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AN EMPIRICAL STUDY.

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EFFICIENT MARKET THEORY AND TRADING HALTS: AN EMPIRICAL STUDY

by

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A dissertation submitted to the Graduate Faculty in Business in partial fulfillment of the requirements for the degree of Doctor of Philosophy, The City University of New York

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This manuscript has been read and accepted by the Graduate Faculty in Business in satisfaction of the dissertation requirement for the degree of Doctor of Philosophy.

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PREFACE

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CHAPTER I

INTRODUCTION

Hypothesis

To test the hypothesis that the stock market adjusts to trading halts efficiently and instantaneously as stated in the efficient markets model.

Background

Efficient markets theory states that all available information is reflected in the existing price of a security. Therefore, incremental analysis of empirical data on price patterns, or on the fundamentals of industry or corporate operations, will not be helpful. Successive price changes after adjustment for market movements will be random with an expected value of zero. Consequently, attempts to build a model to yield profits greater than that produced by market averages after adjustment for risk, will be unsuccessful. The theory is divided into three subjects: strong form, semi-strong form and weak form, based on the degree of rigidity of the underlying assumptions.

Importance of Topic

A. Current Topic in Literature

Although articles on evidence of random movements in stock prices date back to the early nineteen hundreds,[1] the efficient market model was not developed until the nineteen sixties.[2] The proponents and the opponents of the theory have been engaging in a lively debate on the subject for many years. The weight of scientific evidence has been on the side of the advocates of the model; consequently it has been gaining in favor. Major articles on the topic have been published in leading financial journals in recent years.[3] The lack of consensus on many issues suggests that it will continue to be one of the more important finance topics in the future.

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[1]For early articles see Paul Cootner (ed.), The Random Character of Stock Market Prices (Cambridge: the M.I.T. Press, 1971).

[2]Paul A. Samuelson, "Proof that Properly Anticipated Prices Fluctuate Randomly," Industrial Management Review, VII (Spring, 1965), pp. 41-49; Eugene E. Fama, The Behavior of Stock Market Prices," The Journal of Business, XXXVIII (January, 1965), pp. 34-105.

[3]Eugene E. Fama, et al., "The Adjustment of Stock Prices to New Information," International Economic Review, X (February, 1969), pp. 1-21; Eugene F. Fama, "Efficient Capital Markets: A Review of Theory and Empirical Works," The Journal of Finance, XXV (May, 1970), pp. 383-417; Myron Scholes, "The Market for Securities: Substitution versus Price Pressure and the Effect of Information on Share Prices," The Journal of Business, XLIV (April, 1972), pp. 179-211; Alan Kraus and Hans R. Stoll, "Price Impact of Block Trading on New York Stock Exchange," The Journal of Finance, XXVII (June, 1972), pp. 569-88.

B. Impact on Existing Financial Theory

Overall acceptance of efficient markets theory would provide the investments area with a powerful economic model and move it even farther away from the qualitative approach of the past. By challenging the assumption that further analysis of empirical data can provide residual yields on investments (returns in excess of the market after adjustment for risk), it would also result in major changes in valuation models and portfolio theory.

C. Public Policy Questions

The points brought up revolve around the question of whether the capital markets are efficient. If they are, then institutions set up to manage money with their in-house research departments and substantial commission expenditures may be inefficient when compared with one-decision buy and hold strategies.[4] If, on the other hand, large expenditures on research and close contacts with companies they invest in provide institutions with the potential for residual profits, is the small investor who chooses not to use financial intermediaries then unfairly discriminated against? The SEC recently has become in-

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[4]See M. C. Jensen, "The Performance of Mutual Funds in the Period 1945-64," The Journal of Finance, XXIII (May, 1968, pp. 389-416; also, Securities and Exchange Commission, Institutional Investor Study Report of the Securities and Exchange Commission 92nd Congress, 1st Session, House Document No. 92-64 (Washington, D.C.: U.S. Government Printing Office, 1971).

creasingly concerned with the information process and has moved aggressively to restrict the flow of "insider" information. Obviously further testing of efficient markets theory using recent data would be of current benefit.

Specific Contributions of this Study

A. New Body of Research Data Used

As Pettit mentioned in his article, since each study in the past has concentrated on only one area of information, "the validity of the hypothesis is confirmed only as more kinds of information are studied."[5] The need for analysis of alternative research data is also indicated by the fact that most research done to date, although substantial in terms of contribution, has had weaknesses in methodology or in the data analyzed. Kraus and Stoll's analysis of block trades[6] and Scholes' analysis of secondary distributions[7] were not news of a fundamental nature as presented by the company. Scholes himself admitted that he chose secondary instead of primary distributions because they ". . . are the result of decisions that are presumably independent of factors affecting company opera-

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[5]R. Richardson Pettit, "Dividend Announcements, Security Performance and Capital Market Efficiency," The Journal of Finance, XXVII (December, 1972), p. 993.

[6]Kraus and Stoll, The Journal of Finance, XXVII (June, 1972), pp. 569-88.

[7]Scholes, The Journal of Business, XLIV (April, 1972), pp. 179-211.

tions.[8] (Actually secondaries are not entirely independent since Scholes shows that insiders are able to earn above-average returns.)[9] Moreover, the results of Scholes' analysis are flawed by the fact that he did not include secondary issues cancelled in his study which may have been cancelled due to extreme negative price pressure. Fama, Fisher, Jensen, and Roll's (hereafter referred to as FFJ&R) analysis of stock splits[10] is concerned with a development which has no fundamental significance itself and which is news only insofar as it leads to the expectation of other favorable developments.

B. More Precise Investigation of Information Hypothesis

Most research studies concerning the impact of new information on security prices have had difficulty determining when that information was first announced or, in any event, have analyzed the period surrounding the announcement in terms of weeks or months. For example, the FFJ&R article on stock splits assumed that the announcement date was eight weeks prior to the split--the average amount of time observed empirically. Since FFJ&R did not study the period from announcement date to split date, it is not possible to know how long it took for the news

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[8] Ibid., p. 186.

[9] Ibid., p. 203.

[10] Fama, et al., International Economic Review, X (February, 1969), pp. 1-21.

to be disseminated. Additionally, as Brealey points out, one cannot be sure that the residual tendencies found prior to the split data are not due entirely to stocks with late announcement dates[11] instead of other alternatives, such as insider activity or anticipation of the split by other investors. The importance of analyzing this period carefully is emphasized in Davis' dissertation,[12] since he found that it took from one to three days to disseminate "low level" news published in The Wall Street Journal. Consequently, it is important to test whether it could be profitable to benefit from quick reaction to more significant news. By using the data available in this study, it will be possible to analyze not only the effect of dissemination of news by day but also the instantaneous adjustments by looking at the last trade before the halt, the opening trade after the halt, and to compare these with closing price on the days surrounding the announcement.

C. Initial Multi-Content Approach to the Announcement Effect

Trading halts are extraordinary events which occur because of the inability of specialists to match buy and

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[11] Richard A. Brealey, Security Prices in a Competitive Market: More about Risk and Return from Common Stocks (Cambridge: The M.I.T. Press, 1971), p. 70.

[12] J. V. Davis, "The Adjustment of Stock Prices to New Information," Unpublished Ph.D. dissertation, Cornell University, 1967.

sell orders due to a material change in the potential buyer's and/or seller's perception of the intrinsic value of a stock. Alternatively, the halt is sometimes due to the ex-ante belief of the New York Stock Exchange (acting in some cases at the suggestion of the company involved) that the announcement to come, or which has just come, is of sufficient importance to stop trading in the shares and allow time for news to be disseminated. The extraordinary nature of this event can be ascertained by generalizing from past data. The 434 trading halts that occurred during the first nine months of 1972 suggest that the average common stock, which is available for trading more than five hours a day, 250 days a year, has its trading stopped temporarily less than once every two years. Individual trading halts can reflect changes in any one of a number of factors since there are a variety of items that could conceivably alter the relative outlook for a company. Heretofore, individual research study has been restricted to one specialized kind of announcement (dividend changes, secondary offerings) because of the difficulty of determining when new items are released and whether they are material in substance.

Review of Literature

An important overview of efficient capital marekets and random walk theory was presented by one of its leading proponents, Eugene Fama, in a journal article in 1970.[13] Fama defined efficient capital markets as a market in which prices always "fully reflect" available information. The conditions for capital market efficiency in practice, according to Fama, are:

1. "transactors take account of all available information."

2. "sufficient numbers of investors have ready access to available information."

3. An absence of investors "who can consistently make better evaluations of available information than are implicit in market prices."[14]

Within the context of efficient capital markets is the "fair game" model, as introduced by Mandelbrot[15] and Samuelson.[16] The "fair game" model uses expected return as the measure of market equilibrium and states that since all available information is reflected in a stock, no one can anticipate an above-average return on his investment.

The theory can be described notationally as:

$$E(\tilde{p}_{j,t+1} \mid \phi_t) = [1+E(r_{j,t+1} \mid \phi_t)]p_{jt}$$

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[13] Eugene F. Fama, The Journal of Finance, XXV (May, 1970), pp. 383-417.

[14] Ibid., pp. 387-88.

[15] Benoit Mandelbrot, "Forecasts of Future Prices, Unbiased Markets, and Martingale Models," The Journal of Business, XXXIX (Special Supplement, January, 1966), pp. 242-55.

[16] Samuelson, Industrial Management Review, VII (Spring, 1965), pp. 41-49.

Legend for preceding section:

E = expected value

p_{jt} = price of security j at time t

r_{jt+1} = one period % return $(p_{jt+1}-p_{jt})|p_{jt}$

ϕ = information set at time t

$\sim$ = denotes random variable at time t

The martingale model in efficient markets as stated on the preceding page is one in which the conditional expectation of the price of the ntl term is equal to the n^{th} value of security j. The stock market is a submartingale, however, since there is a long term trend upward in price within it,[17] and empirical testing of the models must adjust for it by comparing the return for a security or portfolio with the market return.[18] Therefore,

$$E(\tilde{p}_{j,t+1}|\phi_j) \geq p_{jt}$$

The random walk model is a special submartingale efficient markets model which states that successive price changes are independent and identically distributed. The characteristic of an independent distribution is that the security has no detectable cycle or pattern. An identi-

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[17]See L. Fisher and J. H. Lorie, "Rates of Return on Investments in Common Stock," The Journal of Business, XXXVII (January, 1964), pp. 1-21.

[18]Of course, individual stocks that are negatively correlated would have $E(p_{jt+1}|\phi_t) < p_{jt}$.

cally distributed group of securities is one in which the rates of return distributions are stationary. Obviously, if no pattern can be found in the data that leads to an above-average return because all the available information currently is in the price of the stock, then neither detailed fundamental analysis nor technical analysis can be useful. The formula for the random walk model is given below.

$$f(r_{j,t+1}|\Phi_t)=f(r_{j,t+1})$$

f = the density function

The efficient markets model is generally separated into three sections based on the assumptions of the submodels. The strong form, which is the most rigorous, maintains that all information whether publicly or privately available is reflected in the price of a security. That statement suggests that no one possesses information that is useful in gaining above-average returns. Tests by Niederhoffer and Osborne[19] on specialists indicated that they possess information concerning interested buyers and sellers which is not available to others and that this information can be used to gain substantial residual profits. Scholes' work concerning insiders in secondary

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[19]V. Niederhoffer and M. Osborne, "Market Making and Reversal on the Stock Exchange," Journal of the American Statistical Association, LXI (December, 1966), pp. 897-916.

distributions[20] suggests that corporate executives who invest in their own stock frequently possess information that can lead to performance which exceeds stock market averages. Therefore, as Fama indicates about the strong form subset, "we already have enough evidence to determine that the model is not strictly valid."[21]

The weak form hypothesis, on the other hand, is the least severe form of the efficient markets model. Researchers using this subset of the model make no assumptions about information at all except as to the interpretation of patterns of trading in particular shares. Various permutations and combinations of filter rules and trading rules were tested by Niederhoffer and Osborne,[22] Fama and Blume,[23] and others. While patterns were sometimes discovered (for example, Niederhoffer found that a movement in the price of a stock in one direction is followed by a reversal in significantly more than 50% of the cases), no one was able to anticipate above-average profits from the rules after deducting commissions.

The semi-strong form of the efficient markets model is perhaps the most widely tested of the three,

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[20]Scholes, The Journal of Business, XLIV (April, 1972), p. 202.

[21]Fama, The Journal of Finance, XXV (May, 1970, p. 408.

[22]Niederhoffer and Osborne, Journal of American Statistical Association, LXI (December, 1966), pp. 897-916.

[23]Eugene Fama and Marshall Blume, "Filter Rules and Stock Market Trading," The Journal of Business, XXXIX (January, 1966), pp. 226-41.

for it properly merges a rational hypothesis, with origins in classical economic theory and empirical data. It states that all publicly available information is fully reflected in the price of a security. Consequently, the important articles in those fields will be described more extensively, starting with five research studies.

Fama, Fisher, Jensen and Roll

The most prominent article on the semi-strong form efficient markets hypothesis and the adjustment of stock prices to new information was by Fama, Fisher, Jensen and Roll[24] (FFJ&R) published in 1969. Their article can be distinguished from previous research in that they focused on the semi-strong market hypothesis testing while previous literature was concerned primarily with the weak form of the efficient market hypothesis. The period examined was the thirty months prior to and after the effect date of the stock split as to their market performance, as compared with the average for all securities listed on the New York Stock Exchange. They found that in the two-and-one-half year period prior to the stock split, the average positive residual was approximately 33%. In the two-and-one-half year period subsequent to the split, however, there were no average residuals, but instead the shares over time consistently performed at about the same rate as the average security on the exchange. FFJ&R concluded

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[24]Fama, et al., International Economic Review, X (February, 1969), pp. 1-21.

that the strong residual performance prior to the split was not due to anticipation of the split per se but to an improvement relative to the market in the future earnings and dividend prospects of the company; more specifically, the dividend would be increased very shortly thereafter. An analysis of the price performance of those companies that did not raise their cash payout tended to bear out this hypothesis, since the shares performed poorly over the following twelve months. The absence of residual performance subsequent to the effective date of the split was viewed as evidence that there was no method of profiting from investment in these securities at any time after the split took effect. FFJ&R concluded that the market adjusts quickly to new information presented, thereby confirming their belief in the semi-strong efficient market hypothesis. FFJ&R did not explore comprehensively the period surrounding the announcement of the stock split. They did compare the announcement month and the split month as a whole for a sample of securities tested and found behavior of residuals after both months to be similar.

Scholes

Myron Scholes' dissertation and his article published in 1972[25] extended empirical testing of new information and efficient markets hypothesis to secondary distri-

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[25]Scholes, The Journal of Business, XLIV (April, 1972), pp. 179-211.

butions.[26] For the first time, large volume (block) trading was introduced as a consideration and the analysis of subsequent performance of securities by type of seller was made. Price performance was compared with the Standard and Poor 500 Index after adjustment for systematic and non-systematic risk for the seventy day period surrounding the secondary offering. The types of sellers were separated into five general categories: investment companies, banks and insurance companies, individuals, corporations or corporate officers, and estates and trusts. In the case of secondary issues the "information" was not released by the management of the company invested in, but by the stockholders who may have been signaling a change in their expectations of future earnings of the company by selling their shares. Unfortunately, it is not possible to distinguish between changes in expectations of the company and other reasons for selling the stock, such as the belief that there are better investment opportunities in other equities, or forced liquidation through mutual fund redemptions. Scholes found that the stock market viewed the "information" received by each category of seller differently. The category of corporations and officers is believed to be the most informative

[26]Sales of securities in which underwriters acting as principal or agent buy an entire block of stock from the selling shareholder, instead of the stockholder offering his shares on the floor of the exchange.

since it may have access to insider information, a characteristic consistent with the semi-strong markets hypothesis. (These results tended to bear on this contention with an average positive residual of 8% in the eighteen month period prior to the secondary for corporations and officers and a 6% negative residual in the year-and-a-half after the sale of their stock, but this information as to the type of seller is not known at the time of many offerings.) Scholes found that the market took approximately six days to adjust to the sale of the secondary. However, as will be explained below, the negative residual overall did not present any opportunity for above-average profits, and Scholes believes that the price declines could be due to stock "overhanging the market or the investment banking group 'easing' the price adjustment in the market."

However, it was not Scholes' primary intention to measure the effects of information on share prices. In fact, Scholes indicated that he chose secondary issues instead of primary ones because announcements of new issues are not issued by the company and are therefore more independent of the changes in the internal workings of the firm. Rather, Scholes was interested primarily in the impact of large volume trades on the stock market. He tested two alternative hypotheses. The first one, the "selling pressure hypothesis," suggests that large discounts for current prices are needed to sell large blocks of stocks. Investors view individual companies as having low cross elasticities of demand because of strong individual characteristics and therefore small declines in the price of stock will not induce investment by new buyers. The alternative hypothesis, which is consistent with the theory of efficient markets, assumes that individual securities are readily substitutable for one another since investors are concerned primarily with risk and return and not with other characteristics peculiar to any one company. In his empirical testing, Scholes found no significant relationship between the size of the secondary and its drop in price before or after being offered. This, of course, is consistent with the substitution hypothesis. He found that the stocks declined about 1% in the five days after the secondary, and in the eighteen month period tested thereafter there were no residual returns. The buyer of the shares in a secondary did not pay commissions--they are absorbed by the seller in an underwriting--which came to approximately 1%. On balance, there was no net profit or loss for him. The buyer who waited the five days after the secondary until the shares reached their lowest point would have his 1% savings in market price offset by the 1% commission. Since Scholes' results indicate that block trading itself does not lead to drops in stocks, he attributed the entire drop of 2% in the twenty-five days before the secondary and the five days after the secondary to information possessed by the seller. But the seller cannot profit by this information because he would have to pay an average 2% commission to the investment banker for his services, and the market would decline roughly 1% before he had the opportunity to sell. The other holders of the stock who can sell after the announcement of the secondary, but prior to the offering, if they are to avoid an average 1% decline (there is a 1% decline prior to the announcement) must pay a 1% commission. Consequently, Scholes found that there is no mechanical trading rule for making profits on a secondary offering. The author concluded with his belief that individuals and organizations with large holdings in a firm need not be concerned with disposing of them. He said, "Since the empirical evidence suggests that price discounts are not necessary to sell new issues, managers can concentrate on the investment worth of projects, without committing energies to evaluation of the effects of selling quantities of stock on share prices."[27] A significant implication of Scholes' hypothesis is that at least before their administrative and selling expenses, mutual funds must be considered insiders in view of their access to expert opinion.

Kraus and Stoll

Kraus and Stoll (hereafter referred to as K&S),[28] in their July 1972 article, disputed Scholes' conclusion as to the cause of changes in price in connection with

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[27]Scholes, ibid., p. 211.

[28]Kraus and Stoll, The Journal of Finance, XXVII (June, 1972), pp. 569-88.

block trades. K&S maintained that the price declines were due to the "distribution effect" (their term for Scholes' "selling pressure hypothesis") and not the "information effect." K&S collected information on all block trades over 10,000 shares on the New York Stock Exchange during the period July 1, 1968 - September 30, 1969. The blocks were separated into those "bought," those "traded," and those "sold" with the criterion being whether the transaction was effected on a minus, zero, or plus tick. The blocks were examined for the twenty day period surrounding the transaction date. For minus ticks, K&S found an almost 40% recovery in price of the shares after the block was traded, as compared with the closing price on the previous day. On the other hand, they found no major change in price subsequent to a block being traded on a plus tick. The results were then mixed overall with the absence of a recovery on blocks "bought" consistent with the information hypothesis presented by Scholes--the change in price is due to the new information implied by an informed purchaser in the market--while the partial recovery on blocks sold being consistent with the distribution hypothesis; that is, the need to convince less willing buyers to purchase the stock. In contrast to Scholes' research, however, K&S found a significant positive relationship between the size of the block and the impact of price for both blocks bought and sold. This factor would be consistent with the distribution hypothesis. K&S also found serial correlation in price pattern starting three days before the block was transacted, but felt that the pattern need not be inconsistent with the random walk hypothesis; the current block may have been preceded by other blocks, or the market could have discovered that the block was for sale. Since, in the majority of cases, blocks are "sold" not "bought" (empirically a three-to-one ratio), they find the distribution hypothesis more convincing in explaining the effects of block trading than Scholes' information hypothesis. K&S said, "The difference in these empirical results (with Scholes' findings) appears to be due to differences in institutional arrangements for handling large sales through secondary distributors and through block trades. In a secondary, the underwriter usually takes the entire issue at risk and is not constrained in the commission he charges. Contrary to Scholes' assumption, commissions on secondary distributions are significantly higher than normal NYSE commissions."[28] K&S conclude that institutions do affect the prices of stocks, and, contrary to the efficient markets hypothesis, it is possible to benefit from a filter rule of buying stocks during block selling if one is a member of the New York Stock Exchange and does not have to pay the normal commission.

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[29]Kraus and Stoll, <u>ibid</u>., p. 586.

Klemkosky

Robert Klemkosky's article[30] published in 1977 deals with institutional buying and selling of securities. Mr. Klemkosky analyzed the ten largest net dollar purchases and sales of securities by investment companies each quarter for the period 1963-1972. These one-sided transactions, named "net trading imbalances," were separated into buying and selling segments. Since the source used Vickers, which only publishes results quarterly, Klemkosky was not able to pinpoint the exact day or month of the transaction, only its quarter. For buying imbalances Klemkosky found significant positive residuals, adjusted for aggregate market effects, beginning eight months before the trading imbalance quarter. These residuals continued to mount during the three months of the net imbalance. However, after a three month period subsequent to the event quarter, the residuals began to decline steadily. For the period as a whole, the cumulative residual to month -1 was + 8%, the peak during the imbalance period was + 16%, and after month + 12 was + 9%. For selling imbalances, interestingly, similar--not opposite--results were noted for the period prior to and after the quarter of the event. (The event quarter was significantly negative, however.) A cumulative positive residual

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[30]Robert Klemkosky, "The Impact and Efficiency of Institutional Net Trading Imbalances," The Journal of Finance, XXXII (March, 1977), pp. 79-86.

was noted which peaked in month -4 at 8% (with month -1 having 7%), which declined during the selling imbalance quarter to a low of + 3% and then declined fairly steadily to - 5% at the end of month + 12.

Klemkosky concluded that the institutions "participating in the net buying may have been influenced by the favorable abnormal returns [prior to or during the imbalance period], whereas the funds doing the net selling may have correctly perceived the securities to be overvalued."[31] Klemkosky also found that the results supported the Institutional Investor Study[32] and the study by Friend *et al.*[33] who believed that buying patterns of investment companies influence stock prices. Finally he indicated his evidence supports the "follow-the-leader type of trading pattern found in the study by Friend,"[34] "whereby certain leader institutions purchase a particular security before the culmination of the large net buying imbalance[35] . . . and for negative imbalances, "certain leader institutions traded first, because the $\bar{AR}_m$ was significantly negative in the month immediately preceeding the large net selling."[36]

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[31]Klemkosky, *ibid.*, pp. 85-86.

[32]Securities and Exchange Commission (92nd Congress; 1st Session, House Document No. 92-64).

[33]Irwin Friend, Marshall Blume and Jean Crockett, *Mutual Funds and Other Institutional Investors. A New Perspective* (New York: McGraw Hill Book Company, 1970).

[34]Klemkosky, *The Journal of Finance*, XXXII (March, 1977), p. 84.

[35]*Ibid.*

[36]*Ibid.*, p. 85.

Basu

S. Basu's article published in 1977[37] explores the effect of price earnings multiples on common stock returns. The actual data have averaged about 500 New York Stock Exchange common stocks for the period September 1956-August 1971. The stocks were ranked by PE ratio and divided into five portfolios. The PE ratio was calculated once a year, on April 1, since most companies with fiscal years ending December 31 (which were the only ones selected for this test) reported within three months. Each of the five portfolios was held for one year and then dissolved with the proceeds employed in new portfolios with the same ranking by PE multiple. The average annual rate of return after adjustment for aggregate market effects, was highest for low multiple stocks and was lowest for high multiple stocks. The average annual rates of return ranked from highest to lowest PE multiples are as follows: 9.34%, 9.28%, 11.7%, 13.6%, 16.3%.[38] The differences in results were statistically significant. Basu found that beta coefficients were significantly higher for high PE stocks. He indicated that he believed high PE stocks signified "exaggerated investor expectations."[39]

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[37]S. Basu, "Investment Performance of Common Stocks in Relation to Their Price-Earnings Ratios: A Test of the Efficient Market Hypothesis," The Journal of Finance, XXXII (June, 1977), pp. 663-82.

[38]Ibid., Table 1, p. 667.

[39]Ibid., p. 680.

Other Contributors

Other important research studies includ block trading,[40, 41, 42] the announcement effect and Federal Reserve discount rate exchanges,[43] the information content of recurring types of data,[44] the information content of changes in dividend policy,[45] special information and insider trading,[46] and the Securities and Exchange Commission's study of institutional investors.[47]

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[40]Paul C. Grier and Peter S. Albin, "Non Random Price Changes in Association with Trading in Large Blocks," The Journal of Business, XLVI (July, 1973), pp. 425-33.

[41]Larry Dann, David Mayers and Robert Raab Jr., "Trading rules, large blocks and the speed of price adjustment," Journal of Financial Economics, IV (January, 1977), pp. 3-22.

[42]Kenneth J. Carey, "Nonrandom Price Changes in Association with Trading in Large Blocks Evidence of Market Efficiency in Behavior of Investor Returns," The Journal of Business, L (October, 1977), pp. 407-14.

[43]Roger N. Waud, "Public Interpretation of Discount Rate Changes: Evidence on the 'Announcement Effect,'" Econometrics, XXXVIIII (April, 1970), pp. 231-50.

[44]Davis, Unpublished Ph.D. dissertation, Cornell University.

[45]Pettit, The Journal of Finance, XXVII (December, 1972), pp. 993-1007.

[46]Jeffrey F. Jaffe, "Special Information and Insider Trading," The Journal of Business, XLVII (July, 1974), pp. 410-28.

[47]Securities and Exchange Commission (92nd Congress, 1st Session, House Document No. 92-64).

In contrast to the articles previously mentioned, which tested empirically efficient market theory, Smidt provides a theoretical basis for possibile inefficiencies in the capital market.[48] Smidt indicates that "a search for systematic tendencies is likely to be more fruitful if it is guided by special hypotheses about the characteristics of the systematic tendencies that are believed to be present." He "consider[s] the kinds of behavior that seem most likely to produce some residual systematic tendencies in sequences of price change."[49] Smidt considers three main types of potential systematic tendencies. They result from "demand for liquidity, lags in response to new information, and inappropriate responses to new information."[50]

Demand for liquidity is the desire to move from stock ownership to cash. If there is a large demand for liquidity, as reflected in large blocks of stock for sale, the seller may have to accept a discount from current market price to trade his shares for cash. The trader could take this opportunity to purchase the shares and potentially receive a residual return when the shares are sold at higher levels. As Smidt says: "Large liquidity demands, spread over a period of days should produce a reversal pattern."[51]

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[48]Seymour Smidt, "A New Look at the Random Walk Hypothesis," Journal of Financial and Quantitative Analysis, III (September, 1968), pp. 235-61.

[49]Ibid., pp. 238-39. [50]Ibid., p. 239.

[51]Ibid., p. 245.

The second source of residual returns, lags in response to new information, arise because of dependencies in the information generating process. As Smidt indicates, "If frictions exist, as they undoubtedly do in the real world, then there should be some lags in the response of prices to new information. . . . The challenge in this instance, as in others, is to identify the lags in response to new information, and to estimate whether their magnitude is justified by the cost of reducing them even further. The frictionless model would be violated if prices failed to respond to relevant new information, or if they responded, but not immediately. A delay in the response to new information might take the form of a rapid adjustment that occurred some time after the new information became available. A delay could also take the form of a gradual adjustment of prices to the new information. In the latter case there should be a systematic tendency for price movements in one direction to be followed by additional movements in the same direction, a pattern that could be called a price trend."[52]

The final source of residual returns, which Smidt calls speculative bubbles, are produced by an inappropriate response to new information. "Superficially the price pattern produced by a speculative bubble resembles the dips or bulges produced by liquidity demands, except that speculative bubbles are likely to produce larger

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[52] Ibid., pp. 251-52.

price fluctuations and to extend over much longer periods of time. The price fluctuations caused by demands for liquidity are normally caused by the action of a single decision-making unit. Speculative bubbles, like trends, are the result of the actions of large numbers of decision-making units responding to the same information. In the case of a trend, the price reaction is exaggerated, and eventually produces a corrective reaction in the opposite direction."[53]

Smidt then describes one potential kind of speculative bubble: "One type of speculative bubble is the result of an exaggerated response to new information. Presumably it is most often the result of exaggerated optimism, but in principle it could also be the result of exaggerated pessimism."[54] Smidt concludes by saying that evidence of non-randomness is not enough; one must be able to generate above-average profits from the systematic tendencies for it to constitute a violation of the random walk hypothesis.

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[53] *Ibid.*, p. 257.

[54] *Ibid.*

CHAPTER II

METHODOLOGY

Introduction

This chapter will establish the framework for empirical testing of the efficient market hypothesis. The data to be tested is New York Stock Exchange common stock trading halts for the first nine months of 1972, a total of 434 entries. The first part of the chapter will describe the quantitative procedures used in obtaining capital market coefficients and testing for residual profits. This section draws heavily on the methodology employed in the empirical tests discussed in the previous chapter. The second section provides a descriptive and quantitative framework for analyzing residuals, should they be found. This portion of the chapter is based in large part on Smidt's theoretical construct[1] which is also summarized in Chapter I. The last section describes the actual data and relevant New York Stock Exchange procedures.

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[1]Seymour Smidt, "A New Look at the Random Walk Hypothesis," Journal of Financial and Quantitative Analysis, III (September, 1968), pp. 235-61.

Quantitative Procesures

A. Regression Equation

Sharpe's market model is used to eliminate aggregate stock market effects. The model is stated below in its risk premium form for deriving estimated values as described by Modigliani and Pogue.[2] For daily data inputed it is:

$$r_{i,d} = \hat{a}+\hat{B}_i r_{s,d}+\hat{\varepsilon}_{i,d} \quad (1)$$

$r_{s,d}$ = the return on the market portfolio during daily period d after the risk free rate is deducted. The daily S&P 500 is used as a proxy for the market return and the average weekly yield on 30-day Treasury Bills as a proxy for the risk free rate.

$r_{i,d}$ = the return on i^{th} security during period of $\left(\frac{\text{dividends + capital gains}}{\text{original price}} - \text{risk free rate}\right)$.

$\hat{a}$ = the estimated intercept of the fitted line.

$\hat{B}$ = the stocks' estimated systematic risk (the portion of total risk which is related to aggregate market movements).

$\hat{\varepsilon}$ = variation around the regression line resulting from unsystematic risk (unrelated to aggregate market movements).

Similarly, the formula used for monthly data imputed is:

$$r_{i,m} = \hat{a}+\hat{B}_i r_{s,m}+\hat{\varepsilon}_{i,m} \quad (2)$$

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[2]Franco Modigliani and Gerald A. Pogue, "An Introduction to Risk and Return," Financial Analysts Journal, XXX (May-June, 1974), p. 73.

Note: The legend for monthly data is the same as that for daily except that m is substituted for d and the average monthly yield on 30 day Treasury Bills is used for $r_{s,m}$.

The following data sources were employed: Monthly Total Returns--University of Chicago C.R.S.P. File; Daily Total Returns--Returns tape generated from Standard and Poors ISL Tape; S&P 500 Total Returns--Returns generated from Standard and Poors Annual Statistical Handbook; Risk Free Rates--Federal Reserve Bulletin.

B. Regression Procedures

Three regression equations yielding separate estimated market model coefficients are generated from daily returns data. They are based on data for: 1) the 106 days before the halt, 2) the 106 days after the halt and 3) the sum total of the two--the 212 days surrounding the event. Similarly three regressions are developed from monthly returns data: 1) the 60 months prior to the halt, 2) the period subsequent to the halt through December 1976, ranging from 50 to 60 observations, and 3) the period surrounding the halt representing the sum of the two. The market model coefficients generated from daily returns are used to calculate monthly residuals. Three sets of regression equations each were developed so as to note any shift in the coefficients which could distort the analysis of residuals. While the tendency of beta co-efficients to drift toward the mean over time and for individual betas but not portfolio betas to be unstable has been documented,[3, 4] the characteristics of a stock undergoing a trading halt or the information disseminated at the time of the halt could also result in a systematic shift in coefficient. If betas developed from data before the event are significantly different from betas developed from observations after the event and/or if using separate betas better fit the data, then two sets of regression coefficients will be used for the appropriate periods before and after the event. If, on the other hand, the betas are not significantly different, and using them does not improve the fit, one set of market model coefficients for the entire period surrounding the event will be employed.

Since individual betas are unstable and the percentage drop in price at the time of the trading halt might have some relevance to any shift in beta, individual stocks are segregated into sets of positive, negative, and neutral for both daily and monthly items. Within each set, 10 classes were set up with about 20 stocks for each positive and negative set and 2 classes for the significantly fewer neutral events. The rationale for establish-

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[3]Marshall I. Blume, "On the Assessment of Risk," The Journal of Finance, XXVI (March, 1971), pp. 1-10.

[4]Gerald A. Pogue and Bruno Skolnik, "The Market Model Applied to European Common Stocks. Some Empirical Results," Journal of Financial and Quantitative Analysis, IV (December, 1974), p. 940.

ing this procedure is discussed further in Section C of this chapter. The average beta value for each class is calculated using the formulas below:

$$\bar{b}_d = \frac{1}{N}\Sigma_{i=1}^{N} \hat{b}_i r_{s,d} \qquad (3)$$

$$\bar{b}_{d'} = \frac{1}{N}\Sigma_{i=1}^{N} \hat{b}_i r_{s,d'} \qquad (4)$$

$\hat{b}_i r_{s,d}$ = individual beta coefficient based on the period 106 days before the halt.

$\hat{b}_i r_{sd'}$ = individual beta coefficient based on the period 106 days after the halt.

$\bar{b}_d, \bar{b}_{d'}$ = average daily beta for each class of securities.

$$\bar{b}_m 1 = \frac{1}{N}\Sigma_{i=1}^{N} \hat{b}_i r_{s,m} \qquad (5)$$

$$\bar{b}_m 1 = \frac{1}{N}\Sigma_{i=1}^{N} \hat{b}_i r_{s,m'} \qquad (6)$$

$\hat{b}_i r_{s,m}$ = individual beta coefficient based on the period 60 months before the halt.

$\hat{b}_i r_{s,m'}$ = individual beta coefficient based on the period subsequent to the halt through December 1976 (50-60 observations).

$\bar{b}_m, \bar{b}_{m'}$ = average monthly beta for each class of securities.

The significance test used compares the difference between means for paired samples. Thus only those securities within each class which had a sufficient number of observations to generate beta coefficients for both before and after the event were chosen. The number of securities within each class which qualified ranged from 11 to 20.

$$\bar{D}_D \pm t_{.025} \frac{S_D}{\sqrt{N}} > 0 \qquad (7)$$

$D_D = b_D - b_{D'}$ - or the mean difference between classes of beta coefficients before and after each event.

S_D = the standard deviation of the difference between classes of beta coefficients.

N = the number of classes for each set (10 for positive and negative, 2 for neutral).

Note: The monthly legend is the same as that for daily except that the subscript M is substituted for D.

Similarly, the average alpha value for each class is calculated using the formulas below:

$$\bar{a}_D = \frac{1}{N}\Sigma_{i=1}^{N}\bar{a}_{d1} \qquad (8)$$

$$\bar{a}_{D'} = \frac{1}{N}\Sigma_{i=1}^{N}\bar{a}_{d1} \qquad (9)$$

$\hat{a}_d$ = individual alpha coefficient based on the period 106 days before the halt.

$\hat{a}_{d'}$ = individual alpha coefficient based on the period 106 days after the halt

$\bar{a}_D, \bar{a}_{D'}$ = average daily alpha for each class of securities.

$$a_M = \frac{1}{N}\Sigma_{i=1}^{N}\hat{a}_m \qquad (10)$$

$$\bar{a}_{M'} = \frac{1}{N}\Sigma_{i=1}^{N}\hat{a}_{m'} \qquad (11)$$

$\hat{a}_m$ = individual alpha coefficient based on the period 60 months before the halt.

$\hat{a}_{m'}$ = individual alpha coefficient based on the period after the halt through December 1976 (50-60 observations).

$\bar{a}_M, \bar{a}_{M'}$ = average monthly alpha for each class of securities.

The significance test used to determine whether the alphas are different from the expected value is the "student's t test." Since the expected value is zero, the formula is as shown below:

$$\bar{a}_D \pm t_{.025}\frac{S_D}{\sqrt{N}} > 0 \qquad (12)$$

Note: The monthly legend is the same as that for the daily except that the subscript M is substituted for D.

Finally, some additional procedures were followed regarding data to be excluded. The observations for the six days prior to the halt, the day of the halt itself, and the six days subsequent to the halt have been excluded in calculating daily market model coefficients. Since the monthly data generated from the CRSP type is on a calendar month basis and part of the six day period before or after could fall in the month prior or subsequent to the event month, both month +1 and month -1 were excluded in calculating monthly market model coefficients. This procedure of excluding certain data is employed because the information effect on the days surrounding the trading halt might produce a non zero expected return. The exact number of days excluded was selected after examination of the residual data taken as a whole. Scholes, using daily returns to get market model residuals, also excluded observations for the six days prior to the secondary, the day of the secondary, and six days subsequent to the secondary after examination of the data. As Scholes indicated, "The returns for these days were deleted in forming the estimates because if there are price effects of a secondary distribution, the expected value of the disturbance for the day of the distribution and possibly for days around the distribution are non-zero. The inclusion of these days in forming the regression estimates would lead to a specification error in the regression model and would bias the coefficient estimates."[5] The inclusion of positive residuals during the thirteen day period would create an upward bias in the coefficient estimates while including negative residuals would result in a downward bias.

C. Residual Analysis--Background

According to capital market theory the residual term in the regression equation is assumed to be randomly distributed with an expected value of zero. To the extent to which the residual term around the trading halt date is significantly different from zero, an information or liquidity effect has been identified. This effect will be impounded in the residual term. Efficient markets theory assumes that the initial transaction upon resumption of trading will instantaneously incorporate any information being disseminated; thereafter the term will be randomly distributed with an expected value of zero.

[5]Myron Scholes, "The Market for Securities--Substitution versus Price Pressure and the Effects of Information on Share Prices," The Journal of Business, XLIV (April, 1972), p. 189.

The residuals will be analyzed in the following manner. They will be calculated individually by day and all stocks cumulatively. Additionally, an intraday analysis will be undertaken for all stocks on the day of the trading halt using New York Stock Exchange data. The data will be separated into positive, negative, and neutral market reactions based solely on comparison of price upon reopening of the shares with the last price prior to the trading halt. This procedure is established to prevent positive and negative market reactions (hereafter called sets) from offsetting each other. Stocks having more than one stop trade will be treated in the same manner as if each trading halt were a separate event.

Lastly, the positive and negative market sets will be further separated into ten mutually exclusive classes and the neutral set into two classes in the Pettit manner[6] based upon the criteria of percentage change in price when the halt price is compared with the reopening price. Separation by price change is employed to determine whether movement in price at the time trading is resumed differentiates ultimate results.

Using 20 classes is a subjective choice which appears to best fit the data. The subjective nature of the grouping process is suggested by Black and Scholes who say, "We decided, rather arbitrarily to construct 25

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[6]R. Richardson Pettit, "Dividend Announcements, Security Performance and Capital Market Efficiency," The Journal of Finance, XXVII (December, 1972), p. 998.

intermediate portfolios. The number of intermediate portfolios could be larger or smaller without changing the results significantly."[7]

D. Intra Day Analysis--Individual Stock

Intra day effects for each stock during the day of the trading halt will be measured in the following manner:

$$IA = \frac{TH_o - TH}{TH} \qquad (13)$$

$$ID_i = \frac{TH - LTH}{LTH} \qquad (14)$$

IA_i = return from reopening price to closing price.

ID_i = return from price immediately before the trading halt to opening price after the trading halt.

TH = opening price after the trading halt.

LTH = last price before the trading halt.

TH_o = closing price day of trading halt.

D_o = dividend, if any, during this period.

Equation (14) provides the basis for the ranking of portfolios as discussed in Section C.

E. Intra Day Analysis--All Stock Average

The average for all stocks intra day effects will

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[7]Fischer Black and Myron Scholes, "The Effects of Dividend Yield and Divident Policy on Common Stocks and Returns," Journal of Financial Economics, I (May, 1974), p. 11.

be calculated using the formulas below:

$$IA=\frac{1}{N}\Sigma_{i=1}^{N} IA_i \qquad (15)$$

$$ID=\frac{1}{N}\Sigma_{i=1}^{N} ID_i \qquad (16)$$

F. Residual--Individual Stock by Day

The formula for calculation of the residual for each stock by day as employed by Scholes[8] but in risk premium form.

$$\hat{E}_{i,d}=R_{i,d}-[\hat{a}_i+\hat{b}_i R_{s,d}] \qquad (17)$$

$R_{i,d}$ = actual return for security i on day d after risk free rate is deducted.

$\hat{E}_{i,d}$ = estimated prediction error by day.

$R_{s,d}$ = return on S&P 425 for day d after risk free rate is deducted.

$\hat{a}_i+\hat{b}_i$ = the estimated coefficients of the market model in its risk premium form.

The residual will be calculated for the 25 days prior to the trading halt and the 25 day period after it.

The residuals from equation (17) are not equivalent to those from equation (1) because observations surrounding the stop trade date were eliminated from equation (1) in the procedure for obtaining the coefficients. That is why the terms for residuals in equation (17) are given different notations.

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[8]Scholes, The Journal of Business, XLIV (April, 1972), p. 189.

G. Residual--Individual Stock by Month

Using the regression coefficients developed from the period described in Section B, the residuals for the 12 months prior and the 50-60 months subsequent to the trading halt (through December 1976) will be calculated. The formula used is the same as that for daily residuals in equation (17) except that the subscript m which signifies month is substituted for d day.

$$E_{i,m}=R_{i,m}-[\hat{a}_i+\hat{b}_i R_{s,m}] \qquad (18)$$

H. Residual--All Stocks by Days (month)

$$\bar{E}_d=\frac{1}{N}\Sigma_{i=1}^{N}E_{i,d} \qquad (19)$$

N = number of securities in sample

$\bar{E}_d$ = average error for day d.

The formula above represents the arithmetic mean residual for all stocks by day. The day of the trading halt is day 0. The period used is the same as in equation (17).

The residuals for all stocks by month is the same as (19) except that the subscript m for month is substituted for d day. The period used is the same as in equation (18).

$$\bar{E}_m=\Sigma\frac{1}{N}\Sigma_{i=1}^{N}E_{i,m} \qquad (20)$$

I. Abnormal Performance Index--All Stocks Cumulatively

$$API_D = \frac{1}{N}\Sigma_{i=1}^{N}[\Pi_{\tau=d}^{D}(1+\hat{E}_{i,\tau})] \qquad (21)$$

The formula represents the compounded arithmetic average residual for all stocks cumulatively as utilized by Scholes in his work on secondary distributions. As Scholes indicates, the formula answers the question: "What abnormal returns would an investor achieve over time if at the start of day d he bought a portfolio of all securities that subsequently experienced a secondary [a trading halt in our case] and if he held this portfolio from day 0 (distribution day) [reopening day in our case] until some time after the distribution. The index traces out the value of $1.00 invested in equal amounts in each of the N securities in the sample at time T and held until the end of the period D, after abstracting from general market effects on returns."[9, 10] The cumulative average residual for each stock, an intermediate step, is also developed since it is needed in the test of significance for cumulative residuals. Its formula is:

$$API_{i,D} = \Pi_{\tau=d}^{D}(1+\hat{E}_{i,\tau}) \qquad (22)$$

For cumulative residuals by month m is substituted for d:

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[9]Scholes, The Journal of Business, XLIV (April, 1972), p. 190.

[10]The tables and figurse have 1 subtracted from Scholes' Abnormal Performance Index thus providing a pure residual number.

$$API_M=\frac{1}{N}\Sigma_{i=1}^{N}[\Pi_{f=m}^{M}(1+\hat{E}_{i,f})] \qquad (23)$$

and

$$API_{i,M}=\Pi_{f=m}^{M}(1+\hat{E}_{i,f})] \qquad (24)$$

J. Test of Significance[11]

a) In order to ascertain whether any residual returns are significantly greater than zero, the standard deviation of the residual return by day will be employed. The equation for the standard deviation is given below:

$$S_d=[\frac{\Sigma_{i=1}^{N}(\hat{E}_{i,d}-\bar{E}_d)^2}{N-1}]^{\frac{1}{2}} \qquad (25)$$

Additionally, the standard deviation of the cumulative arithmetic mean residual return will be calculated at the end of the 25 day period subsequent to the trading halt (day 0) using the following formula:

$$S_D=[\frac{\Sigma_{i=1}^{N}(API_{i,D}-API_D)^2}{N-1}]^{\frac{1}{2}} \qquad (26)$$

The same procedure will be followed for monthly and intraday residuals, with the significance test for cumulative monthly residuals taken at the end of month +48 replacing d.

$$S_m=[\frac{\Sigma_{i=1}^{N}(\hat{E}_{i,m}-\bar{E})^2}{N-1}]^{\frac{1}{2}} \qquad (27)$$

11Fama and Mandelbrot have proposed that price changes in a series of securities resemble a normal distribution but have infinite tails. Therefore utilization of tests of significance based on the normal distribution are an imperfect measure, but an established practice in tests of this type. See, for example, Scholes, The Journal of Business, XLIV (April, 1972), p. 219. See also Eugene F. Fama, "The Behavior of Stock Market Prices," The Journal of Business, XXXVIII (January, 1965), pp. 34-105, and Benoit Mandelbrot, "Forecasts of Future Prices, Unbiased Markets and Martingale Models," The Journal of Business, XXXIX (January, 1966), pp. 242-55.

$$S_M=[\frac{\Sigma_{i=1}^{N}(API_{i,M}-API_M)^2}{N-1}]^{\frac{1}{2}} \quad (28)$$

The standard deviation of aggregate intraday residuals from the opening price after the trading halt to the closing price on day 0 will be calculated according to the following formula:

$$S_{IA}=[\frac{\Sigma_{i=1}^{N}(IA_i-IA)^2}{N-1}]^{\frac{1}{2}} \quad (29)$$

b) The level of confidence selected to support conclusions is 2 standard deviations from the mean as shown below:

$$\bar{E}_d-2S_d>0 \quad (30)$$

$$API_D-2S_D>0 \quad (31)$$

$$\bar{E}_m-2S_m>0 \quad (32)$$

$$API_M-2S_m>0 \quad (33)$$

$$IA-2S_{IA}>0 \quad (34)$$

K. Transaction Cost

While systematic residuals may be observed, that does not necessarily present the possibility for above average returns since transaction costs must be taken into account. Although most empirical studies assume a 2% cost for buying and selling securities,[12] transaction costs on the New York Stock Exchange are in fact, a function of

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[12]See for example Scholes, The Journal of Business, XLIV (April, 1972), pp. 209-10.

the price of the stock and the number of the shares being traded. The actual price and volume statistics will be calculated for each stock in the test data and will then be used to compute the applicable transaction costs using the New York Stock Exchange commission rates including empirical evidence on large volume discounts.[13] It will be assumed that the shares were purchased in the same quantity and price as the actual opening trade. This assumption might not be appropriate for most stock exchange transactions where there may be a lag between the time a significant corporate announcement is made or a block trade is transacted and the time the investor can act on that information. However, trading is halted in stocks specifically to avoid placing any group of investors at a disadvantage. Therefore, presumably any investor could buy the same number of shares at the opening price just by making his bid during the period trading has stopped, prior to the bid of the subsequent buyer.

Analysis of Results

A. Introduction

Three potential explanations for residual returns from the trading halt, if observed, will be considered.

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[13]For a discussion of transaction costs and timing of purchases see Robert Reback, "Nonrandom Price Changes in Association with Trading in Large Blocks: A Comment," The Journal of Business, XLVII (October, 1974), pp. 564-65.

They are, as suggested by Smidt, "demands for liquidity, lags in response to new information and exaggerated response to new information."[14] The three sources will henceforth be referred to as the liquidity hypothesis, the information hypothesis and the inappropriate response hypothesis. A discussion of the appropriate ways of attempting to differentiate each of the potential sources of residual returns follows.

B. No Residuals Found

1. Quantitative Observations

a) $IA \simeq 0$

b) $E_d, E_m \simeq 0$

c) $API_D, API_M \simeq 0$

2. Explanation

If the residuals are found not to be significantly different from zero, then obviously the efficient market hypothesis will have been confirmed on a new set of data. We can say that the market adjusts almost instantaneously to new information without misperception of its importance and that no inducements are necessary to sell block trades.

C. Intraday Residuals--Liquidity Hypothesis

1. Quantitative Observations

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[14] Seymour Smidt, Journal of Financial and Quantitative Analysis, III (September, 1968), p. 259.

a. $IA \neq 0$

b. $IA + ID > ID$

2. Explanation

If IA (the return from reopening price to closing price) is significantly different from zero, we can state that there is some systematic disturbance that violates the efficient market hypothesis and which may present the possibility for abnormal profits. The fact that ID (the return from price immediately before trading halt to opening price after trading halt has a larger negative price movement than IA + ID indicates a recovery in price. This recovery can be interpreted as support for the liquidity hypothesis since reopening the stock frequently is accompanied by a block trade. Under this hypothesis, once the block is cleared, the shares would be expected to recover with no residuals observed in the daily or monthly testing. As Kraus and Stoll indicate, "the price impact produced by short run liquidity effects involves a transaction away from the equilibrium price (for small transactions) rather than a change in the equilibrium price. Expected rate of return is altered only temporarily, since the price is expected to return to equilibrium fairly quickly."[15] This approach, as opposed to E, would be most appropriate if there were no further adjustments after the recovery on day 0.

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[15]Alan Kraus and Hans R. Stoll, "Price Impact of Block Trading on New York Stock Exchange," The Journal of Finance, XXVII (June, 1972), p. 571.

Note: The quantitative observation and explanation in this and succeeding sections utilize the case of negative market reaction (defined in Methodology Section C). Positive market reactions would be handled in the same manner with the only difference being the sign of the residual $ID<0$ for negative market reactions and $ID>0$ for positive market reactions.

D. Intraday Residuals--Information Hypothesis

1. Quantitative Observation

a. $IA \nless 0$

b. $IA+ID<ID$

2. Explanation

In the information hypothesis the stock prices move in the same direction toward the new equilibrium's price from trading halt to closing price instead of reversing as in the liquidity hypothesis. As Smidt indicates lags may come about through "the form of a gradual adjustment of prices to the new information."[16] This approach, as opposed to F, would be most appropriate, if the adjustment were completed by the close of day 0.

E. Interday Residuals--Liquidity Hypothesis

1. Quantitative Observations

a. E_d or E_m or API_D or $API_M \nless 0$

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[16]Smidt, Journal of Financial and Quantitative Analysis, III (September, 1968), pp. 235-61.

b. $API_{D+1} \geqq API_D$ or

c. $API_{M+1} \geqq API_M$

2. Explanation

The residuals observed here extend beyond the day of the trading halt with the same expectation as in intra-day activities, that ultimately there will be a reversal in price. Kraus and Stoll call this behavior the distribution hypothesis which, although actually just an elongated liquidity effect, is treated separately by them. "The speed with which prices return distinguishes the liquidity cost version of this hypothesis from the distribution effect due to differences in marginal preferences. The price movement associated with the former version [liquidity] should be of short duration whereas the latter version [distribution] should produce a gradual return of prices."[17] Distribution effects could conceivably be due to temporary positioning of the shares by traders who resell them when they feel market conditions are appropriate. Alternatively, the seller may have additional shares he may wish to liquidate over the near term with adverse market reaction as those shares are sold. In either case, the price may not move back toward the original equilibrium until all shares have been transferred from one investor to another.

[17]Kraus and Stoll, The Journal of Finance, XXVII (June, 1972), p. 574.

F. Interday Residuals--Information Hypothesis

1. Quantitative Observations

   a. E_d or E_m or API_D or $API_M \neq 0$

   b. $API_{D+1} \leqq API_D$ or

   c. $API_{M+1} \leqq API_M$

2. Explanation

As in the information effect for intraday observations, residuals are attributable to the lag in response to new information. Since the new information received relates to company or industry data and not to the aggregate market, price movements may have a strong unsystematic component over several days until a new equilibrium price is reached relative to the market. As Smidt indicates "there should be a systematic tendency for price movements in the same direction, a pattern that could be called a price trend."[18]

G. Interday Residuals--Inappropriate Response Hypothesis

1. Quantitative Observations

   a. $API_M \neq 0$

   b. $API_{M+1} \neq API_M$

2. Explanation

Inappropriate responses to new information occur

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[18]Smidt, *Journal of Financial and Quantitative Analysis*, III (September, 1969), p. 252.

all the time. However, the overestimation and underestimation of the data should occur randomly and therefore in large samples should offset each other. When there are systematic tendencies, an alternative hypothesis may be assumed. Smidt calls these responses speculative bubbles.

The inappropriate response hypothesis can be distinguished from the liquidity, and company information hypotheses by the length of time necessary for an equilibrium price to be established. Liquidity effects are generally believed to be overcome in a matter of days. For example, Kraus and Stoll's results were given for the twenty days period after the block trade and no significant reversal in price occurred between day 15 and day 20 for either plus or minus ticks.[19] Information effects for well orchestrated events such as trading halts are also believed to be adjusted for in a matter of days, if not sooner. For example, Scholes found "that the total adjustment to the sale of a secondary distribution takes approximately six days."[20] Smidt quotes Scholes and two other studies as indicating "a very prompt market response to events that are widely publicized and therefore available

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[19]Kraus and Stoll, The Journal of Finance, XXVII (June, 1972), Tables 2 and 3, pp. 579-80.

[20]Scholes, The Journal of Business, XLIV (April, 1972), p. 207.

to many persons at low cost."[21]

The adjustment to equilibrium is believed to take considerably longer for inappropriate responses. As Smidt indicates, "The fact that existing studies of the random-walk hypothesis have not uncovered evidence of the existence of speculative bubbles is far from convincing. Such price patterns, if they exist, probably extend over a period of months or years."[22] Therefore, any significant change in residuals from the month after the trading halt to the end of the eighteen month period will be attributed to the inappropriate response hypothesis.

Characteristics of Data

A. The Data Described

The research body proposed consists of all New York Stock Exchange trading halt data for common stocks from January 1 to September 30, 1972, totaling approximately 430 entries. When trading is halted in a stock it is either because : a) the specialist wants to give the market time to absorb and evaluate a new development, b) management has requested that the specialist halt trading in the shares pending a news release, or c) investors have signaled the appearance of a new development creating an influx of buy or sell orders. The data includes stocks

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[21]Smidt, Journal of Financial and Quantitative Analysis, III (September, 1968), pp. 254-55.

[22]Smidt, ibid., p. 258.

where trading has been held up during the day and those which have had delayed openings. The difference between the two has to do with the timing of the new information. A delayed opening typically is caused by release of news resulting in an influx of buy or sell orders since the close on the day prior. Each individual entry has the time and price of the last transaction and the time, volume, and price of the opening transaction after trading has been resumed.

B. Dissemination of Public Information

News of the halt generally appears on the Dow Jones tape which conveys to the investing public the information that either a significant piece of corporate information has or will shortly occur, or that the specialist is faced with an influx of buy or sell orders and temporarily cannot match them. In the latter case the apparent "block" effect (the imbalance) may in fact be due to news which has been released by the company or acquired through other sources.

The New York Stock Exchange provides guidelines for dissemination of public information "when the announcement of news of a material event or a statement dealing with a rumor which calls for IMMEDIATE RELEASE is made shortly before the opening or during market hours (10 a.m to 3:30 p.m., New York time), it is recommended that the Department of Stock List of the Exchange be notified by telephone no later than simultaneously with the release of the announcement to the news media. If the Exchange receives such notification in time, it will be in a position to consider whether, in the opinion of the Exchange, trading in the security should be halted temporarily. A delay in trading, which normally would last about 15 minutes after the appearance of the news on the Dow-Jones news ticker, provides a period for the public evaluation of the announcement. A longer delay in trading may be necessary if there is an unusual influx of orders."[23] The delay in resumption of trading until all public news is disseminated, or until buy and sell orders can be matched, indicates that from the standpoint of the New York Stock Exchange the capital markets are efficient as to public information.

C. Dissemination of Private Information

There are times when there has been no public announcement of information but rumor and/or unusual trading activity in a stock suggests a potentially important piece of news should be made public. New York Stock Exchange guidelines indicate, "For its part, the Exchange maintains a continuous market surveillance program through its Division of Stock Watch. The program is designed to closely review the markets in those securities in which

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[23]New York Stock Exchange Company Manual 17-18-68 PA-23 reprinted in the Institute of Chartered Financial Analysts, 1973 Supplementary Readings in Financial Analysis (Homewood, Ill., Richard D. Irwin, 1967), p. 354.

unusual price and volume changes occur or where there is a large unexplained influx of buy or sell orders. Under such circumstances, the company may be called by a member of the Department of Stock List to inquire about any company developments which have not been publicly announced, but which could be responsible for unusual market activity. Where the market appears to be reflecting undisclosed information, the Corporation will normally be requested to make it public immediately. [In cases of trading halts the company may be asked to make a public statement indicating any reason or absence of reason as a precondition to opening the stock.] Occasionally it may be necessary to carry out a stock watch inquiry after the Fact and the Exchange may request such information from the company as may be necessary to complete such an inquiry."[24]

Where the Exchange has requested such information there are substantial incentives to comply: 1) The shares may not open until the corporation responds "in print" to the request for material non-public information. 2) Any misstatement by the company as indicated by subsequent events might be uncovered by NYSE investigation. The public disclosure of the finding of misstatements by the Exchange would prove to be embarrassing and, if severe, could lead to delisting of the shares. 3) Material misstatements by corporate officers could lead to stockholder

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[24]Ibid., p. 340.

suits with the possibility of civil and/or criminal liability proceedings for the person(s) making such statements. Thus, the request for corporations for making any material "insider information" public prior to resumption of trading with substantial costs for non-compliance, suggests that there should be an absence of staggered news developments and, at least in theory, all material corporate information is in the hands of investors for decision making purposes.

CHAPTER III

ANALYSIS OF MARKET MODEL COEFFICIENTS

Beta Coefficients

The paired beta coefficients by type of event--positive, negative, neutral--for both monthly and daily data are given below. Within each set, the classes are ranked in the manner described in section c, chapter two.

TABLE 1

COMPARISON OF MONTHLY BETA COEFFICIENTS
NEGATIVE SET

CLASS	BETA BEFORE EVENT	BETA AFTER EVENT
N-1	1.8143	1.4713
N-2	1.6932	1.3065
N-3	1.3484	1.1930
N-4	1.6156	1.2012
N-5	1.4628	1.2405
N-6	1.2861	1.2858
N-7	1.4211	1.2350
N-8	1.5700	1.2923
N-9	1.6638	1.1804
N-10	1.2552	1.2939
TOTAL	1.4925	1.2609

TABLE 2

COMPARISON OF MONTHLY BETA COEFFICIENTS
POSITIVE SET

CLASS	BETA BEFORE EVENT	BETA AFTER EVENT
P-1	1.6942	1.2968
P-2	1.8384	1.4307
P-3	1.3859	1.3436
P-4	1.3110	1.1275
P-5	1.4212	1.4797
P-6	1.3728	1.1519
P-7	1.2868	1.1018
P-8	1.2603	1.1349
P-9	1.3024	1.3054
P-10	1.5714	1.3673
TOTAL	1.4405	1.2726

TABLE 3

COMPARISON OF MONTHLY BETA COEFFICIENTS
NEUTRAL SET

CLASS	BETA BEFORE EVENT	BETA AFTER EVENT
Neu-1	1.4480	1.1824
Neu-2	1.5923	1.3019
TOTAL	1.5175	1.2400

TABLE 4

COMPARISON OF DAILY BETA COEFFICIENTS
NEGATIVE SET

CLASS	BETA BEFORE EVENT	BETA AFTER EVENT
N-1	1.5240	1.0017
N-2	1.6232	1.0348
N-3	1.3625	1.2737
N-4	1.5151	1.1440
N-5	1.1565	1.2621
N-6	1.3346	1.1299
N-7	1.4508	1.2203
N-8	1.5671	1.3802
N-9	1.1382	1.2166
N-10	1.0438	1.2536
TOTAL	1.3703	1.1912

TABLE 5

COMPARISON OF DAILY BETA COEFFICIENTS
POSITIVE SET

CLASS	BETA BEFORE EVENT	BETA AFTER EVENT
P-1	1.0973	0.9562
P-2	1.5616	1.3058
P-3	1.0167	1.4489
P-4	1.2250	1.1296
P-5	1.2563	1.2908
P-6	1.1241	1.1902
P-7	1.1415	1.1664
P-8	0.9414	0.8509
P-9	1.1768	1.2682
P-10	1.2900	0.9132
TOTAL	1.1844	1.1529

TABLE 6

COMPARISON OF DAILY BETA COEFFICIENTS
NEUTRAL SET

CLASS	BETA BEFORE EVENT	BETA AFTER EVENT
Neu-1	1.1048	1.1113
Neu-2	0.7796	0.7147
TOTAL	0.9613	0.9363

As can be seen, in every set the betas before the event are larger than the betas after the event. Except for positive and neutral daily events, there is a pronounced shift downward for both monthly and daily betas with the differences significant at the 95% level of confidence. (The neutral monthly events were not significant probably because the sample size is too small.) Additionally, using separate betas appears to better fit the data, as will be explained further in the subsequent chapters on analysis of daily and monthly residuals. Since the significance test is one using paired samples, and a number of companies were not listed on the New York Stock Exchange for the entire five years before and four to five years after the event, the average monthly betas are not exactly comparable to average daily betas. However, results were similar when residuals using daily betas were tested against residuals developed from monthly betas.

There does not appear to be a material difference in beta coefficient within each type of event by class. However, it can be readily observed that the type of stock which undergoes a trading halt is more volatile than the average New York Stock Exchange stock, since average beta values are generally substantially greater than 1.0 even after their shift downward after the event.

In summary, there is a statistically significant shift downward in beta coefficients after the event. Due to the statistically significant shift in coefficients, and also because it appears to better fit the data, the analysis of alpha coefficients and residuals concentrates principally on output using separate betas for observations before and after the halt.

Alpha Coefficients

A detailed presentation of monthly and daily alpha coefficients is given below by class and set.

TABLE 7

MONTHLY ALPHA COEFFICIENTS--BEFORE EVENT
NEGATIVE SET

CLASS	ALPHA COEFFICIENT (%)	STANDARD DEVIATION	TEST OF SIGNIFICANCE	N
N-1	-0.09	1.34	0.23	13
N-2	0.29	2.19	0.48	14
N-3	0.45	1.12	1.66	18
N-4	0.03	1.44	0.09	19
N-5	0.36	1.57	0.89	16
N-6	0.32	1.53	0.89	19
N-7	0.04	1.83	0.08	16
N-8	0.46	1.32	1.21	13
N-9	0.15	1.20	0.53	19
N-10	1.18	1.27	3.83	18
TOTAL	0.33	1.49	2.82	165

TABLE 8

MONTHLY ALPHA COEFFICIENTS--BEFORE EVENT
POSITIVE SET

CLASS	ALPHA COEFFICIENT (%)	STANDARD DEVIATION	TEST OF SIGNIFICANCE	N
P-1	-0.26	0.84	1.31	19
P-2	0.11	1.40	0.29	15
P-3	0.06	1.59	0.16	19
P-4	0.80	1.83	1.80	18
P-5	1.07	1.41	3.13	18
P-6	0.58	1.17	2.04	18
P-7	0.68	1.35	2.08	18
P-8	0.66	1.08	2.52	18
P-9	0.96	1.15	2.64	11
P-10	1.33	1.23	4.46	18
TOTAL	0.59	1.39	5.53	172

TABLE 9

MONTHLY ALPHA COEFFICIENTS--BEFORE EVENT
NEUTRAL SET

CLASS	ALPHA COEFFICIENT (%)	STANDARD DEVIATION	TEST OF SIGNIFICANCE	N
Neu-1	0.13	1.06	0.44	14
Neu-2	0.34	1.40	0.94	16
TOTAL	0.25	1.24	1.07	30

TABLE 10

MONTHLY ALPHA COEFFICIENTS--AFTER EVENT
NEGATIVE SET

CLASS	ALPHA COEFFICIENT (%)	STANDARD DEVIATION	TEST OF SIGNIFICANCE	N
N-1	-0.48	1.15	1.72	18
N-2	0.54	1.40	1.64	19
N-3	0.36	0.76	1.95	18
N-4	0.43	1.29	1.33	17
N-5	-0.31	1.30	1.04	20
N-6	0.32	1.24	1.06	18
N-7	0.39	1.32	1.29	20
N-8	-0.07	1.28	0.23	18
N-9	0.27	1.19	0.96	19
N-10	-0.24	0.74	1.38	19
TOTAL	0.12	1.21	1.33	186

TABLE 11

MONTHLY ALPHA COEFFICIENTS--AFTER EVENT
POSITIVE SET

CLASS	ALPHA COEFFICIENT (%)	STANDARD DEVIATION	TEST OF SIGNIFICANCE	N
P-1	0.58	1.18	1.94	16
P-2	-0.13	1.26	0.38	18
P-3	0.32	1.64	1.79	19
P-4	-0.21	0.89	0.65	17
P-5	-0.39	0.76	1.27	19
P-6	0.01	0.87	0.04	20
P-7	0.12	0.91	0.37	18
P-8	0.80	1.17	2.58	18
P-9	0.22	1.33	0.78	19
P-10	0.18	0.59	1.06	20
TOTAL	0.14	1.12	1.74	184

TABLE 12

MONTHLY ALPHA COEFFICIENTS--AFTER EVENT
NEUTRAL SET

CLASS	ALPHA COEFFICIENT (%)	STANDARD DEVIATION	TEST OF SIGNIFICANCE	N
Neu-1	0.27	1.20	0.95	19
Neu-2	0.11	0.99	0.42	15
TOTAL	0.20	1.11	1.04	34

TABLE 13

DAILY ALPHA COEFFICIENTS--BEFORE EVENT
NEGATIVE SET

CLASS	ALPHA COEFFICIENT (%)	STANDARD DEVIATION	TEST OF SIGNIFICANCE	N
N-1	-0.02	0.35	0.25	20
N-2	-0.11	0.25	1.92	20
N-3	0.10	0.31	1.37	19
N-4	0.04	0.24	0.73	20
N-5	0.07	0.29	1.05	20
N-6	0.11	0.26	1.79	19
N-7	0.06	0.32	0.82	20
N-8	0.03	0.25	0.85	19
N-9	0.06	0.19	1.38	20
N-10	0.14	0.22	2.70	19
TOTAL	0.05	0.27	2.31	196

TABLE 14

DAILY ALPHA COEFFICIENTS--BEFORE EVENT
POSITIVE SET

CLASS	ALPHA COEFFICIENT (%)	STANDARD DEVIATION	TEST OF SIGNIFICANCE	N
P-1	0.00	0.19	0.00	20
P-2	0.11	0.29	1.65	20
P-3	0.14	0.36	1.70	20
P-4	0.11	0.27	1.78	20
P-5	0.12	0.20	2.62	20
P-6	0.04	0.25	0.70	20
P-7	0.11	0.23	2.08	20
P-8	0.05	0.14	1.56	20
P-9	0.13	0.25	2.20	19
P-10	0.12	0.31	0.16	20
TOTAL	0.09	0.25	5.20	199

TABLE 15

DAILY ALPHA COEFFICIENTS--BEFORE EVENT
NEUTRAL SET

CLASS	ALPHA COEFFICIENT (%)	STANDARD DEVIATION	TEST OF SIGNIFICANCE	N
Neu-1	0.05	0.22	0.96	19
Neu-2	-0.06	0.27	0.92	17
TOTAL	0.00	0.25	0.12	36

TABLE 16

DAILY ALPHA COEFFICIENTS--AFTER EVENT
NEGATIVE SET

CLASS	ALPHA COEFFICIENT (%)	STANDARD DEVIATION	TEST OF SIGNIFICANCE	N
N-1	-0.19	0.24	3.26	18
N-2	-0.12	0.24	2.18	20
N-3	-0.05	0.21	1.04	20
N-4	-0.10	0.25	1.70	19
N-5	-0.12	0.27	1.89	19
N-6	0.07	0.20	1.48	19
N-7	-0.09	0.23	1.71	20
N-8	-0.05	0.20	1.06	19
N-9	-0.06	0.25	1.05	20
N-10	-0.04	0.24	0.71	19
TOTAL	-0.07	0.24	4.18	193

TABLE 17

DAILY ALPHA COEFFICIENTS--AFTER EVENT
POSITIVE SET

CLASS	ALPHA COEFFICNET (%)	STANDARD DEVIATION	TEST OF SIGNIFICANCE	N
P-1	-0.15	0.18	3.63	20
P-2	-0.07	0.25	1.22	20
P-3	-0.08	0.21	1.66	20
P-4	-0.02	0.19	0.45	19
P-5	-0.01	0.14	0.31	20
P-6	-0.03	0.27	0.47	19
P-7	-0.03	0.15	0.87	20
P-8	0.03	0.18	0.71	19
P-9	-0.10	0.25	1.70	19
P-10	-0.05	0.22	0.99	20
TOTAL	-0.05	0.21	3.44	196

TABLE 18

DAILY ALPHA COEFFICIENTS--AFTER EVENT
NEUTRAL SET

CLASS	ALPHA COEFFICIENT (%)	STANDARD DEVIATION	TEST OF SIGNIFICANCE	N
Neu-1	-0.03	0.23	0.55	19
Neu-2	-0.10	0.17	2.28	16
TOTAL	-0.06	0.20	1.87	35

Alpha coefficients for regressions developed from monthly data before their halts are distinctly positive. For negative events the average coefficient for the set of 0.33 is significant at the 95% level of confidence. All the classes of stocks have positive alphas with the exception of class 1, which has a small negative coefficient that is not statistically significant. There are no other material deviations by class. Positive monthly alphas before the event have even larger coefficients prior to the event, which are also statistically significant. Nine out of ten portfolios have positive alphas with some tendency to have larger alphas in higher classes. The only class which has a negative residual is P-1, but the residual is not statistically significant. Neutral monthly alphas prior to the event are also positive.

Negative monthly alpha coefficients based on observations after the event have a small positive alpha over the average 53 month period. However, four out of ten classes have negative coefficients, and these results are not statistically significant. There is no apparent pattern by class. Positive monthly alphas after the event also have a small positive residual overall, while two of the portfolios have negative coefficients and the results in aggregate are not statistically significant. There is no apparent pattern by class. Neutral monthlies have a moderate positive residual.

As is evident, daily alpha coefficients for negative events, based on approximately 100 observations prior to the event, have a moderate positive alpha which is statistically significant. In contrast to aggregate results, classes 1 and 2 have negative alphas. These negative alphas are not statistically significant. Daily positive alphas prior to the event also have a positive return which is statistically significant. Class 1 portfolio has no alpha coefficient at all, and all the other classes were positive with no differentiating pattern. Daily neutral alphas before the event split with one class having a moderate positive residual and the other a moderate negative one, with the two just about offsetting each other.

Daily negative alphas for the 100 days after the event tend to be negative. There appears to be some relationship between class position and alpha, with the top half having larger negative alphas and class 1 having the highest negative alpha. The bottom half has smaller negative alphas. Daily positive alphas also tend to be negative. These results are statistically significant. Again, here there seems to be a tendency for higher classes to have greater alphas, with most of the difference accounted for by the return for class 1.

Neutral alphas after the event have a negative alpha which is consistent with positive and negative class results.

In summary, alphas generally tend to follow a pattern. Before the event there are large positive results for both daily and monthly alpha coefficients. After the event there are generally negative coefficients, with the exception of monthly observations which have small positive coefficients that are not significent statistically. Class 1 securities differed in some cases from aggregate results.

CHAPTER IV

RESIDUAL ANALYSIS--INTRADAY RESULTS

The results for intraday price changes are given in the following tables and figures by positive, negative and neutral sets, including tables further dividing each set into class.

TABLE 19

INTRADAY PRICE CHANGES
NEGATIVE SET

CLASS	ID(%)[1]	IA(%)[2]	S_{IA}	TEST OF SIGNIFICANCE	FRACTION NEGATIVE	N
1	-23.47	00.68	09.95	0.30	.53	20
2	-10.48	-00.52	05.33	0.43	.50	20
3	- 7.14	-00.02	02.98	0.03	.41	20
4	- 6.01	-00.66	03.32	0.87	.56	20
5	- 4.68	-01.63	02.80	2.54	.63	20
6	- 3.78	-03.04	04.27	3.02	.72	19
7	- 2.87	-00.40	03.80	0.46	.63	20
8	- 1.75	-01.21	04.16	1.27	.61	20
9	- 0.94	00.05	02.12	0.10	.56	20
10	- 0.34	00.35	01.79	0.83	.53	19
TOTAL	- 6.15	-00.64	04.69	1.92	.57	198

[1]Represents the return from price immediately before the trading halt to opening price after the trading halt. See chapter two, equation (14).

[2]Represents the return from reopening price to closing price. See chapter two, equation (13).

TABLE 20

INTRADAY PRICE CHANGES
POSITIVE SET

CLASS	ID(%)	IA(%)	S_{IA}	TEST OF SIGNIFICANCE	FRACTION NEGATIVE	N
1	16.21	01.37	07.03	0.85	.63	20
2	7.28	02.10	04.13	2.22	.42	20
3	5.44	-01.24	05.07	1.07	.63	20
4	3.84	01.48	04.35	1.48	.44	20
5	2.92	00.48	01.63	1.28	.44	20
6	2.28	00.56	02.66	0.92	.50	20
7	1.61	01.02	02.49	1.79	.29	20
8	1.04	00.64	01.98	1.41	.39	20
9	0.66	00.05	03.28	0.06	.40	19
10	0.34		01.46	1.22	.29	20
TOTAL	4.16	00.69	03.82	2.55	.45	199

TABLE 21

INTRADAY PRICE CHANGES
NEUTRAL SET

CLASS	ID(%)	IA(%)	S_{IA}	TEST OF SIGNIFICANCE	FRACTION NEGATIVE	N
1	-0-	-00.63	02.49	1.07	.65	19
2	-0-	-01.28	03.00	1.76	.75	18
TOTAL	-0-	-00.95	02.75	2.10	.65	37

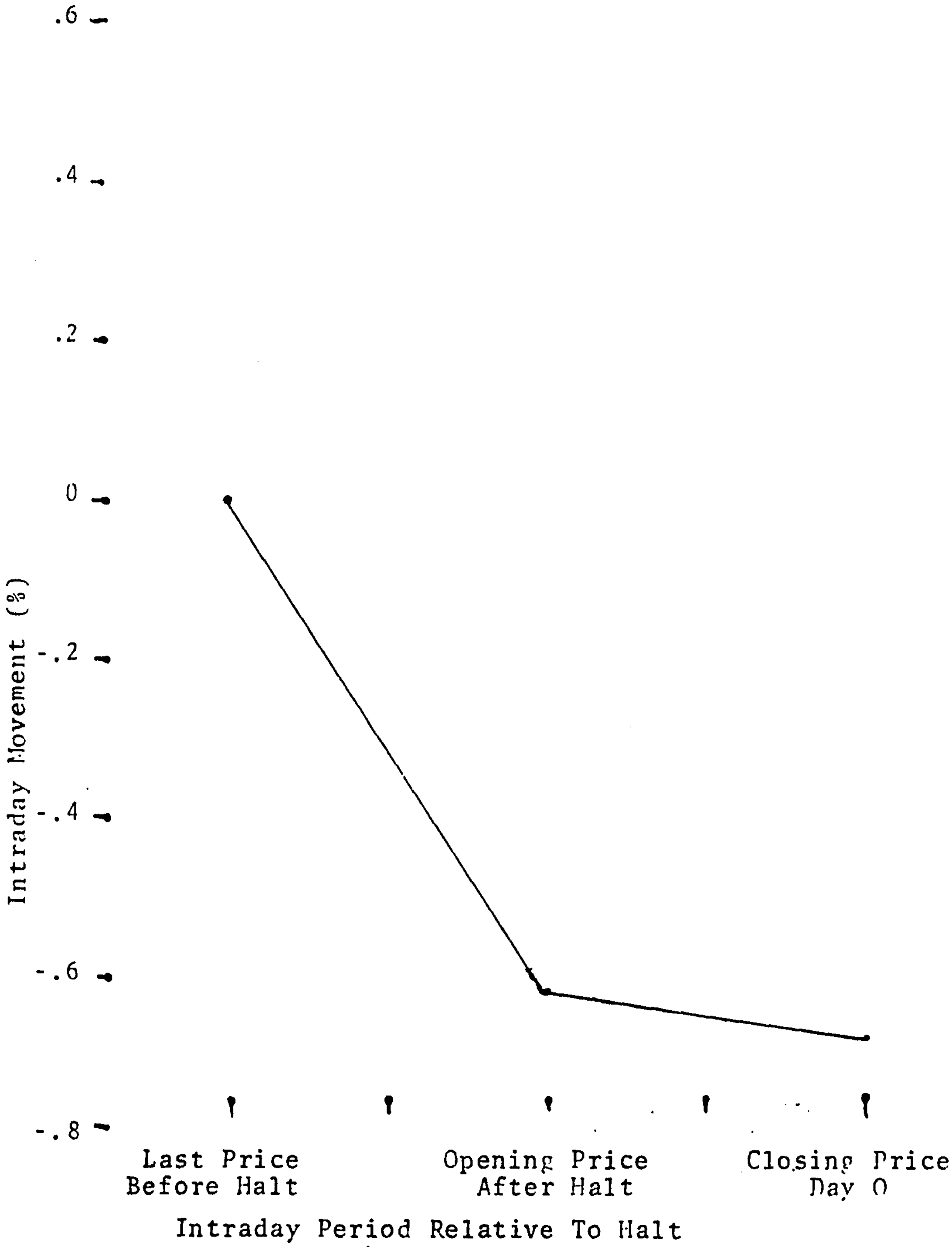

FIGURE 1

SUMMARY OF INTRADAY PRICE CHANGES

NEGATIVE SET

BETAS NOT USED

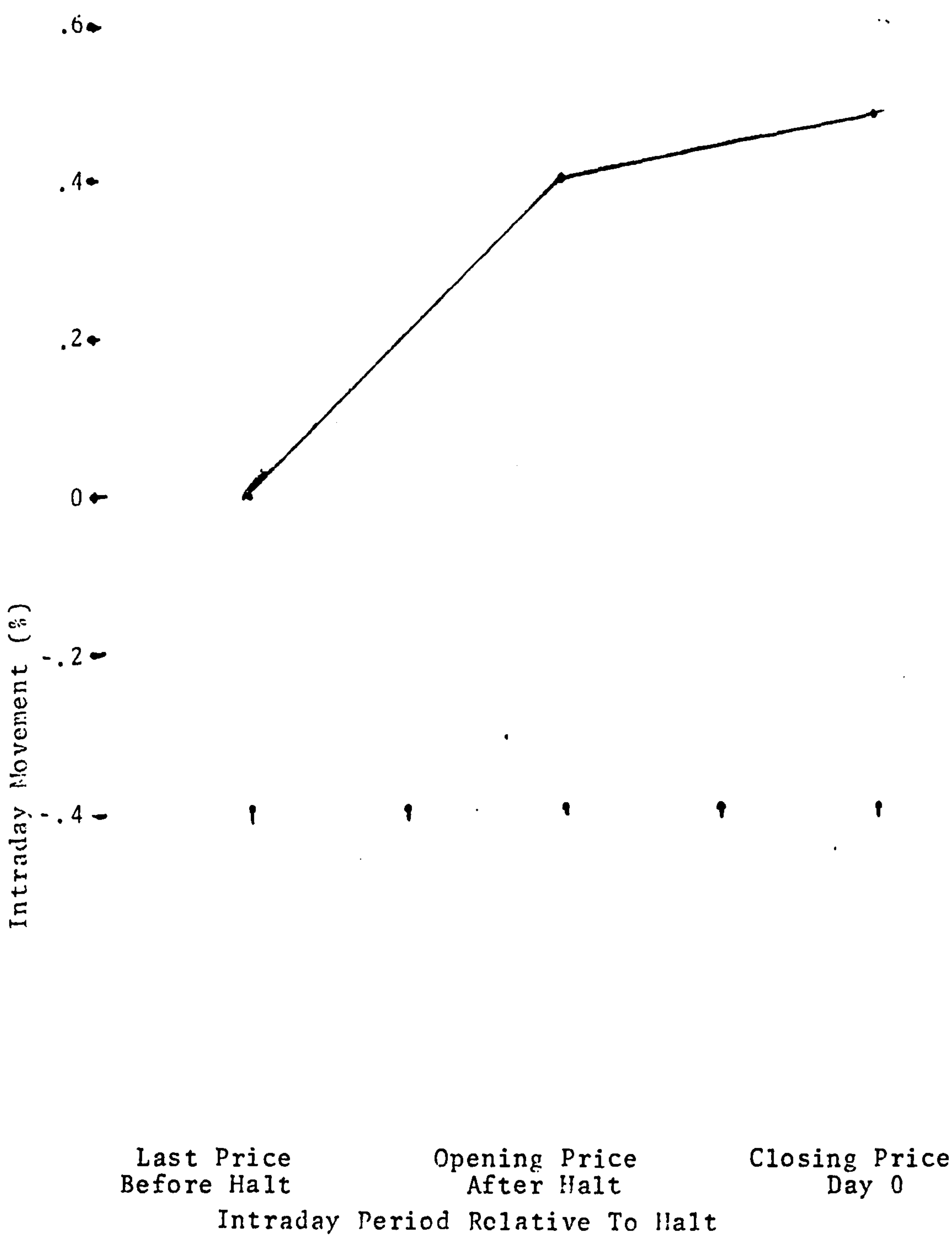

FIGURE 2

SUMMARY OF INTRADAY PRICE CHANGES

POSITIVE SET

BETAS NOT USED

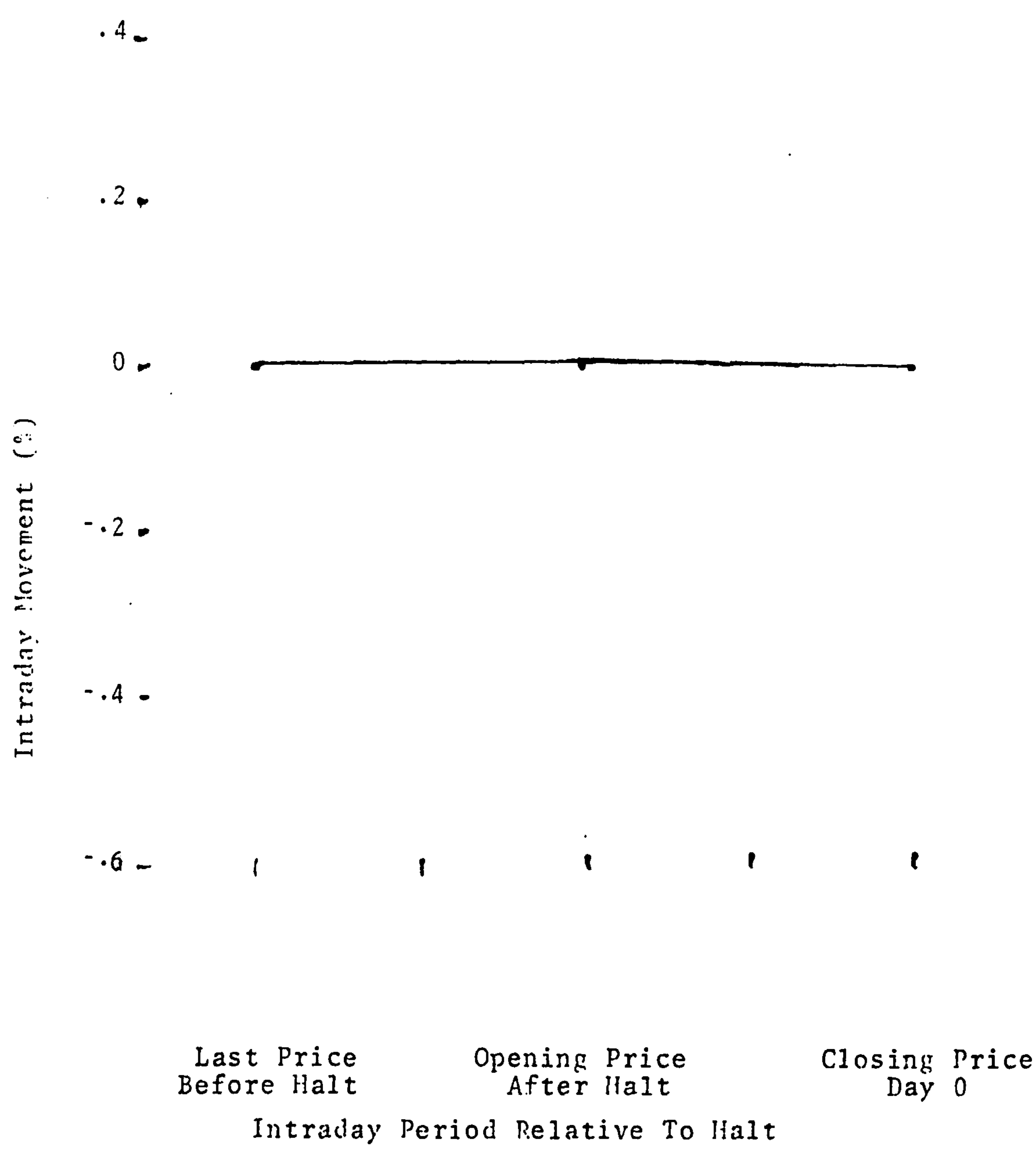

FIGURE 3

SUMMARY OF INTRADAY PRICE CHANGES

NEUTRAL SET

BETAS NOT USED

Taking negative events first, the average price change from price immediately before the trading halt to opening price trading halt (ID) is 6.15%. The array of price changes by class ranging from 23% to less than one half percent just reflects the author's sorting routine which, as previously mentioned, serves as the basis for the breakdown of trading halt by set class. Since there is no opportunity to purchase shares until trading resumes after dissemination of the news, ID cannot serve as an opportunity for abnormal returns. The return from re-opening price to closing price on day 0 (IA) can, however. As can be observed, there is a tendency for negative halts to be followed by negative returns through the close of day. The average for all negative residuals is 0.64% with seven out of ten classes having negative residuals. The average residual for all portfolios barely missed being significant at the 95% level of confidence. There does not appear to be any relationship between the percentage change in price at the time of the halt and subsequent returns. For example, the exceptions to overall results appear in the extremes for IA, classes 1, 9, and 10.

For positive events the average ID of 4.2% is somewhat smaller than that for negative events, as is the average for class 1 (16% as compared to 23%). The average IA tends to continue in the same direction as the original halt through the close on day 0, with the mean return being 0.69%. Nine out of ten classes have positive returns with class 1 twice the average, but still not the largest price fluctuation. The residuals were not significant at the 95% level of confidence.

The neutral portfolios, of course, by definition have an ID of 0. The subsequent IA is negative, with an average negative movement of 0.95%. Due to the relatively small number of neutral observations and classes, it is difficult to draw any firm conclusions from this set.

In summary, there appears to be a tendency for positive and negative trading halts to be followed by small price movements in the same direction as the original event. However, the price movements are too small to yield abnormal returns since the author's calculation of transaction costs of about 1.5% for positive and negative halts and 2.5% for lower volume neutral halts exceeds the movements.

CHAPTER V

RESIDUAL ANALYSIS--DAILY RESULTS

A breakdown of daily residuals by set is given in the tables and figures beginning on the next page, followed by tables further segregating the data at period end by class.

For negative residuals using separate betas before and after halt starting with day -25 there is a small positive cumulative residual which amounts to 1.12% at day -6 and peaks at 2.04% on day -3. Thereafter, it reverses and declines to .86% on day -1 and is a negative 6.07% at the end of day -0, after trading is resumed. No large residuals develop after the event with day +1 at -6.20% day 4 at -6.33% for a net change of -0.26% from day 0, and day +25 at -6.35%. There appear to be no systematic deviations by class from overall results, with the exception of class 1 which contains the largest percentage price drop. There the negative price change is continued after the event with a 3.62% drop from day 0 to day +4 increasing to an overall price drop after the halt of 4.12% at day +25. However, the sample size is too small to draw definitive conclusions and the next largest class does not produce a similar pattern.

TABLE 22

SUMMARY OF TOTAL DAILY RESIDUALS
NEGATIVE SET[1]

DAY	AVERAGE RESIDUAL	PERFORMANCE INDEX	STANDARD DEVIATION	FRACTION NEGATIVE	N
-25	-.0005	-.0005	.025	.52	196
-24	.0015	.0010	.022	.51	196
-23	.0015	.0024	.024	.52	196
-22	.0005	.0027	.024	.52	196
-21	-.0060	-.0032	.028	.50	195
-20	.0022	-.0013	.026	.49	195
-19	-.0008	-.0023	.022	.51	196
-18	-.0011	-.0036	.024	.55	196
-17	.0020	-.0018	.022	.50	195
-16	-.0009	-.0024	.023	.57	194
-15	.0008	-.0021	.023	.58	194
-14	.0011	-.0013	.024	.55	195
-13	.0007	-.0004	.028	.50	196
-12	.0020	.0016	.022	.46	196
-11	.0048	.0065	.028	.43	196
-10	-.0021	.0044	.020	.55	196
- 9	.0026	.0075	.025	.48	195
- 8	-.0017	.0052	.026	.52	194
- 7	.0034	.0089	.028	.47	194
- 6	.0025	.0112	.029	.51	194
- 5	.0012	.0127	.026	.52	193
- 4	-.0015	.0113	.032	.54	194
- 3	.0044	.0204	.034	.47	190
- 2	.0002	.0174	.038	.53	190
- 1	-.0112	.0086	.044	.63	179
0	-.0685	-.0607	.084	.87	196
1	-.0013	-.0620	.033	.52	192
2	-.0036	-.0658	.032	.53	193
3	.0022	-.0640	.034	.44	193
4	.0013	-.0633	.032	.44	192
5	.0020	-.0608	.029	.43	192
6	.0011	-.0597	.024	.53	191
7	-.0003	-.0606	.023	.48	192
8	.0022	-.0591	.028	.48	192
9	.0014	-.0579	.022	.50	193
10	.0023	-.0555	.024	.48	193
11	-.0025	-.0575	.023	.57	192
12	-.0012	-.0587	.023	.59	192
13	-.0010	-.0604	.027	.52	193
14	.0003	-.0605	.023	.54	191
15	.0023	-.0582	.021	.50	192

[1]Residuals for this and all subsequent tables calculated using separate betas before and after the halt.

TABLE 22 (continued)

DAY	AVERAGE RESIDUAL	PERFORMANCE INDEX	STANDARD DEVIATION	FRACTION NEGATIVE	N
16	-.0018	-.0593	.021	.52	192
17	-.0020	-.0605	.020	.55	190
18	-.0021	-.0635	.026	.52	192
19	-.0015	-.0637	.029	.56	190
20	-.0013	-.0659	.026	.51	191
21	-.0036	-.0699	.026	.54	193
22	.0017	-.0685	.024	.52	193
23	-.0016	-.0702	.022	.55	193
24	.0050	-.0653	.125	.44	192
25	.0023	-.0635	.021	.47	193

TABLE 23

SUMMARY OF TOTAL DAILY RESIDUALS
POSITIVE SET

DAY	AVERAGE RESIDUAL	PERFORMANCE INDEX	STANDARD DEVIATION	FRACTION NEGATIVE	N
-25	.0002	.0002	0.24	.57	195
-24	-.0026	-.0024	0.30	.52	199
-23	.0025	.0002	0.24	.52	196
-22	.0028	.0030	0.24	.45	197
-21	.0009	.0048	0.24	.51	195
-20	-.0003	.0034	0.29	.51	197
-19	.0003	.0034	0.34	.52	197
-18	.0001	.0033	0.22	.54	197
-17	.0006	.0043	0.30	.58	199
-16	.0008	.0046	0.24	.54	199
-15	.0006	.0042	0.24	.49	197
-14	.0036	.0084	0.26	.48	199
-13	-.0005	.0075	0.24	.55	199
-12	-.0028	.0049	0.23	.58	199
-11	.0016	.0063	0.24	.53	199
-10	.0024	.0090	0.23	.48	199
- 9	.0006	.0099	0.20	.51	198
- 8	.0025	.0118	0.24	.47	199
- 7	.0021	.0125	0.22	.48	197
- 6	.0006	.0143	0.28	.55	198
- 5	.0008	.0152	0.29	.52	196
- 4	.0025	.0175	0.20	.49	199
- 3	.0033	.0217	0.28	.48	197
- 2	.0052	.0271	0.41	.48	196
- 1	.0190	.0476	0.66	.31	190
0	.0487	.0949	0.79	.15	199
1	.0008	.0941	0.36	.53	194
2	-.0024	.0916	0.30	.56	193
3	-.0041	.0857	0.39	.51	194
4	-.0023	.0835	0.38	.56	195
5	.0000	.0849	0.35	.52	195
6	.0038	.0888	0.25	.45	196
7	.0011	.0901	0.27	.51	196
8	.0008	.0909	0.21	.51	196
9	-.0005	.0904	0.23	.52	195
10	-.0013	.0885	0.25	.53	194
11	-.0025	.0865	0.22	.57	195
12	.0004	.0870	0.25	.49	195
13	.0016	.0881	0.24	.50	195
14	.0009	.0890	0.25	.47	195
15	-.0014	.0875	0.22	.59	194
16	.0003	.0874	0.23	.46	196
17	.0014	.0882	0.24	.52	195
18	-.0030	.0846	0.21	.60	195
19	.0008	.0858	0.19	.46	196
20	.0012	.0868	0.18	.48	194
21	-.0006	.0865	0.21	.52	195
22	.0005	.0864	0.20	.46	195
23	-.0001	.0866	0.25	.50	195
24	-.0001	.0868	0.22	.55	195
25	.0004	.0872	0.25	.52	196

TABLE 24

SUMMARY OF TOTAL DAILY RESIDUALS
NEUTRAL SET

DAY	AVERAGE RESIDUAL	PERFORMANCE INDEX	STANDARD DEVIATION	FRACTION NEGATIVE	N
-25	-.0047	-.0047	0.29	.67	36
-24	.0040	-.0006	0.22	.56	36
-23	.0002	-.0003	0.23	.61	36
-22	-.0006	-.0006	0.24	.56	36
-21	-.0039	-.0043	0.26	.67	36
-20	.0035	-.0016	0.24	.50	36
-19	.0027	.0012	0.25	.47	36
-18	.0004	.0010	0.24	.61	36
-17	.0037	.0048	0.20	.42	36
-16	-.0004	.0044	0.14	.50	36
-15	-.0077	-.0040	0.23	.57	35
-14	.0087	.0063	0.22	.43	35
-13	-.0027	.0027	0.19	.64	36
-12	.0015	.0043	0.16	.58	36
-11	.0058	.0099	0.17	.50	36
-10	.0006	.0103	0.17	.61	36
- 9	-.0045	.0057	0.13	.64	36
- 8	.0024	.0081	0.20	.44	36
- 7	.0012	.0093	0.16	.53	36
- 6	.0046	.0132	0.29	.50	36
- 5	-.0016	.0118	0.18	.53	36
- 4	-.0001	.0116	0.18	.53	36
- 3	.0015	.0172	0.29	.50	36
- 2	.0056	.0196	0.44	.50	34
- 1	.0132	.0367	0.44	.53	36
0	-.0092	.0247	0.33	.60	35
1	.0025	.0252	0.28	.50	34
2	-.0044	.0265	0.20	.56	34
3	-.0057	.0177	0.22	.57	35
4	.0046	.0216	0.25	.51	35
5	-.0044	.0172	0.17	.57	35
6	-.0013	.0157	0.27	.54	35
7	.0006	.0164	0.21	.57	35
8	-.0012	.0151	0.13	.54	35
9	-.0007	.0145	0.14	.57	35
10	.0055	.0198	0.24	.40	35
11	-.0037	.0164	0.16	.63	35
12	.0003	.0170	0.16	.53	34
13	.0044	.0207	0.14	.43	35
14	-.0038	.0169	0.13	.57	35
15	.0001	.0168	0.19	.56	34
16	.0037	.0205	0.18	.43	35
17	-.0038	.0167	0.22	.46	35
18	-.0002	.0166	0.26	.57	35
19	.0033	.0196	0.19	.40	35
20	-.0002	.0194	0.17	.46	35
21	.0037	.0228	0.15	.43	35
22	-.0005	.0214	0.15	.54	35
23	-.0010	.0203	0.16	.46	35
24	-.0014	.0191	0.18	.46	35
25	-.0033	.0161	0.18	.57	35

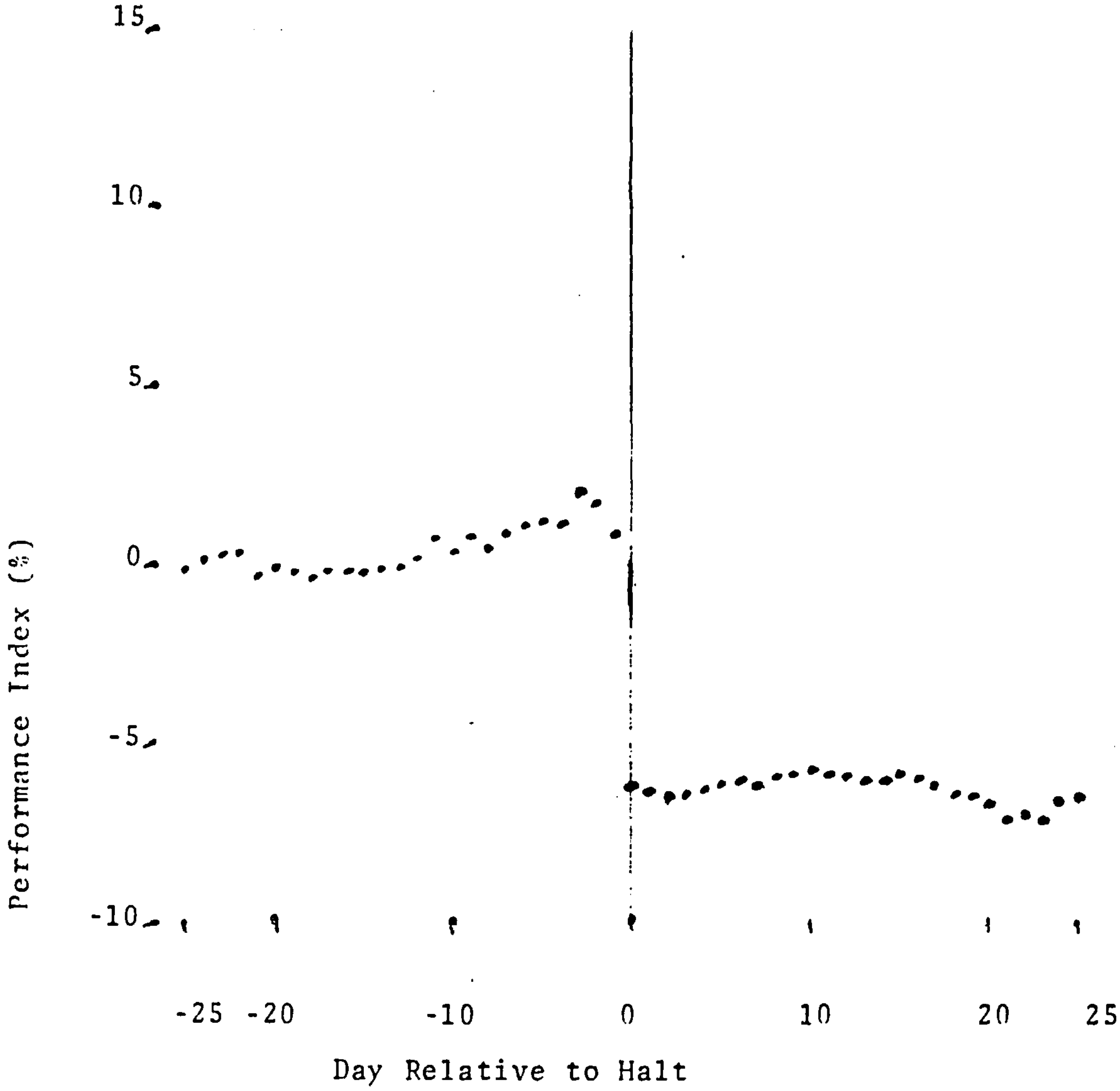

FIGURE 4

SUMMARY OF TOTAL DAILY RESIDUALS

NEGATIVE SET

SEPARATE BETAS--BEFORE AND AFTER HALT

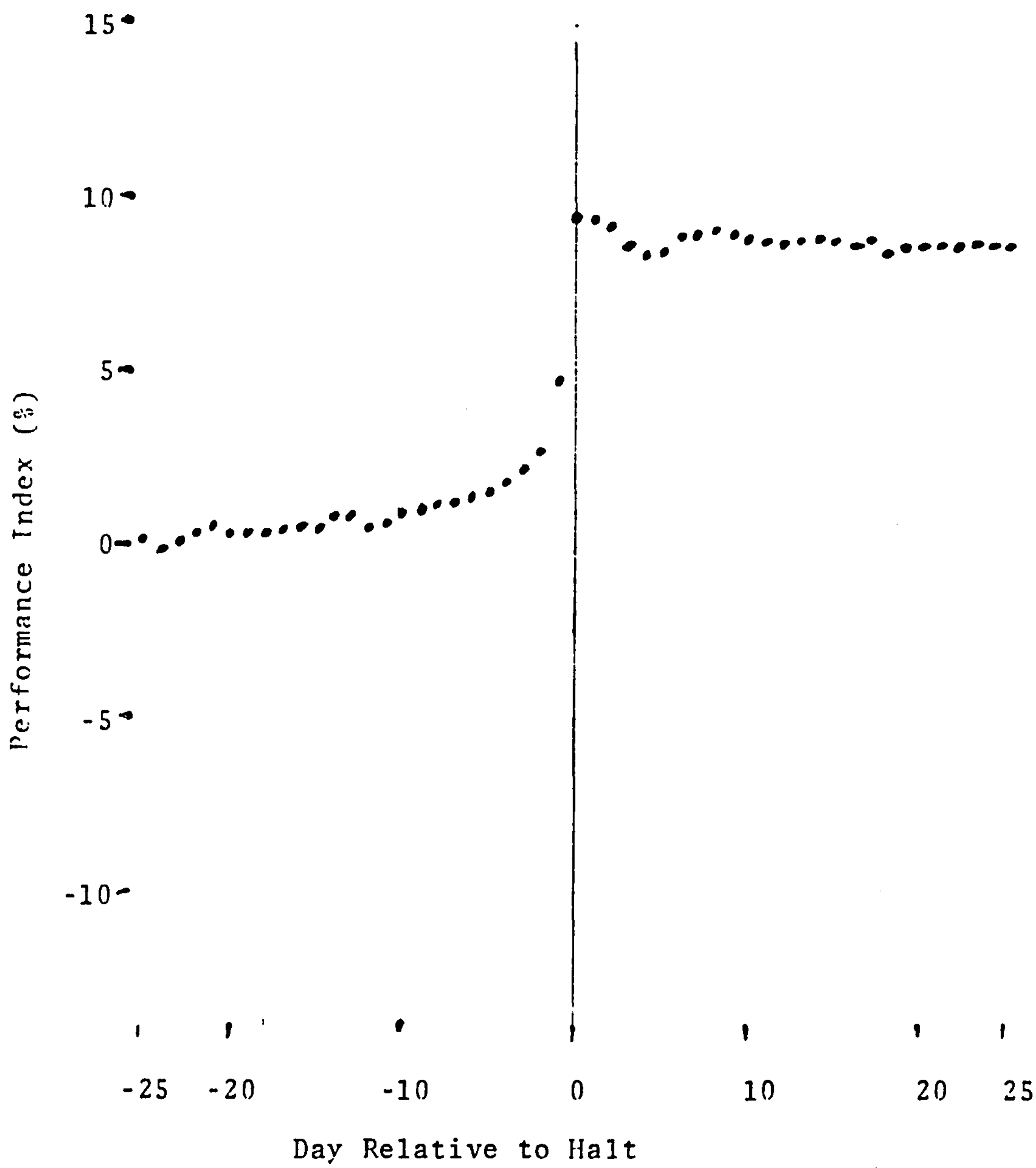

FIGURE 5

SUMMARY OF TOTAL DAILY RESIDUALS

POSITIVE SET

SEPARATE BETAS--BEFORE AND AFTER HALT

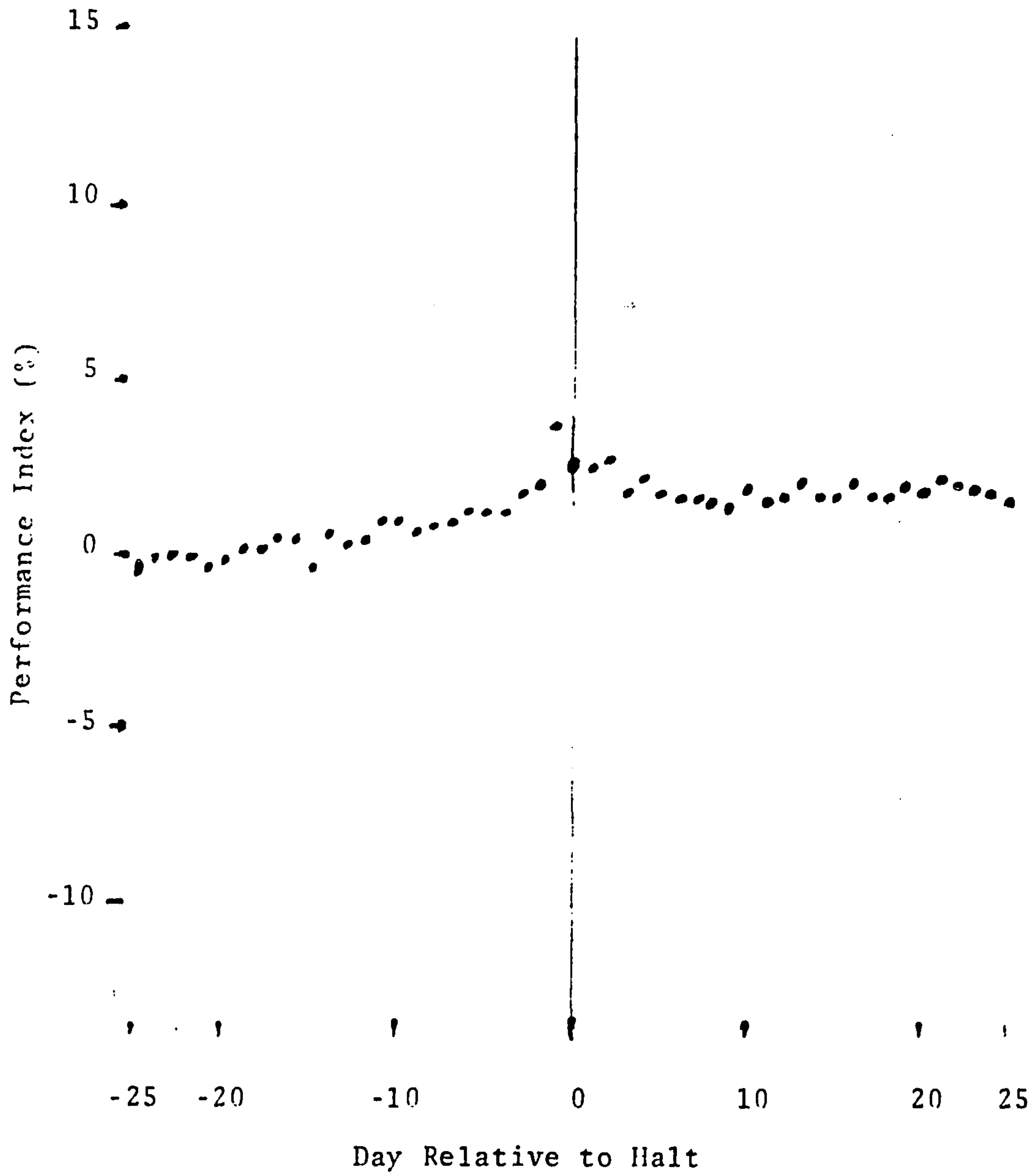

FIGURE 6

SUMMARY OF TOTAL DAILY RESIDUALS

NEUTRAL SET

SEPARATE BETAS--BEFORE AND AFTER HALT

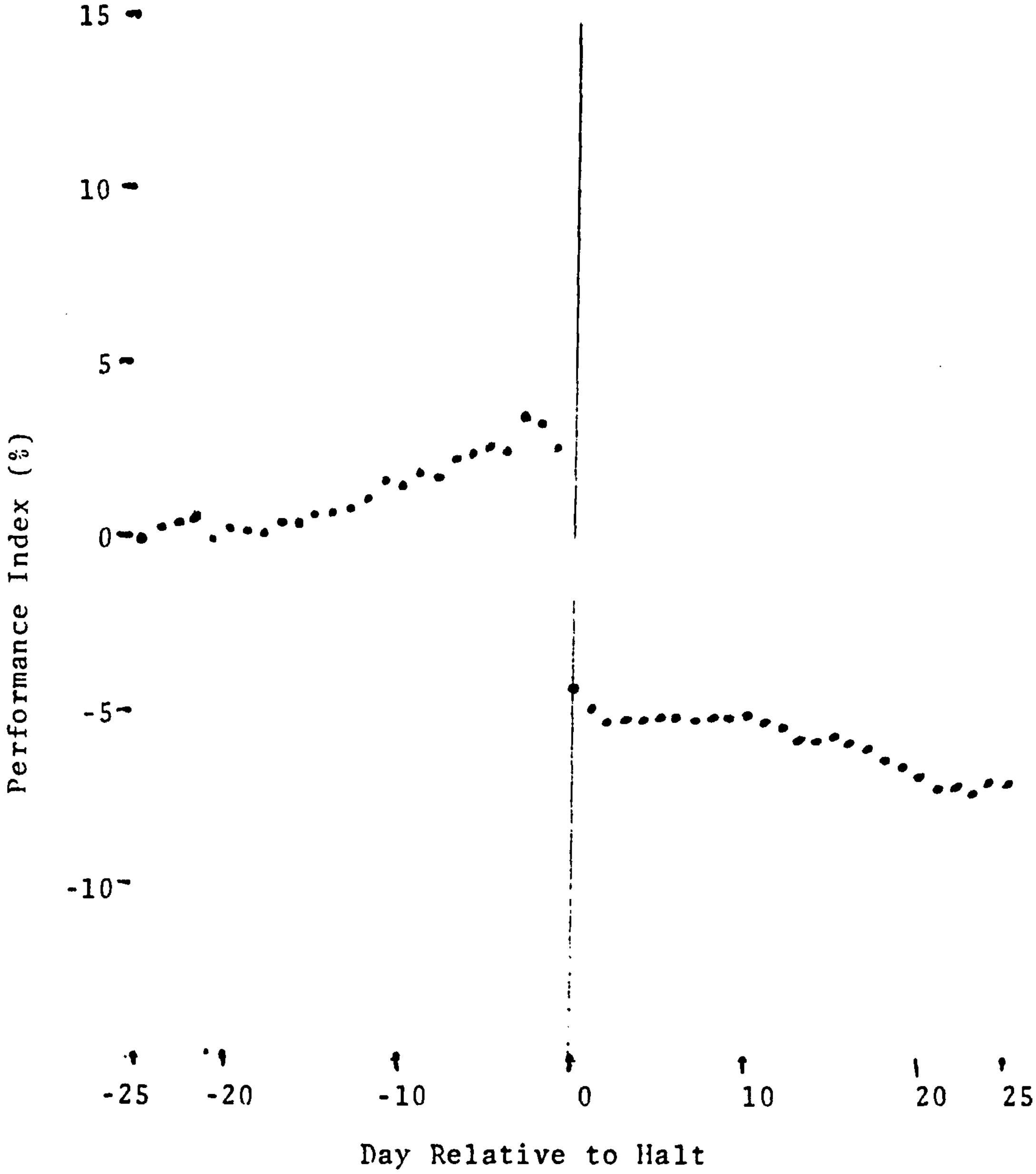

FIGURE 7

SUMMARY OF TOTAL DAILY RESIDUALS

NEGATIVE SET

ONE BETA--AROUND HALT

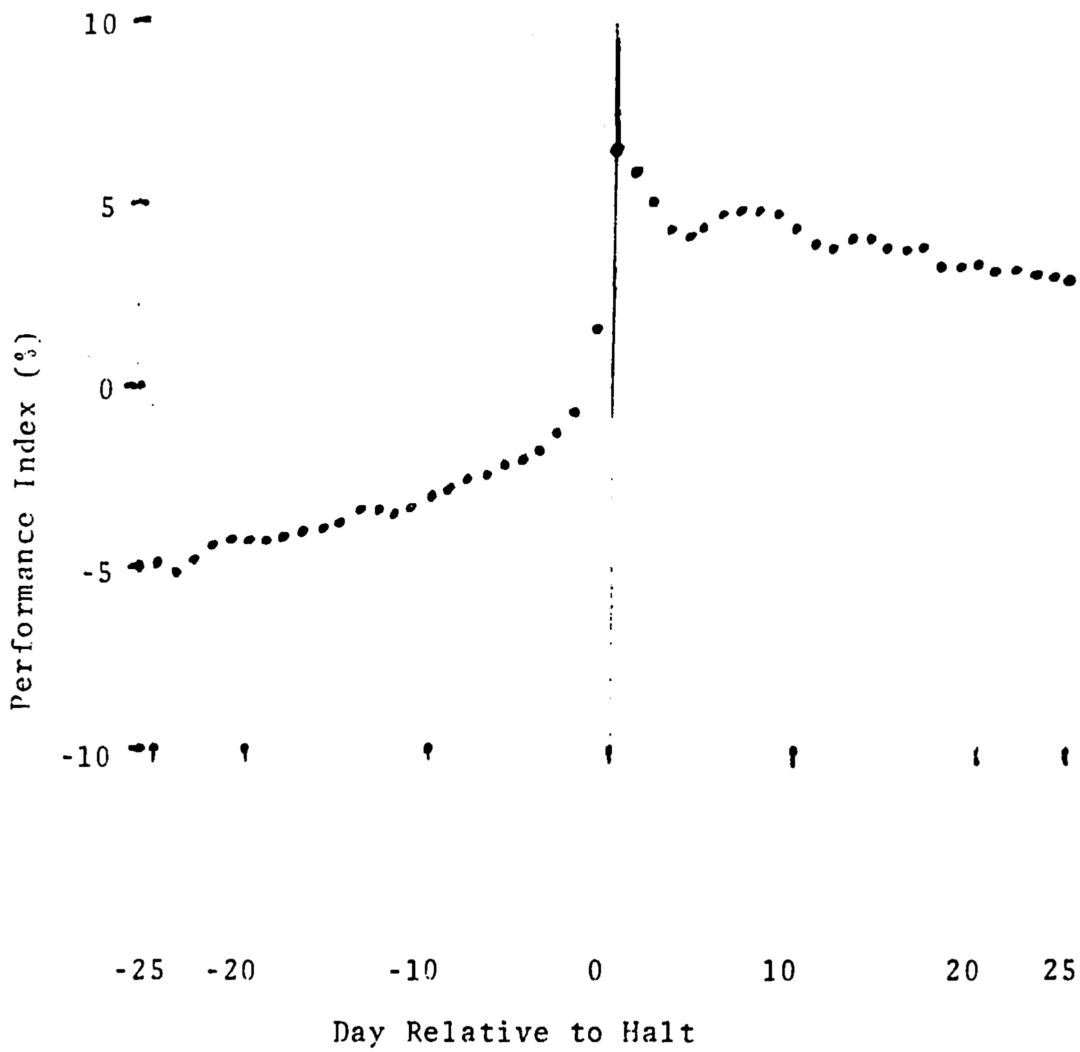

FIGURE 8

SUMMARY OF TOTAL DAILY RESIDUALS

POSITIVE SET

ONE BETA--AROUND HALT

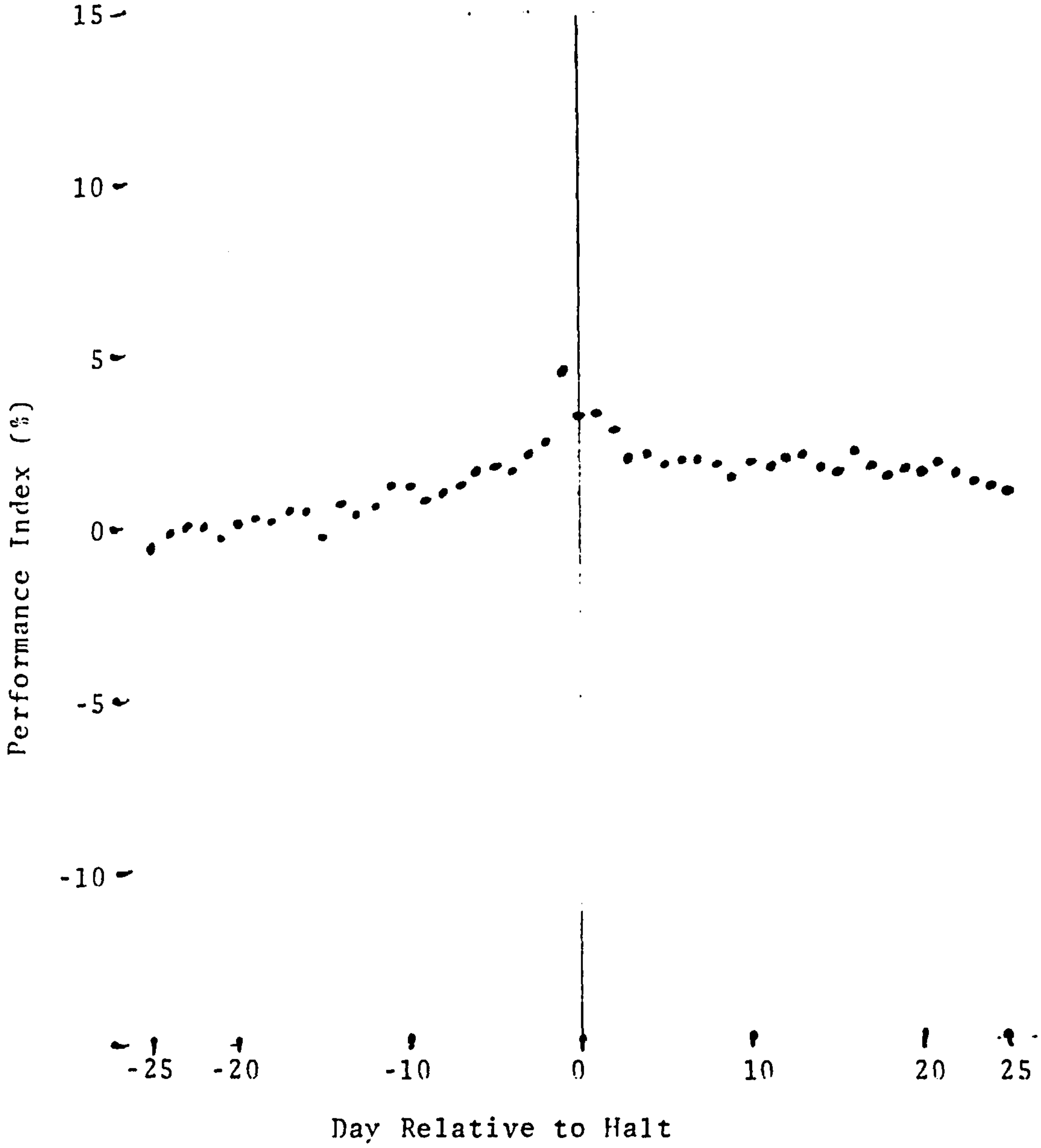

FIGURE 9

SUMMARY OF TOTAL DAILY RESIDUALS

NEUTRAL SET

ONE BETA--AROUND HALT

TABLE 25

CUMULATIVE DAILY RESIDUALS BY CLASS
NEGATIVE SET

CLASS	PERFORMANCE INDEX DAY 25[1]	STANDARD DEVIATION	SIGNIFICANCE	N
N-1	-.0412	.1619	1.05	18
N-2	.0098	.1398	0.31	20
N-3	.0057	.1028	0.24	20
N-4	-.0066	.1125	0.25	19
N-5	-.0011	.1200	0.04	19
N-6	-.0114	.0942	0.51	19
N-7	.0147	.0868	0.74	20
N-8	-.0086	.1317	0.28	19
N-9	.0026	.0910	0.12	20
N-10	.0036	.0808	0.19	19
TOTAL	.0028	.1127	0.35	193

[1]Represents residuals after the event only (day 25-day 0); thus, total residuals in this and the following two tables will not agree with those for day 25 in tables 22-24.

TABLE 26

CUMULATIVE DAILY RESIDUALS BY CLASS
POSITIVE SET

CLASS	PERFORMANCE INDEX DAY 25	STANDARD DEVIATION	SIGNIFICANCE	N
P-1	.0303	.0925	1.43	20
P-2	-.0643	.1676	1.67	20
P-3	.0266	.1720	0.67	20
P-4	-.0111	.1202	0.39	19
P-5	-.0038	.0440	0.38	20
P-6	-.0186	.1125	0.70	19
P-7	-.0096	.0683	0.61	20
P-8	-.0040	.0897	0.19	19
P-9	-.0008	.0740	0.05	19
P-10	-.0242	.0757	1.39	20
TOTAL	-.0077	.1097	0.98	196

TABLE 27

CUMULATIVE DAILY RESIDUALS BY CLASS
NEUTRAL SET

CLASS	PERFORMANCE INDEX DAY 25	STANDARD DEVIATION	SIGNIFICANCE	N
Neu-1	.0020	.0898	0.09	19
Neu-2	-.0211	.0875	0.93	16
TOTAL	-.0086	.0888	0.57	35

Positive daily events exhibit a somewhat similar pattern with a 1.43% positive residual at the end of day -6, but continue to rise through day 0 with a 3.33% positive movement between day -6 and day -1 to 4.76%, and a 9.49% residual on day 0. As with negative events, no large residuals develop, with day +1 at 9.41%, day +6 at 8.88% (for a total difference from day 0 of -0.61%), and day 25 at 8.72%. Again there is a tendency for class 1, containing the largest price changes, to show continued movement in the same direction. At day +6 there is a 1.74% positive movement as compared to day 0, which increases to +3.03% at the end of day +25. Aside from the results for this small sampling, no meaningful differences by class appear.

Residuals arising from neutral halts amount to +1.32% on day -6 and peak at +3.67% on day -1, dropping back to +2.47% on day 0. A small negative residual after the event of .75% develops by day 5 with no further changes. Day +1 total residual is 2.52%, day +6 at 1.57% and day +25 at +1.61%. Since neutral halts have only two classes, the sample does not lend itself to analysis by class.

Using one beta surrounding the event significantly increases the scope of the residuals. For negative events at day -3 the residual amounts to +3.47% as compared to 2.04% for separate betas and, even more meaningfully, a steadily widening residual appears after the event. The residual at day 0 of -4.34% increases to -5.11% at day +6, to -5.57% on day +16, and to -6.88% on day +25. For positive events the residual at day -6 is 2.87% as compared to 1.43% for separate betas. At day 0 the residual is 11.46% as compared to 9.49%. Again, a steadily widening negative residual occurs after the event with day +6 at 9.81%, day 15 at 8.92%, and day 25 at 8.01%. Neutral results show a smaller residual before the event and a steadily increasing negative residual after it, going from +3.17% on day 0 to 1.66% on day +6, 1.53% on day +10 and 0.90% on day +25.

In summary, when separate betas for daily observations immediately before and after the event are used, no large price adjustments develop. There is, however, a small negative residual of 0.26% to day +4 for negative events and a small negative residual of 0.61% for positive events during the first six days which is not significant statistically. The small sampling size of 18-20 for class 1 positive and negative severe price drops does not permit definitive conclusion about its tendency to produce modest residuals, even after transaction costs are deducted. If one beta for the entire period is used, however, larger residuals arise which could provide an opportunity for abnormal gains.

CHAPTER VI

RESIDUAL ANALYSIS--MONTHLY RESULTS

A breakdown of monthly residual results by set is presented in the tables and figures beginning on the next page, followed by tables further segregating the data at the end of month +48 by class.

Taking the negative set first, and using separate betas, during the twelve month period before the event a positive residual develops which peaks at +5.91% during month -1. By the end of calendar month 0 which contains the negative event, this residual reverses to -0.49% For the first ten months after the event, the residual declines fairly rapidly amounting to -23.37% at the end of month +10. From month +10 to month +29 the slope of the decline is more modest with the residual amounting to -30.51% at the end of month +29. Thereafter no clear pattern emerges, with month +48 at -31.60%. No clear pattern emerges from an analysis of negative residuals by class except for class 1. There a steeper decline occurs, with a residual of -41.66% by month +10, increasing to -54.87% by month +29, then reversing to -47.74% by month +48.

Positive events also have positive residuals

TABLE 28

SUMMARY OF TOTAL MONTHLY RESIDUALS
NEGATIVE SET

MONTH	AVERAGE RESIDUAL	PERFORMANCE INDEX	STANDARD DEVIATION	FRACTION NEGATIVE	N
-12	.0189	.0189	0.90	.45	165
-11	.0123	.0321	1.02	.49	165
-10	.0104	.0470	0.93	.49	165
- 9	-.0130	.0350	0.79	.59	165
- 8	-.0081	.0273	0.91	.57	165
- 7	.0085	.0357	0.99	.46	164
- 6	-.0023	.0313	0.87	.53	165
- 5	.0014	.0396	0.97	.52	165
- 4	-.0097	.0290	0.82	.57	165
- 3	.0006	.0348	0.97	.53	165
- 2	.0141	.0441	0.98	.43	164
- 1	.0055	.0591	1.19	.55	163
0	-.0653	-.0049	1.58	.74	165
1	-.0210	-.0259	0.96	.58	185
2	-.0231	-.0497	0.97	.61	186
3	-.0087	-.0594	1.04	.57	185
4	-.0226	-.0772	1.24	.61	184
5	-.0363	-.1097	0.97	.63	186
6	-.0337	-.1348	0.98	.63	186
7	-.0213	-.1578	0.99	.62	186
8	-.0361	-.1866	1.12	.59	186
9	-.0276	-.2095	1.17	.62	186
10	-.0328	-.2337	1.16	.64	186
11	-.0143	-.2377	1.09	.57	185
12	.0034	-.2369	1.16	.52	185
13	-.0111	-.2419	1.04	.55	185
14	-.0084	-.2530	1.05	.57	186
15	-.0222	-.2683	1.14	.59	186
16	.0019	-.2700	1.50	.53	186
17	.0125	-.2620	1.34	.46	186
18	.0267	-.2548	1.47	.49	186
19	.0110	-.2544	1.10	.52	186
20	-.0087	-.2626	1.13	.54	186
21	.0071	-.2581	1.20	.53	186
22	-.0305	-.2813	1.16	.59	186
23	.0300	-.2674	1.38	.46	186
24	.0178	-.2684	1.46	.52	186
25	-.0150	-.2807	1.12	.56	186
26	.0096	-.2810	1.07	.53	186
27	-.0186	-.2978	1.20	.53	186
28	.0015	-.3016	1.43	.48	186
29	-.0001	-.3051	1.43	.51	186
30	.0502	-.2829	1.65	.39	186
31	.0263	-.2753	1.54	.46	185
32	.0290	-.2656	2.13	.44	186
33	-.0070	-.2798	1.53	.56	186
34	.0050	-.2815	1.30	.54	186

MONTH	AVERAGE RESIDUAL	PERFORMANCE INDEX	STANDARD DEVIATION	FRACTION NEGATIVE	N
35	.0057	-.2925	1.44	.58	185
36	.0207	-.2909	1.38	.49	183
37	.0206	-.2856	1.24	.52	183
38	.0041	-.2878	1.10	.57	183
39	.0145	-.2877	1.27	.54	183
40	-.0064	-.2993	1.17	.60	183
41	-.0017	-.3038	1.06	.55	183
42	.0227	-.2991	1.16	.48	183
43	.0089	-.3027	1.19	.52	183
44	-.0014	-.3109	1.11	.52	182
45	-.0004	-.3168	1.21	.54	182
46	.0003	-.3192	0.93	.54	178
47	.0096	-.3210	1.11	.53	179
48	.0144	-.3160	1.05	.49	176

TABLE 29

SUMMARY OF TOTAL MONTHLY RESIDUALS
POSITIVE SET

MONTH	AVERAGE RESIDUAL	PERFORMANCE INDEX	STANDARD DEVIATION	FRACTION NEGATIVE	N
-12	-.0040	-.0040	0.81	.52	172
-11	.0124	.0071	1.07	.48	172
-10	.0083	.0174	0.68	.49	172
- 9	.0009	.0171	0.66	.48	172
- 8	-.0052	.0096	0.92	.49	172
- 7	.0073	.0161	0.82	.51	172
- 6	.0063	.0239	1.03	.53	172
- 5	.0017	.0267	1.22	.58	172
- 4	.0024	.0268	0.87	.50	172
- 3	.0016	.0260	0.84	.45	172
- 2	.0027	.0391	1.01	.52	172
- 1	.0190	.0681	1.27	.47	172
0	.0793	.1357	1.54	.30	172
1	-.0151	.1206	0.82	.55	184
2	-.0134	.1076	0.96	.53	184
3	-.0165	.0915	0.91	.63	183
4	-.0108	.0842	0.85	.58	184
5	-.0287	.0599	0.91	.63	184
6	-.0291	.0346	0.90	.64	184
7	-.0190	.0146	0.89	.68	184
8	-.0279	-.0091	0.92	.66	184
9	-.0319	-.0322	0.90	.67	184
10	-.0189	-.0453	1.01	.58	184
11	-.0138	-.0565	1.00	.63	184
12	-.0162	-.0660	1.06	.55	184
13	-.0139	-.0705	1.92	.58	184
14	-.0122	-.0790	1.88	.58	184
15	.0054	-.0716	1.10	.51	184
16	-.0101	-.0722	1.22	.52	184
17	.0042	-.0782	1.54	.54	184
18	.0282	-.0746	1.23	.42	184
19	-.0021	-.0772	1.07	.41	184
20	-.0075	-.0877	1.12	.58	184
21	.0214	-.0842	1.24	.48	184
22	-.0039	-.0943	1.41	.55	184
23	-.0002	-.0966	1.11	.55	184
24	.0134	-.0934	1.34	.49	184
25	.0095	-.0918	0.99	.51	184
26	-.0050	-.0930	0.96	.58	184
27	.0141	-.0911	1.49	.54	184
28	.0165	-.0882	1.39	.48	184
29	-.0021	-.0930	1.22	.46	184
30	.0027	-.1026	1.62	.55	183
31	.0127	-.1080	1.80	.50	184
32	-.0001	-.1145	1.59	.50	184
33	.0131	-.1098	1.33	.46	183
34	.0115	-.1157	1.58	.55	182

TABLE 29 (continued)

MONTH	AVERAGE RESIDUAL	PERFORMANCE INDEX	STANDARD DEVIATION	FRACTION NEGATIVE	N
35	.0315	-.1095	1.66	.55	182
36	.0205	-.0980	1.33	.47	182
37	-.0028	-.1093	1.06	.57	182
38	-.0019	-.1232	1.18	.60	181
39	.0011	-.1306	1.21	.52	181
40	.0063	-.1341	1.24	.60	181
41	-.0080	-.1410	0.87	.54	180
42	-.0028	-.1467	0.96	.54	179
43	-.0034	-.1535	0.98	.56	179
44	.0102	-.1509	1.24	.51	179
45	.0010	-.1575	1.05	.49	179
46	.0057	-.1585	0.93	.47	179
47	.0185	-.1522	1.00	.49	179
48	.0327	-.1356	1.02	.41	178

TABLE 30

SUMMARY OF TOTAL MONTHLY RESIDUALS
NEUTRAL SET

MONTH	AVERAGE RESIDUAL	PERFORMANCE INDEX	STANDARD DEVIATION	FRACTION NEGATIVE	N
-12	.0228	.0228	0.65	.39	30
-11	.0035	.0235	0.89	.53	30
-10	-.0140	.0079	0.91	.60	30
- 9	.0020	.0131	0.82	.43	30
- 8	-.0099	.0036	0.67	.40	30
- 7	-.0410	-.0378	0.96	.70	30
- 6	.0005	-.0393	0.70	.50	30
- 5	-.0085	-.0449	0.87	.60	30
- 4	-.0164	-.0543	1.23	.73	30
- 3	-.0083	-.0657	0.83	.47	30
- 2	.0008	-.0634	0.96	.53	30
- 1	-.0293	-.0853	0.88	.60	30
0	.0012	-.0912	1.07	.57	30
1	-.0353	-.1265	0.55	.65	34
2	-.0048	-.1311	0.81	.50	34
3	-.0348	-.1632	0.64	.71	34
4	-.0093	-.1734	1.10	.58	33
5	-.0319	-.1976	0.81	.65	34
6	-.0513	-.2433	0.92	.74	34
7	-.0178	-.2613	0.88	.62	34
8	-.0485	-.2964	1.20	.71	34
9	-.0527	-.3355	1.03	.62	34
10	-.0228	-.3532	1.06	.62	34
11	-.0460	-.3851	0.94	.68	34
12	-.0293	-.4020	0.91	.71	34
13	-.0095	-.4157	1.12	.56	34
14	-.0227	-.4307	1.00	.62	34
15	-.0255	-.4488	1.28	.62	34
16	.0527	-.4335	2.03	.47	34
17	.0184	-.4248	1.93	.65	34
18	.0209	-.4223	1.40	.50	34
19	.0294	-.4097	1.44	.53	34
20	-.0352	-.4354	1.06	.65	34
21	.0081	-.4424	1.37	.50	34
22	.0172	-.4292	0.96	.64	34
23	-.0049	-.4297	1.14	.50	34
24	.0366	-.4189	1.00	.41	34
25	-.0019	-.4205	1.49	.50	34
26	-.0022	-.4283	1.12	.47	34
27	.0051	-.4307	1.34	.53	34
28	-.0002	-.4370	1.25	.56	34
29	.0333	-.4121	1.28	.35	34
30	.0191	-.4102	1.48	.38	34
31	.0116	-.4116	1.66	.47	34
32	-.0007	-.4132	1.20	.50	34
33	.0117	-.4026	1.32	.41	34
34	.0717	-.3679	1.41	.35	34

TABLE 30 (continued)

MONTH	AVERAGE RESIDUAL	PERFORMANCE INDEX	STANDARD DEVIATION	FRACTION NEGATIVE	N
35	-.0042	-.3683	1.24	.50	34
36	-.0109	-.4020	1.53	.59	34
37	.0134	-.3985	1.13	.47	34
38	.0214	-.3944	1.38	.50	34
39	-.0050	-.3972	0.90	.50	34
40	.0474	-.3770	1.09	.41	34
41	.0065	-.3719	1.08	.56	34
42	-.0056	-.3800	0.79	.47	34
43	.0079	-.3738	0.92	.44	34
44	-.0032	-.3848	1.40	.53	34
45	-.0038	-.3981	1.09	.47	34
46	.0120	-.3956	0.83	.41	34
47	-.0037	-.3957	0.62	.51	34
48	.0148	-.3895	0.94	.50	34

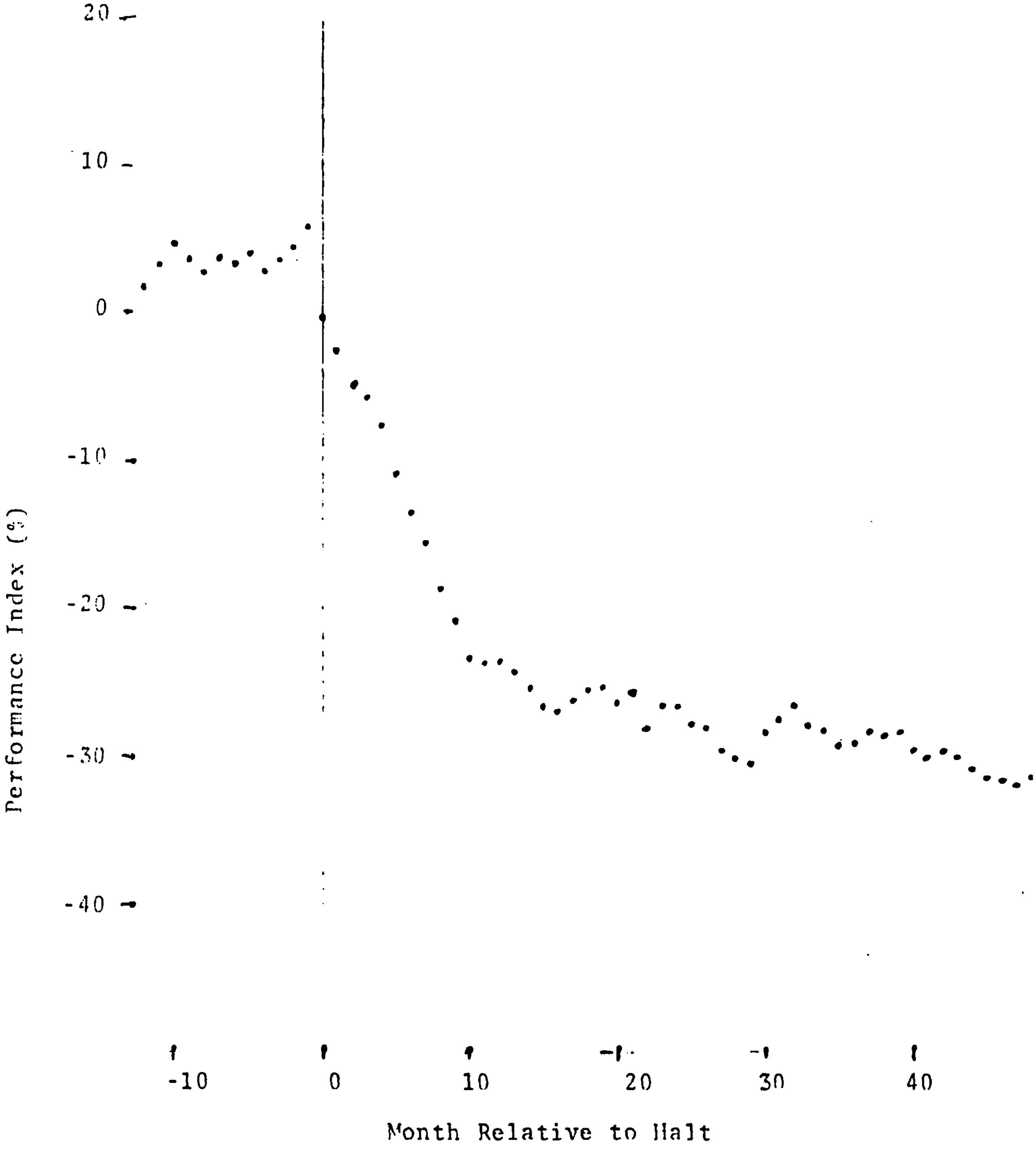

FIGURE 10

SUMMARY OF TOTAL MONTHLY RESIDUALS

NEGATIVE SET

SEPARATE BETAS--BEFORE AND AFTER HALT

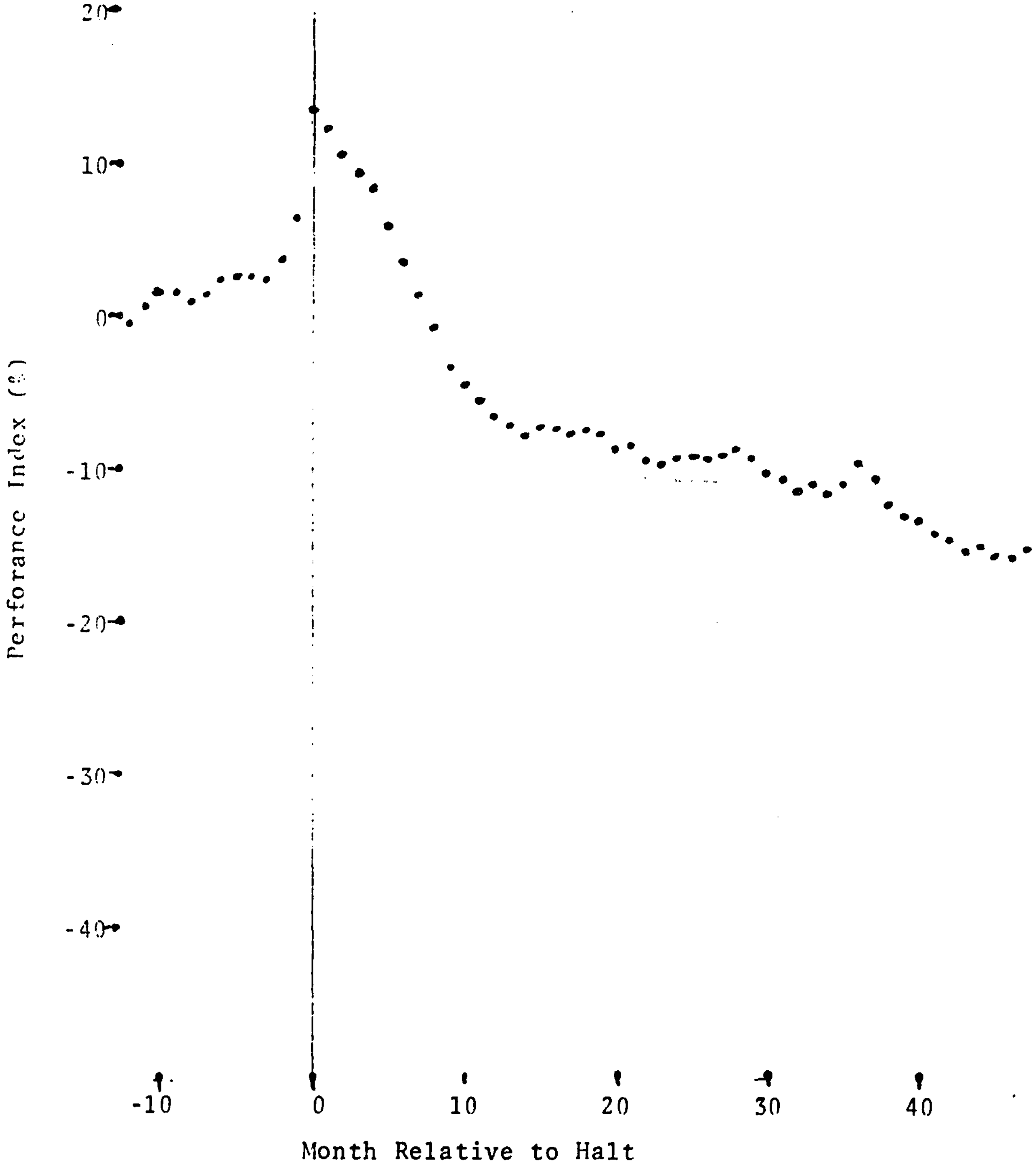

FIGURE 11

SUMMARY OF TOTAL MONTHLY RESIDUALS

POSITIVE SET

SEPARATE BETAS--BEFORE AND AFTER HALT

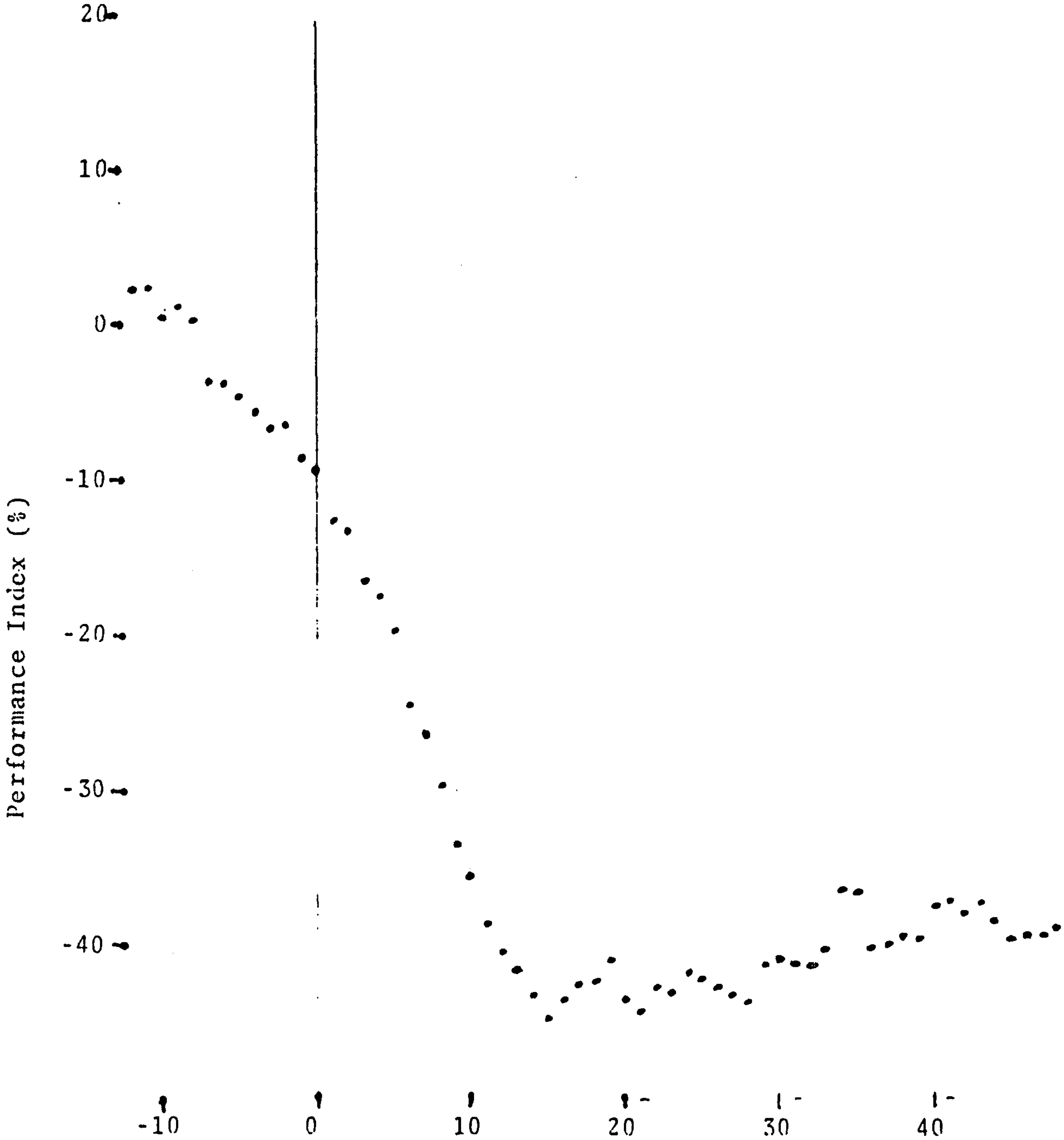

FIGURE 12

SUMMARY OF TOTAL MONTHLY RESIDUALS

NEUTRAL SET

SEPARATE BETAS--BEFORE AND AFTER HALT

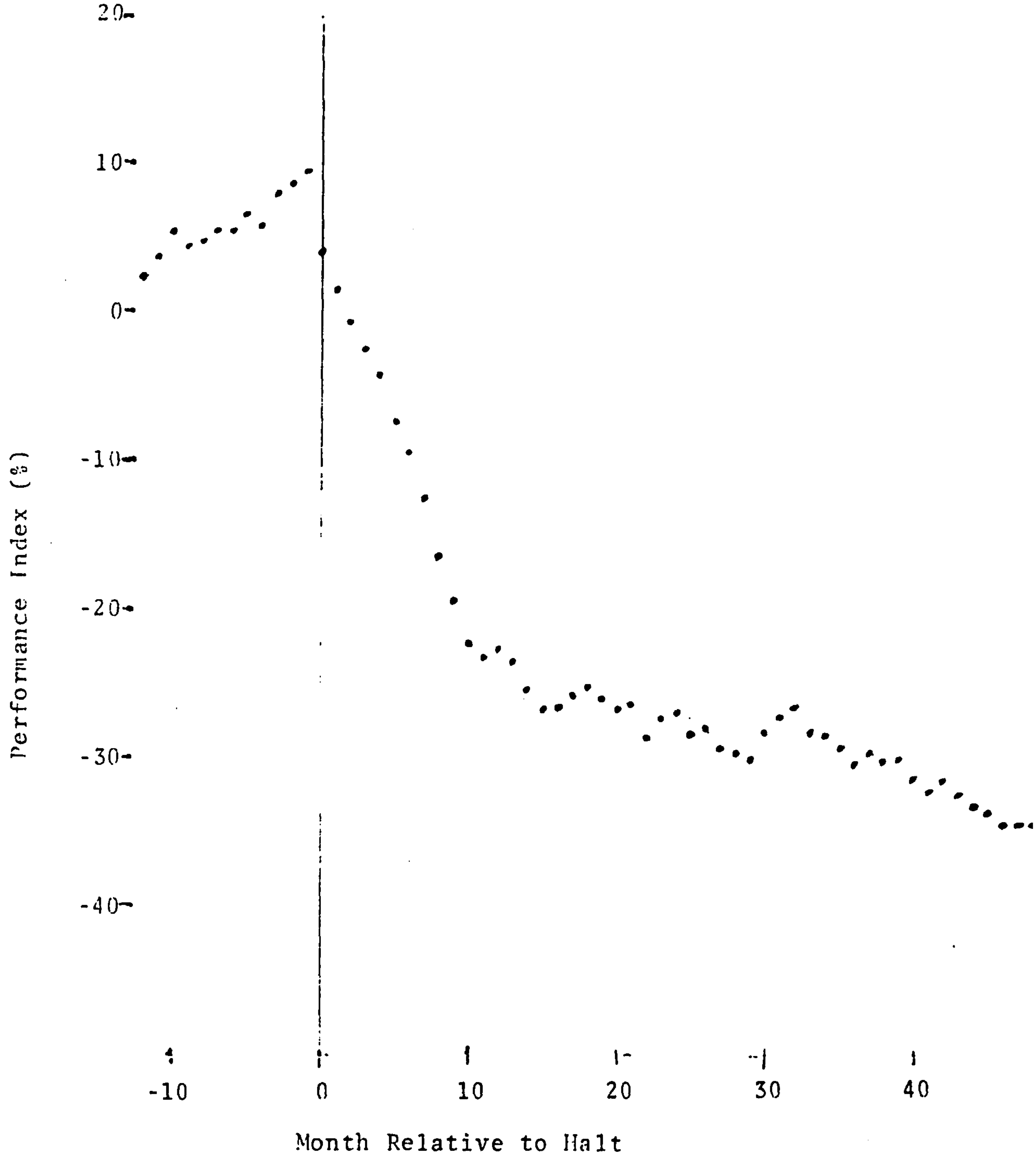

FIGURE 13

SUMMARY OF TOTAL MONTHLY RESIDUALS

NEGATIVE SET

ONE BETA--AROUND HALT

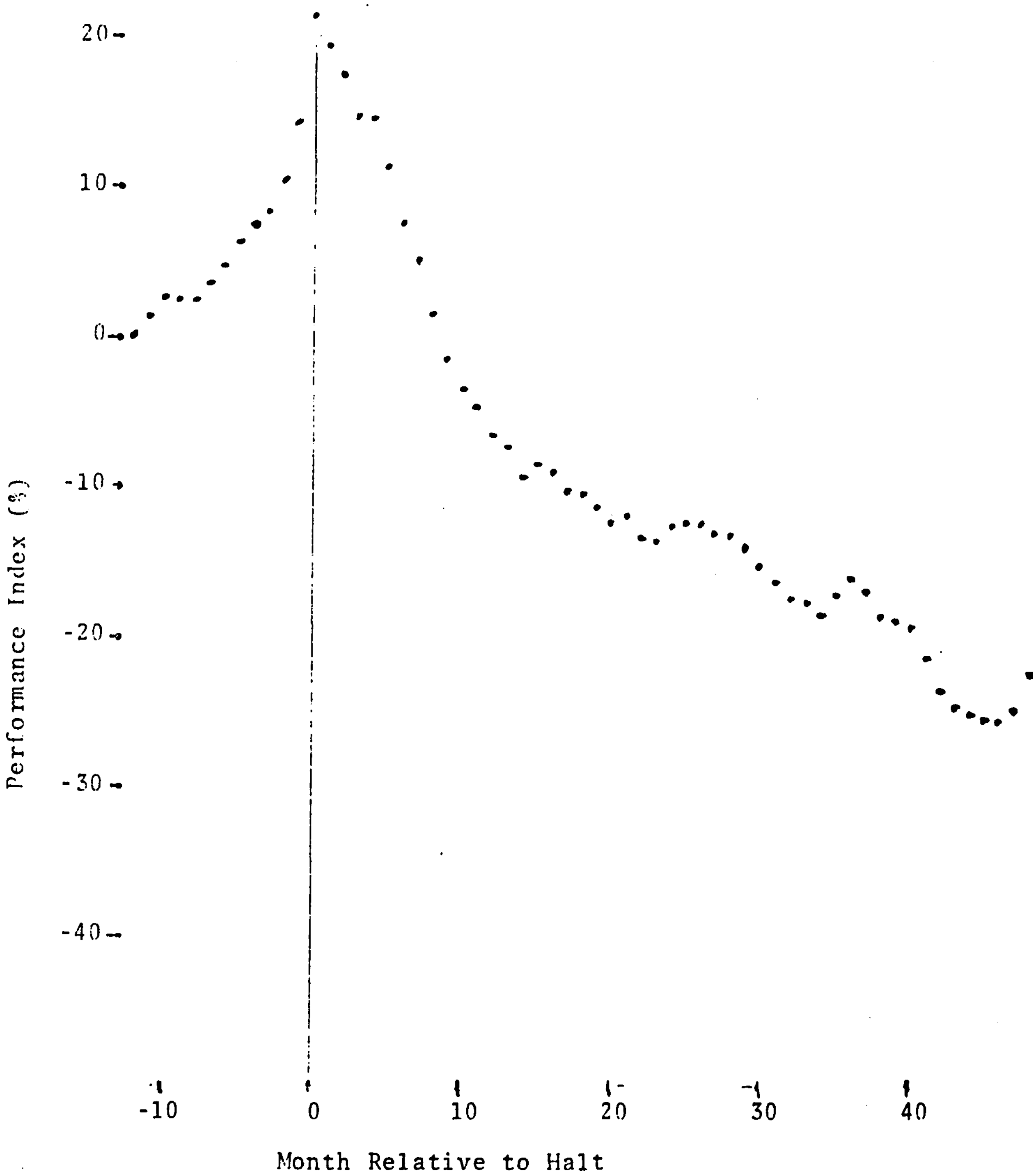

FIGURE 14

SUMMARY OF TOTAL MONTHLY RESIDUALS

POSITIVE SET

ONE BETA AROUND HALT

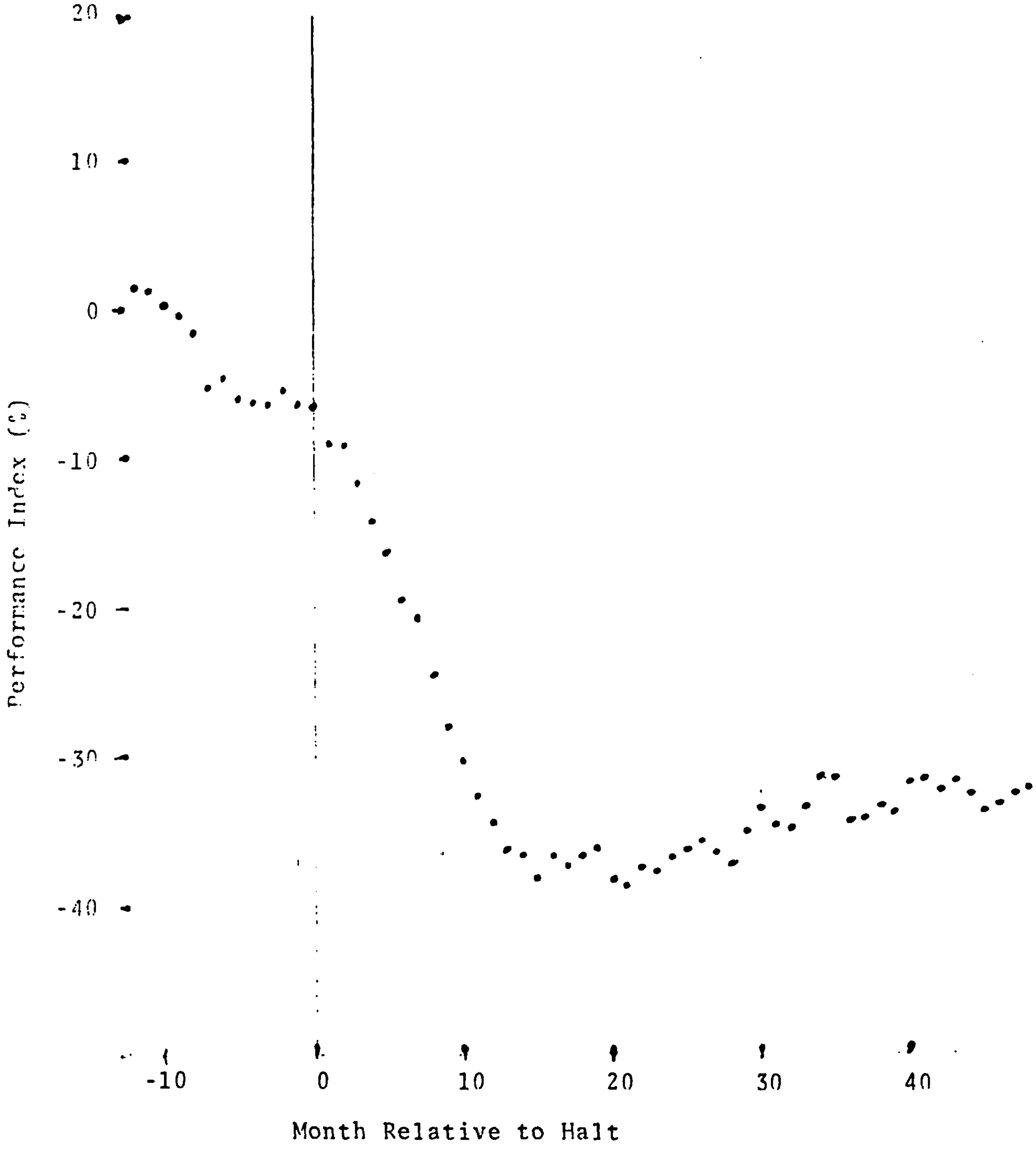

FIGURE 15

SUMMARY OF TOTAL MONTHLY RESIDUALS

NEUTRAL SET

ONE BETA--AROUND HALT

TABLE 31

CUMULATIVE MONTHLY RESIDUALS BY CLASS
NEGATIVE SET

CLASS	PERFORMANCE INDEX[1] MONTH 48	STANDARD DEVIATION	SIGNIFICANCE	N
N-1	-.4774	.1780	10.39	16
N-2	-.3943	.2122	7.88	19
N-3	-.2731	.1845	6.10	18
N-4	-.2579	.2135	4.52	15
N-5	-.3319	.1897	7.21	18
N-6	-.2005	.2334	3.54	18
N-7	-.2470	.2310	4.28	17
N-8	-.3662	.2190	6.69	17
N-9	-.2731	.2323	4.99	19
N-10	-.2970	.2392	5.27	19
TOTAL	-.3111	.2244	18.39	176

[1]Represents residuals after the event only (month 48-month 0); thus, total residuals in this and the following two tables will not agree with those for month 48 in Tables 6-1 to 6-3.

TABLE 32

CUMULATIVE MONTHLY RESIDUALS BY CLASS
POSITIVE SET

CLASS	PERFORMANCE INDEX MONTH 48	STANDARD DEVIATION	SIGNIFICANCE	N
P-1	-.3766	.2588	5.25	14
P-2	-.3615	.1664	8.96	18
P-3	-.3293	.2229	6.09	18
P-4	-.2016	.2392	3.15	15
P-5	-.2633	.1660	6.73	19
P-6	-.3099	.1556	8.68	20
P-7	-.2218	.1689	5.41	18
P-8	-.1689	.1459	4.77	18
P-9	-.2607	.2126	5.06	18
P-10	-.2319	.1680	6.02	20
TOTAL	-.2713	.1961	18.46	178

TABLE 33

CUMULATIVE MONTHLY RESIDUALS BY CLASS
NEUTRAL SET

CLASS	PERFORMANCE INDEX MONTH 48	STANDARD DEVIATION	SIGNIFICANCE	N
Neu-1	-.2352	.2656	3.76	19
Neu-2	-.3781	.1917	7.38	15
TOTAL	-.2983	.2442	7.12	34

prior to the event amounting to +6.81% at month -1, which is somewhat similar to the +5.91% for negative residuals. However, given the positive event during month 0, the residual increases to +13.57% by calendar month end. Therefore, a similar pattern of negative residuals sets in with the sharpest slope occurring during the first 10-12 months. At the end of month +10 the residual is -4.53% and month +12 it is -6.60%. By month +32 it increases to -11.45%. Thereafter an inconclusive pattern of flat to moderate declines occurs with a possible indication of a turnup at the end of the period. At the end of month +48 the residual is -13.56%. Analysis of residuals by class does not reveal any meaningful difference by class except for class 1. Class 1 positive events drop much faster with a residual that amounted to 36.96% by month +10 and then unlike the average class does not decline further thereafter. The magnitude of the decline is also about 10% greater from month 0 to month +48. Unlike class 1 negative events, positive residuals after the event do not reverse in direction over time.

Neutral events develop negative residuals beginning in month -7 which increases to -9.12% by month 0. Again here there is a sharp decline for about a year with month +12 at -40.20% and fluctuation around that figure thereafter. Month +30 is -41.02% and month +48 -38.95%. The sample size of neutral residuals is too small to permit meaningful analyzation by class.

As with daily results, using one beta generally increases the size of the residual both before and after the event. The residual at month -1 for negative halts is 9.28% as compared to 5.91% for separate betas and at the end of month +48 is -34.37% as compared to -31.60% for a total residual from month -1 to month +48 of -43.65% as compared to -37.52%. For positive residuals month -1 is 14.13% as compared 6.81% while month +48 is -22.71% as compared to -13.56%. Thus the residual from month -1 to month +48 is 16.47% greater for positive events if one beta is used. Neutral events inexplicably have moderately smaller residuals with month -1 -6.30% as compared to -8.53% and by month +48 declines to -32.13% as compared to -37.58%.

In summary, a systematic pattern of positive residuals in the twelve months prior to the event and negative residuals in the four years after it is disclosed. The only exception is the small neutral set which began the reversal from positive to negative in month -7. These residuals are statistically significant even after deduction of transaction costs.[2] In each case the sharp-

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[2]The cumulative arithmetic mean residual was also calculated at month 24 and aggregate results were significant at the 99% level of confidence for negative, positive, and neutral classes. Additionally, a signs test was performed at month 24 with cumulative residuals compared with those for month 0. The percentages of stocks exhibiting declines were as follows: Negative Set, 61%; Positive Set, 63%; Neutral Set, 76% Chi square tests performed on each set indicate that the results are significant at the 99% level of confidence.

est abnormal performance takes place within about the first year. There is some indication of leveling out of residuals after two and a half years. Class I securities, which have the greatest negative and positive price changes upon resumption of trading, decline faster and further than average, with negative residuals showing some signs of ultimate reversal. Using one beta tends to increase the size of the residuals and blurs the leveling out process.

CHAPTER VII

CROSS SECTIONAL ANALYSIS OF DATA

Since the calculation of residuals suggests that shares undergoing a trading halt deviate significantly from that of the aggregate market, some further analysis of the characteristics of these shares might prove beneficial. From chapter three, a breakdown of market model coefficients indicates that the beta coefficients are substantially greater than the 1.0 average. The weighted average of monthly betas for all three sets of 1.48 before the event and 1.27 after it suggests that the average stock in this group possesses more risk than the average stock in the common stock universe. As mentioned previously, there is little difference in beta by class or set.

The P/E (price earnings) multiples of the shares were then analyzed. The approach taken was similar to that for S. Basu.[1] Since the majority of companies report at December 31 and, according to Ball and Brown,[2] 90% of

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[1]S. Basu, "Investment Performance of Common Stocks in Relation to their Price-Earnings Ratios: A Test of the Efficient Market Hypothesis," The Journal of Finance, XXXII (June, 1977), pp. 664-65.

[2]R. J. Ball, and P. Brown, "An Empirical Evaluation of Accounting Income Numbers," Journal of Accounting Re-Search, VIII (Autumn, 1968), pp. 159-77.

firms release their yearly results within 4 months of year-end, a March 30 closing price was selected. The earnings used were taken from the ISL Daily Stock Price Index. Thus the P/E ratios were based on the latest twelve months' reporting earnings. A breakdown of the result by class and set is shown below.

TABLE 34

PRICE EARNINGS RATIOS
NEGATIVE SET

CLASS	P/E RATIO	STANDARD DEVIATION
N-1	41.9	29.6
N-2	28.5	21.2
N-3	30.7	20.4
N-4	35.9	24.8
N-5	30.4	20.5
N-6	31.8	13.2
N-7	38.6	28.4
N-8	41.0	25.7
N-9	24.1	21.9
N-10	35.5	20.2
TOTAL	33.7	23.1

TABLE 35

PRICE EARNINGS RATIOS
POSITIVE SET

CLASS	P/E RATIO	STANDARD DEVIATION
P-1	20.2	13.5
P-2	33.7	19.1
P-3	26.2	16.9
P-4	37.5	20.5
P-5	32.4	18.7
P-6	29.5	18.0
P-7	34.5	20.9
P-8	23.6	11.4
P-9	22.4	11.2
P-10	27.6	14.7
TOTAL	28.8	17.2

TABLE 36

PRICE EARNINGS RATIOS
NEUTRAL SET

CLASS	P/E RATIO	STANDARD DEVIATION
Neu-1	29.6	21.6
Neu-2	24.7	12.2
TOTAL	27.5	18.0

As is evident, the price earnings ratios of these stocks are considerably greater than that for the average common. At 3/30/72 the P/E ratio for the S&P 500 x latest twelve month earnings was 18.8. The P/E ratios for negative halts are moderately greater than that for positive and neutral halts. No apparent pattern is divulged by analyzing differences within set by class.

Finally, the data is analyzed by volume based on the average number of shares transacted in the initial trade when the halt is lifted. The results are broken out by set and class.

TABLE 37

SHARES TRANSACTED
NEGATIVE SET

CLASS	SHARES	STANDARD DEVIATION
N-1	111930	103623
N-2	46440	49443
N-3	35565	58696
N-4	27395	54939
N-5	25885	33340
N-6	24495	35792
N-7	15275	18061
N-8	6845	6756
N-9	6180	11706
N-10	5405	8154
TOTAL	20599	55529

TABLE 38

SHARES TRANSACTED
POSITIVE SET

CLASS	SHARES	STANDARD DEVIATION
P-1	65675	126852
P-2	68170	135183
P-3	30350	48898
P-4	14395	31056
P-5	10690	9850
P-6	12770	27365
P-7	9905	15653
P-8	5525	9199
P-9	12247	39618
P-10	13390	44770
TOTAL	24372	67551

TABLE 39

SHARES TRANSACTED
NEUTRAL SET

CLASS	SHARES	STANDARD DEVIATION
Neu-1	4142	8246
Neu-2	36317	135812
TOTAL	19795	94921

It is obvious that the average volume upon reopening substantially exceeds that for the average trade on the New York Stock Exchange. This type of block trading suggests institutional activity in purchasing and sales of the common shares. Negative halts have moderately greater volume than the positives. Finally, there appears to be a relationship between price change and volume with the largest number of shares transacted associated with the large price changes. The only glaring exception is class neu-2, which was influenced by one outlier--a 580,000 share trade.

In summary, the average company undergoing a trading halt for the time period tested is differentiated in many respects from the aggregate universe of stocks. It is riskier and thus more speculative; it has a substantially higher price earnings multiple; large volume generally accompanies the actual halt itself. With the exception of a relationship between number of shares transacted and price changes when trading is resumed, individual classes do not differ greatly from average set results, which suggests that characteristics of this population for the variables tested are not differentiated by price changes at the time of the halt.

CHAPTER VIII

SYNTHESIS

This chapter will summarize and integrate the results disclosed in chapters three to seven and attempt to form a cohesive conclusion. The analysis will start with the period immediately after the halt and extend to the months subsequent to this period with conclusions drawn relative to alternative hypotheses stated in the analysis of results section of chapter two. Analysis of the period before the halt and of common share characteristics will follow. Finally, a theory integrating individual conclusions will be presented.

For negative halts about a two thirds of a percent continuation of the negative price movement from the time trading is resumed to the close that day is observed. On the next three days there is a further one quarter percent negative movement for a total of almost 1%; no additional non market related price changes are noted through the twenty five day period after the event. These negative set results appear similar to those of Scholes[1] on second-

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[1]Myron Scholes, "The Market for Securities: Substitution versus Price Pressure and the Effect of Information on Share Prices," The Journal of Business, XLIV (April, 1972), pp. 179-211.

ary distributions described in chapter one. Scholes found that a 1% negative price adjustment took place in the five day period following secondaries, while trading halts have a similar drop during the intraday and first three full-day period following the event. This similarity in results may be due to characteristics trading halts share with secondaries; trading halts frequently involve block trades with the suspensions an acknowledgment that it is necessary or preferred to notify others, through the announcement of the trading halt (as with the announcement of the secondary), that it is to be handled in a special way. Thus these results appear most consistent with the inerday information hypothesis discussed in chapter two, which would suggest that the halt itself or the information disseminated at the time of the halt creates a permanent negative return which the market takes a few days to adjust to. However, as with Scholes' results after deduction of transaction costs, the 1% residual is not large enough to create opportunities for abnormal returns.

Similarly, neutral halts undergo a .95% intraday price drop followed by a further .75% decline over the next six days. The 1.70% residual is more than offset by a calculated transaction cost of approximately 2.50%--around 1% greater than either positive set transaction costs due to the lower volume accompanying neutral halts.

The nonsystematic price charges associated with positive events, on the other hand, appear most closely associated with the interday liquidity hypothesis. The positive residual developed during the intraday period following the event for positive events, is reversed and eliminated over the subsequent six day period. Thus, there is the suggestion of large volume activity which temporarily affects share prices, with recovery thereafter. As with negative and neutral halts, the residual is too small to afford opportunities for profitable trading.

When the analysis is extended, however, to include the four year period beyond the event, substantial non-systematic negative residuals appear. For the negative sets the residuals to from month 0 to month 48 amount to -31%, positive set -27% and neutral set -30%. In each case the sharpest declines take place within about the first year, generally leveling off after about two and a half years. Since the residuals develop over an extended period of time, the pattern appears to most closely resemble the inappropriate response hypothesis as described by Smidt.[2]

Over the sixty months prior to the month of the trading halt, an above average market performance is demonstrated as indicated by the statistically significant positive alpha coefficient. During the twelve months prior to the halt when residuals are analyzed, positive residuals of 6% for the negative set and 7% for the positive set are disclosed. These positive residuals take place right up

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[2]Seymour Smidt, "A New Look at the Random Walk Hypothesis," Journal of Financial and Quantitative Analysis, III (September, 1968), pp. 235-61.

until day -3 for the negative set and through day 0 for the positive set. The 1% reversal or negative residual from day -3 to day -1 for the negative set, and the unusually large 3% positive residual from day -6 to day -1 for the positive set, may be due to what Pettit indicates is either the result of previous announcements correlated to the current one or activity by insiders in a position to have advance information about the pending announcement.

Thus, overall, a pattern of positive residuals develops prior to the halt and negative residuals develop after the halt regardless of whether the halt itself is a positive or negative one. When residuals developed from daily market model coefficients are tested against those based on monthly coefficients, the results are comparable.

There are a few exceptions to these results. First, monthly alphas after the event are modestly positive for both negative and positive sets. However, these alphas lack statistical significance. Second, the neutral set on a substantially smaller sample size develops a negative cumulative residual of 9% during the twelve months prior to the event. Finally, class 1 halts encompassing those stocks having the largest price changes upon reopening deviate in many respects from aggregate results. The

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[3]R. Richardson Pettit, "Dividend Announcements, Security Performance, and Capital Market Efficiency," The Journal of Finance, XXVII (December, 1972), p. 1002.

shares tend to move materially in the same direction as the original halt in the twenty-five days immediately after it. The positive residual of 3% for positive halts and 4% for negative halts both present the potential for abnormal returns after deduction of transaction costs. While the direction of monthly residuals is similar to the population as a whole, class 1 shares have a steeper slope during the first ten months. Class 1 positive residuals are larger and level off earlier than average and class 1 negative residuals are larger than average, with some indication of reversal at the end of the five year period. However, the small sample size in class 1 and the inability to uncover similar patterns in other classes, make it difficult to draw definitive conclusions.

On balance, a systematic pattern of residual returns both before and after the halt remains. The question then arises as to the possible factors creating the pattern. In the period prior to the trading halt, a pattern of positive residuals develops and the pattern is then reversed in the days and months subsequent to it. Moreover, there is a significant difference in the beta coefficients for the same stocks for the periods before and after the halt which would suggest a shift in the market's perception of the risk of the average firm at the time of the halt. A trading halt is a bona-fide event, signaling to investors that either an important piece of company related news has been, or is about to be, disseminated, or that there is a temporary excess of shares for purchase or sale. Thus, the first thought is that the specific news disseminated by the trading halt, whether it be fundamental information related, or liquidity related creates the subsequent pattern of residuals. However, while the examination of prices during the part of the day following the halt and the days after it discloses systematic patterns, the residuals developed generally are not sufficient to create the potential for abnormal profitability. Thus, except possibly for a small class of halts having the largest price changes, the market appears to adjust efficiently to the specific news. Additionally, the consistency of negative residuals after the event, regardless of whether the halt is caused by positive or negative pressures, tends to dispute a specific news-from-trading-halt oriented approach.

An examination of stocks undergoing trading halts provides certain illuminating characteristics. On balance, the shares provide above average returns for holders prior to the halt, as exemplified by a statistically significant positive alpha coefficient for the five year period before the halt, and positive residuals for the twelve months period immediately preceeding it. This above average stock performance may contribute to the price earnings multiple that is substantially greater than that for the average stock. The large volume of shares that trade at the time of the halt suggests that institutions are involved in many of these stocks. The fact that the shares move in a systematic positive direction prior to the halt may indicate that institutions are large net purchasers during that period. Klemkosky's[4] work on effects of large institutional net purchasing or selling suggests that in either case, significant negative residuals develop in the period thereafter. Interestingly, his term for the effect created "imbalances" is similar to one cause for a trading halt. Thus, it is possible that the characteristic that Klemkosky observed of "net buying . . . influence[d] by favorable abnormal returns"[5] and a "follow the leader type of trading pattern found in the study by Friend"[6] may create a situation in which the market temporarily inappropriately discounts the future earnings and dividend potential of the shares. Basu's[7] work on high price earnings multiple stocks, which shows that they have significant negative residuals in the period subsequent to their developing high relative P/E ratios--attributable to "exaggerated investor expectations,"[8] lends further support to this line of thinking.

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[4]Robert Klemkosky, "The Impact and Efficiency of Institutional Net Trading Imbalances," The Journal of Finance, XXXII (March, 1977), pp. 79-86.

[5]Ibid., p. 85 [6]Ibid., p. 84.

[7]S. Basu, "Investment Performance of Common Stocks in Relation to their Price-Earnings Ratios: A Test of the Efficient Market Hypothesis," The Journal of Finance, XXXII (June, 1977), pp. 43-82.

[8]Ibid., p. 68.

Rather than the specific news disseminated at the time of the positive or negative halt, the trading halt itself might then identify a type of comp which is more speculative than average, as shown by its a beta coefficient, and its high price earnings valu on based upon this speculation is inappropriate. The negative residuals develop over an extended period subsequent to the halt generally without any material reversal over the 48 months after the event covered in this analysis. This type of pattern of positive residuals over an extended period of time, followed by a reversal unfolding over many months, appears consistent with the inappropriate response hypothesis. Smidt indicates that inappropriate responses "are the result of the actions of large decision-making units responding to the same information. In the case of a trend the price reaction is exaggerated and eventually produces a corrective reaction in the opposite direction."[9] The timing, Smidt says, "probably extend[s] over a period of months or years."[10]

Summary and Conclusion

The hypothesis tested was whether the market adjusted efficiently to trading halts. For negative and neutral "news" disseminated at the time of the halt, the price pattern resembled the information hypothesis. For

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[9]Smidt, Journal of Financial and Quantitative Analysis, III (September, 1968), p. 257.

[10]Ibid., p. 258.

positive "news" the pattern resembled the liquidity hypothesis. On the whole, neither pattern of residuals immediately after the halt was sufficient to create the opportunity for abnormal gains in profits. Thus, it can be said that the efficient market hypothesis is affirmed for specific information disseminated at the time of the halt. However, the systematic pattern of positive residuals in the months and years before the halt and negative residuals in the months and years after it appear to create an opportunity for abnormal gains in profitability. The suggestion of periodicity in the price pattern of the stocks tested resembles the inappropriate response hypothesis. Aa distinct from the news disseminated at the time of the trading halt, the trading halt itself appears to possess information as to type of stock which is not impounded at the time trading is resumed. Thus, these results for the period tested would appear to be an exception to the semi-strong form of the efficient market hypothesis which states that all publicly available information is efficiently and instantaneously reflected in the price of common shares.

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