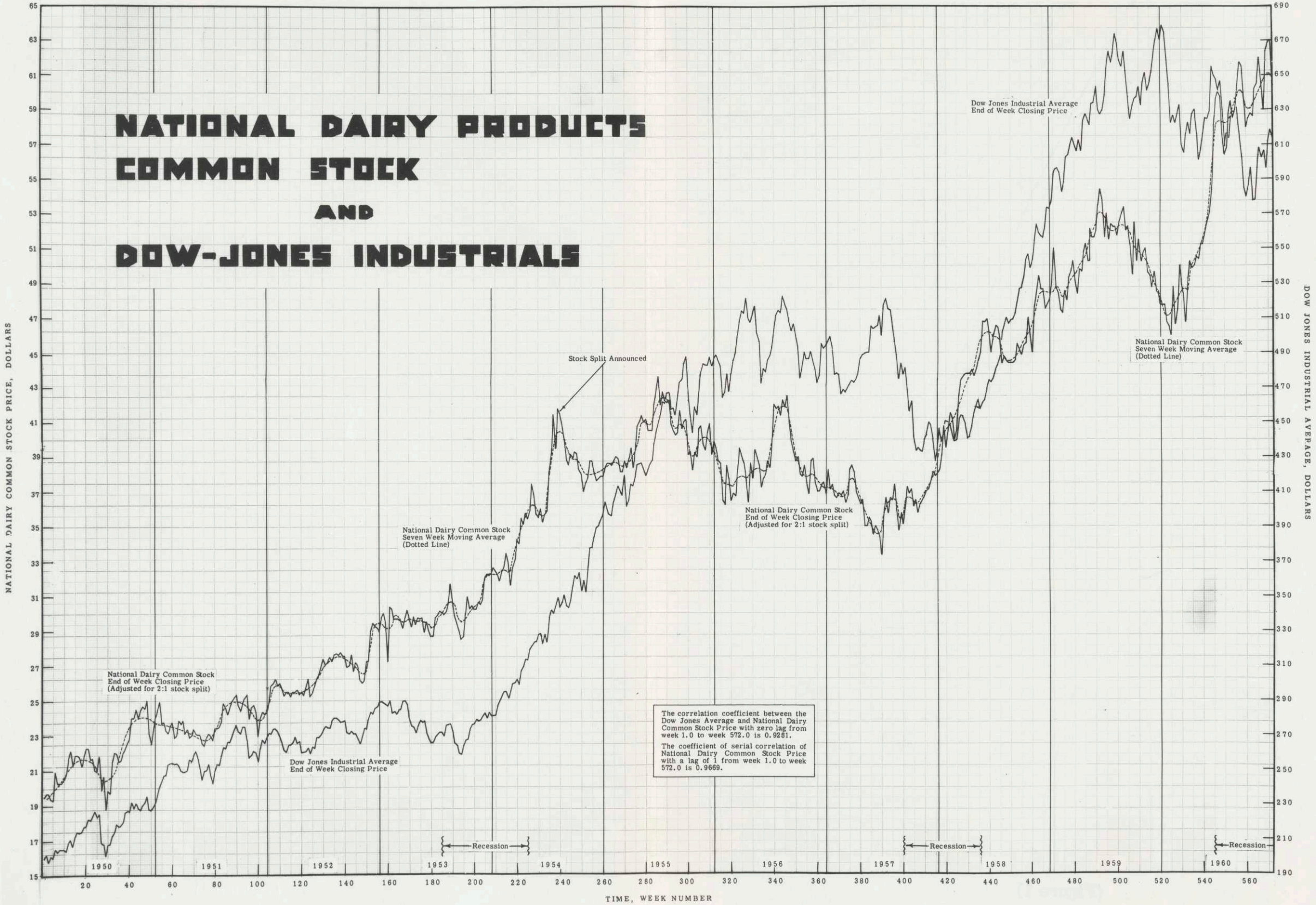
assets of the Corporation and the consolidated funded indebtedness of the Corporation (i.e., Indenture dated December 1, 1945, as supplemented between National Dairy and the Manufacturers Trust Company, as trustee, under which the Corporation's debentures are outstanding) are satisfied. On July 2, 1960, about $52 million of consolidated earned surplus was restricted under such Indenture limitations with respect to the payment of dividends.

During the period 1950 - 1960, significant stock issues included the issuance of 230,000 shares of National Dairy common stock in exchange for all of the outstanding capital stocks of Metro Glass Company , Inc., and the issuance of 100,084 shares of common stock for all the ordinary shares held by others in its partially owned Australian subsidiary, Kraft Holdings limited.

National Dairy's stock character in some respects resembles that of the more vigorously expanding electric-power stocks. It is a high grade stock that has moved upward rather persistently, if not spectacularly in the past decade. Its reliability as an income producer is asserted to by more than 35 years of unbroken cash dividend payments. And, like the forward moving utilities, per share dividends have more than doubled since the late 1940's. National Dairy Product's stock has moved about with the market during the period 1950 - 1960, in particular with the Dow Jones Industrial Average, as shown in the graph in Figure 1. Major discrepancies between National Dairy stock prices and the Dow Jones Industrial Average can be attributed to such temporary influences as the 2:1 stock split in the week of September

(Figure 1)

FIGURE 1


NATIONAL DAIRY PRODUCTS
COMMON STOCK
AND
DOW-JONES INDUSTRIALS
Dow Jones Industrial Average
End of Week Closing Price
National Dairy Common Stock
Seven Week Moving Average
(Dotted Line)
Stock Split Announced
National Dairy Common Stock
End of Week Closing Price
(Adjusted for 2:1 stock split)
National Dairy Common Stock
Seven Week Moving Average
(Dotted Line)
National Dairy Common Stock
End of Week Closing Price
(Adjusted for 2:1 stock split)
Dow Jones Industrial Average
End of Week Closing Price
The correlation coefficient between the Dow Jones Average and National Dairy Common Stock Price with zero lag from week 1.0 to week 572.0 is 0.9261.
The coefficient of serial correlation of National Dairy Common Stock Price with a lag of 1 from week 1.0 to week 572.0 is 0.9669.
Recession
Recession
Recession
1950
1951
1952
1953
1954
1955
1956
1957
1958
1959
1960
NATIONAL DAIRY COMMON STOCK PRICE, DOLLARS
DOW JONES INDUSTRIAL AVERAGE, DOLLARS
TIME, WEEK NUMBER

20, 1954, announced during the week of August 2, 1954, and as the merger negotiations of 1956 and 1960. The National Dairy stock price time-series will be discussed more thoroughly in Chapter III.

CHAPTER III

A Statistical Study of National Dairy Common Stock

Statistical analysis is concerned primarily with data based upon measurement, expressed in either pecuniary or physical units. One of the first steps towards analysis and interpretation of the data is that of presenting the collected data graphically, for not only is such a procedure of scientific value in paving the way for further investigation of relationships, but also it serves an immediate practical purpose in visualizing the results. The interpretation of a column of raw figures, such as the data presented in Appendix I, may be a difficult task; the same data in graphic form may tell a simple and easily understood story. Therefore to initiate a statistical study of National Dairy common stock, it is expedient to begin with a graphic presentation of this common stock time-series, and attempt to evaluate the chronological variations in the values of the data. Such a graph is presented in Figure 1, page 15; the Dow Jones Industrial Average time-series, also for the period January 1, 1950 to December 31, 1960, is included on this graph for comparative purposes.

The dotted line plotted in Figure 1 is a seven week moving average of National Dairy common stock price. It was hoped that a moving average could be used to advantage to analyse certain cyclical characteristics or measure the trend. By employing moving averages an attempt may be made to eliminate passing fluctuations and to arrive at values that define the influence of a steady operating secular factor. Moreover if a moving average describes adequately

the systematic variation in a series, the residuals should constitute a random series, and such a series could be used to determine a theoretical distribution. As it turns out, the seven week moving average does little more than smooth out the fluctuations, a feat that could have been duplicated with almost as much accuracy by eye, and, as was expected, gives no instructive hints to cyclical trends. For this reason, larger moving averages were not calculated. Since the large fluctuations of the time-series lack a constant period, and to a lesser degree, a constant magnitude of variation about a trend, the moving average becomes quite ambiguous and its interpretation is not simple. Because the period of the cycle varies, the selection of a period for the moving average is, at best, arbitrary, and consequently most of the theoretical value of such an average is lost. All in all, the moving average technique is somewhat an inefficient device for evaluating the time-series, and was not employed further.

It looking at the two time-series in Figure 1, it is immediately obvious that the movements of the Dow Jones Industrial Average are quite well correlated with the movements of National Dairy stock price. The correlation between these two series, with zero lag, was computed to be 0.9281. This coefficient of correlation indicates a definite and fairly close connection between the movements of the Dow Jones Industrials and National Dairy stock price. If the relationship between these two time-series is considered to be linear, and a regression equation is computed by the method of least squares, the relation:

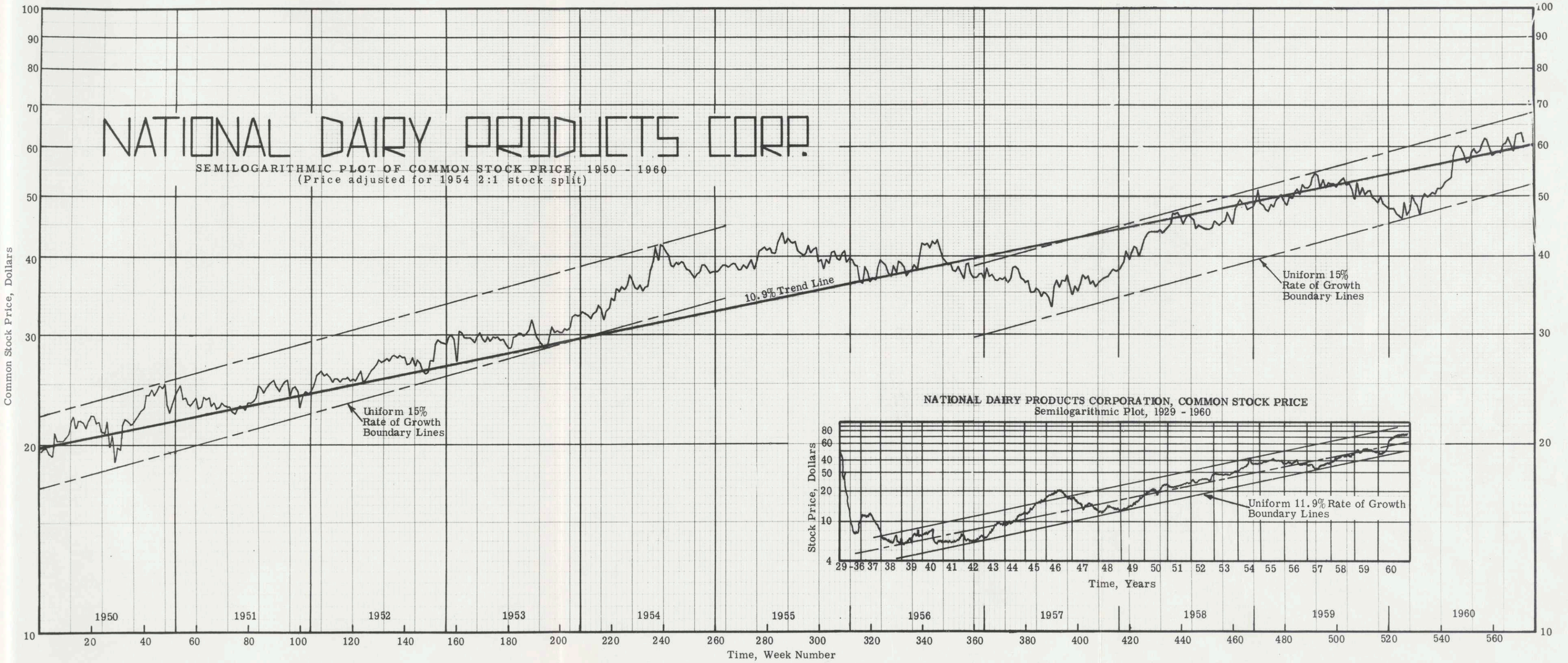
D. J. Price = 6.325(N. D. Adjusted Price) - 54.74

can be computed. To use this equation, one must adjust the stock price of National Dairy upwards after the 1954 stock split, a method which is consistent with the manner in which the Dow Jones is adjusted for stock splits. In view of the fact that the high aggregate correlation coefficient is, in part, a result of the influence of the high positive trend that is characteristic of both series, it is necessary to compute the average coefficient of correlation for the ten year period in six month intervals, which has the effect of reducing the trend influences on the calculations of the coefficient. This computation results in the average correlation coefficient of 0.588 for the aggregate period. However the low value of this coefficient is also somewhat misleading. Since the dairy industry is highly recession-resistant, it would seem reasonable to expect that National Dairy stock price is also 'recession resistant' as compared with the industrial average. For this reason, two sets of correlations were made during the three recessionary periods between 1950 and 1960. The first set covered the period from six months prior to the beginning of the recession up to the mid-point of the recession, and the second set covered the period of the recession itself. The former correlation was found to have an average coefficient of 0.1534; the later correlation was found to have an average coefficient of 0.0675. It therefore can be concluded that National Dairy stock is significantly less affected by recessionary influences than the Dow Jones Industrial Average, and that in non-recession periods these two time-series

are even more highly correlated than the 0.9281 or 0.5883 coefficients would indicate.

While the purpose of the graph in Figure 1 is to emphasize the absolute variations in stock price, the plot in Figure 2, page 21, is chiefly concerned with the relative variations in price. For many purposes there are distinct advantages and features of the ratio or logarithmic presentation; mainly that the graph will be a straight line so long as the rate of increase or decrease in stock price remains constant, that equal relative changes are represented by lines having equal slopes, and that percentages of change may be read and percentage relations between magnitudes determined directly from the chart. From the time-series, 1950 - 1960, certain trend observations can be made. Although it is difficult to draw a realistic trend line for this period, the average uniform rate of growth line, equalling 10.9%, was drawn from the initial to terminal point on the graph to serve as a reference line (See Figure 2). For so brief a period, a variety of trend lines could have been drawn; it is difficult to assert that one is any more valuable or appropriate than another. It is interesting to observe, however, that if the graph is divided into three sections and a line drawn, one connecting the peaks and another connecting the troughs, two sets of boundary lines are formed which have a constant width and a uniform, 15% rate of growth. Again the value of such lines is difficult to imagine, however it seems unlikely that their uniform width and slope are derived from chance alone. One would tend to conclude from these observations that the inherrent growth rate of National Dairy stock is closer to 15% than the calculated 10.9%, and that variations from this growth rate are caused by external influence in the

FIGURE 2


NATIONAL DAIRY PRODUCTS CORP.
SEMILOGARITHMIC PLOT OF COMMON STOCK PRICE, 1950 - 1960
(Price adjusted for 1954 2:1 stock split)
Common Stock Price, Dollars
Time, Week Number
10.9% Trend Line
Uniform 15% Rate of Growth Boundary Lines
Uniform 15% Rate of Growth Boundary Lines
1950
1951
1952
1953
1954
1955
1956
1957
1958
1959
1960
NATIONAL DAIRY PRODUCTS CORPORATION, COMMON STOCK PRICE
Semilogarithmic Plot, 1929 - 1960
Stock Price, Dollars
Uniform 11.9% Rate of Growth Boundary Lines
Time, Years

market structure or national economy. Such conclusions are on tenuous grounds no doubt, however it is interesting to consider such possibilities.

To make the analysis of the relative variations more comprehensive, it is wise to survey a longer period. The insert in Figure 2 presents a logarithmic plot of National Dairy's monthly averaged stock price from the year 1929 to 1960. The dotted line is an extension of the trend line drawn in the main graph, and although it leaves something to be desired, it is not completely inaccurate. Perhaps the most significant observation from this time-series is the uniform, 11.9% rate of growth boundary lines that contain, for the most part, the price fluctuations. The exception occurred in 1946, the first post-war year, at which time the market experienced an unusually bullish attitude. The ex post facto analysis strongly suggests that the 11.9% rate of growth boundary lines are a reliable device for predicting future limiting price movements of National Dairy stock. The long term investor might well use such indicators to determine his most profitable position in the market. As an example, he might purchase National Dairy when its price approached the lower boundary limit, and conversely, sell National short when its price approached the upper boundary limit.

The method of serial correlation was applied to the percentage price changes of National Dairy stock to determine if the percentage change at time, t, was correlated with percentage change at time, t - 1. The serial correlation for this time series was computed to be 0.9669, and the regression equation took the form:

$$\text{Percentage change}_t = 0.9988(\text{Percentage change}_{t-1}) + 0.2325\%$$

This equation constitutes a measure of the functional relationship between price changes at time, t, and time, t - 1, however it only is an expression of average relationship. Since the slope of the regression line is essentially one, the Y-axis intercept of 0.23% should correspond closely to the mean of the percentage price changes, which was manually calculated to be 0.31%. Presumably the results are not significantly different. The serial correlation can be employed for a test of randomness, however this investigation is covered in Chapter IV in the distribution of price change investigation.

The remaining evaluation of the graphs in Figures 1 and 2 is perhaps of a trivial nature and need not be discussed at length here. Many, if not all, of the large peaks and depressions in the National Dairy time-series can be explained by matching these rises and falls with significant market influences. For example the peak that developed during the period from July 5, 1954 to September 13, 1954 can be ascribed to the influence of a stock split which was announced officially during the week of August 9, 1954. To list all such correlations is of little value, particularly since these ex post facto observations offer little constructive value; certainly the one example illustrates the point.

Figure 3 is a graphical presentation of the quarterly comparison of book value, dividends, sales, earnings, seasonally adjusted earnings and a two week high-low average of stock price of National Dairy Products for the year 1950 - 1960. It is felt that it would be con-

QUARTERLY COMPARISON OF BOOK VALUE, STOCK PRICE, DIVIDENDS, SALES AND EARNINGS

National Dairy Products Corporation, 1950-1960

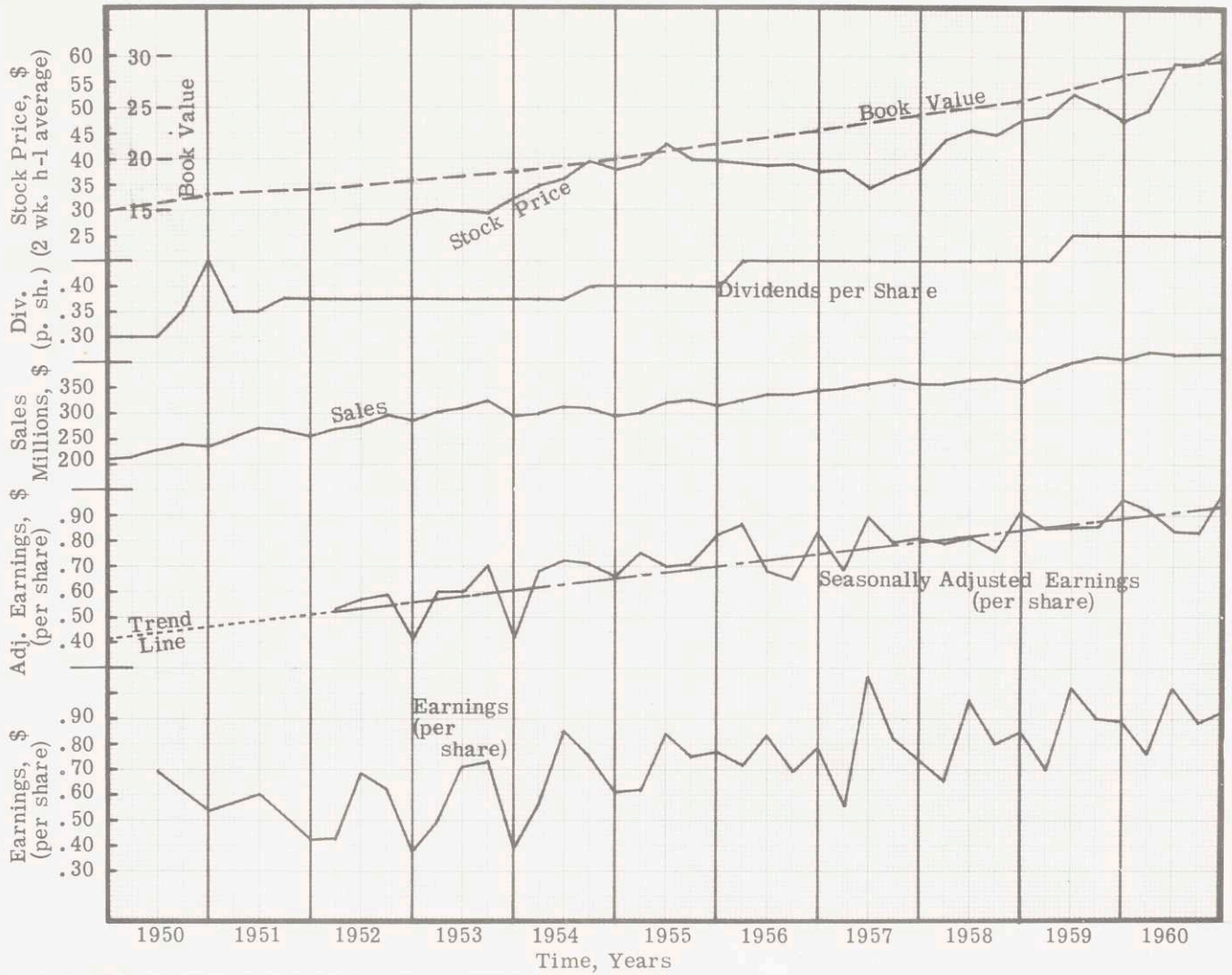


FIGURE 3

structive to test the hypothesis that the company's financial position, past or anticipated, in some way reflects the market value of its common stock. Should the market price the company's stock at an unjustifiably high level relative to book value, dividends or to present earnings, this price might reflect anticipated high earnings in the future. Conversely, if a stock is underpriced, the market might be reacting to past low earnings. Such an hypothesis is best tested by correlating earnings to stock price. Since earnings are on a quarterly basis, and are announced several weeks after the close of a particular quarter, a realistic correlation must include a stock price that is void of day-to-day random fluctuations, and best represent the market's appraisal of the stock price when the earnings are announced. For this reason, high-low averages were calculated for the two weeks prior to the announcement of earnings. Furthermore, because National Dairy sales follow a cyclical pattern that can be ascribed to seasonal demand for food and dairy products, these earnings must be seasonally adjusted. The adjusted quarterly earnings per share are tabulated in Table II for the period 1949 - 1960. Prior to 1952, earnings were announced semi-annually and therefore were not used in the correlation with stock price. The coefficients of correlation between the two variables for varying lag and lead times are presented in Table III.

The results of these correlations do not appear to be extremely significant; their low positive values seem only to reflect the positive trend of the two time-series. Some significance might be attached to the relatively high correlation coefficient of price at time, t, with

Quarterly Earnings Per Share
Seasonally Adjusted*

National Dairy Products Corporation
1949 - 1960

Year	Mar. 31	Jun. 30	Sep. 30	Dec. 31	Full Year
1949	**	$1.31	**	$1.32	$2.63
1950	**	1.39	**	1.18	2.57
1951	**	1.20	**	0.84	2.04
1952	$0.53	0.57	$0.59	0.42	2.11
1953	0.60	0.60	0.70	0.42	2.32
1954	0.68	0.72	0.71	0.66	2.77
1955	0.75	0.70	0.71	0.82	2.98
1956	0.86	0.68	0.65	0.83	3.02
1957	0.69	0.89	0.79	0.81	3.18
1958	0.79	0.81	0.76	0.91	3.27
1959	0.85	0.85	0.85	0.96	3.51
1960	0.92	0.84	0.83	1.00	3.59

* Above per share figures adjusted for 100% stock dividend, September, 1954.

** Quarterly earnings unavailable.

Table II

Coefficients of Correlation
between
Seasonally Adjusted Earnings and Average Stock Price
National Dairy Products Corporation
1952 - 1960

Correlation of:	Coefficient
$Price^{*}_{t}$ with $Earnings_{t-2}$	0.3261
$Price_{t}$ with $Earnings_{t-1}$	0.3667
$Price_{t}$ with $Earnings_{t}$	0.2967
$Price_{t}$ with $Earnings_{t+1}$	0.1127
$Price_{t}$ with $Earnings_{t+2}$	0.4626

* Subscript, t, indicates time of correlation (e.g., t-2 corresponds to the value of the variable two quarters before time, t).

Table III

earnings at time, t plus two quarters, (0.4626), if it were isolated from the other computations; however the small intermediate coefficient of 0.1127 would lead to the conclusion that if in fact present price anticipated earnings two periods in the future, it certainly would reflect earnings one period in the future. Since the stock of National Dairy has generally never been considered to be either under- or over-priced during the past eleven years, it is consistent with the results obtained above that the market could not in fact be anticipating future earnings or reacting to past earnings.

The coefficient of correlation between seasonally adjusted sales at time, t, and average stock price at time, t, is 0.1891, a figure that does little more than indicate the correlation between the trends of the two time-series. No correlation was made between dividends, given in Table IV, page 29, and stock price because of the stable nature of dividend payments.

The remaining internal conditions of National Dairy that could conceivably influence its stock price movements are tabulated in the Summary of Financial Position, Table V, page 30. Although all of the internal financial positions of a corporation, such as profit percentages of sales, plant account and working capital reflect in dividend policy, cash flows even more directly control dividend payments. Because of seasonal, cyclical or random variations in cash inflows and outflows, the cash flow per share (See Table V) is a strong indicator of dividend policy. The fact that a given number of dollars of earnings does not automatically produce an equivalent sum in cash at the end of a period is clearly obvious, for there must be a certain amount of liquidity to

Quarterly Dividend Record*
National Dairy Products Corporation
1949 - 1960

Year	Dividends paid three months ending: Mar. 31	Jun. 30	Sep. 30	Dec. 31	Year
1949	$0.23	$0.23	$0.25	$0.40	$1.10
1950	0.30	0.30	0.35	0.45	1.40
1951	0.35	0.35	0.35	0.38	1.45
1952	0.38	0.38	0.38	0.38	1.50
1953	0.38	0.38	0.38	0.38	1.50
1954	0.38	0.38	0.40	0.40	1.55
1955	0.40	0.40	0.40	0.40	1.60
1956	0.40	0.45	0.45	0.45	1.75
1957	0.45	0.45	0.45	0.45	1.80
1958	0.45	0.45	0.45	0.45	1.80
1959	0.45	0.50	0.50	0.50	1.95
1960	0.50	0.50	0.50	0.50	2.00

---

* Adjusted for a 100% stock dividend, September, 1954.

** Dividend payment dates: March 10th, June 10th, September 10th and December 10th.

Table IV

Summary of Financial Position*

National Dairy Products Corporation
1951 - 1960

	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
Sales, Millions of Dollars	1038.4	1141.3	1232.1	1210.3	1260.2	1352.9	1432.3	1451.2	1605.7	1667.2
Profit Margin, Percent	8.1	8.1	8.3	8.2	8.1	7.4	7.6	7.8	8.0	8.0
Plant Account	170.5	174.5	176.4	191.5	205.5	221.1	239.7	253.4	290.2	298.1
Working Capital	148.6	169.7	180.3	166.7	169.4	171.3	167.1	175.4	194.4	209.2
Book Value per Share	16.8	17.9	18.7	20.0	21.4	22.8	24.2	25.7	28.2	29.8
Cash Flow per Share	3.6	3.7	4.0	4.5	4.8	5.2	5.3	5.7	5.9	6.0
Dividend Payout, Percent	41.0	39.4	37.3	34.6	33.3	35.0	34.6	33.8	33.7	33.8
Price-Earnings Ratio	11.7	12.6	13.0	13.1	13.4	12.7	11.4	13.6	14.4	15.4
Average Dividend Yield, %	6.1	5.6	5.0	4.3	4.0	4.6	5.0	4.0	3.9	3.6

* Table adapted from The Value Line Survey, Arnold Bernhard and Company, Inc., April 3, 1961, New York, N.Y.

Table V

foster unbroken dividend payments. The cash flow figures indicate that National Dairy is able to preserve, and increase, its margin of liquidity; this fact assures future dividend payments. It can be noted from table V that National Dairy's dividend payout, as a percentage of earnings, has continuously decreased during the period 1951 - 1960. Such a trend indicates increasing retained earnings and therefore increasing expansion. Such policy could motivate market anticipation of future earnings, on a long term basis, and could effect speculation on National Dairy stock. Yet the figures themselves do not indicate any rigorous correlation with stock price other than past norms modified for trend.

In general it can be concluded that the correlation between stock price and National Dairy's financial position is, at best, a correlation between trend lines. Although the scaling of the six plots in Figure 3, page 24, distorts, for comparative purposes, the nature of the slope of the trend line, empirical calculations indicate that all trend lines have a relatively equal and uniform, 10% average yearly growth rate. As a result the original hypothesis is rejected; and the movements of National Dairy stock price must be analysed from the point of view that external and random market influences determine, by enlarge, the most significant price movements of National Dairy stock about its trend.

CHAPTER IV

The Distribution of Price Change of National Dairy Common Stock

A knowledge of the theoretical frequencies of the observed distribution of price changes is basic to a statistical study of stock price, for a knowledge of the theoretical frequencies permits generalization beyond the limits of direct observation. Basically, there are three distributions of the National Dairy stock time-series that merit investigation; namely, the distribution of absolute price changes, of percentage or logarithmic price changes, and of the signs of the first order differences in consecutive observations. Should the analyst be able to identify any of these distributions with an ideal distribution, he might well know in advance the probabilities attaching to similar but independent National Dairy stock price movements heretofore unencountered. Thus he is lo longer limited to the classes establised; he may compute the probabilities of a price lying between any two points, or above or below any value. The distinction between a priori probabilities which are assumed to be known apart from experience, and empirical probabilities which are derived from observation, is often necessary to keep in mind; the a priori probabilities are the conceptual counterparts of the frequency ratios that provide measures of empirical probabilities. In essence, the theoretical distribution has none of the limitations that exist in the observed distributions, and therefore the search for such a comparison is justified.

In selecting a theoretical distribution for comparison with the actual distribution of price change, there seems to be enough evidence to justify the use of normal theory. The normal theory has long occupied a central place in the theory of statistics and in appli-

cation of this theory. It was first defined over 200 years ago be De Moivre; it was redisovered by C. F. Gauss and P. S. Laplace in the early years of the nineteenth century. This discovery led to great emphasis in the succeeding half century on the normal law as a model to which distributions of observations of all natural phenomena were supposed to conform. Correction of this excessive emphasis was made in later years, however the normal distribution has retained its place as one of the pillars of modern statistics.

Normal theory has clearly a wide field of application, and many practical problems have statistical answers that are based on the assumption that the distribution of a population is normal. The argument for using normal theory in this case is two-fold. Firstly, the central limit theory indicates that almost any sum-generated process must resemble the normal very well; and secondly, a great many natural and random processes, most of which do not fall immediately into the category of obviously sum-generated processes, resemble in many ways the normal distribution. Although it is easy to argue that stock price movements are essentially sum-generated, since they are a resultant of a myriad of small and independent market impulses or influences, and that the distribution of these price movements do have a bell-shaped frequency function much like many processes, it is not necessarily a conclusive or completely accurate rationale for using normal theory. Many bell-shaped functions show significant departure from normal theory; however, on the whole, the application of normal theory to the distribution of National Dairy common stock prices seems to be the most promising method of checking for a theoretically matched distribution that best resembles the actual

distribution.

It is therefore a tenable preliminary hypothesis that the conditions giving rise to a normal distribution prevail in the stock market, and specifically are characteristic of the movements of National Dairy stock price. To test this hypothesis, the normal curve is matched with the set of observations. Such a process involves the computation of the theoretical frequencies corresponding to the observed frequencies, and judging whether or not the difference between the two is significant. Significance can be determined by using the chi-squared frequency distribution.

The Distribution of Absolute Price Change

The investigation of distribution begins with the classification of absolute price changes into intervals differing in size by one-eighth of a point, which,of course, is the smallest stock movement possible. From these results the frequency histogram in Figure 4, page 35, is drafted. The mean and standard deviation of this distribution is calculated and used to determine the corresponding theoretical normal curve. This mean and standard deviation uniquely define a normal curve which best represents, because the equal moment contribution of the class intervals, the observed distribution. The theoretically equivalent normal curve is also plotted on the graph in Figure 4. The histogram is said to be approximately normal when the areas of the rectangles are approximately equal to the corresponding areas under the normal curve; intuitively the analyst can observe from the graph that the normal curve does not give a very good fit to the observed

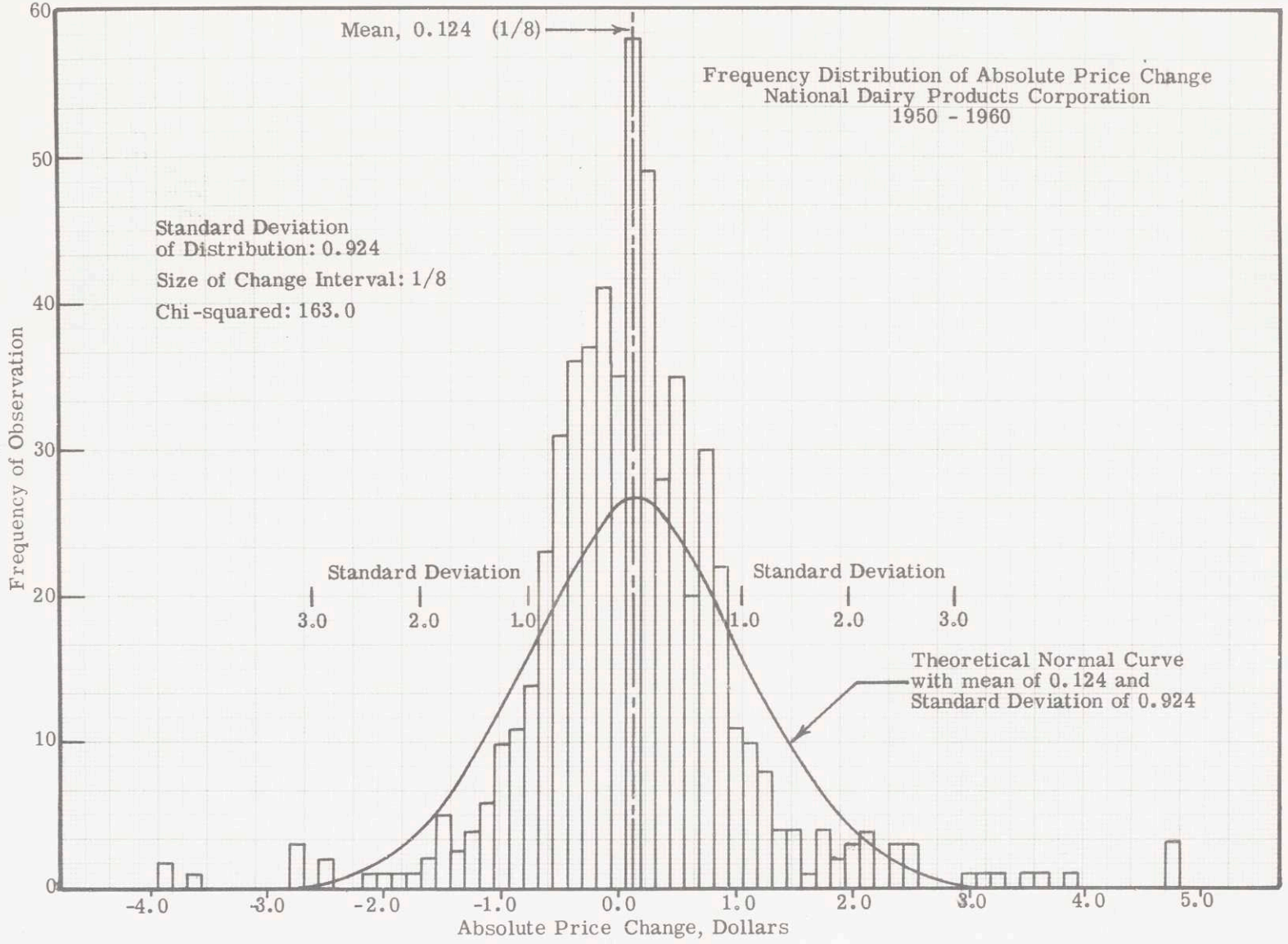

Mean, 0.124 (1/8)
Frequency Distribution of Absolute Price Change
National Dairy Products Corporation
1950 - 1960
Standard Deviation
of Distribution: 0.924
Size of Change Interval: 1/8
Chi-squared: 163.0
Standard Deviation
3.0
2.0
1.0
Standard Deviation
1.0
2.0
3.0
Theoretical Normal Curve
with mean of 0.124 and
Standard Deviation of 0.924
Frequency of Observation
60
50
40
30
20
10
0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Absolute Price Change, Dollars

FIGURE 4

data, for there are more than several classes in which the differences are marked. Because of the size of the differences, it may be concluded that there is a fundamental failure of such a distribution to accord with the normal theory, and thus the preliminary hypothesis is tentatively rejected. If a chi-squared test is performed on these differences, the inspective results are empirically confirmed, for the values of the chi-squared distribution can be calculated to be 163.0. If the preliminary hypothesis had been in fact true, the play of chance could not have brought about so great a value of chi-squared, for its value for 60 degrees of freedom in the 99.5 percentile should have been 91.95, which of course is significantly smaller than 163.0.

It is possible, however, that errors were made in grouping since the distribution is not continuously variable, i.e., a price change of one-sixteenth of a point or smaller is not permitted in stock price movements; moreover, because of the 2 :1 split of National Dairy stock in 1954 that necessitated a backward adjustment of price, a sixteenth of a point relative movement can, in fact be observed and thereby affect the distribution. So as to avoid any possible grouping errors, larger interval classes of two-eighths and three-eighths of a point were used to calculate the distribution of absolute price change. The results of these investigations are presented in the graphs in Figures 5 and 6, pages 37 and 38. By inspection, it can be seen that these frequency histograms are not significantly closer to the theoretical equivalent normal curve. Thus the preliminary hypothesis is conclusively rejected.

Although the distribution of absolute price movements

FIGURE 5

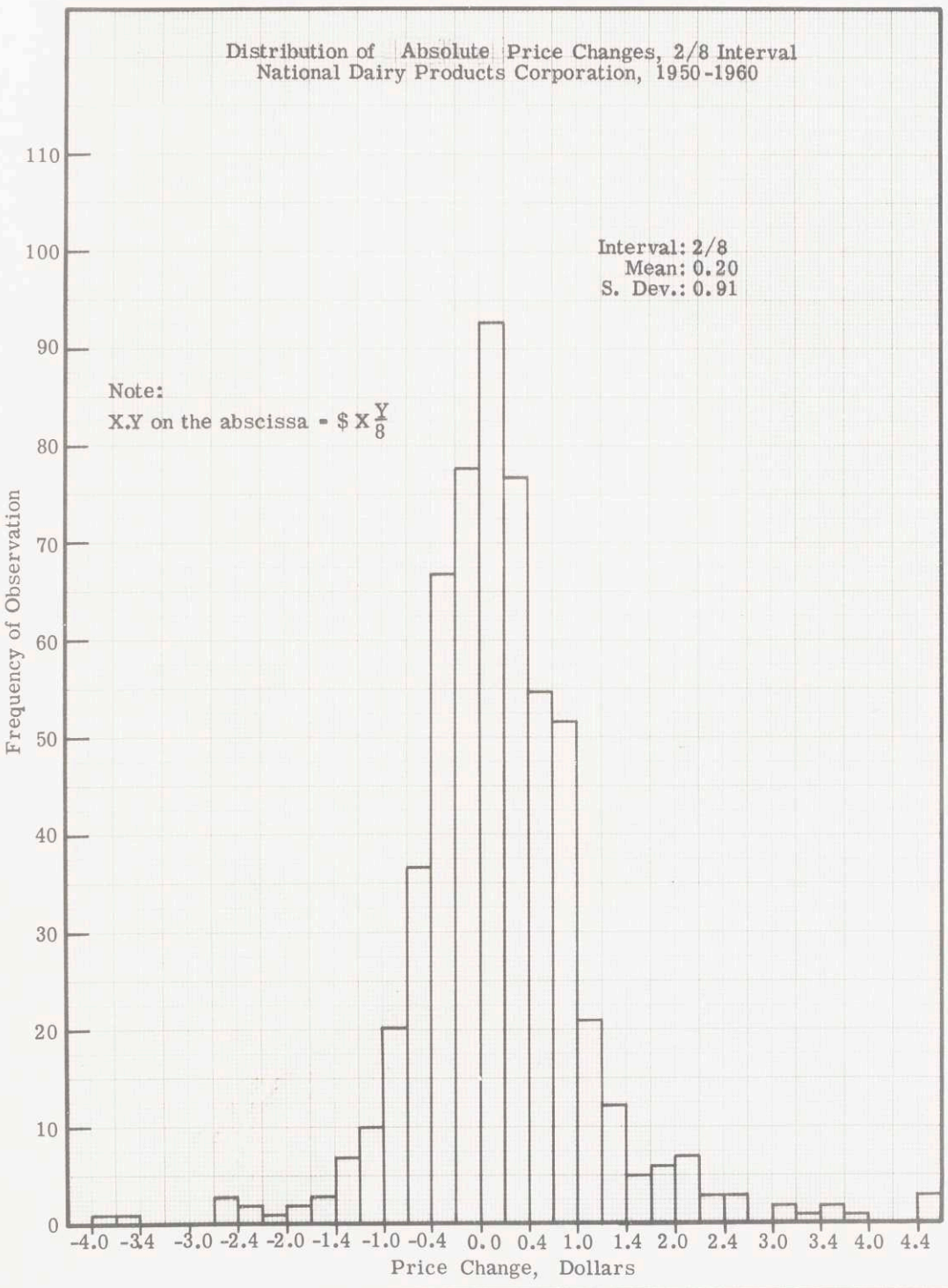
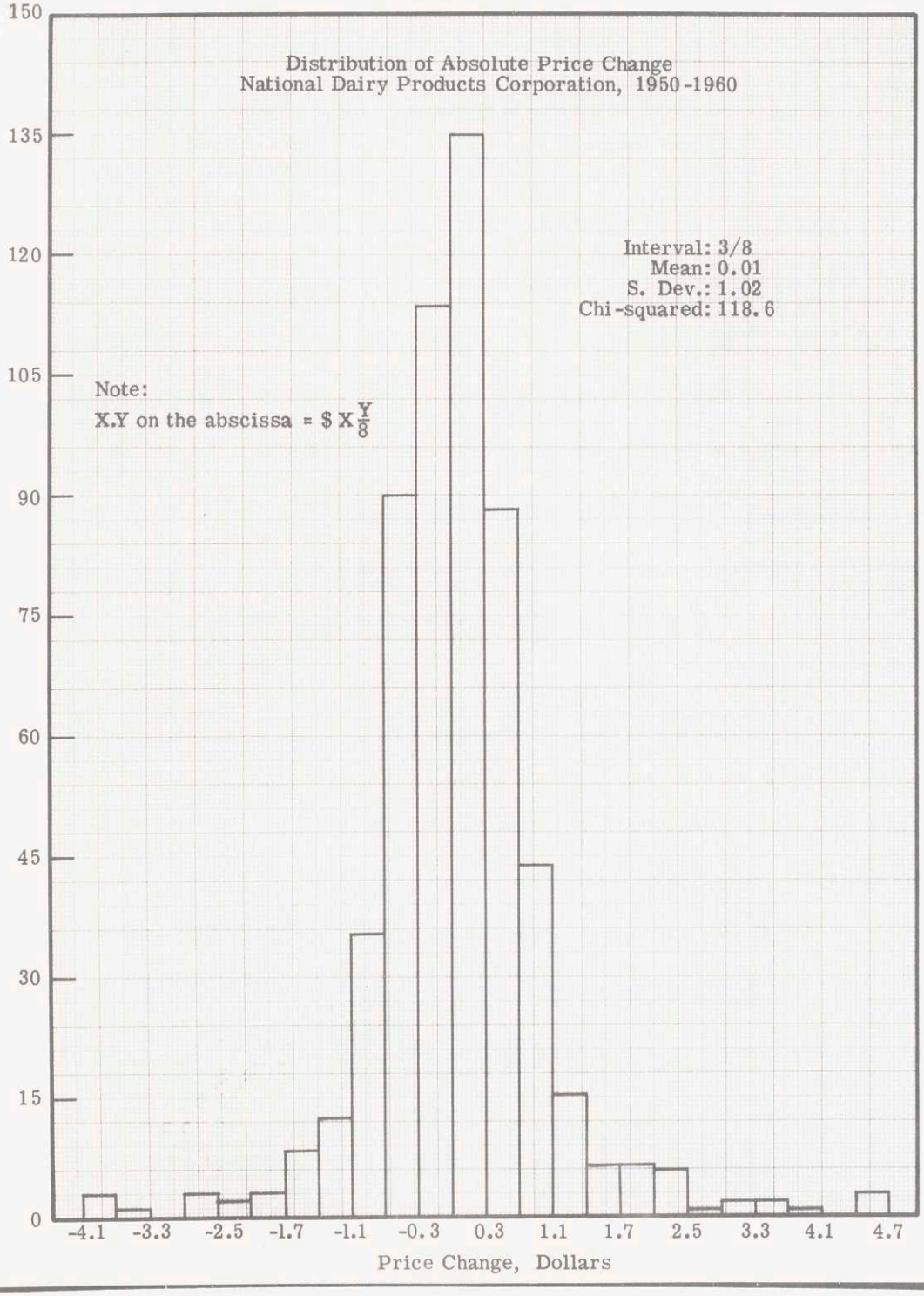

Distribution of Absolute Price Changes, 2/8 Interval
National Dairy Products Corporation, 1950-1960
Interval: 2/8
Mean: 0.20
S. Dev.: 0.91
Note:
X.Y on the abscissa = $ X Y/8
Frequency of Observation
0
10
20
30
40
50
60
70
80
90
100
110
-4.0 -3.4 -3.0 -2.4 -2.0 -1.4 -1.0 -0.4 0.0 0.4 1.0 1.4 2.0 2.4 3.0 3.4 4.0 4.4
Price Change, Dollars

FIGURE 6


Distribution of Absolute Price Change
National Dairy Products Corporation, 1950-1960
Interval: 3/8
Mean: 0.01
S. Dev.: 1.02
Chi-squared: 118.6
Note:
X.Y on the abscissa = $ X $\frac{Y}{8}$
150
135
120
105
90
75
60
45
30
15
0
-4.1
-3.3
-2.5
-1.7
-1.1
-0.3
0.3
1.1
1.7
2.5
3.3
4.1
4.7
Price Change, Dollars

is not normal, constructive evaluation of the frequency histograms can be made that would indicate the distribution type to which it belongs. The method employed to descibe the descriptive measures make use of the higher order moments of the distribution. Because of the complexity involved in calculating and applying such moments, it is expedient to construct an histogram with a large interval and thereby minimize mode and moment calculations. The results of such an investigation can then be used to approximate the description of the aggregate distribution. The intervals used, six-eighths and seven-eighths of a point, were selected for two reasons. First such an interval resulted in the desired minimum number of classes (about ten); and second, these intervals correspond closely to the calculated interval that supposedly gives the most normal distribution. The equation[2] that describes this interval is,

$$\text{Interval} = \frac{\text{Range}}{1 + 3.28(\log_{10} \text{Number of Observations})}$$

which result in 0.8225, a figure below seven-eighths, but above six-eighths of a point. The histogram for these intervals, measured from the negative limit, about the mean, and from the positive limit, are presented in Figure 7, page 40. For these distributions, the kurtosis and skewness in addition to the mean and standard deviation were calculated.

The rigorous relation for skewness is derived from the sec-

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[2] Adapted from Mills, F. C., Statistical Methods, Henry Holt and Company, New York, N. Y., 1955.

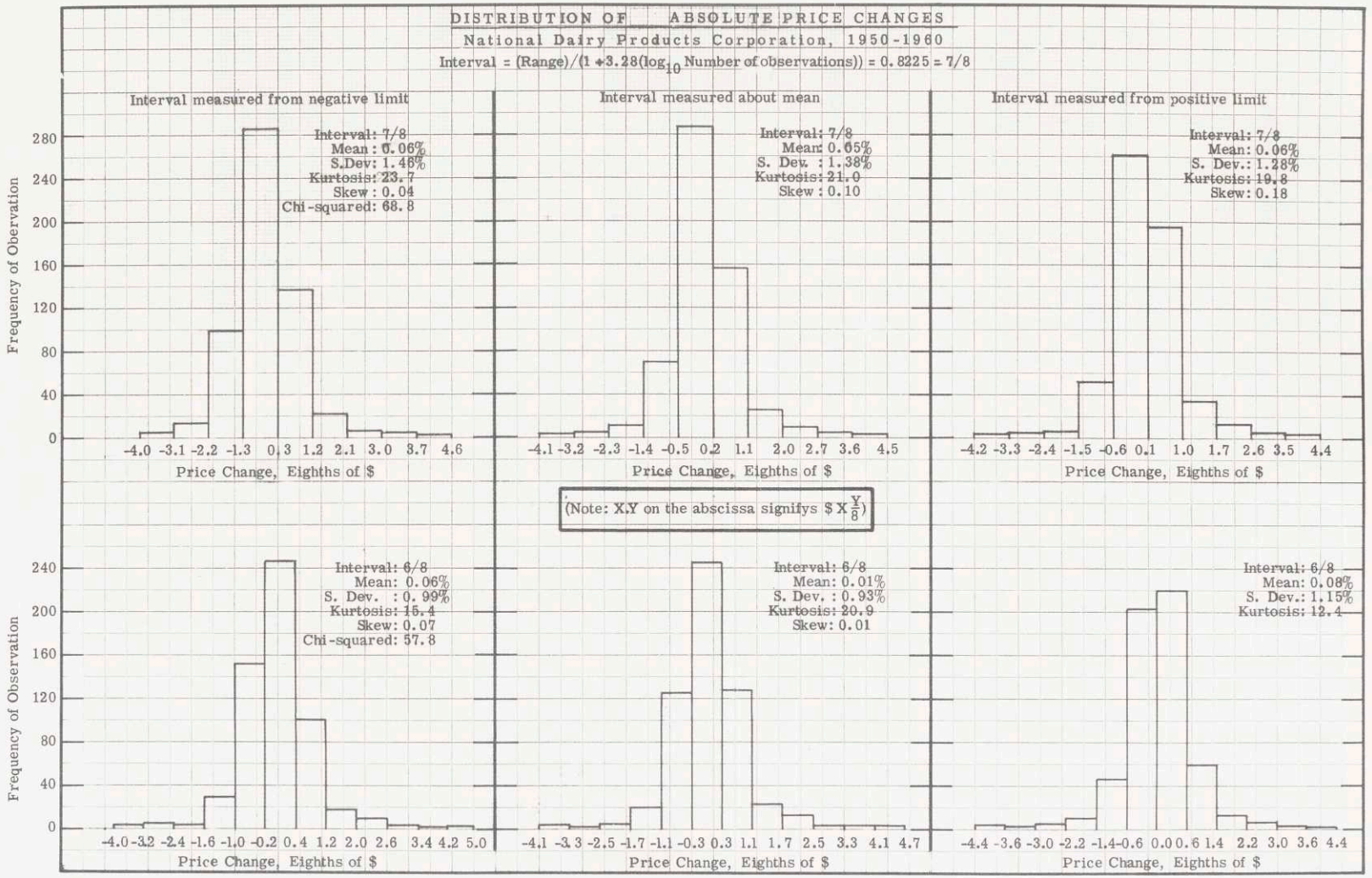
DISTRIBUTION OF ABSOLUTE PRICE CHANGES
National Dairy Products Corporation, 1950-1960
Interval = (Range)/(1 +3.28(log10 Number of observations)) = 0.8225 = 7/8
Interval measured from negative limit
Interval: 7/8
Mean : 0.06%
S.Dev: 1.46%
Kurtosis: 23.7
Skew : 0.04
Chi-squared: 68.8
Interval measured about mean
Interval: 7/8
Mean: 0.05%
S. Dev. : 1.38%
Kurtosis: 21.0
Skew : 0.10
Interval measured from positive limit
Interval: 7/8
Mean: 0.06%
S. Dev.: 1.28%
Kurtosis: 19.8
Skew: 0.18
Frequency of Observation
Price Change, Eighths of $
(Note: X.Y on the abscissa signifys $ X Y/8)
Interval: 6/8
Mean: 0.06%
S. Dev. : 0.99%
Kurtosis: 15.4
Skew: 0.07
Chi-squared: 57.8
Interval: 6/8
Mean: 0.01%
S. Dev. : 0.93%
Kurtosis: 20.9
Skew: 0.01
Interval: 6/8
Mean: 0.08%
S. Dev.: 1.15%
Kurtosis: 12.4

FIGURE 7

ond, third and fourth moments, m_2, m_3, and m_4 respectively, about the mean according to the equation[3],

$$\text{Skewness} = \frac{1}{2}\left[\frac{m_3^2}{m_2^3}\right]^{\frac{1}{2}}\left[\frac{m_4}{m_2^2} + 3\right]\left[5\frac{m_4}{m_2^2} - 6\frac{m_3^2}{m_2^3} - 9\right]^{-1} .$$

However the basic measure of skewness is $(M - M_o)/s$, the difference between the mean, M, and the mode, M_o, divided by the standard deviation, s; and if the mode can be fairly accurately estimated, the near value of skewness can be easily calculated. The values of skewness of the distribution are included on the graphs in Figure 7, page 40. Since skewness equals zero for the normal distribution, and will be zero for any symmetrical distribution, the low values (less than 0.1) for skewness of the frequency histograms indicate that the distribution of absolute price changes of National Dairy stock are quite symmetrical.

Kurtosis can be calculated from the second and fourth moments by the following relation:

$$\text{Kurtosis} = (m_4/m_2^2) - 3 .$$

Positive values indicate a concentration of frequencies near the normal central tendency. The values of kurtosis in Figure 7, page 40, indicate an extremely high peakedness as compared to the distribution of frequencies in a normal distribution with the same standard deviation and

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[3]Pearson, E. S., and Hartley, H., Biometrika Tables for Statisticians, Vol. 1, Cambridge University Press, 1954.

mean.

Although the distribution was not found to be normal, it is now sufficiently well described so as to be of some value to the speculator. The mean, standard deviation, skew and kurtosis define a distribution that can be used to assign probabilities to price changes with a reasonable degree of accuracy.

The Relative Price Change Distribution

Rather than go any deeper into the analysis of the distribution of absolute price changes, it is well to investigate and study the distribution of relative price changes, for there is reason to believe that such a study would be relatively more beneficial. The technique employed in evaluating this distribution is, in many respects, similar to the methods employed in analysing the first distribution, explained in the preceding section. It is convenient to begin the analysis by plotting the cumulative distribution of the percentage price changes upon normal probability paper, since the percentage changes are almost a continuous distribution. Probability paper is used to indicate whether the distribution is normal, a straight line through the plot designating normality. In Figure 8, page 43, the cumulative curve for approximately 100 observations of percentage price change is plotted. A normal line is fitted to these points; it indicates, from its intersection with the 50% probability line, the mean of the distribution of 0.3% (corresponding to the calculated value of 0.3128%), and from its slope, the standard deviation of the distribution of approximately 2.0% (corresponding to the calculated value of 2.299%). By

Cumulative Distribution of Percentage Price Change
of National Dairy Products Common Stock versus Normal Probability
Period of Observation: 1950 - 1960

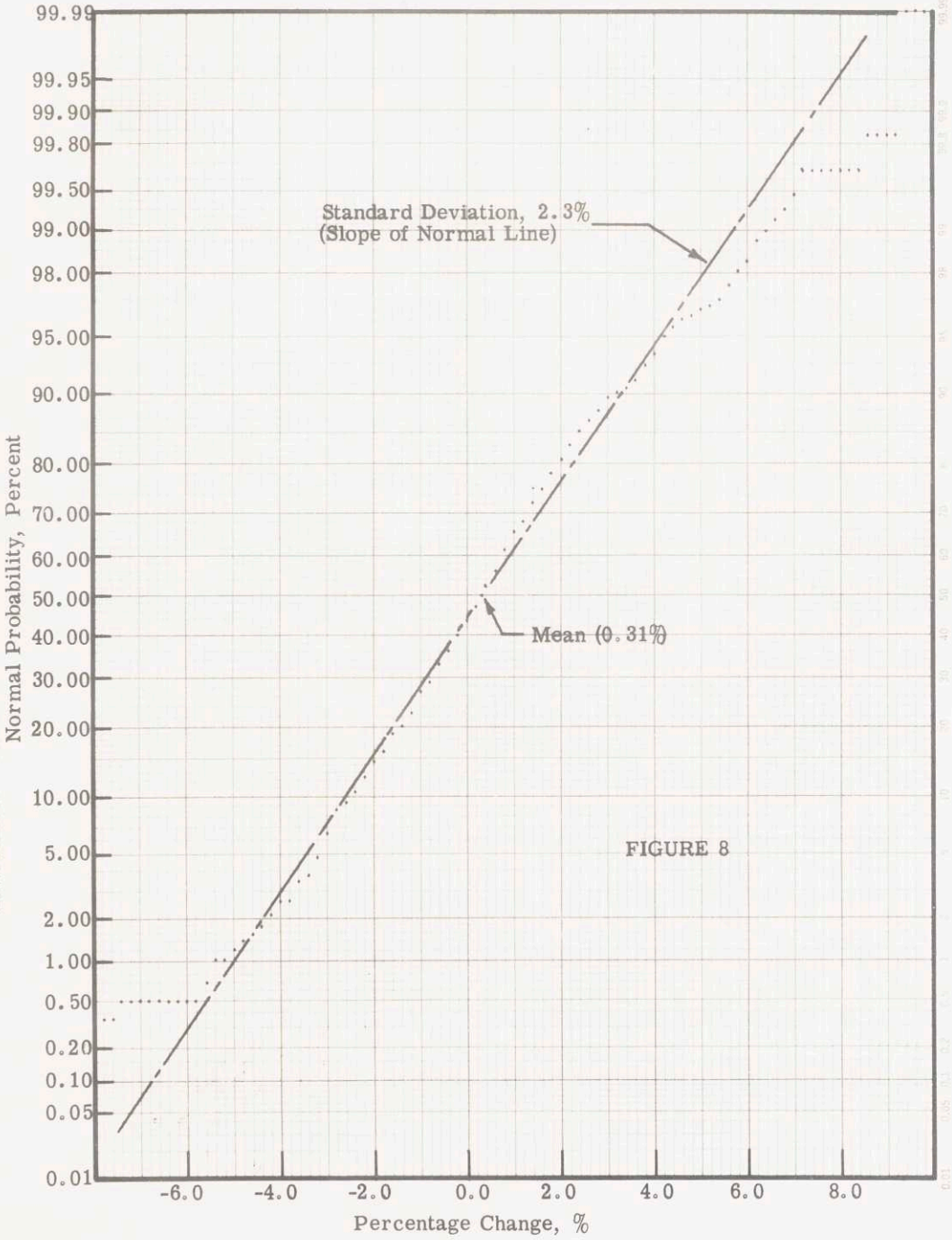


FIGURE 8

inspection it can be observed that the distribution is almost a straight line, particularly from -6.0% to 4.0%, and would appear to be more normal than the absolute change distribution. If a 0.4% interval class is selected, a frequency histogram can be constructed that shows the percentage change distribution more clearly. Figure 9, page 45, compares this histogram with the theoretical normal curve of the same mean and standard deviation that was calculated for the observed distribution. In this case, the chi-squared value is 62.4 which is somewhat larger than the value given in the chi-squared distribution tables under the 99th percentile for the proper degrees of freedom. Since the observed value of chi-squared is greater than the percentile value that corresponds to the chosen significance level, in this case 0.99, the hypothesis that percentage changes is normally distributed is rejected. If the hypothesis should in fact be true, chance would bring about such an observed value of chi-squared only 1 time in 100, or less frequently. However, the test indicates that the percentage change distribution is considerably nearer normality than the absolute change distribution. If the interval class is made even larger, as in the histograms in Figure 10, page 46, the distribution looses a great amount of normality, as can be empirically confirmed by the chi-squared values. It is clear from Figures 8, 9 and 10, that as the interval size is increased, normality decreases. Since absolute accuracy would only be obtained by having a class for every value, the large intervals selected introduce a certain amount of error and are only used in the study so that the data can be easily manipulated to determine skewness and kurtosis. The values calculated for kurtosis

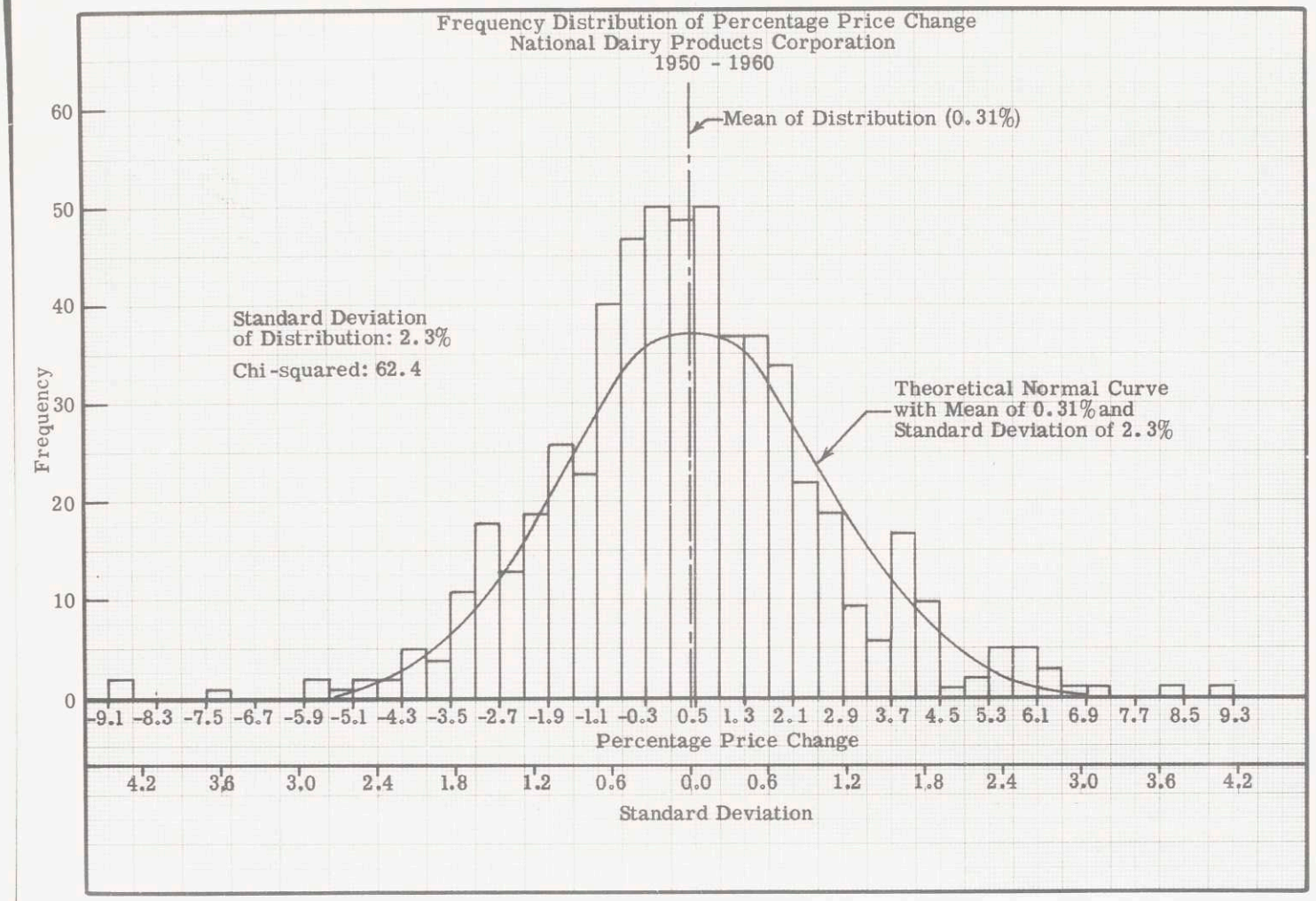

Frequency Distribution of Percentage Price Change
National Dairy Products Corporation
1950 - 1960
Mean of Distribution (0.31%)
Standard Deviation
of Distribution: 2.3%
Chi-squared: 62.4
Theoretical Normal Curve
with Mean of 0.31% and
Standard Deviation of 2.3%
Frequency
60
50
40
30
20
10
0
-9.1 -8.3 -7.5 -6.7 -5.9 -5.1 -4.3 -3.5 -2.7 -1.9 -1.1 -0.3 0.5 1.3 2.1 2.9 3.7 4.5 5.3 6.1 6.9 7.7 8.5 9.3
Percentage Price Change
4.2 3.6 3.0 2.4 1.8 1.2 0.6 0.0 0.6 1.2 1.8 2.4 3.0 3.6 4.2
Standard Deviation

FIGURE 9

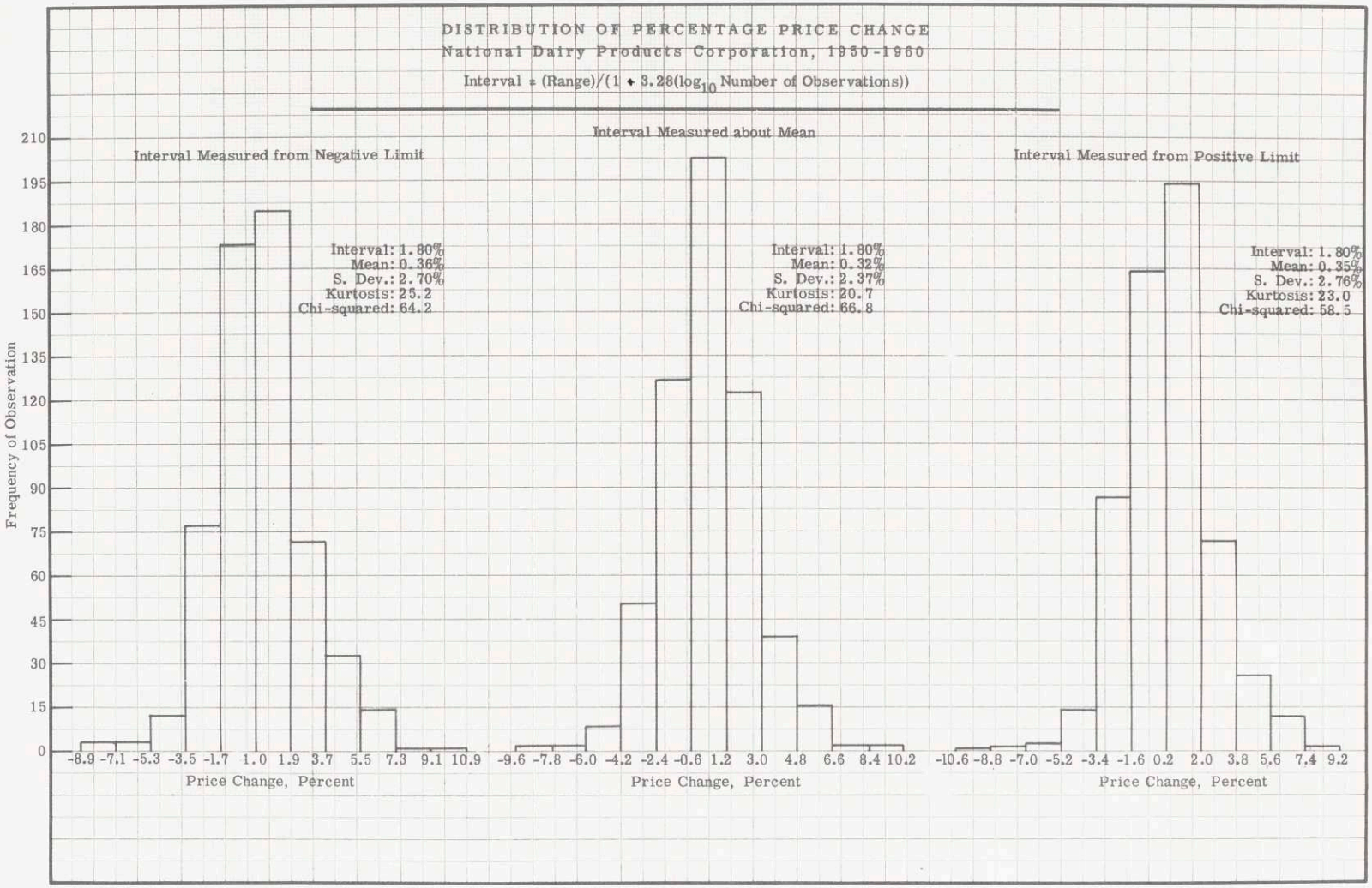

DISTRIBUTION OF PERCENTAGE PRICE CHANGE
National Dairy Products Corporation, 1950-1960
Interval = (Range)/(1 + 3.28(log10 Number of Observations))
Interval Measured from Negative Limit
Interval: 1.80%
Mean: 0.36%
S. Dev.: 2.70%
Kurtosis: 25.2
Chi-squared: 64.2
Interval Measured about Mean
Interval: 1.80%
Mean: 0.32%
S. Dev.: 2.37%
Kurtosis: 20.7
Chi-squared: 66.8
Interval Measured from Positive Limit
Interval: 1.80%
Mean: 0.35%
S. Dev.: 2.76%
Kurtosis: 23.0
Chi-squared: 58.5
Frequency of Observation
0
15
30
45
60
75
90
105
120
135
150
165
180
195
210
-8.9 -7.1 -5.3 -3.5 -1.7 1.0 1.9 3.7 5.5 7.3 9.1 10.9
-9.6 -7.8 -6.0 -4.2 -2.4 -0.6 1.2 3.0 4.8 6.6 8.4 10.2
-10.6 -8.8 -7.0 -5.2 -3.4 -1.6 0.2 2.0 3.8 5.6 7.4 9.2
Price Change, Percent
Price Change, Percent
Price Change, Percent

FIGURE 10

indicate that the major discrepancies between the actual distributions and the normal distributions are the high concentrations of frequencies near the central tendencies.

The Log-Normal Distribution

One refinement of the percentage price change analysis might be the investigation of the distribution's log-normal characteristic. It seems valid to hypothesize that percentage moves upward should equal logarithmic moves downward, that is a 25% rise is equal to a 20% fall. If a stock, for illustration, is priced at 100 and moves to 125, this is obviously a 25%rise; if at 125 the stock returns to 100, this is a 20% fall. From this example, it is logical to contend that the distribution of percentage rises might be asymmetric with unequal percentage declines, more precisely with equal logarithmic declines. Thus the argument for comparing the percentage change distribution with the theoretical log-normal frequency distribution becomes clear; the comparison is most easily effected by plotting the cumulative percentage price changes on log-normal graph paper. Such a technique requires some modification however, for the limits of the log-normal distribution are zero and plus infinity while the theoretical limits of the percentage price change distribution are -100% and plus infinity. Clearly the limits of the percentage price change distribution can be transformed into proper form by adding 100% to both limiting values, so that the adjusted limits correspond to the limits of the log-normal distribution. The graph in Figure 11, page 48, presents the cumulative frequency polygon of percentage price change, adjusted, for

CUMULATIVE LOG-NORMAL PLOT OF PERCENTAGE PRICE CHANGE OF NATIONAL DAIRY COMMON STOCK
Period of Observation: 1950 - 1960

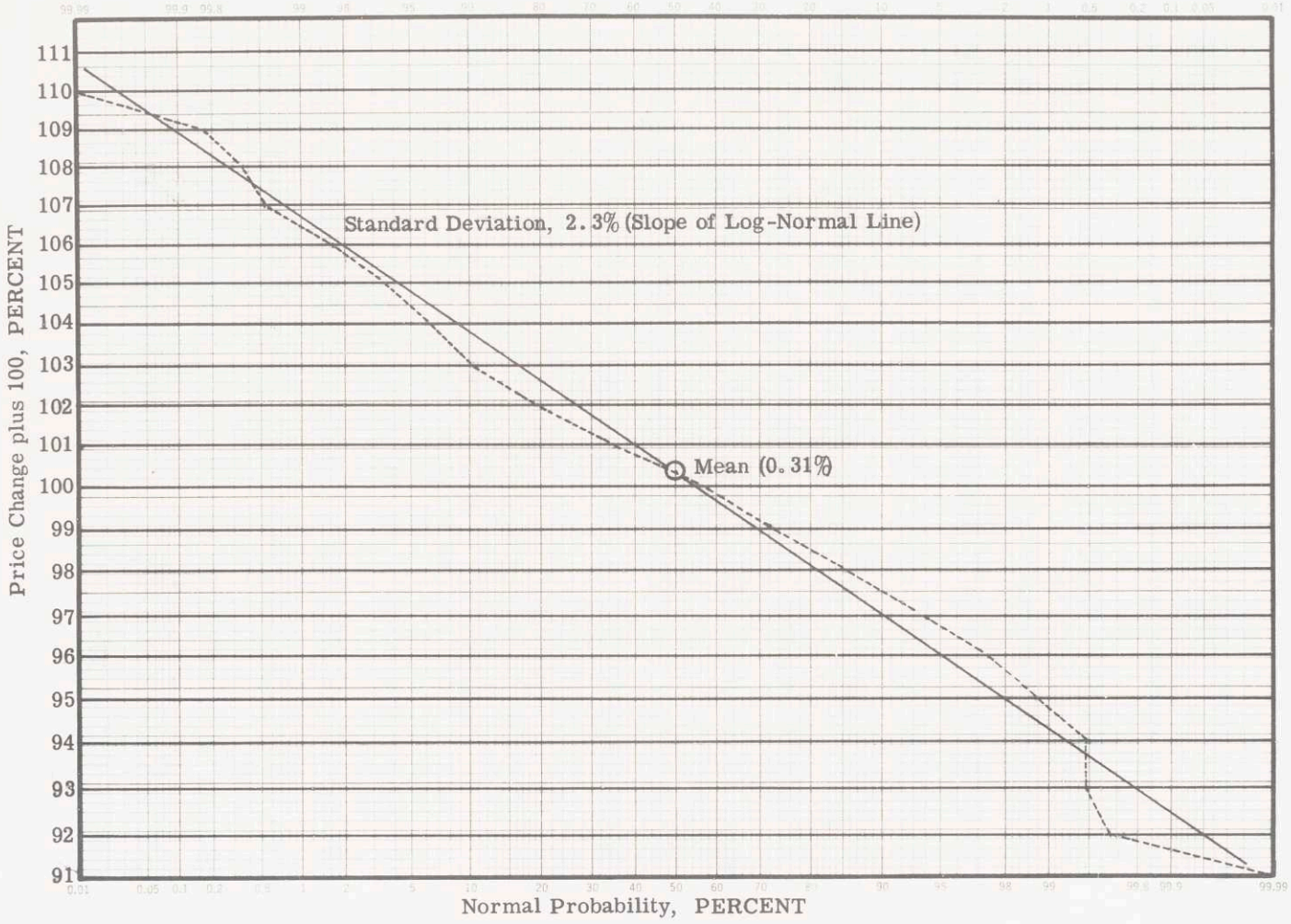


FIGURE 11

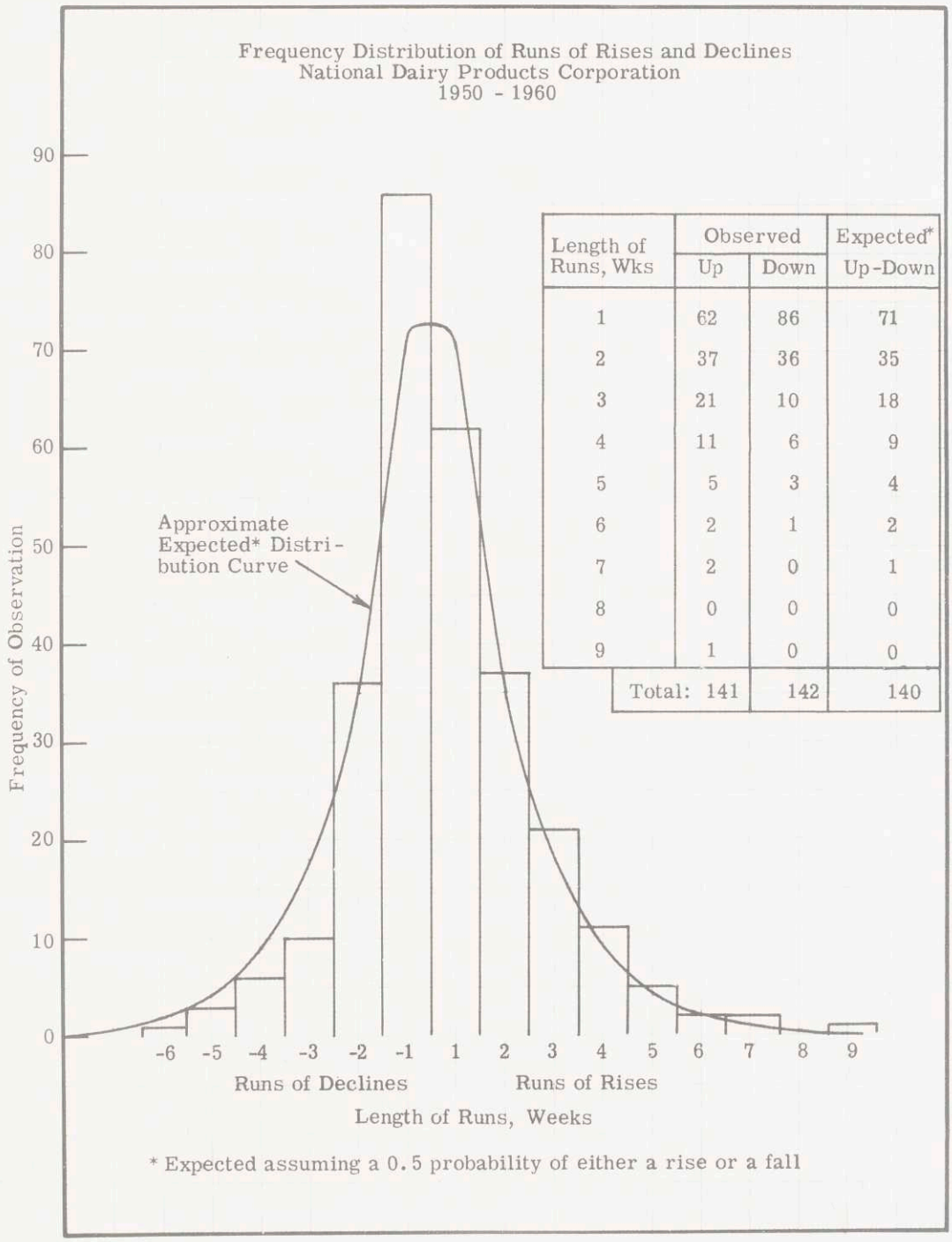
National Dairy common stock. The log of percentage change is the ordinate; percent normal probability is the abscissa. Because of the different scaling factors, it is difficult to compare visually the arithmetic-normal distribution in Figure 8, page 42, and the log-normal distribution; theoretically there should be little difference. Because the percentage change of National Dairy stock varies only from -8.8% to 9.2%, the logarithmic difference is almost insignificant; for a 10% rise is logarithmically equal to a 9.1% fall, and these values are arithmetically very close. As a result, the log-normal distribution is not a particularly effective form of analysis for a stock whose percentage standard deviation, skewness and range are relatively small.

The analysis of the various price change distributions leads to the conclusion that the change in National Dairy stock price can best be compared to the theoretical normal frequency curve of percentage price change distribution. By no means is the observed-theoretical fit a perfect one, but the fit can serve as a guide to speculative activities.

The Distribution of Signs of First Order Differences

Frequently, populations can be divided into two groups on the basis of some characteristic. The National Dairy stock price time-series was transformed into a dichotomous population by classifying each week as being a week of price rise or price fall. A run is defined as a sequence of successive weeks in which the price moves in the same direction. Figure 12, page 50, and the table included there-on, presents the observed frequencies of runs of rises and falls and the expected frequencies, assuming a 0.5 probability of a rise or fall.

FIGURE 12



Length of Runs, Wks	Observed		Expected*
	Up	Down	Up-Down
1	62	86	71
2	37	36	35
3	21	10	18
4	11	6	9
5	5	3	4
6	2	1	2
7	2	0	1
8	0	0	0
9	1	0	0
Total:	141	142	140

The correspondence between the observed and expected frequencies are close enough to suggest that the sequence of directions of changes in weekly National Dairy stock prices might have been produced by a random walk, at least in part. However, the question of whether this sample can be regarded as random is not sufficiently exact to admit of an answer. There are too many ambiguous elements in the question, for if this dichotomous time-series is analysed for randomness from another approach, whereby no assumption is made about the fundamental probability distribution, a somewhat different result is obtained.[4] Such a test of significance for the National Dairy time-series is also based on the frequency distribution of sequences of like signs in the first differences, however the approach differs from the technique used in the runs analysis.

Whereas the run length was the basis for the preceding analysis, the study of phase length is appropriate in this investigation. Conceptually the two terminologies are equivalent and represent the fundamental characteristics of the time-series; yet in analysis and in the method of their application there are distinct differences. The phase concept may be most easily clarified by considering the following distribution:

Sign of first order differences:	+	-	-	+	-	+	-	+	+	+	-
Turning points :	*		*	*	*	*	*			*	
Week number:	1	2	3	4	5	6	7	8	9	10	11

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[4] the ensuing analysis is adapted from the study made by W. A. Wallis and G. H. Moore in their treatise, A Significance Test for Time Series, Technical Paper No. 1, National Bureau of Economic Research, New York, N. Y., 1941.

In this example, the sign of the first order difference in week No. 7 constitutes one of the turning points in the phase analysis. Between week No. 7 and week No. 10 there is a phase duration of three weeks. In many respects the phase technique is analogous to the run analysis, however there are some fundamental concepts that make phase investigation more sophisticated.

Before beginning the analysis, it is convenient to define some appropriate terms. When a phase starts from a trough and ends at a peak (e.g., week No. 3 to week No. 4), it is considered to be an expansion; when it starts at a peak and ends at a trough (e.g., week No. 4 to week No. 5), it is a contraction. The duration of a phase is defined as the number of intervals, in this case weeks, between the initial and terminal points of the phase. By the method of rank transformations, duration expectations can be calculated.[5] The probability that a given number of different observations define a turning point is found from the ratio of the permutations that produce either a peak or a trough to the total number of possible permutations. For example, the probability that any particular set of three observations constitutes a turning point can be calculated from this ratio to be 2/3. In general, in a series of N observations, there are N - (n + 1) sets of n consecutive items. Since n consecutive items have n! permutations, the probability of an uninterrupted movement, that is one observation exceeding or being exceeded by its predecessor, is 2/n!, since two of the permutations

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[5] For a more thorough, analytical and non-inductive treatment of this subject, the reader is referred to Wallis, ob. cit., pp. 3-12.

produce an uninterrupted movement. Clearly then, the expected number of uninterrupted movements, m, in N observations is the number of sets, $N - (n + 1)$, in the series times the probability of an uninterrupted movement in each set, $2/n!$, the product being equal to $(N - (n + 1))/(2/n!)$. Inductively, the expected number of phases for each set of consecutive items can be found from the expected number of uninterrupted movements, by finding first the expected number of uninterrupted movements per set of consecutive items, and then adding the necessary adjustment factor, a multiple of phase length and the expected number of uninterrupted moves. Thus the equation for the expected number of phases per number of consecutive items takes the form, $p/n = m/n + d \cdot m$, which can be readily converted to the general expression for the expected number of phases of d years' duration:

$$p = (nd + 1)(N - (n + 1))(2/n!)$$

By substituting $n = d + 3$ into the equation and expanding, the reader will note that the resulting equation is equivalent to Wallis' general frequency equation shown in Table VI, page 54.

Wallis and Moore go on to derive similar equations to calculate the expected mean and variance of duration,[6] which can be used to obtain the expected mean duration of 1.5 and the variance of duration of 0.56 for 572 observations. The observed mean duration is calculated to be 1.9 while the observed variance of duration is 1.2. Additional results of the analysis of the phase duration of the National Dairy time-

[6]Wallis, W. A., op. cit., pp. 13ff.

Expected Distribution of Phase Durations in Random Series*

National Dairy Products Corporation
1950 - 1960

Phase Duration	Frequency	Probability	Limiting Probability (N = ∞)	Probability (N = 572)	Expected Frequency	Observed Frequencies Total	Expansions	Contractions
1	$\frac{5(N-3)}{12}$	$\frac{5(N-3)}{4(2N-7)}$	0.6250	0.6257	224	148	62	86
2	$\frac{11(N-4)}{60}$	$\frac{11(N-4)}{20(2N-7)}$	0.2750	0.2747	98	73	37	36
3	$\frac{19(N-5)}{360}$	$\frac{19(N-5)}{120(2N-7)}$	0.0792	0.0789	29	31	21	10
4	$\frac{29(N-6)}{2520}$	$\frac{29(N-6)}{840(2N-7)}$	0.0173	0.0167	6	17	11	6
5	$\frac{41(N-7)}{20160}$	$\frac{41(N-7)}{6720(2N-7)}$	0.0031	0.0028	1	8	5	3
6	$\frac{55(N-8)}{181440}$	$\frac{55(N-8)}{60480(2N-7)}$	0.0005	0.0004	0	3	2	1
d	$\frac{2(d^2+3d+1)(N-d-2)}{(d+3)!}$	$\frac{6(d^2+3d+1)(N-d-2)}{(d+3)!(2N-7)}$	$\frac{3(d^2+3d+1)}{(d+3)!}$					
Total	$\frac{2N-7}{3}$	1.0	1.0	1.0	358	283	141	142

* Table taken, in part, from Wallis, W.A., and Moore, G.H., A Significance Test for Time Series, National Bureau of Economic Research, New York, N.Y., 1941, pp. 10ff.

Table VI

series, tabulated in Table VI, page 54. By comparing the mean, variance and frequency of the theoretically expected distribution with corresponding values of the observed distribution, little similarity is noted. The phase chi-squared can be calculated by combining all durations in excess of two in order to test for general significance. This procedure is outline by Wallis in his forementioned paper.[7] Since there seemed to be little justification for calculating this value accurately because of the large differences between the observed and expected frequencies, a rough approximation of the phase chi-squared distribution was made. The results indicate that the duration distribution lies well above the chi-squared value in the 99.9 percentile for two degrees of freedom; thus the hypothesis that the first order differences of the National Dairy time-series follows a random pattern can be confidently rejected. This result is somewhat consistent with an intuitive evaluation of National Dairy's phase distribution, for excessive amounts of long phases, or runs, according to both criteria of randomness studied in this investigation, are striking. Moreover, if one long phase occurs, another long one is more probable than it otherwise would have been; for a long rise, for example, would inflate the value of a stock to a point where there would be a higher probability that it would have a long decline rather than either a further rise or a short decline. Referring once again to the 1929 - 1960 uniform rate of growth boundary lines plotted in Figure 2, page 21, one might convince the skeptic of the validity of this notion. From historical price

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[7]Wallis, W.A., op. cit., pp. 18-31.

movement observations, it is clear that those long runs of rises which approached the upper boundary lines, invariably were associated with future declines that were long enough to invalidate any criterion of randomness. Short expansion phases, on the other hand, seem to be asymmetrical with short contraction phases, an occurrence that hardly can be considered random.

Although the conclusions developed from the phase duration analysis do not closely coincide with those conclusions reached in the analysis of runs, that is the phase test showed a smaller degree of randomness, the two conclusions do not necessarily contradict each other. Because of the ambiguous elements inherrent in a strict definition of randomness, it is difficult to say that the former test is either more or less significant than the later. Both tests show that the discrepancies between the actual time-series data of first order differences and the calculated probability distributions based on some null hypothesis can not be confidently ascribed to chance.

CHAPTER V

The Alexander Filter Applied to National Dairy Stock

S. S. Alexander, in his Price Movements in Speculative Markets, furnishes evidence from certain statistical studies of the Dow Jones and the Standard and Poor's industrial averages that stock price changes are not generated by a random walk and that the application of a filter to these index prices eliminates spurious movements and produces discernable trends. Such trends, it is proposed, can then be profitably used by the speculator to his financial advantage. A range of filters, varying from 5% to 50% were used in Alexander's study to determine the relative advantage of the various filter sizes. The application of the filter to time-varying industrial averages, or stock prices, is conceptually simple. Should the price of a stock rise by a given filter percent, say 10%, from an arbitrarily selected reference point, the investor is signalled to purchase a certain block of stock, say 100 shares. The stock remains in the investor's portfolio until it drops an equal logarithmic amount, which in this case is 9.09%, from the most recent high. At this point in time, the investor is signalled to sell his present holdings; and in order to maintain a constant position in the market, the investor also sells an additional and equal block of stock short. In the example given, the total transaction would necessarily involve 200 shares of stock so that the investor would always maintain a 100 share position in the market. He remains in this short position until that time when the stock rises by the

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[8]Alexander, S. S., Price Movements in Speculative Markets: Trends or Random Walks, Industrial Management Review, Cambridge, 1961.

filter amount, which in this case is 10%. The cycle of trading is continued as prices rise and fall, and the speculator is in a position to take advantage of both upward and downward trends. The hour-to-hour, day-to-day or week-to-week stock movements that seem to present a characteristic randomness are mechanically ignored by the filter technique and are smoothed into useful trends.

The results of the application of various filters to the Dow Jones and Standard and Poor's industrial averages are presented in Table VII, page 59, and the accompanying footnotes, page 60. Since these filter calculations yielded such high average profits per year as compared with comparable buy and hold yearly percentage profits, the application of various filters to the daily common stock prices of National Dairy Products seemed worthy of investigation. The results of this study are tabulated in Table VIII, page 61. After comparing Tables VII and VIII, it is immediately clear that there appears to be little correlation between the two sets of data. Superficially it does not seem to hold true that the filter can, in fact, be profitably applied to an individual stock as compared with straight buy and hold procedures. If this is the case then, why does the filter technique yield such successful results, relative to buy and hold averages, on industrial indexes?

First of all the sampling period must be considered. National Dairy was studied from 1950 to 1960, while the industrial average was studied from 1929 to 1959. As a result, it is misleading to compare, strictly, such differently time-dimensioned statistics. Specifically, the 3.0% average profit per year for buy and hold for the period 1929 -

PROFITS FROM FILTERS OF VARIOUS SIZES COMPARED WITH BUY AND HOLD,[1] (1897-1959)[2]

Period	Filter Size[3] 5%	6%	8%	10%	12.5%	15%	20%	25%	30%	40%	50%	Buy and Hold
	Average Move (%)[4]											
1897-1914	13.8	15.8	19.8	22.8	30.7	39.6	62.6	62.6	82.5	80.2	97.0	--
1914-1929	12.8	14.9	19.7	25.4	33.3	43.0	69.4	115.8	115.8	115.8	115.8	--
1929-1959	14.5	16.4	22.3	26.3	31.6	36.1	52.9	72.3	188.9	199.0	291.0	--
	Average Profit Per Transaction, Before Commissions (%)[5]											
1897-1914	2.9	3.0	2.7	1.5	3.2	5.4	12.2	4.0	7.7	(9.2)	(15.5)	75.3
1914-1929	2.0	2.2	2.6	3.6	5.2	7.8	16.3	32.5	24.7	9.6	(5.7)	596.6
1929-1959	3.5	3.6	4.8	4.3	3.9	2.9	6.0	9.8	11.2	43.2	57.3	154.1
	Number of Transactions[6]											
1897-1914	117	95	67	53	32	22	12	12	8	7	5	1
1914-1929	112	93	59	40	28	19	10	6	6	6	6	1
1929-1959	274	228	144	113	86	70	40	26	20	8	6	1
	Average Transactions Per Year											
1897-1914	6.5	5.4	3.8	3.0	1.8	1.2	0.7	0.7	0.4	0.4	0.3	--
1914-1929	6.6	6.3	4.0	2.7	1.9	1.3	0.7	0.4	0.4	0.4	0.4	--
1929-1959	9.0	7.5	4.7	3.7	2.8	2.3	1.3	0.8	0.6	0.3	0.2	--
	AVERAGE PROFIT PER YEAR, Before Commissions (%)[7]											
1897-1914	20.5	17.4	10.5	4.6	5.8	6.6	7.8	2.6	3.2	(3.3)	(3.9)	3.2
1914-1929	15.8	14.7	10.7	10.0	9.9	9.9	10.3	11.1	8.6	3.4	(3.1)	14.1
1929-1959	36.8	30.0	24.5	16.8	11.4	6.9	7.8	8.2	7.0	9.3	8.5	3.0

(Parentheses signify losses)

Table VII

Footnotes to Table VII

[1] Table and footnotes reproduced in their entirety from the study by S. S. Alexander, Price Movements in Speculative Markets: Trends or Random Walks, Industrial Management Review, School of Industrial Management, Massachusetts Institute of Technology, May, 1961, pp. 24 - 25. Table based on Dow Jones Industrials, 1897-1929 and Standard and Poor's Industrials, 1929 - 1959.

[2] Periods: January 2, 1897 to July 30, 1914
December 12, 1914 to September 3, 1929
September 7, 1929 to December 31, 1959

[3] 5% filter here designates 5% in either direction, others designate indicated percentages upward and equal logarithmic moves downward. E.g., 10% filter implies 10% upward or 9.09% downward.

[4] Calculated as follows: for each move, as defined by a specific filter, let the variable, M, denote the difference between the logarithms of the upper and lower endpoints of the move. The figure given as the average move is 100(antilog $\bar{M}$-1) where $\bar{M}$ is the arithmetic mean of the M's.

[5] Let $\bar{R}$ Be the average logarithmic profit defined as $\bar{R} = \bar{M} - 2F$. $\bar{M}$ is defined in fn. 4 and F is log(1 + f), where f is the filter expressed as a ratio, e.g., f is .10 for a 10% filter. The quantity 2F corresponds to the portion of the move that is used up in getting in or out. On an upward move of average size $\bar{M}$ the percentage profit would be $P_u = 100(\text{antilog } \bar{R} - 1)$; on a down move, $P_d = 100P_u/(100 + P_u)$.

The average profit entered in Table VII is: $\bar{P} = (100+P_u)^{.5}(100+P_d)^{.5} - 100$.

[6] A transaction is defined as a purchase and sale, so that each transaction would require two commissions. In each period there is one terminal transaction, such as for December 31, 1959, terminated not only by a filter signal, but by the period limits. The corresponding terminal move was counted as half a move in the computation of $\bar{M}$, and of the number of transactions per year.

[7] Computed as $100\left(1 + \frac{\bar{P}}{100}\right)^{\bar{q}} - 100$, where $\bar{q}$ is the average number of transactions per year, and $\bar{P}$ is defined in fn. 5

Profits from Filters of Various Sizes Compared with Buy and Hold[1]

National Dairy Products Corporation
1950 - 1960

Filter Size	5%	8%	10%	12.5%	15%	20%	25%	30%	Buy and Hold
Average Move (%)	10.4	15.2	21.3	25.4	41.1	41.1	52.9	52.9	
Average Profit Per Transaction (%)	(0.36)	(0.65)	(o.34)	0.33	8.40	(0.76)	11.85	9.08	
Number of Transactions	128	54	32	21	9	9	2	2	1
Average Transaction Per Year	11.6	4.9	2.9	1.9	0.82	0.82	0.18	0.18	
Average Profit Per Year (%)	(4.38)	(3.41)	(1.02)	0.64	6.68	(0.68)	2.13	1.63	10.93

[1] For an explanation of method of calculation, ref. fn. 3 - 7, Table VII. Daily high-low prices were used to determine the values presented in the table.

Table VIII

1959 is small as a partial result of the market crash in the early part of that period. Examining the Dow Jones Average for the period 1950 - 1960, one finds an average profit per year for buy and hold of 10.7%, a figure surprisingly close to National Dairy's average profit per year of 10.9%. In similar fashion, if a given filter is applied to the Dow Jones industrial averages for the years 1950 - 1960, one would find that the average percentage profit per year would be significantly lower than the data presented in Table VII. For illustration, the 10% filter yields an average profit of 16.9% per year for the period 1929 - 1959; the same filter reduces this average profit to 9.4% for the period 1950 - 1960. It is reasonable to conclude therefore that the filter technique would have been a more efficient and profitable device during the 30's and early 40's because of the Great Depression and the war years than during the more recent years. This view is supported by the fact that the filter derives its success from relatively long upward and downward trends, a series more characteristic of the 1930 - 1945 period than the 1945 - 1960 period. During the 1950 - 1960 period, there were two three-year runs with almost zero trend for National Dairy stock prices (See Figure 1, page 15, or Figure 2, page 21). Such a market situation will invariably prove disasterous for the investor who rigorously applies the filter principle.

Moreover the successful application of a filter to an industrial average does not necessarily imply that a filter can be used successfully with an individual stock, especially if the variance of the percentage price changes of the two time-series are significantly different. Here the variance serves fundamentally as a measure of dispersion,

the greater the variance the greater the dispersion away from the mean. In the time-series of stock prices, or of industrial averages, it is well to measure the dispersion away from a trend line for the dispersions will be more random in nature and the comparison of the two variances will yield a more significant result. Although it might seem as though the variance of an average of stock prices, in this case the Dow Jones average, should be smaller than the variance of the individual stock prices that make up this average, this contention does not necessarily hold in the case of stock prices. First of all there are random impulses or influences that affect the overall average, the Eisenhower heart attack would be a case in point; and secondly there are impulses that influence the price of a particular stock. It is difficult, if not impossible, to ascertain therefore how much dispersion is jointly variable and how much is individually variable. Thus one may not generally assert that the variance of the Dow Jones is theoretically smaller than the variance of the individual stock prices. Certainly, though, this may be the case when the analyst is choosing a particular company at random for a variance comparison. Fortunately National Dairy Products is not included in the Dow Jones industrials, and any comparison made between the variances of the two time-series can be considered significant since the analyst would not be correlating, in effect, a time-series with itself.

The variance of the percentage changes of the Dow Jones industrial average is calculated to be 3.8% during the period 1950 - 1960, while the variance of the percentage change of the common stock of National Dairy is 5.3%. Such a difference in variance is certainly

significant, for if the F-test is applied to the variance ratio, taking into account the degrees of freedom involved in 572 observations, it is found that only 1 time out of 100 would the play of chance account for a value of F exceeding 1.2 if the true value were unity. The actual F, 1.4, is in excess of 1.2, and therefore it can be concluded that the observed variance can not be regarded as coming from the same population. As a result, the significantly higher variation of National Dairy stock price tends to limit the usefulness of the small filter, since large dispersions would signal what would turn out to be unprofitable transactions. The utility of the large filter is also limited, for the potentially profitable trends are filtered out along with the random dispersions. In essence, the filter technique is most advantageously suited to those time-series whose variance is small compared with either the percentage rise or fall of the trend line.

One final question need be raised when comparing the filter results from the Dow Jones industrials, or the Standard and Poor's, and the stock price series of National Dairy: is the profitability of a given filter a function of the distribution of lengths of runs? A run, it may be remembered, is a sequence of either positive changes or of negative changes. Intuitively it seems reasonable to assume that the greater the frequency of long runs in a given time series, the greater the chance of profit from the application of the filter technique. Interestingly enough, if the lengths of the runs of the Dow Jones time-series is compared with the lengths of runs of the National Dairy time-series, one finds that on the average there are 11% more

runs of length equal to or less than three weeks long and 23% fewer runs of length equal to or greater than four weeks in the National Dairy time-series than in the Dow Jones series. It is difficult to say whether such observations do in fact correlate with the poor results found from applying the filter to National Dairy stock price, and although there seems to be no empirical justification for such a conclusion, such an hypothesis seems to warrant further study.

One further application of the filter technique seems appropriate. Since the National Dairy time-series is closely correlated with the Dow Jones industrial average, having a coefficient of correlation of 0.9281, and since the application of a given filter to the Dow Jones offers more profitable returns than equivalent filters applied to the individual stock time-series, the speculator might well apply the most profitable filter to the Dow Jones, which is assumed to be a filter size of 5%, and use the results of these calculations to signal the purchase or sale of National Dairy stock. If this technique is used, the percentage average profit per year is found to be 8.4%, which is a value 13% higher than would have been found if the filter had been applied directly to the National Dairy stock time-series. In similar fashion, if a 15% filter is applied to the Dow Jones average and used to signal the buy and sell transactions of National Dairy, the average profit per year can be calculated to be 5.8%. Because this value is somewhat less than the figure obtained by using the filter directly, it may be concluded that this device is not applicable in general to more advantageous results.

Thus it may be stated that for the period 1950 - 1960, the

filter is in no ways a more ways a profitable tool of speculation than the simple procedure of buy and hold. Moreover since the calculations in Table VIII did not take into account any of the brokerage fees, for which there would be two commissions for each transaction, the profits realized from the 12.5%, 15%, 25% and 30% filter sizes would be greatly reduced. As a result, the speculator must be content with the 10.9% average profit per year realized from a buy and hold procedure; and although such an investment lacks much of the excitement and sophistication involved in computing the filter signals from day to day, this investment does give him a certain amount of peace of mind.

CHAPTER VI

Conclusions

It is now propitious, after this all too brief statistical survey, to try to appraise the stock price analysis of National Dairy Products. Two aspects must be considered. One is the usefulness of the approach for a better understanding of past price movements, market conditions and general characteristics. The other is the effectiveness of the analysis as a means of forecasting stock prices, or more precisely, of attaching probabilities to future stock prices. In regard to the first aspect, there can be no doubt that factual knowledge of National Dairy stock price movement has been furthered by the statistical study. It seems appropriate at this time to recall La Place's statement that, assuming someone knew everything that had ever occurred in the past, he would be able to predict all future happenings. Can not these thoughts shed some light on the considerations of the second aspect? Unfortunately, the trouble with any statistical analysis of a stock is not that knowledge of the past and present can not be helpful in forecasting prices, rather that this knowledge is incomplete. The statistical analyst is not in the fortunate position of knowing every past event in the political, economic and corporate world. His study, as is this study, is finite and is confined to a minuscule portion of the theoretically complete statistical investigation; and even if he knew everything regarding the statistical structure of a stock in the past and present it would not follow that he could predict this stock's prices since these prices are partly influenced by factors which are not reflected in the market structure before they become effective. In other words future stock market prices are largely determined by political, economic and corporate events which the

past and present performance of the stock does not and can not take into account.

However the value of statistical analysis is not lost; the results of such an investigation would be an important guide for the investor if business cycles in the future will be pretty much like those in the past 30 years, if the same secular trends toward expansion or contraction which has existed in the past will exist in the future, if the economic system will remain the same as it has been since 1930, and if the purchasing power of money continues to flucuate in the future in the same manner in which it has fluctuated in the past. It is not completely unrealistic to expect that the above-mentioned conditions will exist in future periods, for the present governmented structure of the national economy is such that business cycles are less likely to be violent, corporate profits less likely to be cut drastically, inflation less likely to be runaway, and purchasing power less likely to decrease exponentially.

A thorough statistical study of the internal corporate situations and external political and economic conditions can not always prevent temporary losses in a common stock, however thorough knowledge is likely to lead in the long run to better than average investment results. The investor who takes a skeptical attitude in regard to many stock market ideas is less likely to be skeptical about the results of a statistical investigation, and with just cause for such an analysis prepares the ground for constructive planning. Superficial reasoning leads to rash action; statistical reasoning, at least, leads to logical and conservative action. Although this study does not offer

any specific advice, it is useful as an introduction to the fundamental probabilities associated with stock price movements. The results of the statistical investigation of National Dairy stock are by no means conclusive and undoubtedly they do not indicate, in general, the distribution of price changes of all stocks.

The distributions tested did not closely match any of the theoretical distributions that are generally regarded to be representative of stock price movements. The attempt made to correlate stock price fluctuations with the financial data of the Corporation did not prove to be extremely successful. The method used for smoothing out random fluctuations in National Dairy's stock price so an to increase the profitability of buy and sell transactions proved to be unprofitable.

Yet all these results are not without value, should the reader have a touch of Stoicism. The Stoic regarded life as play. Yet his main concern was not the outcome of the play, but the manner in which he applied the rules of the game. Similarly, the reader should find satisfaction in following these principles of statistical procedure rather than principles of superficial reasoning in the analysis of stock price movements and their distributions. The statistical technique is a proper and reliable tool for the investor, for any conclusions as meager as they may be are at least well founded. Finally, knowledge of past price movement probabilities, although inadequate at times in their role to predict conclusively future price movement probabilities, does make an investor follow the example of that ancient philosophical School in regard to his concern of the outcome of a stock transaction;

for such knowledge makes him less eager for quick profits, more indifferent to temporary losses, and thus gives him greater assurance that the probability of yield on his capital will be, over a period of years, far above normal.

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APPENDIX I

(National Dairy Products Stock Price Data)
1950-1960

				STOCK PRICE (EIGHTHS)								DIVIDENDS			EARNINGS	
				YEAR		LAST WK		LAST	NET			LAT	LAT	REC	LAST	LAST
CODE	DATE		D-J	HIGH	LOW	HIGH	LOW	SALE	CHAN	S-T		YEAR	QUAR	DATE	QUAR	YEAR
001	JAN	02 50	200.13	39.0	21.1	39.3	38.4	39.0	+0.1	062		2.20	0.80	12/10	1.32	5.26
002	JAN	09 50	201.94	39.3	27.1	39.5	38.6	39.3	+0.3	066		2.20	0.80	12/10	1.32	5.26
003	JAN	16 50	196.92	39.5	27.1	39.5	38.5	39.3	+0.0	159		2.20	0.80	12/10	1.32	5.26
004	JAN	23 50	200.97	39.5	27.1	39.7	38.6	38.6	-0.5	100		2.20	0.80	12/10	1.32	5.26
005	JAN	30 50	200.08	39.7	27.1	39.2	38.0	38.5	-0.1	134		2.20	0.80	12/10	1.32	5.26
006	FEB	06 50	205.03	39.7	27.1	42.0	38.6	41.7	+3.2	242		2.35	0.60	03/10	1.32	5.26
007	FEB	13 50	203.36	42.0	27.1	42.0	40.2	40.5	-1.2	128		2.35	0.60	03/10	1.32	5.26
008	FEB	20 50	204.05	42.0	27.1	40.7	39.4	40.5	+0.5	071		2.35	0.60	03/10	1.32	5.26
009	FEB	27 50	204.71	42.0	27.1	41.2	40.3	40.5	+0.0	082		2.35	0.60	03/10	1.32	5.26
010	MAR	06 50	204.71	42.0	27.1	41.0	40.1	41.0	+0.3	068		2.35	0.60	03/10	1.32	5.26
011	MAR	13 50	202.96	42.0	38.0	41.7	40.6	41.4	+0.4	093		2.35	0.60	03/10	1.32	5.26
012	MAR	20 50	208.09	42.0	38.0	44.2	41.1	43.2	+1.6	195		2.35	0.60	03/10	1.32	5.26
013	MAR	27 50	210.62	44.2	38.0	44.5	43.0	44.2	+1.0	135		2.35	0.60	03/10	1.32	5.26
014	APR	03 50	206.37	44.5	38.0	44.5	42.5	42.5	-1.5	084		2.35	0.60	03/10	1.39	5.26
015	APR	10 50	212.55	44.5	38.0	43.7	42.3	43.6	+1.1	086		2.35	0.60	03/10	1.39	5.26
016	APR	17 50	214.48	44.5	38.0	44.3	43.3	43.6	+0.0	135		2.35	0.60	03/10	1.39	5.26
017	APR	24 50	213.90	44.5	38.0	44.0	42.5	43.4	-0.2	107		2.50	0.60	06/10	1.39	5.26
018	MAY	01 50	214.33	44.5	38.0	43.3	42.1	42.4	-1.0	120		2.50	0.60	06/10	1.39	5.26
019	MAY	08 50	217.02	44.5	38.0	44.0	42.4	43.6	+1.2	120		2.50	0.60	06/10	1.39	5.26
020	MAY	15 50	217.78	44.5	38.0	44.5	43.4	44.4	+0.6	121		2.50	0.60	06/10	1.39	5.26
021	MAY	22 50	222.41	44.5	38.0	44.6	43.3	44.4	+0.5	123		2.50	0.60	06/10	1.39	5.26
022	MAY	29 50	221.71	44.6	38.0	44.5	43.2	43.2	-1.2	103		2.50	0.60	06/10	1.39	5.26
023	JUN	05 50	223.71	44.6	38.0	44.2	43.0	43.3	+0.1	058		2.50	0.60	06/10	1.39	5.26
024	JUN	12 50	226.86	44.6	38.0	44.3	41.5	42.0	-1.3	106		2.50	0.60	06/10	1.39	5.26
025	JUN	19 50	222.71	44.6	38.0	43.3	41.6	41.7	-0.1	125		2.50	0.60	06/10	1.39	5.26
026	JUN	26 50	224.35	44.6	38.0	43.5	41.5	43.5	+1.6	134		2.50	0.60	06/10	1.39	5.26
027	JUL	03 50	209.08	44.6	38.0	43.0	38.6	39.6	-3.7	150		2.50	0.60	06/10	1.32	5.26
028	JUL	10 50	208.59	44.6	38.0	41.6	39.5	41.2	+1.4	123		2.50	0.60	06/10	1.32	5.26
029	JUL	17 50	199.83	44.6	38.0	41.6	36.6	37.5	-3.5	170		2.50	0.60	06/10	1.32	5.26
030	JUL	24 50	207.65	44.6	36.6	39.6	36.0	39.5	+2.0	080		2.50	0.60	06/10	1.32	5.26
031	JUL	31 50	208.21	44.6	36.0	39.6	37.6	39.3	-0.2	090		2.50	0.60	06/10	1.32	5.26
032	AUG	07 50	212.66	44.6	36.0	43.0	39.2	43.0	+3.5	176		2.70	0.70	09/11	1.32	5.26
033	AUG	14 50	215.03	44.6	36.0	44.2	42.3	44.0	+1.0	109		2.70	0.70	09/11	1.32	5.26
034	AUG	21 50	219.23	44.6	36.0	44.7	43.2	43.6	-0.4	106		2.70	0.70	09/11	1.32	5.26
035	AUG	28 50	218.10	44.7	36.0	44.0	42.6	43.0	-0.6	053		2.70	0.70	09/11	1.32	5.26
036	SEP	04 50	218.42	44.7	36.0	43.6	42.1	43.1	+0.1	060		2.70	0.70	09/11	1.32	5.26
037	SEP	11 50	220.03	44.7	36.0	44.6	43.5	44.0	+0.7	085		2.70	0.70	09/11	1.32	5.26
038	SEP	18 50	225.85	44.7	36.0	44.5	43.6	44.4	+0.4	141		2.70	0.70	09/11	1.32	5.26
039	SEP	25 50	226.64	44.7	36.0	45.1	44.2	45.1	+0.5	121		2.70	0.70	09/11	1.32	5.26
040	OCT	02 50	226.36	45.1	36.0	45.5	44.5	45.5	+0.4	131		2.70	0.70	09/11	1.18	5.26
041	OCT	09 50	231.81	45.5	36.0	48.5	45.5	48.0	+2.3	136		2.70	0.70	09/11	1.18	5.26
042	OCT	16 50	227.63	48.5	36.0	48.3	46.6	48.0	+0.0	104		2.70	0.70	09/11	1.18	5.26
043	OCT	23 50	230.88	48.5	36.0	49.4	47.6	49.0	+1.0	129		2.70	0.70	09/11	1.18	5.26
044	OCT	30 50	228.56	49.4	36.0	49.3	46.0	48.0	-1.0	149		2.70	0.70	09/11	1.18	5.26
045	NOV	06 50	227.42	49.4	36.0	48.7	46.4	48.6	+0.6	137		2.80	0.90	12/11	1.18	5.26
046	NOV	13 50	229.29	49.4	36.0	49.4	46.7	49.3	+0.5	092		2.80	0.90	12/11	1.18	5.26
047	NOV	20 50	231.64	49.4	36.0	50.0	48.1	49.1	+0.6	081		2.80	0.90	12/11	1.18	5.26
048	NOV	27 50	235.06	50.0	36.0	50.0	48.5	50.0	+0.7	100		2.80	0.90	12/11	1.18	5.26
049	DEC	04 50	227.55	50.0	36.0	50.0	46.2	46.2	-3.6	108		2.80	0.90	12/11	1.18	5.26
050	DEC	11 50	227.30	50.0	36.0	46.0	44.6	45.0	-1.2	122		2.80	0.90	12/11	1.18	5.26
051	DEC	18 50	228.34	50.0	36.0	46.4	44.6	46.4	+1.4	076		2.80	0.90	12/11	1.18	5.26
052	DEC	25 50	231.54	50.0	36.0	48.4	46.4	48.0	+1.4	071		2.80	0.90	12/11	1.18	5.26

			STOCK PRICE (EIGHTHS)								DIVIDENDS			EARNINGS	
			YEAR		LAST WK		LAST NET				LAT	LAT	REC	LAST	LAST
CODE	DATE	D-J	HIGH	LOW	HIGH	LOW	SALE	CHAN	S-T		YEAR	QUAR	DATE	QUAR	YEAR
053	JAN 01 51	235.41	50.0	36.0	49.0	47.6	49.0	+1.0	104		2.80	0.90	12/11	1.18	5.14
054	JAN 08 51	240.68	50.0	36.0	50.0	48.2	49.7	+0.7	098		2.80	0.90	12/11	1.18	5.14
055	JAN 15 51	243.61	50.0	36.0	50.0	47.3	47.3	-2.4	094		2.80	0.90	12/11	1.18	5.14
056	JAN 22 51	246.91	50.0	36.0	48.4	46.6	47.4	+0.1	077		2.80	0.90	12/11	1.18	5.14
057	JAN 29 51	247.36	50.0	36.0	48.0	46.0	46.5	-0.7	082		2.80	0.90	12/11	1.18	5.14
058	FEB 05 51	253.92	50.0	36.0	47.2	45.4	46.2	-0.3	073		2.90	0.70	03/10	1.18	5.14
059	FEB 12 51	254.80	50.0	36.0	47.4	45.2	47.0	+0.6	077		2.90	0.70	03/10	1.18	5.14
060	FEB 19 51	254.70	50.0	36.0	48.0	47.0	47.4	+1.2	051		2.90	0.70	03/10	1.18	5.14
061	FEB 26 51	252.93	50.0	36.0	47.7	45.2	45.6	-1.6	050		2.90	0.70	03/10	1.18	5.14
062	MAR 05 51	253.43	50.0	36.0	46.4	45.4	46.0	+0.2	049		2.90	0.70	03/10	1.18	5.14
063	MAR 12 51	252.02	50.0	36.0	48.0	45.7	47.6	+1.6	060		2.90	0.70	03/10	1.18	5.14
064	MAR 19 51	249.03	50.0	36.0	48.2	46.2	47.3	-0.3	080		2.90	0.70	03/10	1.18	5.14
065	MAR 26 51	248.14	50.0	36.0	47.6	46.6	47.6	+0.3	036		2.90	0.70	03/10	1.18	5.14
066	APR 02 51	247.94	50.0	45.2	47.5	45.6	46.2	-1.4	051		2.90	0.70	03/10	1.20	5.14
067	APR 09 51	250.28	50.0	45.2	47.4	45.4	46.6	+0.4	064		2.90	0.70	03/10	1.20	5.14
068	APR 16 51	256.18	50.0	45.2	47.1	45.6	45.6	-1.0	082		2.90	0.70	03/10	1.20	5.14
069	APR 23 51	255.02	50.0	45.2	46.4	45.4	46.0	+0.2	068		3.00	0.70	06/11	1.20	5.14
070	APR 30 51	259.08	50.0	45.2	46.6	45.6	46.6	+0.6	070		3.00	0.70	06/11	1.20	5.14
071	MAY 07 51	261.76	50.0	45.2	46.7	45.6	46.2	-0.4	092		3.00	0.70	06/11	1.20	5.14
072	MAY 14 51	257.26	50.0	45.2	46.4	45.6	46.1	-0.1	042		3.00	0.70	06/11	1.20	5.14
073	MAY 21 51	250.63	50.0	45.2	46.4	45.0	46.1	+0.6	078		3.00	0.70	06/11	1.20	5.14
074	MAY 28 51	245.83	50.0	45.0	46.3	45.0	45.2	-0.7	077		3.00	0.70	06/11	1.20	5.14
075	JUN 04 51	249.33	50.0	45.0	45.2	44.4	44.7	-0.3	073		3.00	0.70	06/11	1.20	5.14
076	JUN 11 51	250.39	50.0	44.4	46.2	44.6	45.6	+0.7	075		3.00	0.70	06/11	1.20	5.14
077	JUN 18 51	254.03	50.0	44.4	46.3	45.0	46.1	+0.3	070		3.00	0.70	06/11	1.20	5.14
078	JUN 25 51	247.86	50.0	44.4	46.7	46.0	46.0	-0.1	058		3.00	0.70	06/11	1.20	5.14
079	JUL 02 51	242.64	50.0	44.4	46.7	45.0	45.4	-0.4	067		3.00	0.70	06/11	1.20	5.14
080	JUL 09 51	250.01	50.0	44.4	46.7	45.0	46.7	+1.3	059		3.00	0.70	06/11	1.20	5.14
081	JUL 16 51	254.32	50.0	44.4	46.7	45.6	46.7	+0.0	055		3.00	0.70	06/11	1.20	5.14
082	JUL 23 51	253.73	50.0	44.4	47.5	46.4	47.0	+0.1	062		3.00	0.70	06/11	1.20	5.14
083	JUL 30 51	259.23	50.0	44.4	48.4	46.7	47.5	+0.5	083		3.00	0.70	06/11	1.20	5.14
084	AUG 06 51	262.98	50.0	44.4	49.6	48.0	49.6	+2.1	072		3.05	0.75	09/10	1.20	5.14
085	AUG 13 51	261.92	50.0	44.4	49.7	49.2	49.2	-0.4	041		3.05	0.75	09/10	1.20	5.14
086	AUG 20 51	266.17	50.0	44.4	49.1	47.7	48.4	+0.0	071		3.05	0.75	09/10	1.20	5.14
087	AUG 27 51	266.30	50.0	44.4	49.6	48.6	49.1	+0.5	036		3.05	0.75	09/10	1.20	5.14
088	SEP 03 51	270.25	50.0	44.4	50.0	48.4	50.0	+0.7	040		3.05	0.75	09/10	1.20	5.14
089	SEP 10 51	273.89	50.0	44.4	50.3	49.6	50.3	+0.3	051		3.05	0.75	09/10	1.20	5.14
090	SEP 17 51	276.06	50.3	44.4	51.6	50.4	50.6	+0.3	062		3.05	0.75	09/10	1.20	5.14
091	SEP 24 51	272.11	51.6	44.4	50.7	49.0	49.4	-1.4	052		3.05	0.75	09/10	1.20	5.14
092	OCT 01 51	271.16	51.6	44.4	49.2	48.0	48.7	-0.5	084		3.05	0.75	09/10	0.84	5.14
093	OCT 08 51	275.53	51.6	44.4	50.0	48.6	49.6	+0.7	119		3.05	0.75	09/10	0.84	5.14
094	OCT 15 51	275.13	51.6	44.4	50.4	49.7	50.3	+0.5	059		3.05	0.75	09/10	0.84	5.14
095	OCT 22 51	267.42	51.6	44.4	51.5	50.2	50.6	+0.3	068		3.05	0.75	09/10	0.84	5.14
096	OCT 29 51	258.53	51.6	44.4	50.4	47.4	48.0	-2.6	084		3.05	0.75	09/10	0.84	5.14
097	NOV 05 51	259.57	51.6	44.4	50.2	47.5	49.2	+1.2	069		2.90	0.75	12/10	0.84	5.14
098	NOV 12 51	261.29	51.6	44.4	49.6	48.6	49.4	+0.2	042		2.90	0.75	12/10	0.84	5.14
099	NOV 19 51	260.82	51.6	44.4	49.6	48.6	48.6	+0.0	070		2.90	0.75	12/10	0.84	5.14
100	NOV 26 51	255.95	51.6	44.4	48.6	46.0	46.0	-2.6	051		2.90	0.75	12/10	0.84	5.14
101	DEC 03 51	262.29	51.6	44.4	48.3	46.0	48.0	+2.0	060		2.90	0.75	12/10	0.84	5.14
102	DEC 10 51	266.90	51.6	44.4	49.3	48.3	48.6	+0.6	059		2.90	0.75	12/10	0.84	5.14
103	DEC 17 51	265.48	51.6	44.4	49.0	48.1	48.4	-0.2	059		2.90	0.75	12/10	0.84	5.14
104	DEC 31 51	268.52	51.6	44.4	49.1	47.4	48.5	+0.1	138		2.90	0.75	12/10	0.84	5.14

				STOCK PRICE (EIGHTHS)								DIVIDENDS			EARNINGS	
				YEAR		LAST WK		LAST	NET			LAT	LAT	REC	LAST	LAST
CODE	DATE		D-J	HIGH	LOW	HIGH	LOW	SALE	CHAN	S-T		YEAR	QUAR	DATE	QUAR	YEAR
105	JAN	07 52	271.26	51.6	44.4	50.4	48.6	49.6	+1.1	067		2.90	0.75	12/10	0.84	4.07
106	JAN	14 52	270.73	51.6	44.4	51.6	50.2	51.6	+2.0	085		2.90	0.75	12/10	0.84	4.07
107	JAN	21 52	272.93	51.6	44.4	53.7	51.5	52.0	+0.2	081		2.90	0.75	12/10	0.84	4.07
108	JAN	28 52	273.69	53.7	44.4	53.0	51.2	52.4	+0.4	079		2.90	0.75	12/10	0.84	4.07
109	FEB	04 52	272.22	53.7	44.4	53.0	51.0	51.6	-0.6	066		2.90	0.75	12/10	0.84	4.07
110	FEB	11 52	269.83	53.7	44.4	52.2	51.4	52.0	+0.2	056		2.95	0.75	03/10	0.84	4.07
111	FEB	18 52	266.30	53.7	44.4	52.7	51.1	51.3	+0.1	074		2.95	0.75	03/10	0.84	4.07
112	FEB	25 52	261.40	53.7	44.4	51.5	50.3	50.5	-0.6	054		2.95	0.75	03/10	0.84	4.07
113	MAR	03 52	260.27	53.7	44.4	51.0	50.2	51.0	+0.3	065		2.95	0.75	03/10	0.84	4.07
114	MAR	10 52	264.14	53.7	44.4	51.4	50.4	51.0	+0.0	072		2.95	0.75	03/10	0.84	4.07
115	MAR	17 52	264.43	53.7	44.4	51.4	50.0	50.4	-0.4	045		2.95	0.75	03/10	0.84	4.07
116	MAR	24 52	265.69	53.7	44.4	51.0	50.2	51.0	+0.4	064		2.95	0.75	03/10	0.84	4.07
117	MAR	31 52	269.00	53.7	44.4	51.2	50.2	51.0	+0.0	042		2.95	0.75	03/10	0.84	4.07
118	APR	07 52	265.44	53.7	44.4	52.4	51.0	51.2	+0.2	048		2.95	0.75	03/10	0.87	4.07
119	APR	14 52	266.29	53.7	48.6	51.7	49.6	50.6	-0.4	052		2.95	0.75	03/10	0.87	4.07
120	APR	21 52	260.14	53.7	48.6	52.0	50.6	51.0	+0.2	058		3.00	0.75	06/10	0.87	4.07
121	APR	28 52	260.27	53.7	48.6	51.7	50.5	50.5	-0.3	076		3.00	0.75	06/10	0.87	4.07
122	MAY	05 52	260.55	53.7	48.6	51.4	49.6	51.4	+0.7	082		3.00	0.75	06/10	0.87	4.07
123	MAY	12 52	262.50	53.7	48.6	52.4	51.2	52.4	+1.0	050		3.00	0.75	06/10	0.87	4.07
124	MAY	19 52	259.88	53.7	48.6	52.6	50.4	50.4	-1.2	048		3.00	0.75	06/10	0.87	4.07
125	MAY	26 52	263.23	53.7	48.6	51.1	49.6	50.7	+0.3	052		3.00	0.75	06/10	0.87	4.07
126	JUN	02 52	263.10	53.7	48.6	52.5	50.6	51.5	+0.6	070		3.00	0.75	06/10	0.87	4.07
127	JUN	09 52	268.03	53.7	48.6	53.1	51.1	52.4	+0.7	064		3.00	0.75	06/10	0.87	4.07
128	JUN	16 52	268.56	53.7	48.6	53.3	52.2	53.0	+0.4	047		3.00	0.75	06/10	0.87	4.07
129	JUN	23 52	270.19	53.7	48.6	53.7	52.2	53.6	+0.6	042		3.00	0.75	06/10	0.87	4.07
130	JUN	30 52	272.44	53.7	48.6	54.7	53.1	54.7	+1.1	045		3.00	0.75	06/10	0.87	4.07
131	JUL	07 52	274.95	54.7	48.6	54.7	54.0	54.1	-0.6	027		3.00	0.75	06/10	1.35	4.07
132	JUL	14 52	274.22	54.7	48.6	54.6	53.0	54.3	+0.2	063		3.00	0.75	06/10	1.35	4.07
133	JUL	21 52	273.90	54.7	48.6	55.3	54.2	55.0	+0.5	060		3.00	0.75	06/10	1.35	4.07
134	JUL	28 52	277.71	55.3	48.6	54.6	54.0	54.4	-0.4	033		3.00	0.75	06/10	1.35	4.07
135	AUG	04 52	279.80	55.3	48.6	55.2	54.0	55.2	+0.6	057		3.00	0.75	06/10	1.35	4.07
136	AUG	11 52	279.84	55.3	48.6	55.4	54.6	55.3	+0.1	053		3.00	0.75	09/10	1.35	4.07
137	AUG	18 52	277.37	55.4	48.6	56.0	54.4	55.2	+0.5	048		3.00	0.75	09/10	1.35	4.07
138	AUG	25 52	274.43	56.0	48.6	55.4	54.4	55.4	+0.2	039		3.00	0.75	09/10	1.35	4.07
139	SEP	01 52	275.04	56.0	48.6	55.2	54.5	55.1	-0.3	029		3.00	0.75	09/10	1.35	4.07
140	SEP	08 52	276.50	56.0	48.6	55.2	54.4	55.1	+0.0	033		3.00	0.75	09/10	1.35	4.07
141	SEP	15 52	271.02	56.0	48.6	55.6	53.2	53.7	-1.2	033		3.00	0.75	09/10	1.35	4.07
142	SEP	22 52	270.55	56.0	48.6	54.5	53.3	54.0	+0.1	023		3.00	0.75	09/10	1.35	4.07
143	SEP	29 52	271.95	56.0	48.6	55.4	54.0	55.2	+1.2	044		3.00	0.75	09/10	1.35	4.07
144	OCT	06 52	270.55	56.0	48.6	56.0	52.0	53.3	-1.7	070		3.00	0.75	09/10	1.24	4.07
145	OCT	13 52	270.61	56.0	48.6	54.6	53.0	54.3	+1.0	046		3.00	0.75	09/10	1.24	4.07
146	OCT	20 52	267.30	56.0	48.6	54.3	53.1	54.0	-0.3	088		3.00	0.75	09/10	1.24	4.07
147	OCT	27 52	265.46	56.0	48.6	54.4	52.0	52.3	-1.5	073		3.00	0.75	09/10	1.24	4.07
148	NOV	03 52	269.23	56.0	48.6	52.5	51.1	52.0	-0.3	064		3.00	0.75	09/10	1.24	4.07
149	NOV	10 52	273.47	56.0	48.6	52.1	50.0	52.1	+0.1	085		3.00	0.75	12/10	1.24	4.07
150	NOV	17 52	273.43	56.0	48.6	54.5	52.1	54.4	+2.3	091		3.00	0.75	12/10	1.24	4.07
151	NOV	24 52	279.32	56.0	48.6	54.6	53.4	54.4	+0.0	111		3.00	0.75	12/10	1.24	4.07
152	DEC	01 52	283.66	56.0	48.6	58.0	54.5	58.0	+3.4	095		3.00	0.75	12/10	1.24	4.07
153	DEC	08 52	282.06	58.0	48.6	60.0	57.4	58.7	+0.7	079		3.00	0.75	12/10	1.24	4.07
154	DEC	15 52	285.20	60.0	48.6	59.1	58.3	58.4	-0.3	066		3.00	0.75	12/10	1.24	4.07
155	DEC	22 52	286.52	60.0	48.6	59.0	58.0	58.3	-0.1	061		3.00	0.75	12/10	1.24	4.07
156	DEC	29 52	288.23	60.0	48.6	58.7	57.4	58.0	-0.3	026		3.00	0.75	12/10	1.24	4.07

			STOCK PRICE (EIGHTHS)							DIVIDENDS			EARNINGS	
			YEAR		LAST WK		LAST	NET		LAT	LAT	REC	LAST	LAST
CODE	DATE	D-J	HIGH	LOW	HIGH	LOW	SALE	CHAN	S-T	YEAR	QUAR	DATE	QUAR	YEAR
157	JAN 05 53	292.14	60.0	48.6	59.4	57.2	59.4	+1.4	038	3.00	0.75	12/10	0.76	4.22
158	JAN 12 53	287.52	60.0	48.6	60.0	59.0	60.0	+0.4	081	3.00	0.75	12/10	0.76	4.22
159	JAN 19 53	287.11	60.0	48.6	59.7	59.0	59.0	-1.0	051	3.00	0.75	12/10	0.76	4.22
160	JAN 26 53	286.89	60.0	48.6	59.7	59.2	59.4	+0.4	044	3.00	0.75	12/10	0.76	4.22
161	FEB 02 53	289.77	60.0	48.6	60.6	59.5	60.6	+1.2	066	3.00	0.75	12/10	0.76	4.22
162	FEB 09 53	282.85	60.6	48.6	62.4	60.3	60.4	-0.2	090	3.00	0.75	03/10	0.76	4.22
163	FEB 16 53	283.11	62.4	48.6	60.0	59.0	59.3	-0.3	043	3.00	0.75	03/10	0.76	4.22
164	FEB 23 53	281.89	62.4	48.6	59.7	59.1	59.3	+0.0	056	3.00	0.75	03/10	0.76	4.22
165	MAR 02 53	284.27	62.4	48.6	59.5	59.2	59.3	+0.0	041	3.00	0.75	03/10	0.76	4.22
166	MAR 09 53	284.82	62.4	48.6	59.6	58.2	59.1	-0.2	081	3.00	0.75	03/10	0.76	4.22
167	MAR 16 53	289.04	62.4	48.6	59.0	58.2	58.3	-0.6	040	3.00	0.75	03/10	0.76	4.22
168	MAR 23 53	289.69	62.4	48.6	59.6	57.5	59.4	+1.1	055	3.00	0.75	03/10	0.76	4.22
169	MAR 30 53	287.33	62.4	48.6	60.4	59.0	60.3	+0.7	062	3.00	0.75	03/10	0.76	4.22
170	APR 06 53	280.03	62.4	48.6	60.6	58.4	59.3	-1.0	080	3.00	0.75	03/10	1.03	4.22
171	APR 13 53	275.50	62.4	57.5	59.6	58.3	58.4	-0.7	114	3.00	0.75	03/10	1.03	4.22
172	APR 20 53	274.41	62.4	57.5	59.5	56.7	59.5	+1.1	083	3.00	0.75	06/10	1.03	4.22
173	APR 27 53	271.26	62.4	56.7	60.2	58.4	58.6	-0.7	075	3.00	0.75	06/10	1.03	4.22
174	MAY 04 53	275.66	62.4	56.7	59.4	58.4	59.4	+0.6	100	3.00	0.75	06/10	1.03	4.22
175	MAY 11 53	278.22	62.4	56.7	59.4	59.0	59.3	-0.1	056	3.00	0.75	06/10	1.03	4.22
176	MAY 18 53	277.90	62.4	56.7	59.6	58.6	59.4	+0.7	036	3.00	0.75	06/10	1.03	4.22
177	MAY 25 53	278.16	62.4	56.7	59.3	58.4	58.7	-0.5	022	3.00	0.75	06/10	1.03	4.22
178	JUN 01 53	271.48	62.4	56.7	59.1	58.3	59.0	+0.1	057	3.00	0.75	06/10	1.03	4.22
179	JUN 08 53	268.32	62.4	56.7	59.2	58.0	58.0	-1.0	046	3.00	0.75	06/10	1.03	4.22
180	JUN 15 53	265.78	62.4	56.7	58.3	56.5	57.3	-0.5	058	3.00	0.75	06/10	1.03	4.22
181	JUN 22 53	265.80	62.4	56.5	57.7	57.0	57.3	+0.0	039	3.00	0.75	06/10	1.03	4.22
182	JUN 29 53	269.05	62.4	56.5	59.4	57.1	59.4	+2.1	035	3.00	0.75	06/10	1.03	4.22
183	JUL 06 53	270.53	62.4	56.5	60.0	59.2	59.6	+0.2	029	3.00	0.75	06/10	1.26	4.22
184	JUL 13 53	271.06	62.4	56.5	60.2	59.5	60.2	+0.4	028	3.00	0.75	06/10	1.26	4.22
185	JUL 20 53	270.06	62.4	56.5	60.1	59.1	60.1	-0.1	046	3.00	0.75	06/10	1.26	4.22
186	JUL 27 53	269.76	62.4	56.5	60.1	59.2	59.7	-0.2	044	3.00	0.75	06/10	1.26	4.22
187	AUG 03 53	275.38	62.4	56.5	60.1	58.6	60.1	+0.2	038	3.00	0.75	06/10	1.26	4.22
188	AUG 10 53	275.54	62.4	56.5	61.6	60.0	61.0	+0.7	046	3.00	0.75	09/10	1.26	4.22
189	AUG 17 53	275.71	62.4	56.5	63.3	61.2	63.3	+2.3	046	3.00	0.75	09/10	1.26	4.22
190	AUG 24 53	271.93	63.3	56.5	63.0	61.2	61.6	-0.7	039	3.00	0.75	09/10	1.26	4.22
191	AUG 31 53	265.74	63.3	56.5	62.0	59.4	59.6	-2.0	031	3.00	0.75	09/10	1.26	4.22
192	SEP 07 53	264.34	63.3	56.5	60.1	58.4	58.5	-1.1	044	3.00	0.75	09/10	1.26	4.22
193	SEP 14 53	259.71	63.3	56.5	59.2	58.0	58.0	-0.5	021	3.00	0.75	09/10	1.26	4.22
194	SEP 21 53	258.78	63.3	56.5	58.3	57.0	57.0	-1.0	079	3.00	0.75	09/10	1.26	4.22
195	SEP 28 53	263.31	63.3	56.5	57.3	56.6	57.2	+0.2	044	3.00	0.75	09/10	1.26	4.22
196	OCT 05 53	266.70	63.3	56.5	59.6	57.3	59.6	+2.4	077	3.00	0.75	09/10	1.46	4.22
197	OCT 12 53	267.40	63.3	56.5	61.7	59.2	61.7	+2.1	065	3.00	0.75	09/10	1.46	4.22
198	OCT 19 53	272.80	63.3	56.5	62.2	60.4	60.4	-1.3	056	3.00	0.75	09/10	1.46	4.22
199	OCT 26 53	275.34	63.3	56.5	60.7	59.3	60.7	+0.3	062	3.00	0.75	09/10	1.46	4.22
200	NOV 02 53	275.81	63.3	56.5	61.2	60.4	60.4	-0.3	060	3.00	0.75	09/10	1.46	4.22
201	NOV 09 53	278.83	63.3	56.5	61.0	60.2	60.4	+0.0	062	3.00	0.75	12/10	1.46	4.22
202	NOV 16 53	277.53	63.3	56.5	61.2	60.2	61.2	+0.6	057	3.00	0.75	12/10	1.46	4.22
203	NOV 23 53	276.05	63.3	56.5	61.7	60.6	61.0	+0.4	099	3.00	0.75	12/10	1.46	4.22
204	NOV 30 53	280.23	63.3	56.5	61.6	60.6	61.4	+0.4	041	3.00	0.75	12/10	1.46	4.22
205	DEC 07 53	282.71	63.3	56.5	64.3	61.1	64.0	+2.4	117	3.00	0.75	12/10	1.46	4.22
206	DEC 14 53	279.91	64.3	56.5	64.4	63.3	64.4	+0.4	067	3.00	0.75	12/10	1.46	4.22
207	DEC 21 53	283.54	64.4	56.5	66.4	64.3	64.3	-0.1	072	3.00	0.75	12/10	1.46	4.22
208	DEC 28 53	280.92	66.4	56.5	64.7	63.6	64.4	+0.1	045	3.00	0.75	12/10	1.46	4.22

			STOCK PRICE (EIGHTHS)							DIVIDENDS			EARNINGS	
		YEAR		LAST WK		LAST NET			LAT	LAT	REC	LAST	LAST
CODE	DATE	D-J	HIGH	LOW	HIGH	LOW	SALE	CHAN	S-T	YEAR	QUAR	DATE	QUAR	YEAR
209	JAN 04 54	280.90	66.4	56.5	65.4	63.6	65.2	+0.6	034	3.00	0.75	12/10	0.78	4.64
210	JAN 11 54	281.51	66.4	56.5	65.1	64.0	64.7	-0.3	061	3.00	0.75	12/10	0.78	4.64
211	JAN 18 54	286.72	66.4	56.5	65.1	64.0	64.4	-0.3	073	3.00	0.75	12/10	0.78	4.64
212	JAN 25 54	289.65	66.4	56.5	64.6	63.0	63.6	-0.6	084	3.00	0.75	12/10	0.78	4.64
213	FEB 01 54	292.39	66.4	56.5	65.4	63.6	64.6	+1.0	069	3.00	0.75	12/10	0.78	4.64
214	FEB 08 54	293.97	66.4	56.5	65.4	64.4	65.2	+0.4	066	3.00	0.75	12/10	0.78	4.64
215	FEB 15 54	293.99	66.4	56.5	68.2	65.0	66.7	+1.5	075	3.00	0.75	03/10	0.78	4.64
216	FEB 22 54	291.07	68.2	56.5	67.3	65.0	66.0	-0.1	067	3.00	0.75	03/10	0.78	4.64
217	MAR 01 54	294.54	68.2	56.5	65.4	62.1	63.2	-2.6	060	3.00	0.75	03/10	0.78	4.64
218	MAR 08 54	299.45	68.2	56.5	68.0	63.0	65.1	+1.7	128	3.00	0.75	03/10	0.78	4.64
219	MAR 15 54	299.71	68.2	56.5	66.2	65.0	66.0	+0.7	096	3.00	0.75	03/10	0.78	4.64
220	MAR 22 54	301.44	68.2	56.5	68.7	65.4	68.4	+2.4	153	3.00	0.75	03/10	0.78	4.64
221	MAR 29 54	299.08	68.7	62.1	68.7	67.0	68.0	-0.4	081	3.00	0.75	03/10	0.78	4.64
222	APR 05 54	306.67	68.7	62.1	71.6	68.0	71.0	+3.0	106	3.00	0.75	03/10	1.12	4.64
223	APR 12 54	309.39	71.6	62.1	70.4	67.4	70.2	-0.6	089	3.00	0.75	03/10	1.12	4.64
224	APR 19 54	313.77	71.6	62.1	72.2	70.1	71.4	+1.2	122	3.00	0.75	06/10	1.12	4.64
225	APR 26 54	313.37	72.2	62.1	71.6	69.4	70.7	-0.5	094	3.00	0.75	06/10	1.12	4.64
226	MAY 03 54	319.33	72.2	62.1	71.6	69.0	71.6	+0.7	072	3.00	0.75	06/10	1.12	4.64
227	MAY 10 54	321.30	72.2	62.1	75.4	71.5	74.7	+3.1	084	3.00	0.75	06/10	1.12	4.64
228	MAY 17 54	322.50	75.4	62.1	74.6	73.0	73.5	-0.5	065	3.00	0.75	06/10	1.12	4.64
229	MAY 24 54	326.09	75.4	62.1	73.4	69.7	71.3	-2.1	070	3.00	0.75	06/10	1.12	4.64
230	MAY 31 54	327.49	75.4	62.1	72.0	70.1	71.0	-0.3	067	3.00	0.75	06/10	1.12	4.64
231	JUN 07 54	327.63	75.4	62.1	72.3	70.4	72.0	+1.0	037	3.00	0.75	06/10	1.12	4.64
232	JUN 14 54	322.09	75.4	62.1	72.0	69.7	70.4	-1.4	074	3.00	0.75	06/10	1.12	4.64
233	JUN 21 54	327.91	75.4	62.1	72.6	69.4	71.3	+0.7	089	3.00	0.75	06/10	1.12	4.64
234	JUN 28 54	323.53	75.4	62.1	71.6	70.4	71.6	+0.3	073	3.00	0.75	06/10	1.12	4.64
235	JUL 05 54	337.66	75.4	62.1	77.0	71.4	76.2	+4.4	111	3.00	0.75	06/10	1.70	4.64
236	JUL 12 54	341.25	77.0	62.1	78.6	77.2	78.3	+2.1	085	3.00	0.75	06/10	1.70	4.64
237	JUL 19 54	339.96	78.6	62.1	83.0	78.0	82.7	+4.4	117	3.00	0.75	06/10	1.70	4.64
238	JUL 26 54	343.48	83.0	62.1	83.3	78.4	79.0	-3.7	075	3.00	0.75	06/10	1.70	4.64
239	AUG 02 54	347.92	83.3	62.1	84.0	78.4	83.4	+4.4	125	3.00	0.75	06/10	1.70	4.64
240	AUG 09 54	343.06	84.0	62.1	89.4	81.1	83.0	-0.4	338	3.00	0.80	09/10	1.70	4.64
241	AUG 16 54	346.64	89.4	62.1	83.7	80.0	81.6	-0.3	114	3.00	0.80	09/10	1.70	4.64
242	AUG 23 54	350.38	89.4	62.1	83.0	80.2	80.2	-1.4	067	3.00	0.80	09/10	1.70	4.64
243	AUG 30 54	344.48	89.4	62.1	80.2	76.6	77.6	-2.4	050	3.00	0.80	09/10	1.70	4.64
244	SEP 06 54	343.10	89.4	62.1	77.4	75.2	77.1	-0.5	079	3.00	0.80	09/10	1.70	4.64
245	SEP 13 54	347.83	89.4	62.1	78.5	77.0	78.2	+1.1	056	3.00	0.80	09/10	1.70	4.64
246	SEP 20 54	355.32	89.4	62.1	78.4	77.4	77.7	-0.3	038	3.00	0.80	09/10	1.70	4.64
247	SEP 27 54	361.67	41.6	37.6	39.3	38.2	39.2	+0.2	152	1.53	0.40	09/10	0.85	2.32
248	OCT 04 54	359.88	41.6	37.6	39.5	39.0	39.1	-0.1	109	1.53	0.40	09/10	0.75	2.32
249	OCT 11 54	363.77	41.6	37.6	39.3	38.0	38.2	-0.7	102	1.53	0.40	09/10	0.75	2.32
250	OCT 18 54	353.20	41.6	37.6	38.7	37.7	38.0	-0.2	108	1.53	0.40	09/10	0.75	2.32
251	OCT 25 54	358.61	41.6	37.6	38.4	36.3	37.0	-1.0	175	1.53	0.40	09/10	0.75	2.32
252	NOV 01 54	352.14	41.6	36.3	37.6	35.4	37.4	+0.4	204	1.53	0.40	09/10	0.75	2.32
253	NOV 08 54	366.00	41.6	35.4	38.4	37.0	37.6	+0.2	200	1.55	0.40	12/10	0.75	2.32
254	NOV 15 54	377.10	41.6	35.4	38.7	37.5	38.6	+1.4	236	1.55	0.40	12/10	0.75	2.32
255	NOV 22 54	378.01	41.6	35.4	39.0	38.1	38.6	+0.0	182	1.55	0.40	12/10	0.75	2.32
256	NOV 29 54	384.63	41.6	35.4	38.4	37.5	38.1	-0.5	144	1.55	0.40	12/10	0.75	2.32
257	DEC 06 54	389.60	41.6	35.4	38.5	37.1	37.5	-0.4	214	1.55	0.40	12/10	0.75	2.32
258	DEC 13 54	390.08	41.6	35.4	38.4	36.6	37.6	+0.1	310	1.55	0.40	12/10	0.75	2.32
259	DEC 20 54	394.94	41.6	35.4	38.0	37.2	37.7	+0.1	193	1.55	0.40	12/10	1.70	4.64
260	DEC 27 54	397.15	41.6	35.4	38.1	37.2	37.7	+0.0	128	1.55	0.40	12/10	1.70	4.64

			STOCK PRICE (EIGHTHS)								DIVIDENDS			EARNINGS	
			YEAR		LAST WK		LAST	NET			LAT	LAT	REC	LAST	LAST
CODE	DATE	D-J	HIGH	LOW	HIGH	LOW	SALE	CHAN	S-T		YEAR	QUAR	DATE	QUAR	YEAR
261	JAN 03 55	404.39	41.6	35.4	38.4	37.1	38.3	+0.4	234		1.55	0.40	12/10	0.61	2.32
262	JAN 10 55	395.60	41.6	35.4	39.0	37.5	38.5	+0.2	260		1.55	0.40	12/10	0.61	2.32
263	JAN 17 55	396.54	41.6	35.4	39.7	38.4	38.5	+0.0	209		1.55	0.40	12/10	0.61	2.32
264	JAN 24 55	395.90	41.6	35.4	38.6	37.4	38.4	-0.1	144		1.55	0.40	12/10	0.61	2.32
265	JAN 31 55	404.68	41.6	35.4	38.6	37.4	38.6	+0.2	194		1.55	0.40	12/10	0.61	2.32
266	FEB 07 55	409.76	41.6	35.4	39.3	38.2	39.0	+0.2	228		1.58	0.40	03/10	0.61	2.32
267	FEB 14 55	413.99	41.6	35.4	39.1	38.3	38.7	-0.1	208		1.58	0.40	03/10	0.61	2.32
268	FEB 21 55	411.63	41.6	35.4	38.5	38.1	38.1	-0.2	234		1.58	0.40	03/10	0.61	2.32
269	FEB 28 55	409.50	41.6	35.4	38.4	38.0	38.1	+0.0	167		1.58	0.40	03/10	0.61	2.32
270	MAR 07 55	419.68	41.6	35.4	39.1	38.0	38.6	+0.5	180		1.58	0.40	03/10	0.61	2.32
271	MAR 14 55	401.08	41.6	35.4	39.0	38.1	38.3	-0.3	160		1.58	0.40	03/10	0.61	2.32
272	MAR 21 55	404.75	41.6	35.4	39.0	38.0	38.7	+0.4	205		1.58	0.40	03/10	0.61	2.32
273	MAR 28 55	414.77	39.7	37.4	39.5	38.2	39.4	+0.5	129		1.58	0.40	03/10	0.61	2.32
274	APR 04 55	413.84	39.7	37.4	39.4	38.1	38.3	-1.1	159		1.58	0.40	03/10	0.62	2.32
275	APR 11 55	418.20	39.7	37.4	39.3	38.2	39.3	+1.0	101		1.58	0.40	03/10	0.62	2.32
276	APR 18 55	425.45	39.7	37.4	40.7	39.0	40.6	+1.3	158		1.58	0.40	03/10	0.62	2.32
277	APR 25 55	425.52	40.7	37.4	41.2	40.2	41.0	+0.2	131		1.60	0.40	06/10	0.62	2.32
278	MAY 02 55	425.65	41.2	37.4	41.7	40.5	41.3	+0.3	135		1.60	0.40	06/10	0.62	2.32
279	MAY 09 55	423.84	41.7	37.4	41.3	40.2	41.0	-0.3	134		1.60	0.40	06/10	0.62	2.32
280	MAY 16 55	419.17	41.7	37.4	41.3	40.2	41.2	+0.6	087		1.60	0.40	06/10	0.62	2.32
281	MAY 23 55	422.89	41.7	37.4	41.1	40.1	40.4	-0.6	107		1.60	0.40	06/10	0.62	2.32
282	MAY 30 55	425.66	41.7	37.4	40.6	39.5	40.4	+0.0	082		1.60	0.40	06/10	0.62	2.32
283	JUN 06 55	428.53	41.7	37.4	40.4	39.5	40.4	+0.0	118		1.60	0.40	06/10	0.62	2.32
284	JUN 13 55	437.72	41.7	37.4	42.0	40.0	42.0	+1.4	150		1.60	0.40	06/10	0.62	2.32
285	JUN 20 55	444.08	42.0	37.4	43.5	41.7	42.7	+0.7	106		1.60	0.40	06/10	0.62	2.32
286	JUN 27 55	448.93	43.5	37.4	43.5	42.3	43.5	+0.6	108		1.60	0.40	06/10	0.62	2.32
287	JUL 04 55	453.82	43.5	37.4	43.4	41.6	42.0	-1.5	101		1.60	0.40	06/10	0.84	2.32
288	JUL 11 55	461.18	43.5	37.4	42.6	41.5	42.6	+0.6	096		1.60	0.40	06/10	0.84	2.32
289	JUL 18 55	460.23	43.5	37.4	42.6	41.5	42.2	-0.4	157		1.60	0.40	06/10	0.84	2.32
290	JUL 25 55	464.69	43.5	37.4	42.6	41.4	42.1	-0.1	116		1.60	0.40	06/10	0.84	2.32
291	AUG 01 55	465.85	43.5	37.4	42.3	41.5	42.2	+0.1	102		1.60	0.40	06/10	0.84	2.32
292	AUG 08 55	456.40	43.5	37.4	42.4	40.6	40.7	-1.3	132		1.60	0.40	09/10	0.84	2.32
293	AUG 15 55	457.01	43.5	37.4	41.4	39.5	40.4	+0.1	122		1.60	0.40	09/10	0.84	2.32
294	AUG 22 55	453.57	43.5	37.4	40.7	40.0	40.2	-0.2	100		1.60	0.40	09/10	0.84	2.32
295	AUG 29 55	463.70	43.5	37.4	41.0	40.3	40.3	+0.1	097		1.60	0.40	09/10	0.84	2.32
296	SEP 05 55	472.53	43.5	37.4	41.5	40.1	41.5	+1.2	077		1.60	0.40	09/10	0.84	2.32
297	SEP 12 55	474.59	43.5	37.4	41.7	40.2	40.5	-1.0	083		1.60	0.40	09/10	0.84	2.32
298	SEP 19 55	483.67	43.5	37.4	41.4	40.1	41.0	+0.3	106		1.60	0.40	09/10	0.84	2.32
299	SEP 26 55	487.45	43.5	37.4	41.3	40.2	41.1	+0.1	073		1.60	0.40	09/10	0.84	2.32
300	OCT 03 55	466.62	43.5	37.4	39.7	38.0	39.1	-2.0	187		1.60	0.40	09/10	0.75	2.32
301	OCT 10 55	454.41	43.5	37.4	40.2	38.5	39.2	+0.1	084		1.60	0.40	09/10	0.75	2.32
302	OCT 17 55	444.68	43.5	37.4	39.1	38.0	38.2	-1.0	095		1.60	0.40	09/10	0.75	2.32
303	OCT 24 55	458.47	43.5	37.4	39.7	38.3	39.2	+1.0	099		1.60	0.40	09/10	0.75	2.32
304	OCT 31 55	454.85	43.5	37.4	39.2	38.2	39.0	-0.2	080		1.60	0.40	09/10	0.75	2.32
305	NOV 07 55	467.35	43.5	37.4	41.3	38.2	40.5	+1.5	140		1.60	0.40	12/10	0.75	2.32
306	NOV 14 55	476.54	43.5	37.4	41.2	40.1	40.6	+0.1	073		1.60	0.40	12/10	0.75	2.32
307	NOV 21 55	482.91	43.5	37.4	40.7	39.6	39.6	-0.4	088		1.60	0.40	12/10	0.75	2.32
308	NOV 28 55	482.88	43.5	37.4	39.5	39.4	39.4	-0.2	083		1.60	0.40	12/10	0.75	2.32
309	DEC 05 55	482.72	43.5	37.4	40.7	38.6	40.3	+0.7	108		1.60	0.40	12/10	0.75	2.32
310	DEC 12 55	487.64	43.5	37.4	41.4	40.2	40.7	+0.4	111		1.60	0.40	12/10	0.75	2.32
311	DEC 19 55	482.08	43.5	37.4	40.4	39.0	39.1	-1.6	077		1.60	0.40	12/10	0.75	2.32
312	DEC 26 55	486.59	43.5	37.4	39.7	38.2	39.7	+0.6	164		1.60	0.40	12/10	0.75	2.32

			STOCK PRICE (EIGHTHS)							DIVIDENDS			EARNINGS	
			YEAR		LAST WK		LAST	NET		LAT	LAT	REC	LAST	LAST
CODE	DATE	D-J	HIGH	LOW	HIGH	LOW	SALE	CHAN	S-T	YEAR	QUAR	DATE	QUAR	YEAR
313	JAN 02 56	488.40	43.5	37.4	40.7	39.0	39.4	-0.3	124	1.60	0.40	12/10	0.77	2.77
314	JAN 09 56	485.68	43.5	37.4	39.6	38.1	38.6	-0.6	101	1.60	0.40	12/10	0.77	2.77
315	JAN 16 56	481.80	43.5	37.4	38.7	37.5	38.5	-0.1	169	1.60	0.40	12/10	0.77	2.77
316	JAN 23 56	464.40	43.5	37.4	38.6	36.4	36.4	-2.1	177	1.60	0.40	12/10	0.77	2.77
317	JAN 30 56	466.56	43.5	36.4	36.5	34.5	36.2	-0.2	209	1.60	0.40	12/10	0.77	2.77
318	FEB 06 56	477.44	43.5	34.5	39.1	35.6	38.4	+2.2	168	1.60	0.40	03/10	0.77	2.77
319	FEB 13 56	467.66	43.5	34.5	39.5	36.4	37.6	-0.6	202	1.60	0.40	03/10	0.77	2.77
320	FEB 20 56	477.05	43.5	34.5	37.7	36.1	36.4	-0.6	124	1.60	0.40	03/10	0.77	2.77
321	FEB 27 56	485.66	43.5	34.5	38.0	36.0	36.7	+0.3	147	1.60	0.40	03/10	0.77	2.77
322	MAR 05 56	488.84	43.5	34.5	37.4	36.1	36.6	-0.1	160	1.60	0.40	03/10	0.77	2.77
323	MAR 12 56	497.84	43.5	34.5	38.3	36.1	38.2	+1.4	224	1.60	0.40	03/10	0.77	2.77
324	MAR 19 56	507.60	43.5	34.5	40.2	37.7	39.4	+1.2	221	1.60	0.40	03/10	0.77	2.77
325	MAR 26 56	513.03	43.5	34.5	39.7	38.4	39.0	-0.4	152	1.60	0.40	03/10	0.77	2.77
326	APR 02 56	511.79	40.2	34.5	39.6	38.4	38.5	-0.3	095	1.60	0.40	03/10	0.72	2.77
327	APR 09 56	521.05	40.2	34.5	39.1	37.5	37.5	-1.0	141	1.60	0.40	03/10	0.72	2.77
328	APR 16 56	509.99	40.2	34.5	37.7	35.5	36.3	-1.2	221	1.60	0.40	03/10	0.72	2.77
329	APR 23 56	507.20	40.2	34.5	38.7	36.3	38.5	+2.2	208	1.65	0.45	06/11	0.72	2.77
330	APR 30 56	512.03	40.2	34.5	39.0	37.4	37.6	-0.7	107	1.65	0.45	06/11	0.72	2.77
331	MAY 07 56	516.44	40.2	34.5	39.7	38.4	39.3	+1.5	204	1.65	0.45	06/11	0.72	2.77
332	MAY 14 56	501.25	40.2	34.5	39.7	38.3	39.0	-0.3	190	1.65	0.45	06/11	0.72	2.77
333	MAY 21 56	496.39	40.2	34.5	39.2	38.4	38.4	+0.0	111	1.65	0.45	06/11	0.72	2.77
334	MAY 28 56	472.49	40.2	34.5	38.7	37.0	37.2	-1.2	153	1.65	0.45	06/11	0.72	2.77
335	JUN 04 56	480.63	40.2	34.5	38.4	37.1	37.6	+0.4	101	1.65	0.45	06/11	0.72	2.77
336	JUN 11 56	478.09	40.2	34.5	38.5	37.2	38.0	+0.2	120	1.65	0.45	06/11	0.72	2.77
337	JUN 18 56	485.91	40.2	34.5	38.7	37.4	38.6	+0.6	088	1.65	0.45	06/11	0.72	2.77
338	JUN 25 56	487.95	40.2	34.5	38.7	37.4	38.3	-0.3	096	1.65	0.45	06/11	0.72	2.77
339	JUL 02 56	492.78	40.2	34.5	40.0	38.5	39.6	+1.3	125	1.65	0.45	06/11	0.83	2.77
340	JUL 09 56	504.14	40.2	34.5	42.0	39.4	42.0	+2.2	141	1.65	0.45	06/11	0.83	2.77
341	JUL 16 56	511.10	42.0	34.5	42.0	41.1	41.6	-0.2	152	1.65	0.45	06/11	0.83	2.77
342	JUL 23 56	514.57	42.0	34.5	41.7	40.1	41.7	+0.1	153	1.65	0.45	06/11	0.83	2.77
343	JUL 30 56	512.30	42.0	34.5	42.3	41.3	41.3	-0.4	130	1.65	0.45	06/11	0.83	2.77
344	AUG 06 56	520.27	42.3	34.5	42.4	40.6	42.2	+0.7	102	1.70	0.45	09/10	0.83	2.77
345	AUG 13 56	517.38	42.3	34.5	42.3	41.6	41.7	-0.3	104	1.70	0.45	09/10	0.83	2.77
346	AUG 20 56	515.79	42.3	34.5	42.5	41.5	42.4	+1.1	125	1.70	0.45	09/10	0.83	2.77
347	AUG 27 56	507.91	42.5	34.5	42.3	41.0	41.0	-1.4	075	1.70	0.45	09/10	0.83	2.77
348	SEP 03 56	502.04	42.5	34.5	41.0	39.4	39.7	-1.1	083	1.70	0.45	09/10	0.83	2.77
349	SEP 10 56	506.76	42.5	34.5	40.3	39.2	39.2	-0.5	108	1.70	0.45	09/10	0.83	2.77
350	SEP 17 56	500.32	42.5	34.5	40.0	38.4	38.6	-0.4	121	1.70	0.45	09/10	0.83	2.77
351	SEP 24 56	490.33	42.5	34.5	39.6	38.4	39.0	+0.2	097	1.70	0.45	09/10	0.83	2.77
352	OCT 01 56	475.25	42.5	34.5	39.4	37.6	38.0	-1.0	088	1.70	0.45	09/10	0.69	2.77
353	OCT 08 56	482.39	42.5	34.5	38.6	35.0	37.7	-0.1	260	1.70	0.45	09/10	0.69	2.77
354	OCT 15 56	490.19	42.5	34.5	38.6	37.4	38.4	+0.5	115	1.70	0.45	09/10	0.69	2.77
355	OCT 22 56	486.12	42.5	34.5	38.4	37.1	37.4	-1.0	104	1.70	0.45	09/10	0.69	2.77
356	OCT 29 56	486.06	42.5	34.5	38.0	36.5	36.7	-0.5	094	1.70	0.45	09/10	0.69	2.77
357	NOV 05 56	490.47	42.5	34.5	38.7	37.0	38.6	+1.7	111	1.70	0.45	12/10	0.69	2.77
358	NOV 12 56	485.35	42.5	34.5	40.0	38.6	38.7	+0.1	093	1.70	0.45	12/10	0.69	2.77
359	NOV 19 56	480.67	42.5	34.5	39.2	36.6	37.4	-0.7	114	1.70	0.45	12/10	0.69	2.77
360	NOV 26 56	472.56	42.5	34.5	38.3	36.7	37.0	-0.4	054	1.70	0.45	12/10	0.69	2.77
361	DEC 03 56	476.15	42.5	34.5	37.6	36.7	37.0	+0.0	082	1.70	0.45	12/10	0.69	2.77
362	DEC 10 56	494.70	42.5	34.5	38.0	37.0	37.3	+0.3	079	1.70	0.45	12/10	0.69	2.77
363	DEC 17 56	492.08	42.5	34.5	37.4	36.2	37.4	+0.1	175	1.70	0.45	12/10	0.69	2.77
364	DEC 24 56	494.38	42.5	34.5	37.0	36.2	36.7	-0.5	074	1.70	0.45	12/10	0.69	2.77
365	DEC 31 56	496.41	42.5	34.5	38.2	36.5	38.2	+1.3	077	1.70	0.45	12/10	0.69	2.77

				STOCK PRICE (EIGHTHS)								DIVIDENDS			EARNINGS	
				YEAR		LAST	WK	LAST	NET		LAT	LAT	REC	LAST	LAST
CODE	DATE	D-J	HIGH	LOW	HIGH	LOW	SALE	CHAN	S-T	YEAR	QUAR	DATE	QUAR	YEAR
366	JAN 07 57	498.22	42.5	34.5	38.2	36.7	37.1	-1.1	145	1.75	0.45	12/10	0.78	2.98
367	JAN 14 57	493.83	42.5	34.5	37.4	37.0	37.3	+0.2	154	1.75	0.45	12/10	0.78	2.98
368	JAN 21 57	477.46	42.5	34.5	37.3	36.4	36.6	-0.5	112	1.75	0.45	12/10	0.78	2.98
369	JAN 28 57	478.34	42.5	34.5	37.4	36.0	36.5	-0.1	122	1.75	0.45	12/10	0.78	2.98
370	FEB 04 57	477.21	42.5	34.5	37.6	36.1	36.7	+0.2	126	1.75	0.45	12/10	0.78	2.98
371	FEB 11 57	466.29	42.5	34.5	37.4	36.1	36.6	-0.1	107	1.80	0.45	03/11	0.78	2.98
372	FEB 18 57	468.07	42.5	34.5	37.5	36.2	37.0	+0.6	140	1.80	0.45	03/11	0.78	2.98
373	FEB 25 57	466.93	42.5	34.5	37.2	35.6	36.3	-0.5	100	1.80	0.45	03/11	0.78	2.98
374	MAR 04 57	468.91	42.5	34.5	36.7	35.5	36.6	+0.3	119	1.80	0.45	03/11	0.78	2.98
375	MAR 11 57	471.63	42.5	34.5	38.3	36.5	38.2	+1.4	136	1.80	0.45	03/11	0.78	2.98
376	MAR 18 57	474.28	42.5	34.5	38.4	37.7	38.4	+0.2	099	1.80	0.45	03/11	0.78	2.98
377	MAR 25 57	472.94	42.5	34.5	38.4	37.3	38.1	-0.3	088	1.80	0.45	03/11	0.78	2.98
378	APR 01 57	474.81	38.4	35.5	38.1	37.0	37.0	-1.1	076	1.80	0.45	03/11	0.56	2.98
379	APR 08 57	477.61	38.4	35.5	37.4	36.2	36.5	-0.3	132	1.80	0.45	03/11	0.56	2.98
380	APR 15 57	486.72	38.4	35.5	37.4	36.2	36.2	-0.3	138	1.80	0.45	03/11	0.56	2.98
381	APR 22 57	488.03	38.4	35.5	37.2	36.1	36.4	+0.2	119	1.80	0.45	05/17	0.56	2.98
382	APR 29 57	491.54	38.4	35.5	36.2	34.6	35.0	-1.4	285	1.80	0.45	05/17	0.56	2.98
383	MAY 06 57	497.54	38.4	34.6	35.0	34.3	35.0	+0.0	366	1.80	0.45	05/17	0.56	2.98
384	MAY 13 57	498.30	38.4	34.3	35.4	34.5	35.4	+0.4	249	1.80	0.45	05/17	0.56	2.98
385	MAY 20 57	505.60	38.4	34.3	35.6	34.5	35.2	+0.1	211	1.80	0.45	05/17	0.56	2.98
386	MAY 27 57	504.02	38.4	34.3	35.3	34.4	34.4	-0.6	269	1.80	0.45	05/17	0.56	2.98
387	JUN 03 57	504.93	38.4	34.3	35.2	34.3	35.0	+0.4	109	1.80	0.45	05/17	0.56	2.98
388	JUN 10 57	505.03	38.4	34.3	35.0	34.3	34.6	-0.2	179	1.80	0.45	05/17	0.56	2.98
389	JUN 17 57	511.79	38.4	34.3	35.0	34.0	34.3	-0.3	269	1.80	0.45	05/17	0.56	2.98
390	JUN 24 57	500.00	38.4	34.0	34.3	33.0	33.3	-1.0	214	1.80	0.45	05/17	0.56	2.98
391	JUL 08 57	516.89	38.4	33.0	36.1	33.1	35.6	+2.3	319	1.80	0.45	05/17	1.06	2.98
392	JUL 15 57	520.77	38.4	33.0	36.7	35.5	36.5	+0.5	225	1.80	0.45	05/17	1.06	2.98
393	JUL 22 57	515.73	38.4	33.0	37.4	35.6	35.6	-0.7	198	1.80	0.45	05/17	1.06	2.98
394	JUL 29 57	514.59	38.4	33.0	37.0	36.0	36.5	+0.7	143	1.80	0.45	05/17	1.06	2.98
395	AUG 05 57	505.10	38.4	33.0	36.5	35.2	36.4	-0.1	232	1.80	0.45	08/16	1.06	2.98
396	AUG 12 57	496.78	38.4	33.0	37.1	36.2	37.3	+0.3	199	1.80	0.45	08/16	1.06	2.98
397	AUG 19 57	488.20	38.4	33.0	37.0	35.5	35.7	-0.4	149	1.80	0.45	08/16	1.06	2.98
398	AUG 26 57	475.74	38.4	33.0	36.2	34.6	34.6	-1.1	148	1.80	0.45	08/16	1.06	2.98
399	SEP 02 57	484.85	38.4	33.0	36.1	34.5	35.6	+1.0	132	1.80	0.45	08/16	1.06	2.98
400	SEP 09 57	478.63	38.4	33.0	36.1	35.0	35.1	-0.5	123	1.80	0.45	08/16	1.06	2.98
401	SEP 16 57	481.02	38.4	33.0	36.4	35.0	36.0	+0.7	091	1.80	0.45	08/16	1.06	2.98
402	SEP 23 57	468.42	38.4	33.0	37.4	36.1	37.2	+1.2	242	1.80	0.45	08/16	1.06	2.98
403	SEP 30 57	456.89	38.4	33.0	37.2	35.6	36.7	-0.3	158	1.80	0.45	08/16	1.06	2.98
404	OCT 07 57	461.70	38.4	33.0	37.2	36.1	37.1	+0.2	101	1.80	0.45	08/16	0.82	2.98
405	OCT 14 57	441.16	38.4	33.0	37.3	35.5	36.1	-1.0	145	1.80	0.45	08/16	0.82	2.98
406	OCT 21 57	433.88	38.4	33.0	37.1	35.5	36.4	+0.3	100	1.80	0.45	08/16	0.82	2.98
407	OCT 28 57	435.15	38.4	33.0	36.3	35.0	35.6	-0.6	152	1.80	0.45	08/16	0.82	2.98
408	NOV 04 57	434.71	38.4	33.0	36.6	35.2	36.2	+0.4	075	1.80	0.45	08/16	0.82	2.98
409	NOV 11 57	434.12	38.4	33.0	36.6	35.1	36.4	+0.2	100	1.80	0.45	11/18	0.82	2.98
410	NOV 18 57	439.35	38.4	33.0	37.0	36.0	36.6	+0.6	098	1.80	0.45	11/18	0.82	2.98
411	NOV 25 57	442.68	38.4	33.0	37.0	36.2	37.0	+0.2	123	1.80	0.45	11/18	0.82	2.98
412	DEC 02 57	449.87	38.4	33.0	37.1	36.0	37.1	+0.1	100	1.80	0.45	11/18	0.82	2.98
413	DEC 09 57	447.20	38.4	33.0	37.7	37.0	37.5	+0.4	109	1.80	0.45	11/18	0.82	2.98
414	DEC 16 57	440.48	38.4	33.0	38.1	36.6	38.1	+0.4	085	1.80	0.45	11/18	0.82	2.98
415	DEC 23 57	427.20	38.4	33.0	38.2	37.0	37.7	-0.2	102	1.80	0.45	11/18	0.82	2.98
416	DEC 30 57	432.90	38.4	33.0	38.5	37.6	38.0	+0.1	178	1.80	0.45	11/18	0.82	2.98

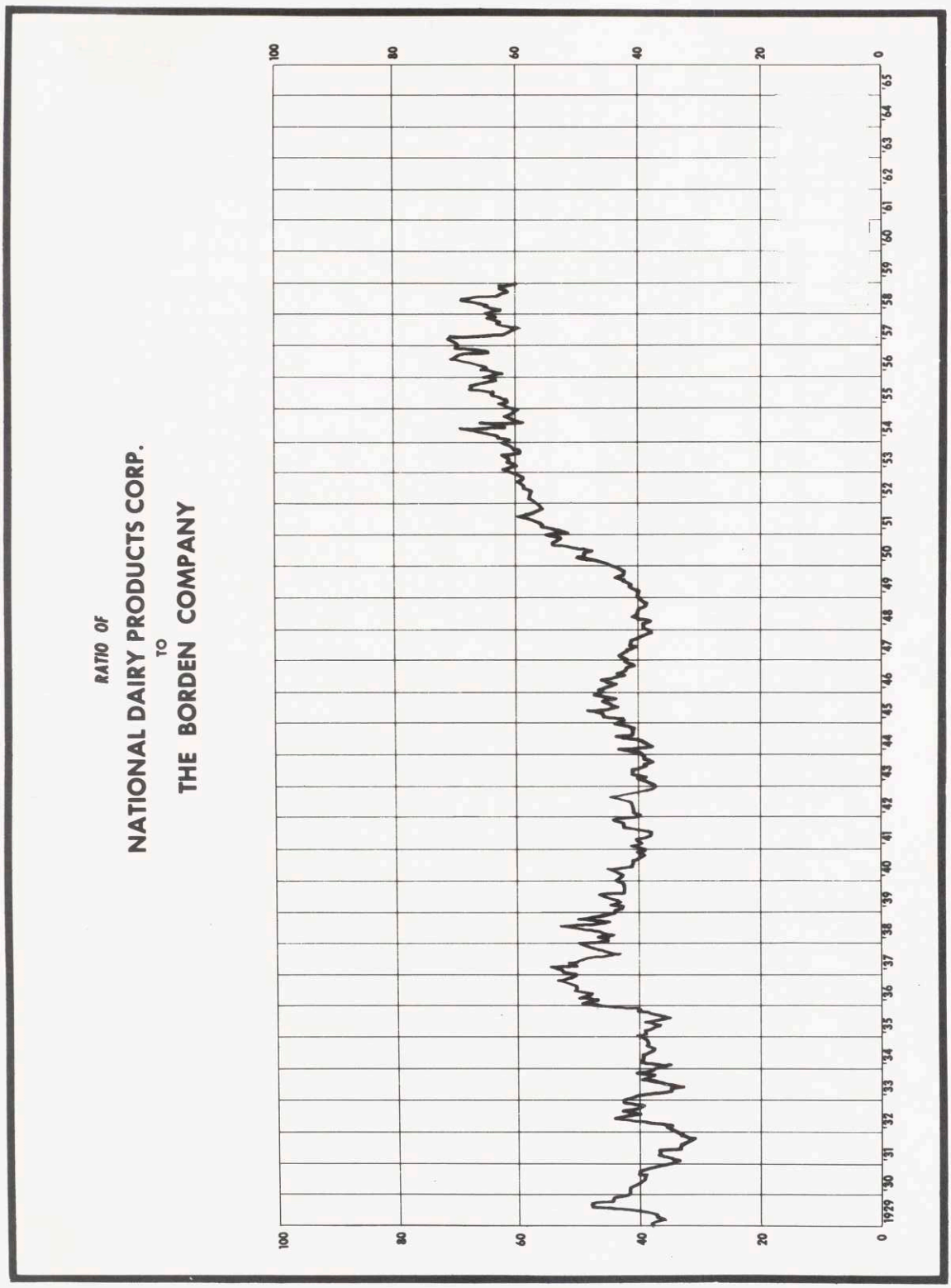
			STOCK PRICE (EIGHTHS)							DIVIDENDS			EARNINGS	
			YEAR		LAST	WK	LAST	NET		LAT	LAT	REC	LAST	LAST
CODE	DATE	D-J	HIGH	LOW	HIGH	LOW	SALE	CHAN	S-T	YEAR	QUAR	DATE	QUAR	YEAR
417	JAN 06 58	444.61	38.4	33.0	38.6	38.0	38.2	+0.2	096	1.80	0.45	11/18	0.74	3.02
418	JAN 13 58	438.68	38.6	33.0	39.0	37.6	39.0	+0.6	082	1.80	0.45	11/18	0.74	3.02
419	JAN 20 58	444.12	39.0	33.0	40.7	38.5	40.6	+1.6	125	1.80	0.45	11/18	0.74	3.02
420	JAN 27 58	450.66	40.7	33.0	40.7	39.1	39.4	-1.2	140	1.80	0.45	11/18	0.74	3.02
421	FEB 03 58	450.02	40.7	33.0	40.7	39.3	40.4	+1.0	135	1.80	0.45	11/18	0.74	3.02
422	FEB 10 58	448.78	40.7	33.0	41.4	40.4	41.4	+1.0	128	1.80	0.45	02/17	0.74	3.02
423	FEB 17 58	444.44	41.4	33.0	41.4	40.5	41.2	+0.2	134	1.80	0.45	02/17	0.74	3.02
424	FEB 24 58	439.62	41.4	33.0	41.5	39.2	40.0	-1.2	086	1.80	0.45	02/17	0.74	3.02
425	MAR 03 58	439.92	41.5	33.0	41.0	39.6	41.0	+1.0	090	1.80	0.45	02/17	0.74	3.02
426	MAR 10 58	451.49	41.5	33.0	42.6	40.3	42.4	+1.4	126	1.80	0.45	02/17	0.74	3.02
427	MAR 17 58	453.04	42.6	33.0	43.5	42.1	43.3	+0.7	127	1.80	0.45	02/17	0.74	3.02
428	MAR 24 58	452.49	43.5	33.0	43.5	42.0	43.5	+0.2	120	1.80	0.45	02/17	0.74	3.02
429	MAR 31 58	448.61	43.5	33.0	44.3	42.5	43.6	+0.1	124	1.80	0.45	02/17	0.74	3.02
430	APR 07 58	440.50	44.3	37.6	45.0	43.2	43.6	+0.0	072	1.80	0.45	02/17	0.65	3.02
431	APR 14 58	441.24	45.0	37.6	44.4	43.0	43.6	+0.0	144	1.80	0.45	02/17	0.65	3.02
432	APR 21 58	447.40	45.0	37.6	44.1	43.2	44.0	+0.2	127	1.80	0.45	02/17	0.65	3.02
433	APR 28 58	454.92	45.0	37.6	44.2	43.3	43.5	-0.3	113	1.80	0.45	05/16	0.65	3.02
434	MAY 05 58	459.56	45.0	37.6	44.0	43.4	44.0	+0.3	112	1.80	0.45	05/16	0.65	3.02
435	MAY 12 58	462.56	45.0	37.6	45.2	43.6	44.4	+0.4	158	1.80	0.45	05/16	0.65	3.02
436	MAY 19 58	457.10	45.2	37.6	45.2	44.2	45.0	+1.0	091	1.80	0.45	05/16	0.65	3.02
437	MAY 26 58	461.03	45.2	37.6	47.3	44.6	46.6	+1.6	105	1.80	0.45	05/16	0.65	3.02
438	JUN 02 58	462.20	47.0	37.6	47.6	46.1	46.6	+0.0	104	1.80	0.45	05/16	0.65	3.02
439	JUN 09 58	469.60	47.6	37.6	47.1	46.0	46.7	+0.1	086	1.80	0.45	05/16	0.65	3.02
440	JUN 16 58	474.77	47.6	37.6	47.0	46.1	46.1	-0.6	085	1.80	0.45	05/16	0.65	3.02
441	JUN 23 58	473.60	47.6	37.6	46.4	44.1	45.0	-1.1	091	1.80	0.45	05/16	0.65	3.02
442	JUN 30 58	475.42	47.6	37.6	46.2	44.4	46.0	+1.0	062	1.80	0.45	05/16	0.65	3.02
443	JUL 07 58	480.17	47.6	37.6	46.4	45.5	46.4	+0.4	087	1.80	0.45	05/16	0.97	3.02
444	JUL 14 58	482.85	47.6	37.6	46.6	46.0	46.3	-0.1	105	1.80	0.45	05/16	0.97	3.02
445	JUL 21 58	486.55	47.6	37.6	46.4	44.5	45.6	-0.5	193	1.80	0.45	05/16	0.97	3.02
446	JUL 28 58	501.76	47.6	37.6	45.5	44.3	44.3	-1.3	138	1.80	0.45	05/16	0.97	3.02
447	AUG 04 58	505.43	47.6	37.6	44.6	43.5	44.6	+0.3	128	1.80	0.45	05/16	0.97	3.02
448	AUG 11 58	510.13	47.6	37.6	45.2	44.0	44.4	-0.2	179	1.80	0.45	08/18	0.97	3.02
449	AUG 18 58	506.13	47.6	37.6	44.7	44.0	44.3	+0.3	162	1.80	0.45	08/18	0.97	3.02
450	AUG 25 58	508.28	47.6	37.6	44.4	44.0	44.3	+0.0	077	1.80	0.45	08/18	0.97	3.02
451	SEP 01 58	508.63	47.6	37.6	44.5	44.0	44.3	+0.0	121	1.80	0.45	08/18	0.97	3.02
452	SEP 08 58	512.77	47.6	37.6	44.6	44.2	44.4	+0.1	096	1.80	0.45	08/18	0.97	3.02
453	SEP 15 58	519.43	47.6	37.6	45.4	44.4	45.4	+1.0	166	1.80	0.45	08/18	0.97	3.02
454	SEP 22 58	526.48	47.6	37.6	46.1	44.7	45.2	-0.2	176	1.80	0.45	08/18	0.97	3.02
455	SEP 29 58	526.83	47.6	37.6	45.5	44.1	44.7	-0.3	162	1.80	0.45	08/18	0.97	3.02
456	OCT 06 58	533.73	47.6	37.6	45.4	44.4	45.3	+0.4	144	1.80	0.45	08/18	0.80	3.02
457	OCT 13 58	543.36	47.6	37.6	46.1	45.1	45.4	+0.1	120	1.80	0.45	08/18	0.80	3.02
458	OCT 20 58	546.36	47.6	37.6	47.1	44.7	47.0	+1.4	184	1.80	0.45	08/18	0.80	3.02
459	OCT 27 58	539.52	47.6	37.6	48.4	45.3	46.0	-1.0	156	1.80	0.45	08/18	0.80	3.02
460	NOV 03 58	543.22	48.4	37.6	46.2	44.5	45.0	-1.0	112	1.80	0.45	08/18	0.80	3.02
461	NOV 10 58	554.26	48.4	37.6	48.4	44.6	47.5	+2.5	140	1.80	0.45	11/17	0.80	3.02
462	NOV 17 58	564.68	48.4	37.6	48.4	46.5	48.4	+1.3	111	1.80	0.45	11/17	0.80	3.02
463	NOV 24 58	559.57	48.4	37.6	49.5	48.2	49.3	+0.7	167	1.80	0.45	11/17	0.80	3.02
464	DEC 01 58	557.46	49.5	37.6	49.0	47.4	48.5	-0.6	087	1.80	0.45	11/17	0.80	3.02
465	DEC 08 58	556.75	49.5	37.6	49.3	47.6	48.5	+0.0	161	1.80	0.45	11/17	0.80	3.02
466	DEC 15 58	562.67	49.5	37.6	48.6	46.5	47.4	-1.1	093	1.80	0.45	11/17	0.80	3.02
467	DEC 22 58	573.17	49.5	37.6	47.7	46.0	47.6	+0.2	101	1.80	0.45	11/17	0.80	3.02
468	DEC 29 58	572.73	49.5	37.6	48.0	46.5	48.0	+0.2	055	1.80	0.45	11/17	0.80	3.02

			STOCK PRICE (EIGHTHS)								DIVIDENDS			EARNINGS	
		YEAR			LAST WK		LAST	NET		LAT	LAT	REC	LAST	LAST
CODE	DATE	D-J	HIGH	LOW	HIGH	LOW	SALE	CHAN	S-T	YEAR	QUAR	DATE	QUAR	YEAR
469	JAN 05 59	578.59	49.5	37.6	49.2	47.6	49.0	+1.0	080	1.80	0.45	11/17	0.85	3.18
470	JAN 12 59	592.72	49.5	37.6	51.0	48.2	51.0	+2.0	111	1.80	0.45	11/17	0.85	3.18
471	JAN 19 59	595.75	51.0	37.6	51.0	48.4	48.6	-2.2	131	1.80	0.45	11/17	0.85	3.18
472	JAN 26 59	596.07	51.0	37.6	49.4	47.2	48.3	-0.3	077	1.80	0.45	11/17	0.85	3.18
473	FEB 02 59	593.96	51.0	37.6	48.1	47.1	47.4	-0.7	160	1.80	0.45	11/17	0.85	3.18
474	FEB 09 59	582.33	51.0	37.6	48.4	46.2	47.2	-0.2	127	1.80	0.45	02/16	0.85	3.18
475	FEB 16 59	587.97	51.0	37.6	48.6	47.0	48.4	+1.6	087	1.80	0.45	02/16	0.85	3.18
476	FEB 23 59	602.21	51.0	37.6	49.4	47.4	48.0	-0.4	103	1.80	0.45	02/16	0.85	3.18
477	MAR 02 59	603.50	51.0	37.6	49.7	47.2	49.2	+1.2	123	1.80	0.45	02/16	0.85	3.18
478	MAR 09 59	609.52	51.0	37.6	50.0	48.7	49.5	+0.3	147	1.80	0.45	02/16	0.85	3.18
479	MAR 16 59	614.69	51.0	37.6	50.6	49.1	50.2	+0.5	124	1.80	0.45	02/16	0.85	3.18
480	MAR 23 59	610.37	51.0	37.6	50.4	49.1	49.1	-1.1	116	1.80	0.45	02/16	0.85	3.18
481	MAR 30 59	606.58	51.0	46.2	49.6	47.4	48.3	-0.6	068	1.80	0.45	02/16	0.85	3.18
482	APR 06 59	611.93	51.0	46.2	49.7	47.2	49.6	+1.3	101	1.80	0.45	02/16	0.70	3.18
483	APR 13 59	605.97	51.0	46.2	50.6	48.2	49.5	-0.1	144	1.80	0.45	02/16	0.70	3.18
484	APR 20 59	624.06	51.0	46.2	51.1	48.5	50.6	+1.1	157	1.85	0.50	05/18	0.70	3.18
485	APR 27 59	627.39	51.1	46.2	52.3	50.3	51.1	+0.3	152	1.85	0.50	05/18	0.70	3.18
486	MAY 04 59	625.06	52.3	46.2	52.0	49.6	50.2	-0.7	133	1.85	0.50	05/18	0.70	3.18
487	MAY 11 59	621.36	52.3	46.2	52.1	50.6	52.1	+1.7	077	1.85	0.50	05/18	0.70	3.18
488	MAY 18 59	634.53	52.3	46.2	52.6	51.2	51.5	+0.0	089	1.85	0.50	05/18	0.70	3.18
489	MAY 25 59	634.74	52.6	46.2	52.0	50.0	51.5	+0.0	098	1.85	0.50	05/18	0.70	3.18
490	JUN 01 59	643.79	52.6	46.2	52.6	51.0	52.0	+0.3	123	1.85	0.50	05/18	0.70	3.18
491	JUN 08 59	629.98	52.6	46.2	54.2	51.4	53.4	+1.4	108	1.85	0.50	05/18	0.70	3.18
492	JUN 15 59	627.42	54.2	46.2	54.6	51.7	54.3	+0.7	105	1.85	0.50	05/18	0.70	3.18
493	JUN 22 59	629.76	54.6	46.2	53.7	52.1	53.7	-0.4	069	1.85	0.50	05/18	0.70	3.18
494	JUN 29 59	639.25	54.6	46.2	53.3	51.5	51.5	-2.2	109	1.85	0.50	05/18	0.70	3.18
495	JUL 06 59	654.76	54.3	46.2	53.2	51.3	53.0	+1.3	068	1.85	0.50	05/18	1.02	3.18
496	JUL 13 59	663.56	54.3	46.2	52.7	51.1	51.4	-1.4	152	1.85	0.50	05/18	1.02	3.18
497	JUL 20 59	657.13	54.3	46.2	52.3	51.0	52.3	+0.7	103	1.85	0.50	05/18	1.02	3.18
498	JUL 27 59	663.72	54.3	46.2	53.1	52.0	52.2	-0.1	076	1.85	0.50	05/18	1.02	3.18
499	AUG 03 59	674.88	54.3	46.2	52.6	51.7	52.2	+0.0	097	1.85	0.50	05/18	1.02	3.18
500	AUG 10 59	668.57	54.3	46.2	52.7	51.2	51.6	-0.4	098	1.90	0.50	08/17	1.02	3.18
501	AUG 17 59	658.74	54.3	46.2	53.3	51.5	52.4	+1.2	211	1.90	0.50	08/17	1.02	3.18
502	AUG 24 59	655.39	54.3	46.2	53.2	52.4	53.0	+0.4	122	1.90	0.50	08/17	1.02	3.18
503	AUG 31 59	663.06	54.3	46.2	53.5	52.4	53.3	+0.3	075	1.90	0.50	08/17	1.02	3.18
504	SEP 07 59	652.18	54.3	46.2	53.0	51.0	52.0	-1.3	080	1.90	0.50	08/17	1.02	3.18
505	SEP 14 59	637.36	54.3	46.2	52.7	50.2	52.2	+0.2	055	1.90	0.50	08/17	1.02	3.18
506	SEP 21 59	625.78	54.3	46.2	52.7	50.7	51.2	-1.0	081	1.90	0.50	08/17	1.02	3.18
507	SEP 28 59	632.59	54.3	46.2	51.4	49.2	49.4	-1.6	102	1.90	0.50	08/17	1.02	3.18
508	OCT 05 59	636.57	54.3	46.2	53.0	48.2	52.4	+3.0	116	1.90	0.50	08/17	0.90	3.18
509	OCT 12 59	636.98	54.3	46.2	52.7	50.2	50.2	-2.2	057	1.90	0.50	08/17	0.90	3.18
510	OCT 19 59	643.22	54.3	46.2	52.0	50.0	51.4	+1.2	049	1.90	0.50	08/17	0.90	3.18
511	OCT 26 59	633.07	54.3	46.2	53.6	50.0	50.2	-1.2	107	1.90	0.50	08/17	0.90	3.18
512	NOV 02 59	646.60	54.3	46.2	52.0	50.6	50.6	+0.4	099	1.90	0.50	08/17	0.90	3.18
513	NOV 09 59	650.92	54.3	46.2	51.7	50.4	51.0	+0.2	095	1.95	0.50	11/17	0.90	3.18
514	NOV 16 59	641.71	54.3	46.2	51.5	49.2	49.5	-0.7	087	1.95	0.50	11/17	0.90	3.18
515	NOV 23 59	645.46	54.3	46.2	50.4	47.6	49.3	-0.2	117	1.95	0.50	11/17	0.90	3.18
516	NOV 30 59	652.42	54.3	46.2	49.6	48.1	48.6	-0.5	089	1.95	0.50	11/17	0.90	3.18
517	DEC 07 59	664.00	54.3	46.2	51.0	48.2	49.6	+1.0	117	1.95	0.50	11/17	0.90	3.18
518	DEC 14 59	670.50	54.3	46.2	50.4	48.1	48.4	-1.2	159	1.95	0.50	11/17	0.90	3.18
519	DEC 21 59	676.65	54.3	46.2	49.3	48.1	48.3	-0.1	118	1.95	0.50	11/17	0.90	3.18
520	DEC 28 59	670.69	54.3	46.2	48.7	47.0	47.6	-0.5	089	1.95	0.50	11/17	0.90	3.18

				STOCK PRICE (EIGHTHS)							DIVIDENDS			EARNINGS	
				YEAR		LAST	WK	LAST	NET		LAT	LAT	REC	LAST	LAST
CODE	DATE		D-J	HIGH	LOW	HIGH	LOW	SALE	CHAN	S-T	YEAR	QUAR	DATE	QUAR	YEAR
521	JAN	04 60	679.36	54.3	46.2	48.5	47.3	47.6	+0.0	085	1.95	0.50	11/17	0.89	3.27
522	JAN	11 60	675.73	54.3	46.2	47.7	47.1	47.6	+0.0	141	1.95	0.50	11/17	0.89	3.27
523	JAN	18 60	659.68	54.3	46.2	48.1	46.2	46.6	-1.0	166	1.95	0.50	11/17	0.89	3.27
524	JAN	25 60	645.85	54.3	46.2	46.6	44.5	46.4	-0.2	286	1.95	0.50	11/17	0.89	3.27
525	FEB	01 60	622.62	54.3	44.5	46.7	45.5	46.0	-0.4	186	1.95	0.50	11/17	0.89	3.27
526	FEB	08 60	626.77	54.3	44.5	49.4	46.4	48.6	+2.6	173	2.00	0.50	02/17	0.89	3.27
527	FEB	15 60	622.23	54.3	44.5	49.2	46.0	46.5	-1.5	115	2.00	0.50	02/17	0.89	3.27
528	FEB	22 60	628.45	54.3	44.5	48.0	46.0	47.3	+0.6	164	2.00	0.50	02/17	0.89	3.27
529	FEB	29 60	632.00	54.3	44.5	50.0	46.6	50.0	+2.5	127	2.00	0.50	02/17	0.89	3.27
530	MAR	07 60	609.79	54.3	44.5	50.3	48.2	49.0	-1.0	185	2.00	0.50	02/17	0.89	3.27
531	MAR	14 60	605.83	54.3	44.5	49.0	46.0	48.3	-0.5	124	2.00	0.50	02/17	0.89	3.27
532	MAR	21 60	616.42	54.3	44.5	48.2	46.6	46.6	-1.5	094	2.00	0.50	02/17	0.89	3.27
533	MAR	28 60	622.47	54.3	44.5	49.7	48.0	49.2	+2.4	191	2.00	0.50	02/17	0.89	3.27
534	APR	04 60	615.98	54.3	44.5	50.3	49.2	50.2	+1.0	107	2.00	0.50	02/17	0.76	3.27
535	APR	11 60	628.10	54.3	44.5	50.2	49.0	49.7	-0.3	239	2.00	0.50	02/17	0.76	3.27
536	APR	18 60	630.12	54.3	44.5	50.2	49.3	50.0	+0.1	089	2.00	0.50	02/17	0.76	3.27
537	APR	25 60	616.32	50.3	44.5	50.5	49.2	50.4	+0.4	134	2.00	0.50	05/17	0.76	3.27
538	MAY	02 60	601.70	50.5	44.5	51.2	50.0	50.3	-0.1	110	2.00	0.50	05/17	0.76	3.27
539	MAY	09 60	607.62	51.2	44.5	51.3	50.0	51.2	+0.7	116	2.00	0.50	05/17	0.76	3.27
540	MAY	16 60	616.03	51.3	44.5	51.7	50.4	51.2	+0.4	119	2.00	0.50	05/17	0.76	3.27
541	MAY	23 60	625.24	51.7	44.5	52.3	51.2	51.7	+0.5	126	2.00	0.50	05/17	0.76	3.27
542	MAY	30 60	624.78	52.3	44.5	52.4	51.2	52.4	+0.5	149	2.00	0.50	05/17	0.76	3.27
543	JUN	06 60	628.98	52.4	44.5	54.2	52.4	53.0	+0.4	107	2.00	0.50	05/17	0.76	3.27
544	JUN	13 60	654.88	54.2	44.5	54.7	52.5	54.3	+1.3	137	2.00	0.50	05/17	0.76	3.27
545	JUN	20 60	650.89	54.7	44.5	58.0	54.6	58.0	+3.5	118	2.00	0.50	05/17	0.76	3.27
546	JUN	27 60	647.01	58.0	44.5	59.5	56.5	59.5	+1.5	132	2.00	0.50	05/17	0.76	3.27
547	JUL	04 60	641.30	59.5	44.5	60.4	58.4	60.0	+0.3	125	2.00	0.50	05/17	1.02	3.27
548	JUL	11 60	646.91	60.4	44.5	59.7	59.1	59.6	-0.2	039	2.00	0.50	05/17	1.02	3.27
549	JUL	18 60	630.24	60.4	44.5	59.3	57.0	57.4	-2.2	096	2.00	0.50	05/17	1.02	3.27
550	JUL	25 60	609.87	60.4	44.5	58.2	56.2	56.3	-1.1	087	2.00	0.50	05/17	1.02	3.27
551	AUG	01 60	616.73	60.4	44.5	57.0	53.0	56.6	+0.3	099	2.00	0.50	05/17	1.02	3.27
552	AUG	08 60	614.29	60.4	44.5	57.7	56.2	58.7	+2.1	081	2.00	0.50	08/17	1.02	3.27
553	AUG	15 60	626.18	60.4	44.5	59.7	58.2	59.4	+1.1	082	2.00	0.50	08/17	1.02	3.27
554	AUG	22 60	629.27	60.4	44.5	59.7	58.2	58.4	-1.0	065	2.00	0.50	08/17	1.02	3.27
555	AUG	29 60	636.13	60.4	44.5	60.0	59.0	59.0	+0.4	113	2.00	0.50	08/17	1.02	3.27
556	SEP	05 60	625.22	60.4	44.5	60.6	58.5	60.2	+1.2	073	2.00	0.50	08/17	1.02	3.27
557	SEP	12 60	614.12	60.6	44.5	61.6	59.2	61.6	+1.4	079	2.00	0.50	08/17	1.02	3.27
558	SEP	19 60	602.18	61.6	44.5	62.0	60.4	61.4	-0.2	073	2.00	0.50	08/17	1.02	3.27
559	SEP	26 60	585.20	62.0	44.5	60.7	59.1	59.5	-1.7	075	2.00	0.50	08/17	1.02	3.27
560	OCT	03 60	580.14	62.0	44.5	59.1	56.4	58.0	-1.5	126	2.00	0.50	08/17	0.88	3.27
561	OCT	10 60	586.42	62.0	44.5	58.5	57.0	58.4	+0.4	077	2.00	0.50	08/17	0.88	3.27
562	OCT	17 60	596.48	62.0	44.5	59.0	57.4	58.6	+0.2	088	2.00	0.50	08/17	0.88	3.27
563	OCT	24 60	577.55	62.0	44.5	60.0	58.5	58.5	-0.1	078	2.00	0.50	08/17	0.88	3.27
564	OCT	31 60	577.92	62.0	44.5	60.7	58.0	60.2	+1.5	121	2.00	0.50	08/17	0.88	3.27
565	NOV	07 60	596.07	62.0	44.5	61.6	59.4	60.4	+0.2	093	2.00	0.50	11/17	0.88	3.27
566	NOV	14 60	608.61	62.0	44.5	62.0	59.7	62.0	+1.4	069	2.00	0.50	11/17	0.88	3.27
567	NOV	21 60	603.62	62.0	44.5	62.3	59.0	60.4	-1.0	106	2.00	0.50	11/17	0.88	3.27
568	NOV	28 60	606.47	62.3	44.5	60.2	58.2	59.0	-1.4	102	2.00	0.50	11/17	0.88	3.27
569	DEC	05 60	596.00	62.3	44.5	62.7	59.3	62.3	+3.3	194	2.00	0.50	11/17	0.88	3.27
570	DEC	12 60	610.90	62.7	44.5	66.2	61.6	62.7	+0.4	237	2.00	0.50	11/17	0.88	3.27
571	DEC	19 60	617.78	66.2	44.5	64.2	62.2	63.0	+0.1	143	2.00	0.50	11/17	0.88	3.27
572	DEC	26 60	613.23	66.2	44.5	63.2	59.4	61.0	-2.0	104	2.00	0.50	11/17	0.88	3.27

APPENDIX II
(Miscellaneous Figures)

FIGURE 13


RATIO OF
NATIONAL DAIRY PRODUCTS CORP.
TO
THE BORDEN COMPANY
100
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60
40
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0
1929
30
31
32
33
34
35
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37
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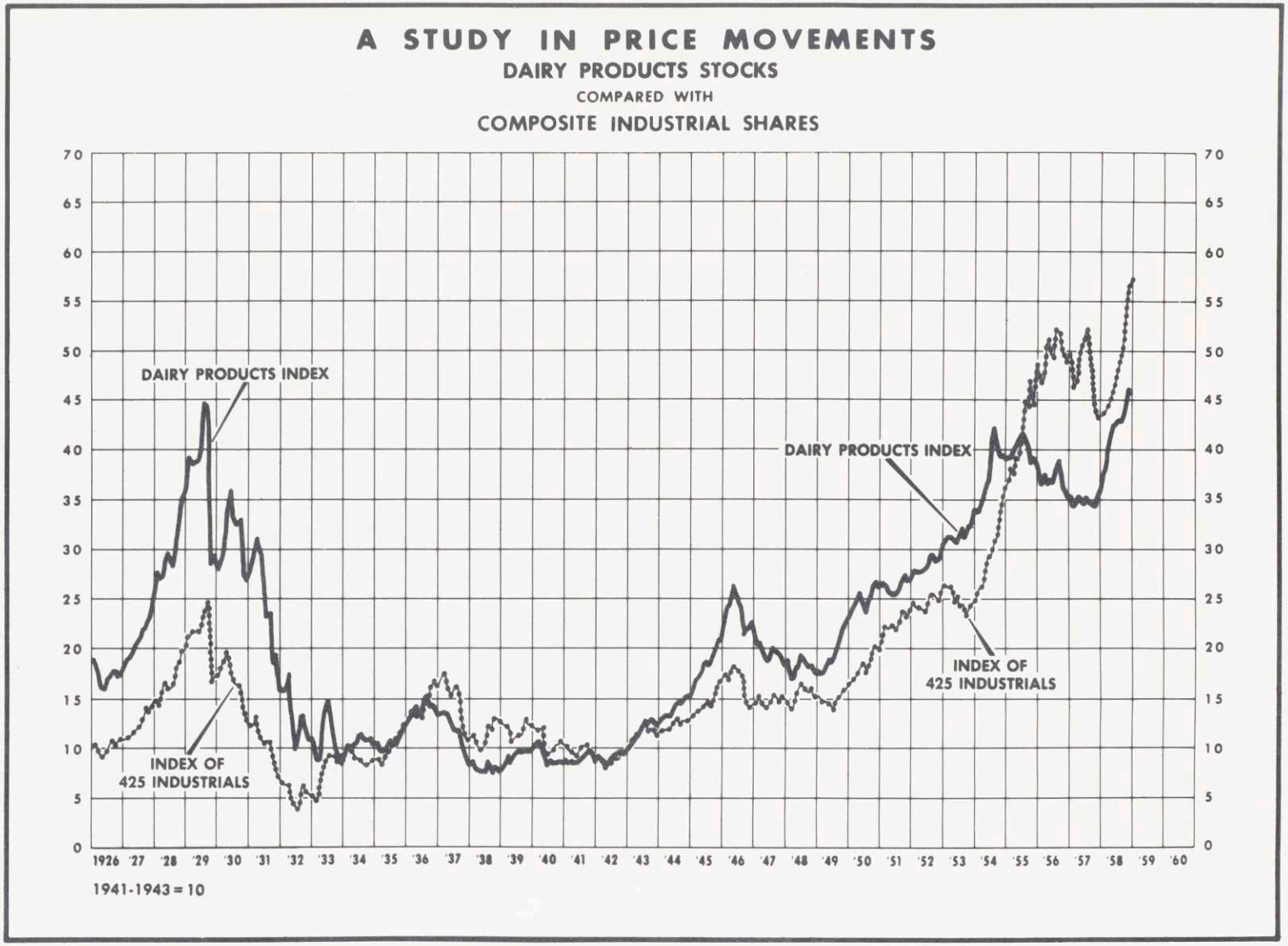
A STUDY IN PRICE MOVEMENTS
DAIRY PRODUCTS STOCKS
COMPARED WITH
COMPOSITE INDUSTRIAL SHARES
DAIRY PRODUCTS INDEX
INDEX OF 425 INDUSTRIALS
DAIRY PRODUCTS INDEX
INDEX OF 425 INDUSTRIALS
70 65 60 55 50 45 40 35 30 25 20 15 10 5 0
1926 '27 '28 '29 '30 '31 '32 '33 '34 '35 '36 '37 '38 '39 '40 '41 '42 '43 '44 '45 '46 '47 '48 '49 '50 '51 '52 '53 '54 '55 '56 '57 '58 '59 '60
1941-1943 = 10

FIGURE 14