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thesis entitled

THE EFFECT OF DIVESTITURE MOTIVES
ON SHAREHOLDER RISK AND RETURN

presented by

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has been accepted towards fulfillment
of the requirements for

Ph.D. degree in Business - Finance

A handwritten signature in cursive script, appearing to read "W. E. J. ...", written over a horizontal line.

Major professor

Date

A handwritten signature in cursive script, appearing to read "October 11, 1978", written over a horizontal line.

THE EFFECT OF DIVESTITURE MOTIVES
ON SHAREHOLDER RISK AND RETURN

By

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ABSTRACT

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This study was undertaken to determine what effect the announcement of a divestiture had on the returns earned and risk borne by the owners of the divesting firms. Three prior studies had examined the impact of announcements on shareholders but this research provides two additional contributions. First, the firms divesting voluntarily are further divided into two groups. In the first group are those firms which divest an asset simply because they wish to change the mix of assets under their command. The other group contains those firms which divest to correct a losing situation in which either the firm as a whole must sell assets to raise cash or else the divested asset is losing money. The other contribution of this study is the analysis of changes in the risk of the firm resulting from the divestiture.

This study used the two factor model to measure abnormal returns for 109 voluntary divestitures and fifty-three involuntary divestitures during the period 1962-1973. A paired comparison study was conducted to measure changes in systematic and unsystematic risk associated with the divestiture announcement.

The findings of this study show that the pattern of abnormal returns to shareholders depends on the motive for divestiture. The pattern of returns differentiates the voluntary from the involuntary divesting firms and within the voluntary sample differentiates those firms which divest to change the mix of assets from those firms which divest to correct a losing situation.

These findings imply that while owners of involuntary divesting firms pay a penalty when divestiture is announced, those of voluntary divesting firms do not. Owners of firms which divest to change their mix of assets continue to earn normal returns or significant positive returns after divestiture is announced. The most profitable finding to investors is that the significant abnormal negative returns to losing firms are essentially eliminated after the firm takes positive steps to correct losing situations. Those investors who have sold short should probably cover their positions after a divestiture announcement.

The results do not show a statistically significant change in either systematic risk or unsystematic risk associated with any of the divestiture motives. The research design could only measure changes in average risk levels before and after divestiture announcement. The author thus concludes that either the divestitures had no impact on risk or the firms' investment and financing policies are such that the effects of divestiture are cancelled.

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CHAPTER 1

INTRODUCTION

During the past fifteen years, many articles analyzing the economic effects of mergers have been published in the finance literature. Most contemporary finance textbooks have a chapter on "Mergers and Acquisitions." However, little empirical or theoretical work has been done on the closely related topic of divestiture.¹

It has been suggested that while the 1960's qualified as the "Age of Acquisition," the 1970's promise to be the "Decade of Divestiture."² This suggestion is motivated by two factors:

1. Economic conditions are forcing many firms involved in the merger movement during the 60's to re-evaluate the value of their acquisitions and weed out those not fitting into their corporate framework; and
2. It is hypothesized that firms will approach the divestiture decision in the same light as investment decisions and use divestiture as a legitimate tool of corporate strategy.

In addition to these motivations, the regulatory environment will play a large role in future divestiture decisions.

Information as to the frequency of divestiture is limited but from data in the publication Mergers and Acquisition,³ it is

possible to observe the trend in divestiture activity. In the late and mid 1950's divestiture frequency was less than one hundred per year. By the mid 1960's it rose to about one hundred fifty per year. It nearly tripled from 1964 to 1971 and in 1972 it increased another fifty percent with some six hundred divestitures reported in 1972. Other publications such as Forbes, Business Week and The Wall Street Journal⁴ also report the frequency of divestiture to be increasing.

Purpose of the Research

The purpose of this research is to measure the effect of the divestiture announcement on the common shareholders of the divesting firm. The effect of divestiture will manifest itself in two ways. First, since the cash flows to the firm are altered, shareholders' expectation of future cash flows are changed. This is observed in the stock price adjustment to the divestiture announcement. Second, if the pattern of cash flow changes, this may lead to changes in the riskiness of the firm and in particular the level of systematic risk.

A large body of empirical research has been conducted which provides evidence to support the hypothesis that the securities markets are efficient in the sense that information affecting shareholders' returns is impounded rapidly in share prices.⁵ Also, research has indicated that there is a relationship between expected return and the level of systematic or relative risk. The present research could be construed as providing additional evidence on the efficiency of capital markets with respect to divestiture announcements. Instead, however, this study assumes an efficient market and measures actual shareholders' returns around the divestiture announcement date to determine the effect of the divestiture on shareholder wealth and risk.

It is hoped that this research can be useful to investors and corporate financial managers in assessing the impact of divestiture upon their firm. Investors can use the results to decide whether to buy or sell the stock of the divesting firm. Executives of the firm can see how the stock market responds when the firm announces a divestiture decision.

Motives for Divestiture

Compared to the literature for mergers, there is little discussion of the motivation for divestitures. Pfahl⁶ and Vignola⁷ are two sources which discuss divestiture. While each author proposes several different motives for divestiture, they both agree that the major motive for divestiture is a desire to increase profitability or return on investment. This motivation may be stimulated when the line of business the firm is in earns a return on investment which is lower than the return that can be earned elsewhere. Firms also find themselves in lines of business which while earning a satisfactory return require additional heavy investments of capital, management and materials. Since a firm is constrained by the available resources, it may choose to divest a division instead of committing itself to an operation for which resources would be unavailable.

In the early 1970's, many conglomerates and other firms were divesting because they were in financial difficulty. These firms were highly leveraged and in combination with poor total earnings were forced to sell sometimes very profitable divisions in order to reduce their debt load. Other firms, though not as highly leveraged, sold operations which were unprofitable in and of themselves. The reduction of leverage

would reduce the level of financial risk or chance of bankruptcy. Risk reduction thus can also be considered a motive for divestiture.

Another motive for divestiture is to get rid of operations that are peripheral to the main activity of the firm or because they are too demanding of management's time in relation to their immediate and future benefit to the corporation.

Legal requirements are also a major reason for divestiture. The Federal Trade Commission and the Department of Justice have filed numerous suits to force divestiture. These usually allege violation of Section 7 of the Clayton Act and allege that certain acquisitions are anti-competitive and must be divested. Other divestitures have been forced by the Federal Reserve Board and Federal Communications Commission for failure to comply with administrative rules and laws of these agencies.

The motive for forcing divestment in antitrust cases is that firms are earning or have the potential to earn monopolistic returns. Forced divestiture should lead to decreases in shareholder wealth if the authorities do their job well.

Contribution of this Research

There have been three published empirical studies dealing with divestiture which utilize the capital asset pricing model.⁸ These studies are described in detail in Chapter 2. In this section the most important differences between those studies and this research are mentioned.

The present research is essentially different from the three previously reported studies in three ways; first, it is hypothesized

that the motive for divestiture is associated with a particular pattern of returns to shareholders about the announcement date. This is certainly evident when comparing the returns of firms engaged in voluntary and involuntary divestitures. Before divestiture announcement firms divesting involuntarily earned positive abnormal returns, afterward they earned negative returns for a short period. Boudreaux⁹ has shown that voluntary divestitures will result in abnormal positive returns being earned after the announcement date. This research shows that there is a distinct difference in the pattern of returns between those voluntary divestitures motivated by the desire to change the mix of invested assets and those divested because of unprofitable operations either in the divested division or the firm as a whole. The information about the divestiture impacts on the market in a manner dependent on the motive of the firm.

Second, the sample includes divestitures during 1970-1973, a period characterized by numerous divestitures and generally declining stock market conditions as measured by indices such as Standard and Poors 500 composite.

Third, none of the three studies have examined the effects of changes in risk associated with divestiture except in tracking the average level of systematic risk. In this study, the association between changes in systematic and unsystematic risk and divestiture announcement is investigated.

Method of Research

This section gives a brief description of the method of research. Chapter 3 provides a more complete description.

Data Used

The basic data used in this research are monthly returns of common stocks on the New York Stock Exchange. The source of the returns are the CRISP monthly return file created and distributed by the University of Chicago Center for Research in Security Prices. This file contains monthly returns for all common stocks listed on the New York Stock Exchange from January 1926 to December 1975.

Sample

The sample of firms consists of 109 firms which announced a voluntary divestiture in the period 1962-1973 and fifty-three firms which announced an involuntary divestiture in the period 1965-1973. The voluntary divesting group is divided into two sub-groups on the basis of divestiture motive. The first group consists of those firms divesting to change the mix of assets employed in the business. The second group is those firms divesting because the firm as a whole or a division of the firm is unprofitable and/or the firm must reduce its debt load.

Measuring Abnormal Returns

The method of measuring returns to shareholders of divesting firms is the residual analysis utilizing the two factor model.¹⁰ The residual analysis measures "abnormal" returns; that is, returns which are the difference between the return actually earned by the investor

and the return expected given the level of risk borne by the investor. If the abnormal return is zero or not statistically different from zero then it can be inferred that the divestiture had no effect on the return earned by the shareholder.

For each divesting group, the abnormal returns are computed for each firm for the twenty-five month period surrounding the divestiture announcement date. The differences in returns for the firm and the expected return given the level of systematic risk are computed for each divesting firm and for each of the twenty-five months surrounding the divestment announcement date.

For each month relative to the announcement date, average and cumulative abnormal returns are found for each group. Statistical significance is determined with a t test.

Measuring Risk Changes

Seventy-one voluntary and thirty-six involuntary divesting firms had sufficient data available to determine if divestiture is associated with changes in risk. Three quantitative measures of risk are used in this study. They are the beta coefficient, correlation coefficient and the standard error of the estimate of the regression relation used to estimate the beta coefficient.

Each divesting firm was matched with a control firm on the basis of industry and asset size. A paired comparison t test was used to measure changes in the three risk measures from pre- to post-announcement periods. The risk measures in each period were estimated using thirty-six observations of monthly rates of return and the market model.

Organization of the Study

Chapter 2 presents a summary of the most relevant past theoretical and empirical studies dealing with the measurement of gains to shareholders and change in risk arising from divestiture. Emphasis is given to the research designs of previous studies. Chapter 3 presents the methodology employed in the research, and the rationale underlying it. Chapter 4 presents the findings of the research and comments on inferences, implications, and possible explanations of the findings. The conclusions, limitations, and some avenues for further research are contained in Chapter 5.

ENDNOTES TO CHAPTER 1

1. The three prior research works dealing with divestiture and discussed in this dissertation are, Kenneth J. Boudreaux, "Divestiture and Share Price," Journal of Financial and Quantitative Analysis, 10 (November, 1975), 619-626; James C. Ellert, "Mergers, Antitrust Law Enforcement and Stockholder Returns," Journal of Finance, 21 (May, 1976), 715-732; Donald Kummer, "Stock Price Reaction to Announcements of Forced Divestiture Proceedings," Journal of the Midwest Finance Association, (1976), 99-123.
2. Robert H. Hayes, "New Emphasis on Divestment Opportunities," Harvard Business Review, 50 (July-August, 1972), 55-64.
3. Mergers and Acquisitions, 1 (1966).
4. Forbes, January 15, 1972; Business Week, August 15, 1972; The Wall Street Journal, October 26, 1971.
5. A number of research articles dealing with efficient markets have been published. The articles by Boudreaux, Ellert and Kummer provide support for this hypothesis. For an early survey see Eugene F. Fama, "Efficient Capital Markets: A Review of Theory and Empirical Work," Journal of Finance, 25 (May, 1970), 383-417.
6. John K. Pfahl, Corporate Finance, 4th ed., New York: Ronald Press, 1975.
7. Leonard Vignola Jr., Strategic Divestment, New York: AMACOM, 1974.
8. Boudreaux, op. cit.; Ellert, op. cit.; Kummer, op. cit.
9. Boudreaux, op. cit.
10. Eugene Fama and James D. MacBeth, "Risk, Return and Equilibrium: Empirical Tests," Journal of Political Economy, 81 (July-August, 1973), 607-636.

CHAPTER 2

REVIEW OF THE LITERATURE

The purpose of this chapter is to review the literature and to compare prior research on divestiture with the present research. Emphasis is given to the methodology of the prior studies, their findings and conclusions and differences between the present and prior research.

Table 2.1 presents a comparison of the present research of the author and the three prior studies of divestiture. As indicated in Chapter 1, the present research is differentiated from the prior research by a research design which divides the sample of voluntary divesting firms on the basis of motive, by analysis of changes in risk associated with divestiture announcement and by other factors including time period of the study.

This chapter is divided into four parts. In the first part the theoretical models and methods for estimating abnormal returns used in the present and prior research are introduced. The second part presents the empirical evidence on abnormal returns provided by the previous studies. The third part discusses the important topic of how risk is measured. The fourth part presents results of empirical studies of risk changes. Since the previous studies of divestiture did not directly address the subject of risk change associated with divestiture the techniques and results discussed in the fourth part of this chapter

TABLE 2.1

COMPARISON OF STUDIES OF DIVESTITURE

Factors Differentiating the Studies	Author's Research	Boudreaux	Ellert	Kummer
Motives	Voluntary, with div- ision into change- mix and losers. Involuntary.	Voluntary and Involuntary	Involuntary	Involuntary
Risk Change	Yes	No	No	No
Time Period	1962 - 1973	1965 - 1970	1950 - 1972	1958 - 1967
Return Computation Technique	Two Factor Model	Market Model	Two Factor Model	Two Factor Model
Sample Size	109 Voluntary 53 Involuntary	138 Voluntary 31 Involuntary	205 Involuntary	76 Involuntary
Size of Divestiture	Yes	No	No	No

primarily deal with the related topic of changes in risk associated with mergers.

Models for Analysis of Returns

In order to assess the effects of divestiture (or any other economic event) on shareholder wealth, a theory is needed which describes the relationship between wealth and economic variables and which is subject to empirical testing. The theoretical model used in the present and prior research is a form of the capital asset pricing model (CAPM).¹

$$E(R_i) = E(R_z) + \beta_i [E(R_m) - E(R_z)]$$

where: $E(R_i)$ = expected return on security i ;

$E(R_m)$ = expected return on market index;

$E(R_z)$ = expected return on zero β portfolio; and

$$\beta_i = \frac{\text{cov}(R_i, R_m)}{\sigma^2(R_m)} = \text{measure of systematic risk.}$$

This model is in terms of expectations and states that expected return on a security is a function of the expected return on the market, expected return on a zero risk portfolio, and the systematic risk of the security as measured by the beta coefficient. It is implied in this model that all other economic variables are incorporated in these three variables or else have a negligible effect.

To empirically test the model or to use it to assess the effects of policy changes, we must assume some stochastic generating distribution for the stock price returns. The earliest stochastic

generating model was the so-called "market model".² This model relates one period returns on a security to the corresponding one period returns of the market.

$$\tilde{R}_{it} = \alpha_i + \beta_i R_{mt} + \tilde{\epsilon}_{it}$$

where: $\tilde{R}_{it}$ = returns on security i in period t;

R_{mt} = return on a market index in period t;

α_i, β_i = constants depending on the firm, β_i being the measure of nondiversifiable or systematic risk; and

$\tilde{\epsilon}_i$ = random error term with mean of zero and constant variance.

To use the market model to determine the effect of a financial event such as a divestiture announcement upon shareholders wealth, we first select a sample of firms which experienced the event. A least squares procedure is then used to estimate the coefficients α_i and β_i for each firm using actual monthly returns about the period t. The expected return $\hat{R}_{it}$ for a firm in period t is computed by

$$\hat{R}_{it} = \hat{\alpha}_i + \hat{\beta}_i R_{mt}.$$

The average difference, AVG, between actual and expected returns for the sample of N firms for a specific period before or after the event is computed by

$$AVG = \frac{1}{N} \sum_{i=1}^N (R_{it} - \hat{R}_{it}).$$

If AVG is statistically different from zero, this indicates that shareholders of firms in the sample earned "abnormal" returns on average in that time period and this presumably is due to the effect of the financial event under study.

Unfortunately, the market model itself is not an adequate representation of the generating process and has been shown to produce biased expected returns when used as above.³ Thus, measured abnormal returns could have been produced by the bias as well as by the event being tested.

A more recent empirical model which better describes the observed relation between risk and return is the two factor model⁴

$$\tilde{R}_{it} = \gamma_{0t} + \gamma_{1t}\beta_i + \tilde{\eta}_{it}$$

where: γ_{0t} , γ_{1t} are market wide random factors; and

$\tilde{\eta}_{it}$ = random error term which is distributed with zero mean and constant variance.

The two factor model is used to test for effects in a manner similar to the above. Estimate the coefficients $\hat{\gamma}_{0t}$, $\hat{\gamma}_{1t}$, $\hat{\beta}_i$ and then compare the predicted return with the actual for a sample of N firms.

The formula for AVG then becomes

$$AVG = \frac{1}{N} \sum_{i=1}^N [R_{it} - (\hat{\gamma}_{0t} + \hat{\gamma}_{1t}\hat{\beta}_i)].$$

In this formula, abnormal return is the difference between actual return and the return expected for any firm whose systematic risk is β_i . The cumulative abnormal return CAR_{t_1, t_2} is the cumulated abnormal gain or loss we would have if we had bought the average stock at the beginning of t_1 and held to the end of t_2 . If there were no effects, we

would not expect AVG or CAR_{t_1, t_2} to be significantly different from zero. If significantly different, we would, as before, attribute it to the event.

The analysis of abnormal returns requires estimates of three terms. The market wide parameters γ_{0t} and γ_{1t} and the systematic risk β_i of each firm in the sample must be estimated.

The market wide parameters can be estimated using the technique of Fama and MacBeth.⁵ The computation of the estimates is on a monthly basis for every month of the study under consideration. These estimates are in a sense a least squares fit of the relationship between actual monthly returns and the systematic risk β , for the common stock of all firms on the New York Stock Exchange for each month. These computations are very costly and time consuming and most researchers thus obtain the estimates from Fama and MacBeth or other sources. This approach is used in the author's research and the estimates of γ_{0t} , γ_{1t} for this research are contained in Appendix B.

The estimate of β is needed for each time period of the study for each firm in the study. For instance if an abnormal return is needed for a firm in January, 1970, the value of β would be estimated in the following manner. Using the prior sixty monthly returns on the common stock and the corresponding returns on the market index, the estimate of β is computed using a least squares fit to the market model. For this example the observations come from the period January, 1965 through December, 1969. If an estimate of β is needed for February, 1970 an updating procedure is used. That β is computed using the sixty monthly pair of returns from February, 1965 through January, 1970. This approach has been used by a number of researchers including the author

when estimates of β are needed for computing abnormal returns. However the availability of data may limit the number of observations to as few as thirty-six.

Sunder has pointed out that changes in risk during the abnormal event under study may produce a bias in the measured abnormal returns.⁶ None of the other empirical studies of divestiture addressed the question of how changes in the estimate of β affected the measured abnormal returns. The author's research does address this issue.

Empirical Evidence of Abnormal Returns

In this section the three empirical studies of returns to shareholders of divesting firms are reviewed. In the first part of this section the only study dealing with voluntary divestitures is reviewed. In the second part of the section the results for involuntary divestitures are presented.

Results for Voluntary Divestitures

Boudreaux⁷ used the market model to determine the abnormal returns earned by shareholders of 138 voluntary divesting firms. The market model coefficients were estimated using five years of monthly observations. His sample consisted of listed firms divesting in the period 1965-1970.

For the voluntary divestitures he determined the abnormal returns in the twelve month period surrounding the announcement date of the divestiture. The average abnormal return in each month was positive and the cumulative average abnormal return steadily increased over the twelve month period with the largest increases in the period from three months before until one month after announcement. He concludes that voluntary divestitures lead to increases in wealth. However, his

results are qualified because of the possible bias introduced through use of the market model rather than the two factor model. Also, he did not present any tests of significance nor did he distinguish these voluntary divestitures as to size or motive, as is done in the present research.

Results for Involuntary Divestitures

Boudreaux also analyzed returns for thirty-one involuntary divestitures. His analysis of involuntary divestitures was conducted in a manner similar to the analysis of voluntary divestitures but he used two announcement dates rather than one. These dates were the complaint date and the judgment date. The complaint date is the date when the government first files a proceeding to force divestiture, usually for alleged violation of Section 7 of the Clayton Act. The judgment date is the date a final decision is rendered by the court. His study was limited to those complaints in which there was a final judgment to divest and in which divestiture actually took place.

For both dates there is a large negative abnormal return in the announcement month and the cumulative effect results in a lower value six months after announcement than six months before. He concludes that involuntary divestitures lead to decreases in shareholder wealth.

Ellert⁸ examined the abnormal returns of firms which were defendants in anti-merger proceedings initiated by either the Department of Justice or the Federal Trade Commission. His sample contained 205 firms for which proceedings were filed in the period 1950-1972, the case was decided by the end of 1974 and the common stock was listed on the New York Stock Exchange. The sample includes 123 firms eventually ordered to divest and 82 not required to divest.

He used the two factor model to compute abnormal returns from 100 months before the initial complaint date until forty-eight months after the last recorded judicial order.⁹ Estimates of systematic risk were obtained using where possible eighty-four months of past monthly returns and updating monthly.

His results show abnormally high and statistically significant returns in the pre-complaint period. For all firms the gains cumulate to approximately 23 percent over the eight years preceding antitrust complaints with about two thirds of the gain accumulating in the first half of this period. Further, those firms ordered to divest earned cumulated returns of 31 percent in the eight year period as compared to 11 percent for those not required to divest. He attributes the positive abnormal returns to the capitalization of the power to earn monopolistic returns and the capacity for operational efficiency in the management of assets.

In the month of the complaint announcement returns adjust downwards by less than 2.0 percent for both those ordered to divest and those not ordered to divest. During the subsequent litigation period and following court decisions, shareholders of these firms earn rates of returns which are not statistically different from those of firms of similar risk. His findings show that the large returns earned before the complaint date are left relatively undisturbed by the antitrust proceedings. This behavior in returns was true whether the defendant was required to divest or not.

Kummer's¹⁰ study duplicates in part that of Ellert. Kummer used the two factor model to measure abnormal returns of firms actually ordered to divest by the Federal Trade Commission or Department of Justice. Estimates of systematic risk were obtained using sixty months



of past monthly returns and updating monthly. His sample contained seventy-six firms ordered to divest in the period 1958 through June 1967. Each order was the result of alleged violation of Section 7 of the Clayton Act.

His findings show an increase in the cumulative abnormal returns from 40 months before announcement to a value of 7.3 percent in the month before announcement. There is a 1.7 percent negative abnormal return in the announcement month and with negative abnormal returns in each of the next seven months, the cumulative effect is to wipe out all abnormal gains earned up to that time. Following the end of the eighth month after announcement, normal returns are earned by shareholders. The cumulative effect for the four year period prior to announcement and the abnormal return in the announcement month agree with Ellert's findings, but the post announcement results differ as to magnitude. Kummer did not identify the final judgment date but, using the average of 34 months computed by Ellert for the time span from initial complaint to final judgment, a cumulative abnormal loss of about 9 percent is indicated by Kummer's data. Ellert found only a 2.6 percent loss. This difference is probably due to sample differences.

Kummer addresses the question of profits to be made from selling short on the basis of forced divestiture announcements. He contends it is possible to earn on average almost 5 percent abnormal return after transaction costs on shares held from the beginning of the first month after announcement through the end of the seventh month after announcement.

Measurement of Risk

One of the motives for divestiture is the reduction of risk. In this section a conceptual definition of risk is first introduced. Then various quantitative measures of risk are introduced and the problems involved in quantifying and estimating risk are discussed.

Sauvain¹¹ conceptualizes risk as the estimated degree of uncertainty with respect to the magnitude of expected future payments to owners of securities. These payments take the form of income either as dividends or interest and recovery of principal either through refunding or sale of securities in the market.

Risk as defined by Sauvain is an introspected concept; that is, the estimate of risk exists in the mind of the decision maker and thus is not uniform with respect to the same security at the same time for all investors in a common stock. For instance, a corporate officer might have much less uncertainty as to future payments of dividends by that corporation than an outsider considering the stock of the same firm.

The conceptual definition of risk cannot be easily measured for any given security. In order to conduct an empirical study of risk changes, one must have an operational definition of risk which leads to a quantitative measure of risk that is generally accepted. Since the uncertain outcome can be described by a probability distribution, the variance or standard deviation of future outcomes has been used as one measure of the future riskiness of securities. One approach in the assessment of risk at a point in time involves constructing a frequency distribution of past rates of return and computing the value of the variance or standard deviation. This value is a measure of the past variability or historical risk endured by security holders up to that

point in time and by extrapolation is assumed to be a measure of future or true risk at that time.

Capital market theory however, divides total variability or risk into systematic and unsystematic components.¹² The systematic component is measured by the beta coefficient which is estimated using the market model. For individual securities, this form of risk is important because it cannot be diversified away through efficient portfolio construction.

Unsystematic risk is the risk which can be diversified away through efficient portfolio construction and can be represented by the residual variance or variance of the error term in the market model. The correlation coefficient or its square, called R square, is a measure of the proportion of systematic risk to total risk. Values of R square of 1.0 indicate all risk is systematic and values of zero indicate all risk is unsystematic.

The most common procedure for estimating systematic and unsystematic risk is to use the market model. There are differences however in the procedure from study to study because the estimate of beta does involve a tradeoff between cost of computing the estimate versus the accuracy of the estimate. Generally the larger the sample size the smaller the measurement or sampling error. The sampling error is the difference between the computed estimate of beta and the true beta. This does assume that the true beta is stable and does not change during the time period from which the observations are drawn.

There is an implicit assumption that the observed monthly returns are generated by a process described by the market model. As previously given the market model is

$$\hat{R}_{it} = \alpha_i + \beta_i R_{Mt} + \hat{\epsilon}_{it}.$$

It is assumed that the coefficients α_i and β_i are constant. Under the assumptions of the linear regression model an estimate of β_i is computed.¹³ This estimate is unbiased but that does not mean that the estimate of β_i equals the true constant value of β_i . The difference is called sampling or measurement error.

The coefficients may be unstable as suggested by some empirical research.¹⁴ Sunder has suggested that a random coefficient model would be more appropriate under these circumstances.¹⁵ This model assumes that α_i and β_i are random variables each of which is described by a probability distribution with a fixed mean value and variance. The parameters of the distributions of α_i and β_i can be estimated using the least squares procedure. These estimates of the mean values of α_i and β_i are unbiased but are subject to a measurement error which is larger than the error that would be expected if the randomness of the coefficients were specifically accounted for.¹⁶ Specific techniques to account for the random coefficients in the market model are available but are more complex to use than the least squares technique and hence more costly. In fact these techniques produce estimates which are asymptotically valid; that is they acquire the desirable property of unbiasedness as the sample size becomes larger and larger and in the limit is infinitely large. It is the author's opinion that the cost of increasing the sample size in order to use these models does not justify the benefit to be gained by their use. Also the author knows of no one using the random coefficient model in producing estimates of beta for commercial use in the investment business and in addition the author has found that little use has been made of it in academic research.

Given these considerations the author feels that a sensible approach is to continue to use the least squares technique to estimate beta, recognizing its limitations.

The major limitation is that we will have to accept the fact that some amount of bias may be present if the least squares technique is used to estimate beta. Rosenberg and Guy¹⁷ state that if the true beta of a firm is changing over time then the historical beta computed using a least square procedure will be an unbiased estimate of the average true beta during the past historical period. However, this estimate is still a biased estimate of beta at a current point in time if beta is changing over time¹⁸.

Figure 2.1 adapted from Rosenberg and Guy illustrates the case where the true beta coefficient is declining over time. At time t_1 , the monthly observations of rate of return in the historical period are regressed against the corresponding returns on the market index and yield an unbiased estimate of the average beta. As shown in the figure, the average historical beta is still a biased estimate of the current or future beta at time t_1 . Two techniques have been suggested to provide less biased estimates of the true beta at a given point in time.

First, a moving average procedure can be used to provide estimates throughout a time period. This is an updating process in which recent observations of returns are added and distant observations dropped. This is a common practice in studies which measure abnormal returns including the present research of the author. While this procedure provides an updated estimate of the average historical beta which is easy to compute for abnormal return analysis, it must be

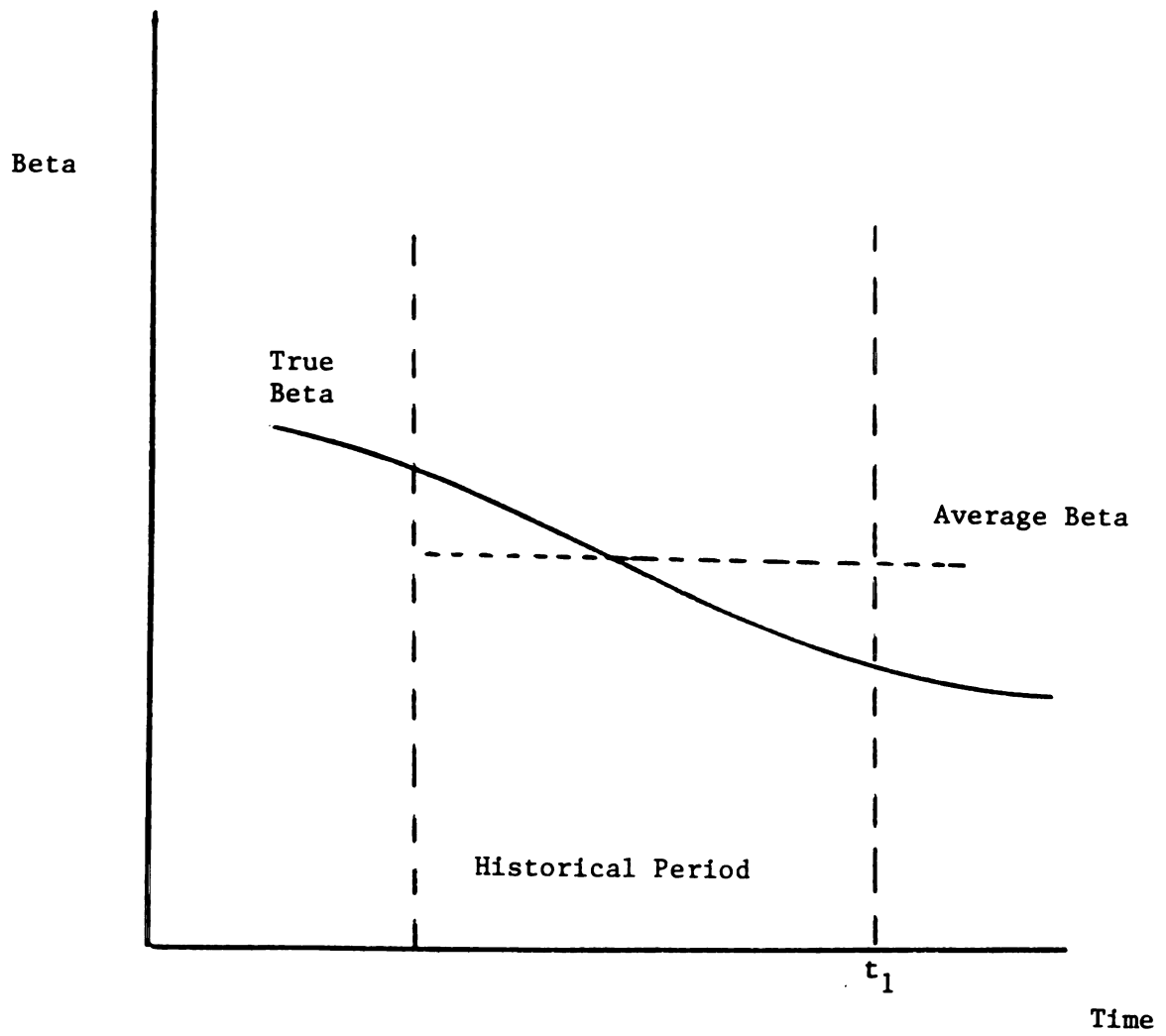


Figure 2.1. CHANGE IN BETA OVER TIME

recognized that it does not provide a completely accurate estimate but one which lags behind the true beta.

The second approach requires determining what economic factors or events cause beta to change and adjusting the forecast of beta with this information. Rosenberg and Guy present values of the adjustments to be made to historical betas given differences between the value of certain fundamental characteristics for the firm and for the average firm in the industry. For example, if a firm has a debt to total asset ratio which is one standard deviation above the mean ratio of all firms, the historical beta computed at this point in time would be adjusted upward by .041. Adjustments for other economic variables are available and when added to the historical beta provide a less biased estimate of future beta. This method seems very promising but it has several drawbacks; it requires an extensive financial data base and analysis, the value of the adjustments change with time and it is only applicable to beta coefficients since no similar empirical analysis has been attempted for unsystematic risk. Because of these limitations the moving average procedure is used for estimating beta in the abnormal return analysis of this research.

Besides estimating risk for computing abnormal returns, estimates are needed to measure changes in risk associated with divestiture. In studies of risk changes associated with financial events, the technique of Rosenberg and Guy has not been reported in the literature; in abnormal return studies, however, it is a common practice to also present the average value of beta for the sample throughout the pre-event and post-event period. This method has all the deficiencies of the moving average method and, in addition, cannot account for changes in beta due to other factors common to all firms in the same industry.

This method is not used in this research but instead a paired comparison technique utilizing a control group is used. The approach in this research is thus consistent with other studies where the main objective is to measure risk changes associated with an event. In those studies the common practice is to compare the average historical beta before the event with the value after the event. The beta computed before the event uses returns entirely in the pre-event period and the beta computed after the event uses returns entirely in the post-event period. This approach assumes that the event produces or is associated with a permanent change in the average risk level of the firm and that the control group firms are properly matched to the firms under study.

Empirical Evidence of Risk Change

There have been no empirical studies dealing specifically with risk changes due to divestiture though Kummer and Ellert both show declines in the average beta coefficient of their samples from the pre- and post-event phases. In the absence of specific studies dealing with divestiture, attention will be drawn to three studies of risk changes associated with mergers. This will give insight as to the magnitude of effects observed and problems of research design which can be anticipated for divestitures.

Joehnk and Nielsen¹⁹ measured the change in beta associated with major mergers by twenty-one conglomerate firms and twenty-three major mergers by nonconglomerate firms in the period 1962-1969. In all cases, no other major merger was undertaken for three years before or after the merger under consideration.

To analyze the effects of mergers on risk, two procedures were used. First, the average pre-merger and post-merger beta and R

square were compared by means of t tests. The values of these variables were computed from thirty-six continuous monthly observations of returns for each period. Pre-merger values used returns up to six months before the merger and post-merger values were computed with returns beginning with the first month after merger. The second procedure used a regression model to examine the effects of certain pre-merger market related variables on beta.

Their results shows significant changes in beta and R square only for nonconglomerate firms which acquired firms with a higher beta. The increase in beta was positive as expected since beta for any portfolio including that of physical assets is a weighted sum of the component betas. The other average changes in beta reflect the idea that the beta of a portfolio is the weighted sum of the component betas.

The results show a tendency for R square to increase for mergers by both conglomerate and non-conglomerate firms though the increase is significant only for nonconglomerates acquiring firms of higher beta. These results suggest that conglomerate merger activity undertaken by conglomerate or nonconglomerate firms results in improved diversification through a reduction in the proportion of unsystematic risk to total risk.

The regression results show that the size of the merger did not have a significant effect on the change in beta. They reason that this implies size as being more associated with income or returns than risk. However, it may be that the size of the mergers and the sample size itself is such that the effect cannot be separated from the random error term.

Lev and Mandelker²⁰ examined the change in systematic risk associated with sixty-nine firms which participated in large mergers.

"Large" mergers were those in which the acquired firm was at least 10 percent of the acquiring firm's asset size. For each firm, a control firm was selected from the same industry and asset size group and was measured for the same chronological time period.

The pre-merger beta coefficients were estimated from sixty monthly returns prior to the merger month and post-merger betas were estimated over the sixty monthly returns subsequent to the merger month. They measured changes in beta with a paired comparison test. The test variable was the difference between the change in beta for the merging firms and the change in beta for the control firms. The mean difference was .012 and was not statistically significant. Their findings show that mergers had no effect on the systematic risk of the acquiring firm. A test was made on the change in the degree of financial leverage. No significant change in leverage was found. Since there is some evidence that the degree of financial leverage is a determinant of systematic risk, this corroborates the finding of no change in risk.²¹

Haugen and Langetieg²² conducted an investigation to determine if changes occurred in the risk attributes of merging firms as measured by the probability distribution of monthly rates of return. Their sample covered fifty-nine industrial mergers between companies listed on the New York Stock Exchange. All mergers took place during the period 1951 through 1968. For each firm, neither the acquiror nor the acquiree merged with other major firms in the seventy-two month period surrounding the merger.

For each merger, the two participating firms are matched with two other NYSE firms that form a control group. Each control firm comes

from the same industry as the merging firm, and is also matched on sales volume.

The acquired-acquiror pair and the corresponding control firm pair are combined into two two-stock portfolios. Portfolio weights are determined on the basis of the total market value of the common stock of each company at the beginning of each year. The rate of return of each two-stock portfolio is then computed for the thirty-six month period prior to merger and for the thirty-six month period subsequent to the merger.

These rates of return are regressed against the Fisher Investment Performance Index to determine the beta coefficient, and the estimate of unsystematic risk for each portfolio and time period. Statistical tests are made of changes of the parameters of each two-stock portfolio. The results show little, if any, difference between changes in risk attributes for merging firms and for the control firms.

In summary, these three empirical studies of risk changes associated with mergers used some form of control group to properly account for effects other than the merger. This is the design used in the author's research. Also, generally little if any significant changes in risk were found. This provides some evidence that either it may be difficult to detect changes in risk for divestitures or that as in merger the divestitures may have little impact on the risk level of the firm.

ENDNOTES TO CHAPTER 2

1. This form of the capital asset pricing model is developed in Fischer Black, Michael C. Jensen and Myron Scholes, "The Capital Asset Pricing Model: Some Empirical Tests," Studies in the Theory of Capital Markets, Michael C. Jensen (ed.) (New York: Praeger: 1972).

2. An excellent discussion of the market model is contained in Eugene F. Fama and James A. MacBeth, "Risk, Return and Equilibrium: Empirical Tests," Journal of Political Economy, 81 (July-August, 1973), 607-636.

3. R. Richardson Petit and Randolph Westerfield, "Using the Capital Asset Pricing Model and the Market Model to Predict Security Returns," Journal of Financial and Quantitative Analysis, 9 (September, 1974), 579-605.

4. Black, Jensen and Scholes, op. cit.

5. Fama and MacBeth, op. cit.

6. Shyam Sunder, "Relationship between Accounting Changes and Stock Prices: Problems of Measurement and Some Empirical Evidence," Empirical Research in Accounting: Selected Studies, 1973, Supplement to Journal of Accounting Research, 11 (1973).

7. Kenneth J. Boudreaux, "Divestiture and Share Price," Journal of Financial and Quantitative Analysis, 10 (November, 1975), 619-626.

8. James C. Ellert, "Merger, Antitrust Law Enforcement and Stockholder Returns," Journal of Finance, 31 (May, 1976), 715-732.

9. Ellert did not use the two factor model as given in this dissertation but rather used a version of the two-factor model which explicitly included the risk free rate.

10. Donald Kummer, "Stock Price Reaction to Announcements of Forced Divestiture Proceedings," Journal of the Midwest Finance Association, (1976), 99-123.

11. Harry C. Sauvain, Investment Management, 4th ed., New York: Prentice-Hall, 1973, p.13.

12. James C. Van Horne, Financial Management and Policy, 4th ed., New York: Prentice-Hall, 1978, Chapter 3.

13. The major assumptions of the linear regression model are 1) linear model with constant coefficients and 2) error term is random with zero mean and constant variance. See Jan Kmenta, Elements of Econometrics, New York: MacMillan, 1971, p.101.

14. For a discussion of prior work on the instability of beta coefficients see Marshall E. Blume, "Betas and Their Regression Tendencies," Journal of Finance, 30 (June, 1975), 785-795.

15. Sunder, op. cit.

16. The term efficient is used by econometricians to indicate that one estimating technique is expected to produce a smaller measurement error than another technique. The application of this concept to random coefficient models is discussed in Henri Theil, Principles of Econometrics, New York: John Wiley and Sons, 1971, Chapter 12; a more extensive discussion of random coefficient models is given in P.A.V.B. Swamy, "Efficient Inference in a Random Coefficient Model," Econometrica, 38, No. 2 (1970), 311-323.

17. Barr Rosenberg and James Guy, "Beta and Investment Fundamentals II," Financial Analyst Journal, 32 (July/August, 1976), 62-72.

18. Brigham and Crum have presented simulation results which show that additional bias may be present when historical rate of return data is used to estimate the beta coefficient. The author feels that their results are very preliminary and that the bias they describe is not any more of a problem than the bias present in using the moving average technique. See Eugene F. Brigham and Roy L. Crum, "On the Use of the CAPM in Public Utility Rate Cases," Financial Management, 6 (Summer, 1977), 7-15.

19. Michael D. Joehnk and James F. Nielsen, "The Effects of Conglomerate Merger Activity on Systematic Risk," Journal of Financial and Quantitative Analysis, 9 (March, 1972), 215-225.

20. Baruch Lev and Gershon Mandelker, "The Microeconomic Consequences of Corporate Mergers," Journal of Business, 47 (January, 1974), 85-104.

21. Several studies have addressed the question of what factors determine systematic risk. These include William Beaver, Paul Kettler and Myron Scholes, "The Association Between Market Determined and Accounting Determined Risk Measures," The Accounting Review, 45 (October, 1970), 654-682; Barr Rosenberg and Walk McKibben, "The Prediction of Systematic and Specific Risk in Common Stocks," Journal of Financial and Quantitative Analysis, 8 (March, 1973), 317-333; Donald J. Thompson II, "Sources of Systematic Risk in Common Stocks," Journal of Business, 48 (January, 1975), 713-188.

22. Robert A. Haugen and Terrence C. Langetieg, "An Empirical Test for Synergism in Merger," Journal of Finance, 30 (September, 1975), 1003-1014.

CHAPTER 3

METHOD OF RESEARCH

Chapter 3 is in three parts. The first part describes the sample of divesting firms and the data sources. The second part describes the technique for computing returns to shareholders and the statistical tests used to determine if the results are statistically significant. The third part describes the procedure for measuring changes in risk associated with the divestiture announcement.

Data

Rates of Return

The basic data used in this research is the Investment Performance File of the Center for Research in Security Prices of the University of Chicago, CRISP. This file contains monthly returns, including dividends and price appreciation, for all common stocks listed on the New York Stock Exchange from December 1925 to December 1975.¹ This file will be used to calculate return and risk values for each firm in the study.

Sample

The sample consists of firms which voluntarily divested and those forced to divest by government order. The criteria for selection of the voluntarily divesting firms is discussed first. This is followed by the criteria for selection of the involuntary divesting firms.

There are 109 voluntary divestitures in the sample covering the period from 1962 through 1973. These firms include those in Boudreaux's² voluntary sample plus other divestitures announced in the "Sell-off Roster" of Mergers and Acquisitions through 1973 and five large divestitures in the Federal Trade Commission tables for 1962-1964.³ To be included in the study the following criteria had to be met:

1. Sufficient return data is available in the CRISP file. Forty-eight monthly returns before and twelve monthly returns after announcement are needed;
2. Date of announcement of divestiture is in the Wall Street Journal Index;
3. Dollar value of the transaction is available; and
4. Divestiture actually takes place.

Including Boudreaux's original 138 divestitures, over four hundred voluntary divestitures were screened and those not meeting the above criteria were eliminated.

These 109 voluntary divestitures were further classified as to the motive of the divestiture as announced by the corporation in the Wall Street Journal, size of the divestiture and time period. The losers group consists of thirty firms which divested a line of business because the business was unprofitable, or because the parent firm needed to raise cash. The change mix group consists of sixty-two firms which divested a line of business because the business no longer fit in with the company's plans for future growth. In none of the latter cases was it determined that the business contributed a loss to the parent though the return may not be as large as the parent felt it

could get in alternative opportunities. For seventeen firms the motive could not be determined.

A number of the divestitures were small when comparing the dollar value of the divestiture to the size of the divesting firm. The size of divestiture was defined as the ratio of the dollar value of the transaction as announced by the company divided by the book value of the firm's assets as of the fiscal year end just prior to the announcement date. Divestitures were considered "large" if the ratio was greater than or equal to .04.

The time period covered by the study is one in which market conditions changed dramatically. The 1960's was a period of generally rising stock prices while the 1970's are characterized by increased variability with a small uptrend as measured by the Standard and Poors 425 Industrials. March 1970 was selected as the month dividing the sample into two parts. This month was selected because the periods before and after do have different chart patterns and firms in the loser group with few exceptions announced divestitures after this date.

There are fifty-three involuntary divestitures in the sample. These divestitures either were included in Boudreaux's sample of thirty-one involuntary divestitures or were announced in issues of Mergers and Acquisitions for the period 1965 through 1973. The relevant date was the initial announcement in the Wall Street Journal that the Federal Trade Commission or the Department of Justice was filing a complaint against the firm. Each of the firms had an announcement in the period 1965-1973, did eventually divest the business and had sufficient return data available on the CRISP tape.

Measuring Returns to Shareholders

This section is divided into two parts. The first part presents the technique for computing returns to shareholders. The second part presents the procedure to determine if the results are statistically significant.

Computing Returns to Shareholders

To test if shareholders benefited from divestiture, this research focuses on the abnormal or residual returns to the shareholders. Abnormal returns are those returns earned by shareholders above or below that expected for the level of systematic risk. To compute abnormal returns, the two factor model will be used.⁴

The two factor model describes the statistical relation between risk and return as

$$\tilde{R}_{it} = \tilde{\gamma}_{0t} + \tilde{\gamma}_{1t} \beta_{it} + \tilde{u}_{it}$$

Where

$$\tilde{R}_{it} = \text{return to firm } i \text{ in period } t;$$

$$\tilde{\gamma}_{0t}, \tilde{\gamma}_{1t} = \text{market wide random factors};$$

$$\beta_{it} = \text{systematic risk of firm } i \text{ in period } t; \text{ and}$$

$$\tilde{u}_{it} = \text{random error term assumed distributed with zero mean and constant variance.}$$

Note: γ_{0t}, γ_{1t} are random across time but not across firms for a fixed time period.

The abnormal or unsystematic return for a firm i in period t is computed by comparing the actual return R_{it} with that expected from the two factor model

$$\hat{u}_{it} = R_{it} - (\hat{\gamma}_{0t} + \hat{\gamma}_{1t}\hat{\beta}_{it})$$

where $\hat{u}_{it}$ = estimate of abnormal return;

R_{it} = observed return for firm i in period t ; and

$\hat{\gamma}_{0t}, \hat{\gamma}_{1t}, \hat{\beta}_{it}$ = estimates of $\tilde{\gamma}_{0t}, \tilde{\gamma}_{1t}$ and β_{it} for firm i and period t .

$\hat{u}_{it}$ is an estimate from the distribution of $\tilde{u}_{it}$. The mean value of $\tilde{u}_{it}$ is zero. A sample mean computed from a collection of $\hat{u}_{it}$ over different firms and time periods should not be significantly different from zero unless some event causes this difference.

$\hat{u}_{it}$ will be computed for each divesting firm for a number of time periods during the study phase. The computation of $\hat{u}_{it}$ will use estimates of $\hat{\gamma}_{0t}$ and $\hat{\gamma}_{1t}$ computed by Rozeff and Kinney using the method of Fama-MacBeth.⁵ The value of $\hat{\gamma}_{0t}$ and $\hat{\gamma}_{1t}$ used in this research are contained in Appendix B.

Estimates of β_{it} for each period will use at least the previous thirty-six and at most the previous sixty monthly returns. Estimates are updated for each month of the study period. Computations are from the market model

$$\tilde{R}_{it} = \alpha_i + \beta_i R_{Mt} + \tilde{\epsilon}_{it}$$

where α_i, β_i = coefficients from least squares regression of R_{it} on market index;

R_{Mt} = monthly return on the Fisher Index⁶; and

$\tilde{\epsilon}_{it}$ = error term distributed with zero mean and constant variance.

The measurement of abnormal return will be centered on the twenty-five month period surrounding the announcement of the divestiture in the Wall Street Journal. The twenty-five month length of the period is such that abnormal returns associated with the announcement should show up in the analysis.

This study assumes that the stock market is efficient and that new information or changes in expectations will impact on prices rapidly. Each firm subjected to a divestiture will experience some abnormal return depending on the size and type of divestiture. This study measures the average effect of divestiture for all firms in each group.

Define $t=0$ as the divestiture announcement month for each firm. We are interested in the returns from twelve months before to twelve months after the announcement month or $t=-12$ to $t=12$. For each group of divesting firms calculate the average abnormal return for each firm, for each month t , relative to the announcement month.

$$AVG = \frac{1}{N} \sum_{i=1}^N \hat{u}_{it}$$

where N = number of firms in the group.

We can further define the cumulative average residual,

$$CAR_{t_1, t_2} = \frac{1}{N} \sum_{i=1}^N \sum_{t=t_1}^{t_2} \hat{u}_{it}$$

CAR_{t_1, t_2} describes the cumulated gain we would have if we had bought the average stock at the beginning of t_1 and held to the end of t_2 .

Tests of Hypotheses

In order to make inferences from the results of this study, tests of significance are helpful. Two kinds of tests are made. First,

a t test is used to determine if the returns are statistically significantly different from zero. Since the validity of the t test rests upon the assumption of a randomly drawn sample, a mean successive difference test is then conducted to test for a random sample.

It should be noted that most prior research has relied on more complex tests of randomness.⁷ The mean successive difference test is used because it is simpler and requires less rate of return data. If the more complex tests were used the number of divestitures in the sample would be drastically reduced.

To test for abnormal returns the null hypothesis is that shareholders of divesting firms did not earn abnormal returns,

$$H_0 : \text{AVG} = 0 \quad t = -12, 12$$

The alternative is that they did earn abnormal returns

$$H_A : \text{AVG} \neq 0 \quad t = -12, 12$$

This hypothesis can be tested using a t test if the assumptions that the elements of the sample are independently drawn from a normal population with constant mean and variance are satisfied.⁸ To test these assumptions a mean square successive difference test is performed for each period t.⁹

The mean square successive difference test is a test of the null hypothesis that a sequence of observations $X_1, X_2, \dots, X_N$ are randomly drawn from a normal distribution. The test statistic, TEST is defined as

$$\text{TEST} = \frac{\frac{d^2}{2s^2} - 1}{\frac{(N-2)}{(N^2-1)}}$$

$$\text{where } d^2 = \frac{1}{N-1} \sum_{i=1}^{N-1} (x_{i+1} - x_i)^2;$$

$$s^2 = \frac{1}{N-1} \sum_{i=1}^N (x_i - \bar{x})^2; \text{ and}$$

$$\bar{x} = \frac{1}{N} \sum_{i=1}^N x_i.$$

Under the null hypothesis TEST is approximately distributed as a unit normal deviate. If the data fails to reject the hypothesis of a random sample from an identically distributed normal distribution, then the value of the t statistic can be properly interpreted.

A similar analysis is conducted on CAR for selected time frames. For any period the CAR is the sum of the CAR for each firm in the sample.

$$\text{CAR}_{i,t} = \sum_{t=t_1}^{t_2} \hat{u}_{it}$$

$$\text{CAR}_{t_1, t_2} = \frac{1}{N} \sum_{i=1}^N \text{CAR}_{i,t}$$

The elements of the sample for test of the significance of CAR are the individual $\text{CAR}_{i,t}$. The t statistic is computed by dividing CAR_{t_1, t_2} by the standard deviation of the $\text{CAR}_{i,t}$ and multiplying by the square root of the sample size. The assumption of a random sample is also tested using the mean square successive difference test.

Measuring Risk Changes

Besides the effects of divestiture on return, changes in risk may accompany divestiture. This will be examined by using a t test to determine whether there were significant changes in the average values of the beta coefficient, the correlation coefficient and the standard error from the pre-announcement period to the post-announcement period. This method requires estimates of the risk measures. In the following paragraphs a description is given of the technique for computing estimates of the beta coefficient, the correlation coefficient and standard error.

For each divesting firm, a value of beta, β_1 has been calculated in the pre-announcement period. It is computed using thirty-six monthly returns from the period seven to forty-two months prior to announcement. For each firm an estimate of beta after the announcement date, β_2 , will be computed using thirty-six monthly returns starting six months after the divestiture announcement. The estimates are computed using the market model.

This data is used to determine whether risk levels for divesting firms change due to divestiture. A t test is used to determine whether the difference in average pre- and post-betas is significantly different from zero. Since other effects may cause beta in the post announcement period to change, a control group is used as a standard of comparison. The control firms are from the same industry and are of the same approximate asset size as the matched treatment firm.¹⁰ They are also free of divestitures in the twenty-five month period surrounding the divestiture announcement. A t test is made with the null hypothesis that the divesting group post- and pre-beta change doesn't differ from the control group post- and pre-beta change.

A change in unsystematic risk may also be associated with divestiture as managers try to change the level of diversification in their portfolios of assets. To test for this the paired comparison t test is repeated using first the correlation coefficient and then the standard error as the test variables. Significant changes in these quantities infer that the level of unsystematic risk has changed.

ENDNOTES TO CHAPTER 3

1. At the time this research was conducted returns were available only to December, 1975.

2. Kenneth J. Boudreaux, "Divestiture and Share Price," Journal of Financial and Quantitative Analysis, 10 (November, 1975), 619-626.

3. Mergers and Acquisitions, Volumes 1-8, (1966-1973); The Federal Trade Commission tables are reproduced in Mergers and Acquisitions, 8 (Winter, 1974), p.24.

4. Eugene F. Fama and James D. MacBeth, "Risk, Return and Equilibrium: Empirical Tests," Journal of Political Economy, 81 (July-August, 1973), 607-636.

5. These estimates were provided to the author. The technique used to compute the estimates is in Eugene F. Fama and James D. MacBeth, op. cit.

6. The Fisher Index is the weighted arithmetic and geometric index of total returns which is available with the CRISP file.

7. Other researchers have used a "portfolio building" procedure to insure that their samples are randomly drawn. A description of this procedure can be found in Gershon Mandelker, "Risk and Return: The Case of Merging Firms," Journal of Financial Economics, 1 (December, 1974), 303-335.

8. Jan Kmenta, Elements of Econometrics, New York: MacMillan, 1971.

9. K.A. Brownlee, Statistical Theory and Methodology in Science and Engineering, 2nd ed., New York: John Wiley & Sons, 1965, p.221.

10. Industry is as defined by SEC 3 digit code. Source is Securities and Exchange Commission, Directory of Companies Filing Annual Reports with the Securities and Exchange Commission (annual), SEC, Washington, D.C.

CHAPTER 4

EMPIRICAL RESULTS AND INTERPRETATION

This chapter is divided into two parts. The first part presents the results and interpretation of the results for that part of the study dealing with the abnormal returns earned by shareholders of divesting firms. The second part presents the results and interpretation for that part of the study dealing with the association between changes in risk and divestiture announcement.

Abnormal Returns to Shareholders

In this study the original sample of firms was further divided into subsamples on the basis of divestiture motive, size of divestiture and time period of divestiture announcement. There are seven "samples" of firms analyzed in this section. These include the entire involuntary sample, the entire voluntary sample and five subsamples, hereafter called samples, into which the voluntary sample was further divided.

Tables 4.1 and 4.2 present summaries of the findings for abnormal returns. For each sample, Table 4.1 presents the number of statistically significant positive and negative average abnormal returns, AVG, in the twelve month period before, in the twelve month period after and in the announcement month. Table 4.2 presents the cumulative average residuals, CAR, for the holding periods from twelve months before announcement until the beginning of the announcement month and from the

TABLE 4.1
NUMBER AND SIGN OF SIGNIFICANT AVERAGE RETURNS

Sample (Figure)	Before Announcement	Announcement Month	After Announcement
53 Involuntary (4.1)	2 Positive 1 Negative	None	1 Negative
109 Voluntary (4.2)	1 Negative	None	None
62 Change-mix (4.3)	1 Negative	None	1 Negative
25 Large Change-mix (4.5)	1 Negative	None	1 Positive
7 Large Change-mix after March 1970 (4.7)	1 Negative	None	1 Positive
30 Losers (4.4)	2 Negative	None	None
14 Large Losers (4.6)	4 Negative	Positive	None

TABLE 4.2
PRE AND POST ANNOUNCEMENT CAR

Sample	CAR t = -12, -1	CAR t = 0, 12
Involuntary	.092	-.077
Voluntary	-.091*	.022
Change-mix	.046	-.038
Large Change-mix	.099	.022
Large Change-mix after March 1970	-.033	.276*
Losers	-.347*	.066
Large Losers	-.581*	.018

*Significant 5% level

beginning of the announcement month until the end of the twelfth month after announcement. The number of firms in each sample is given in Table 4.1. In addition, the number used in the text to indicate the figure in this chapter which refers to the particular sample is given in parentheses.

Briefly, the results in these two tables show that involuntary divestitures penalized investors while voluntary divestitures generally benefited investors. For example, investors in firms which divested to change a losing situation had been earning significant negative returns before the divestiture announcement. After announcement they earned normal returns. In these and all results in the text, significance is determined at the 5 percent level.

For each sample the average residuals, AVG, and cumulative average residual, CAR, for each month of the twenty-five month period surrounding the divestiture announcement date are given in Figures 4.1 through 4.7. Tables of the computer output from which these results and the summaries in Table 4.1 and Table 4.2 were obtained are contained in Appendix A. The results for the involuntary sample are presented first, followed by the results for the voluntary samples.

Involuntary Divestitures

The results in Figure 4.1 for all fifty-three involuntary divesting firms are similar to those reported by other authors. Abnormal returns before announcement tend to be positive as shown by the CAR and the abnormal returns in the period afterward tend to be negative. The significant positive abnormal returns in the fourth and fifth months before announcement are consistent with the hypothesis that owners of firms forced to divest have been earning monopolistic returns. The

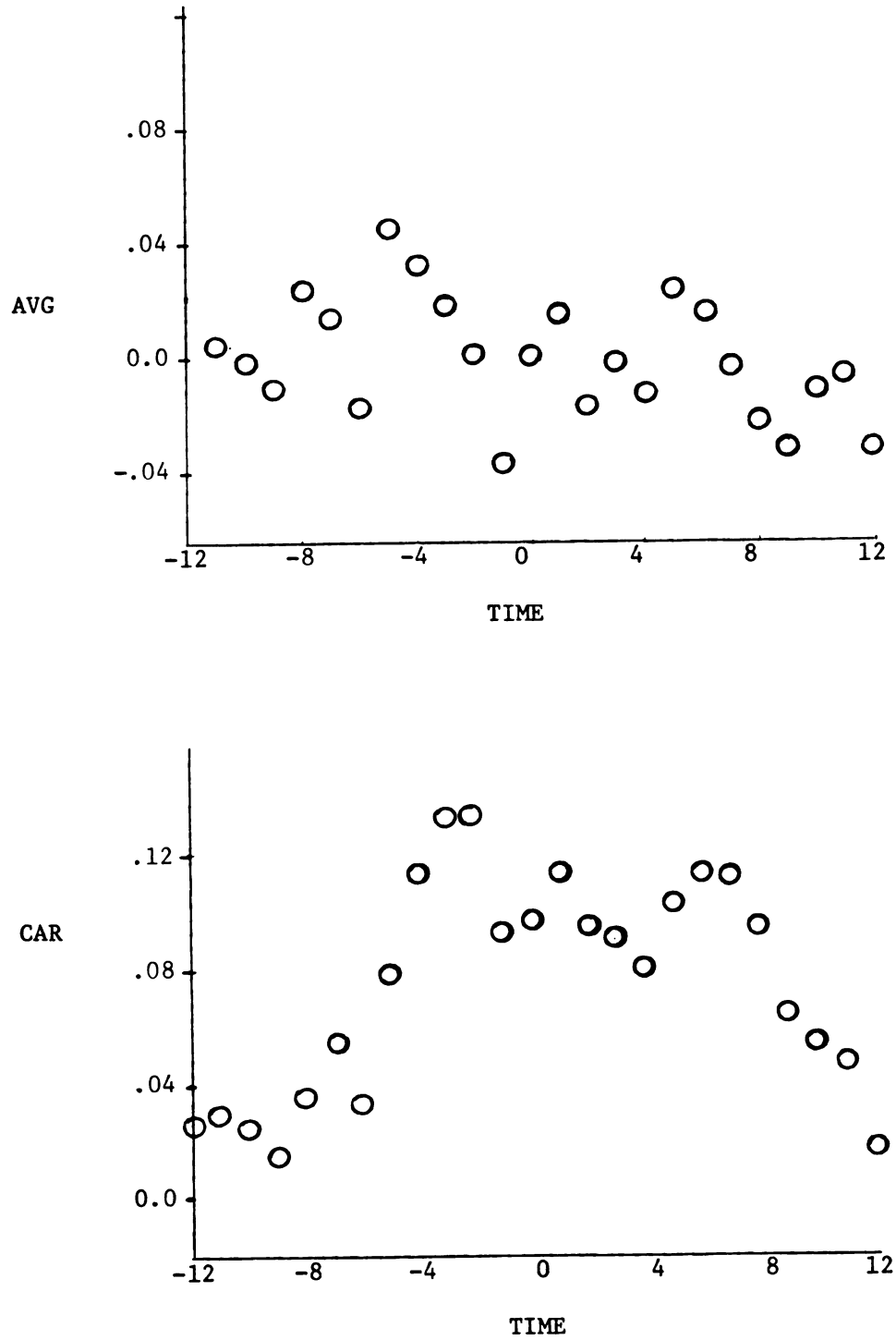


FIGURE 4.1 ABNORMAL RETURNS FOR ALL INVOLUNTARY DIVESTITURES

significant negative average return in the month before announcement may indicate that information about the impending government complaint action is anticipated by the market. Ellert and Kummer also found abnormal negative returns in the month before the complaint date. The nearly eight percent cumulative loss from the beginning of the announcement month to twelve months after announcement agrees closely with Kummer's results of a 7.5 percent loss. Ellert did not present results for the period immediately following the complaint month.

Each firm in the sample eventually did divest but since Ellert reports that the average time between complaint and settlement of the complaint is thirty-four months, the conclusions of this study apply only to the effects of the initial complaint announcement. At the time of the complaint, the market does not know for certain what penalty the firm must pay. Though Boudreaux, using the market model, found additional abnormal losses in the six months after final settlement, Ellert, using the two factor model, found that significant abnormal losses occurred in the complaint month and normal returns thereafter. Thus most of the adjustment in stock prices takes place as a result of the initial complaint and attention on shareholder returns is best focused here. These results provide evidence that the regulatory agencies have been somewhat successful in penalizing owners of firms believed to have violated the antitrust laws.

Voluntary Divestitures

Figure 4.2 presents the pattern for AVG and CAR for all 109 voluntary divestitures. The abnormal returns before announcement cumulate to a statistically significant value of -9.1 percent in the month before announcement. After announcement it appears that normal returns

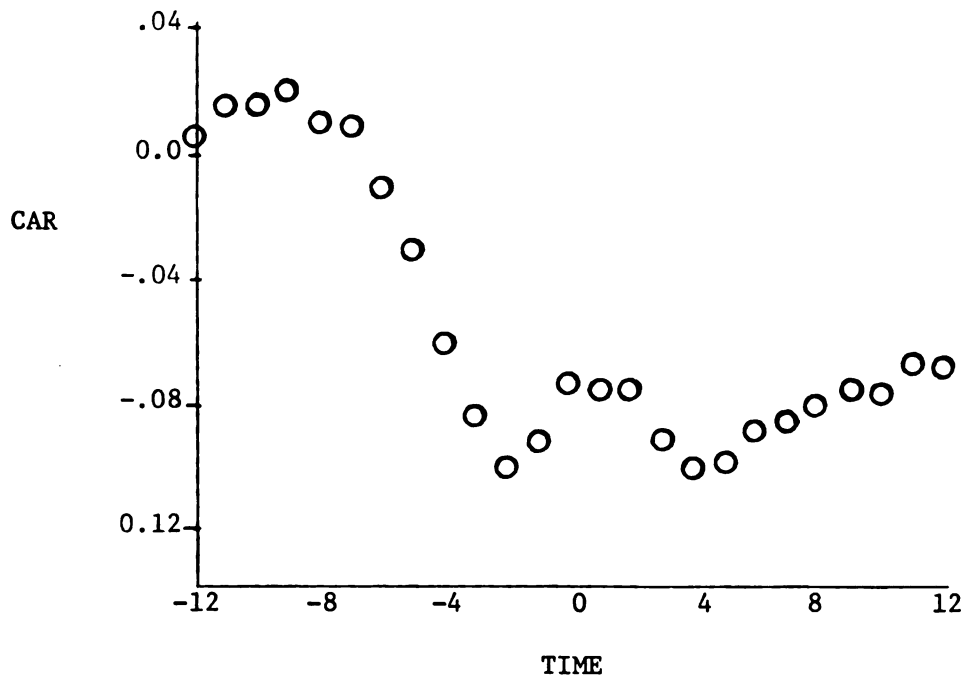
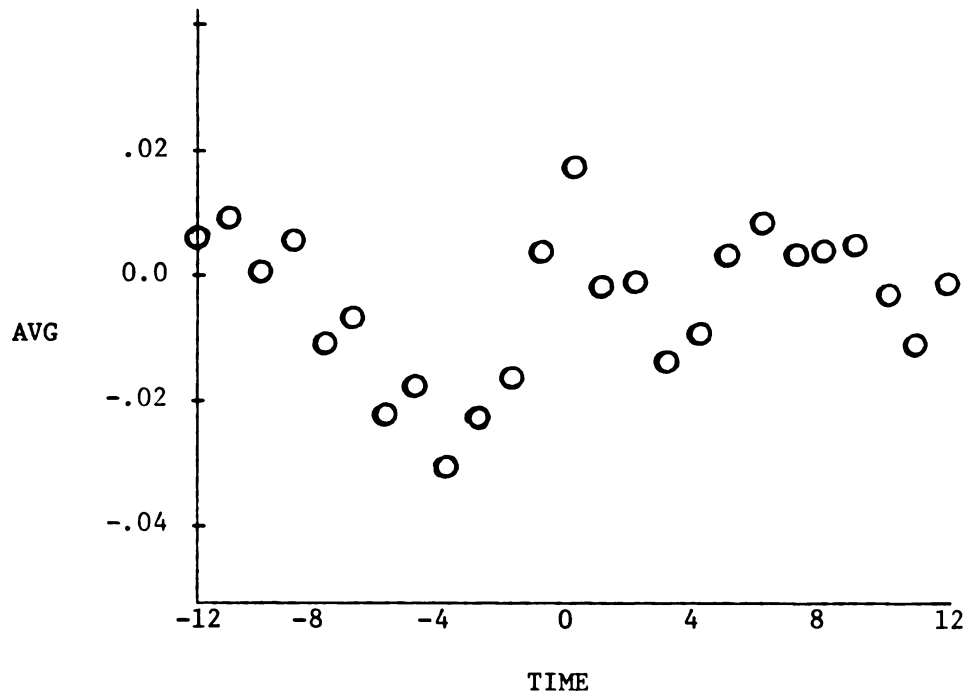


FIGURE 4.2 ABNORMAL RETURNS FOR ALL VOLUNTARY DIVESTITURES

are earned by shareholders. This pattern in returns is interesting because it is different than the pattern for the involuntary sample presented in Figure 4.1 and it suggests that divestitures undertaken voluntarily do benefit shareholders, at least on average. The results also agree with Boudreaux's findings that shareholders benefit from voluntary divestitures. However, Boudreaux did not present any indication of statistical significance. He also treated all voluntary divestitures alike.

To further differentiate the voluntary divestitures, results were obtained for those divestitures where the announced motive was to change the asset mix, and those in which the divested asset was contributing a loss or else the firm was in a losing situation and needed to raise cash to reduce the debt load.

Figures 4.3 and 4.4 present results for sixty-two change-mix firms and thirty losers. The return history of the two groups are markedly different. Though for the entire sample of change-mix firms, the AVG was statistically negative for the sixth month before and third month after, on a cumulative basis the returns are generally positive but not significantly different from zero. In addition the number of significant negative average returns and their magnitude is less than the number and magnitude for the losers group.

For the entire loser group the results are quite different. Before the announcement the market reacts very unfavorably toward these firms but after the announcement it does not. At eight and four months before divestiture announcement, the AVG is significantly negative. Also, an investor would have realized a 31.3 percent abnormal loss if he bought the loser stocks twelve months before the announcement month and

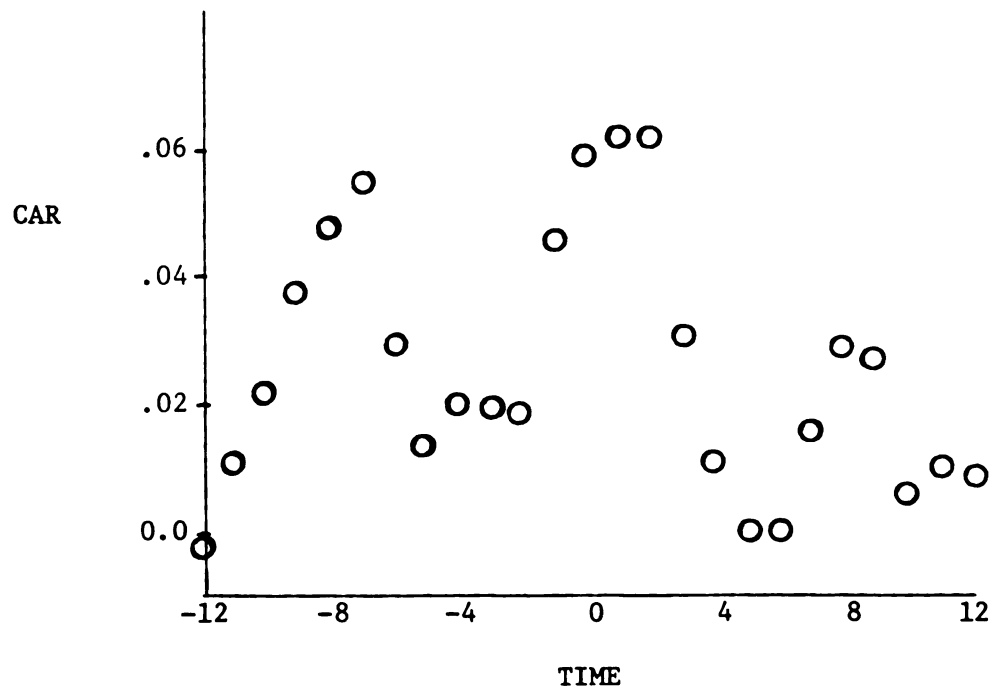
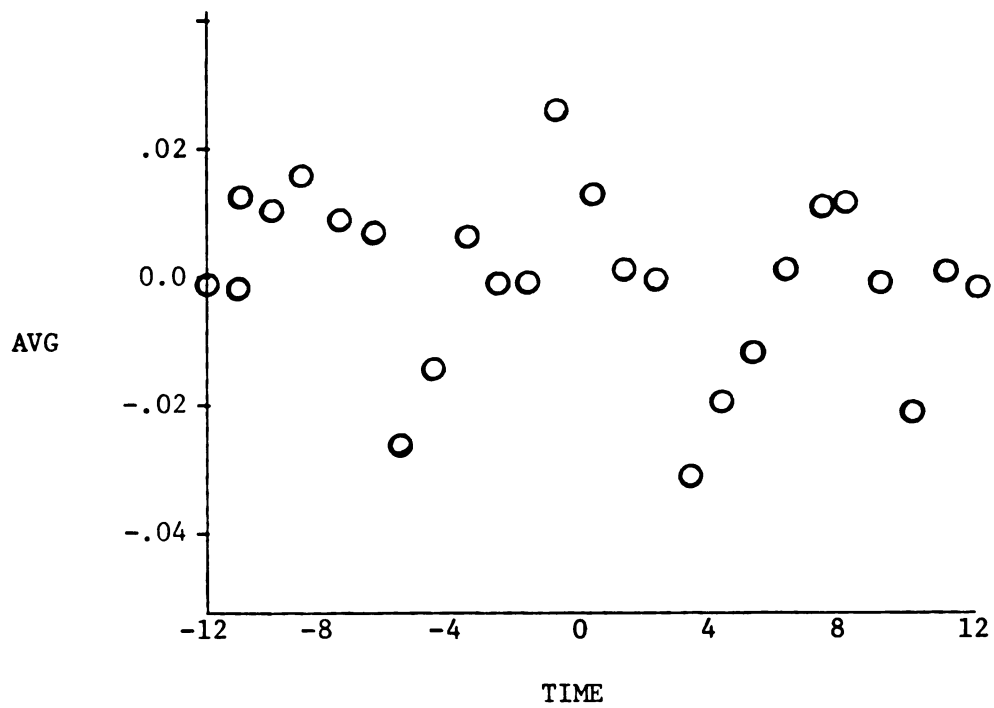


FIGURE 4.3 ABNORMAL RETURNS FOR ALL CHANGE-MIX DIVESTITURES

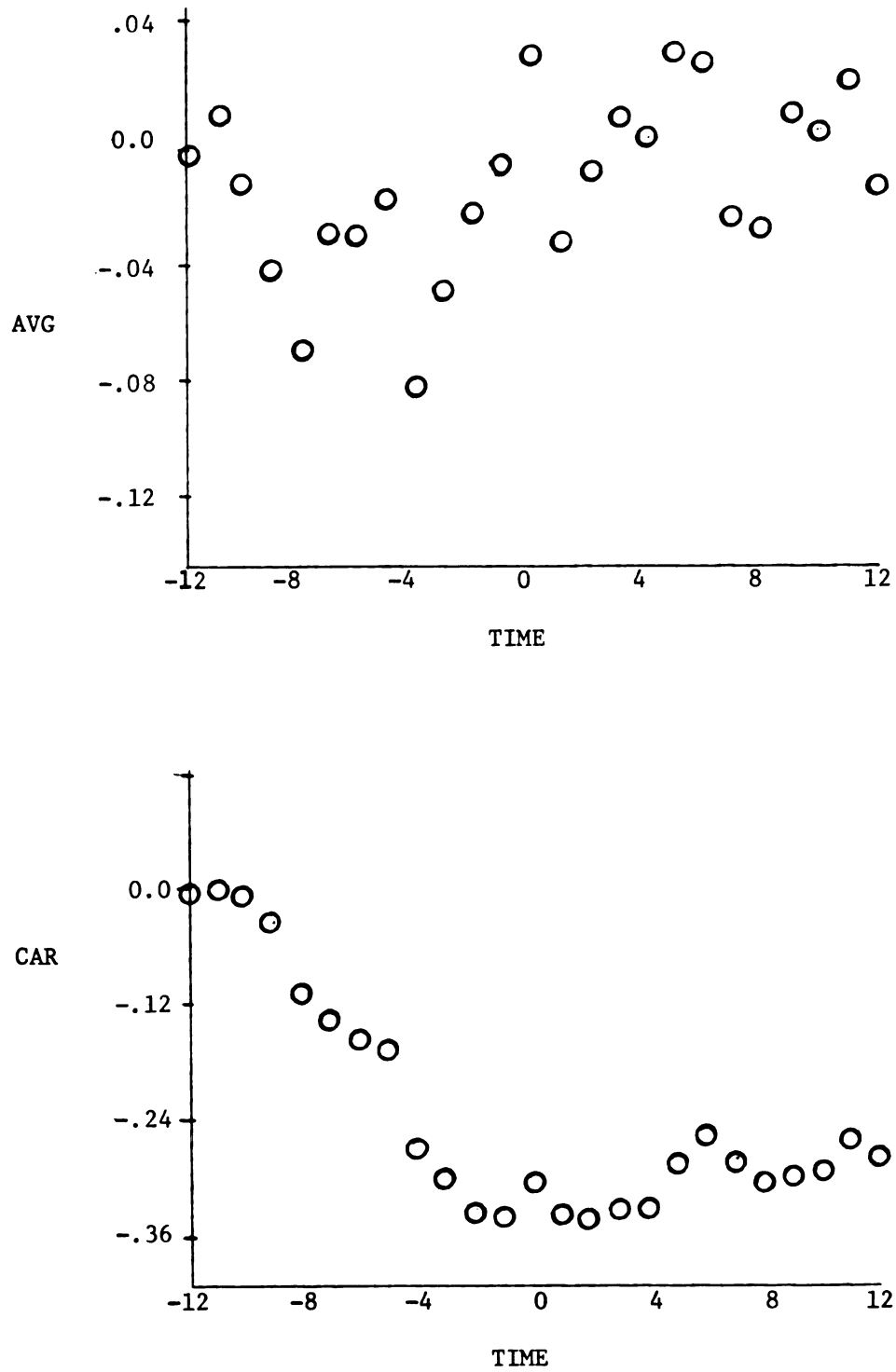


FIGURE 4.4 ABNORMAL RETURNS FOR ALL LOSERS

held to the end of that month. This value was statistically significant and after announcement the market appears to react more favorably toward the firms in the sample and no statistically significant abnormal losses are sustained.

The implications for shareholders is that in a losing situation they can expect to earn less on their investments when compared to other investments of equivalent risk. When the firm takes some definitive action to correct the situation, the market responds and normal returns are earned afterwards. The best strategy for investors would seem to be to sell losers short and cover their positions on announcement of a divestiture made to correct the losing situation.

These results should be qualified in two ways. First, the sample of thirty losers is small when compared to samples sizes in other studies of abnormal returns. This makes it more difficult to find significant results if they exist and to make inferences about the population. Second, the time frame in which the losers announced divestiture was for the period from March, 1970 until December, 1973. This was a period of volatile market behavior and it is possible that the observed abnormal returns are due to extreme overvaluation and undervaluation of shares which may not be duplicated in other time periods. Also, the findings do not lead to any inference as to the long run investor performance in shares of loser firms nor is anything inferred as to the long run effect of the divestiture on firm performance.

A number of the divestitures were small when comparing the value of the divested asset to the size of the divesting firm. The size of divestiture was defined as the ratio of the dollar value of the transaction divided by the book value of the firm's assets as of the fiscal year end just prior to the announcement date. Divestitures for which

the ratio was .04 or greater were considered "large." When only "large" divestitures are considered, statistical significance improves, losses become more pronounced but implication of the findings are not changed.

Figures 4.5 and 4.6 present results for twenty-five large change-mix and fourteen large losing divestitures. The results for the large losers are similar to the previous results though more pronounced. Owners of these stocks would have sustained statistically significant abnormal losses of 58.1 percent if they held through the month before announcement. After announcement there is a recovery in return followed by some further erosion.

The pattern of returns for the large change-mix firms show a significant increase in CAR through the first month after announcement of 18.8 percent. This is followed by oscillation between 12 and 18 percent. The average return in the month after announcement was almost 6 percent and statistically significant. Investors in these firms clearly would have earned some positive abnormal returns as the market responds to the announcement.

All the losing firms except one announced divestitures after March, 1970. To determine if market conditions better explained the return history rather than the motive the voluntary divestitures were classified as to whether announcement occurred before or after March, 1970.

Figure 4.7 presents results for seven large change-mix firms which announced divestitures after March, 1970. It is a small sample but it does show a different return profile than the one shown by the fourteen large losers in Figure 4.6. The CAR before announcement oscillates between positive and negative values and in contrast to the losing firms there is no large decline in CAR before announcement. After

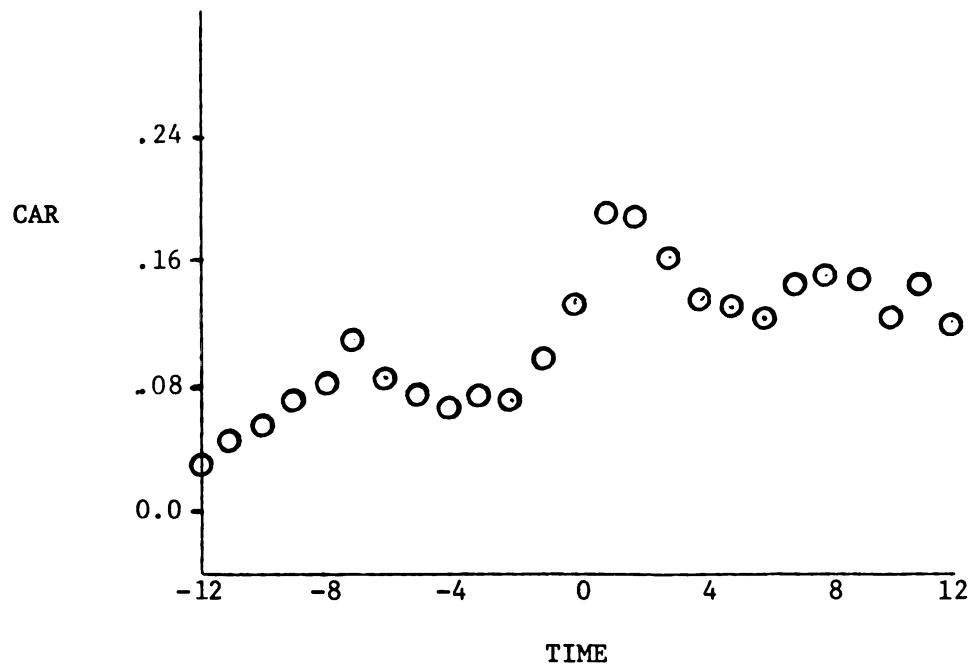
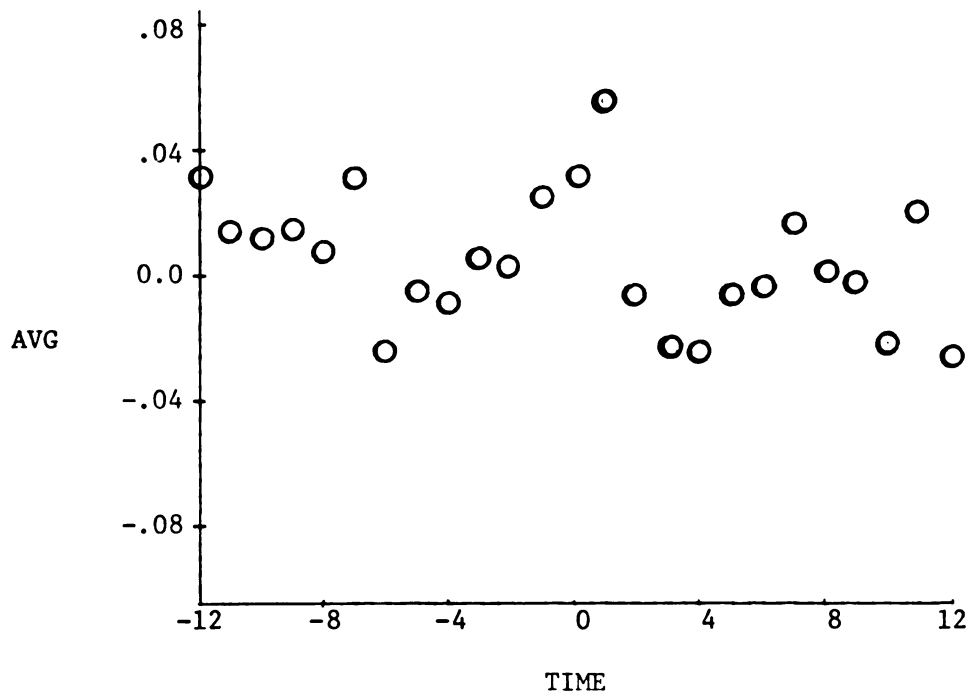


FIGURE 4.5 ABNORMAL RETURNS FOR LARGE CHANGE-MIX DIVESTITURES

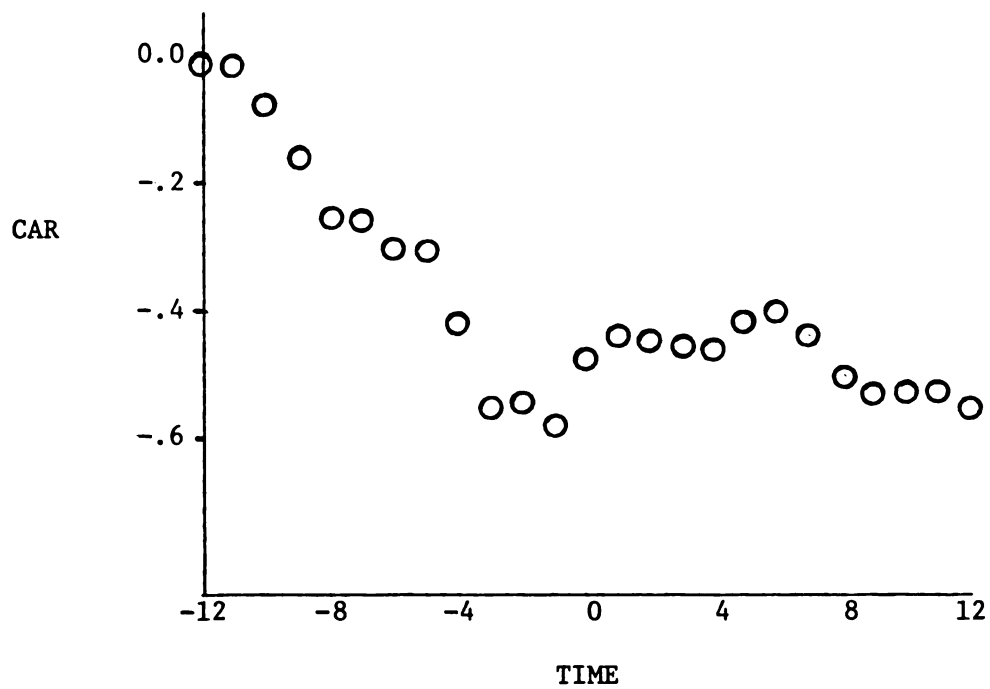
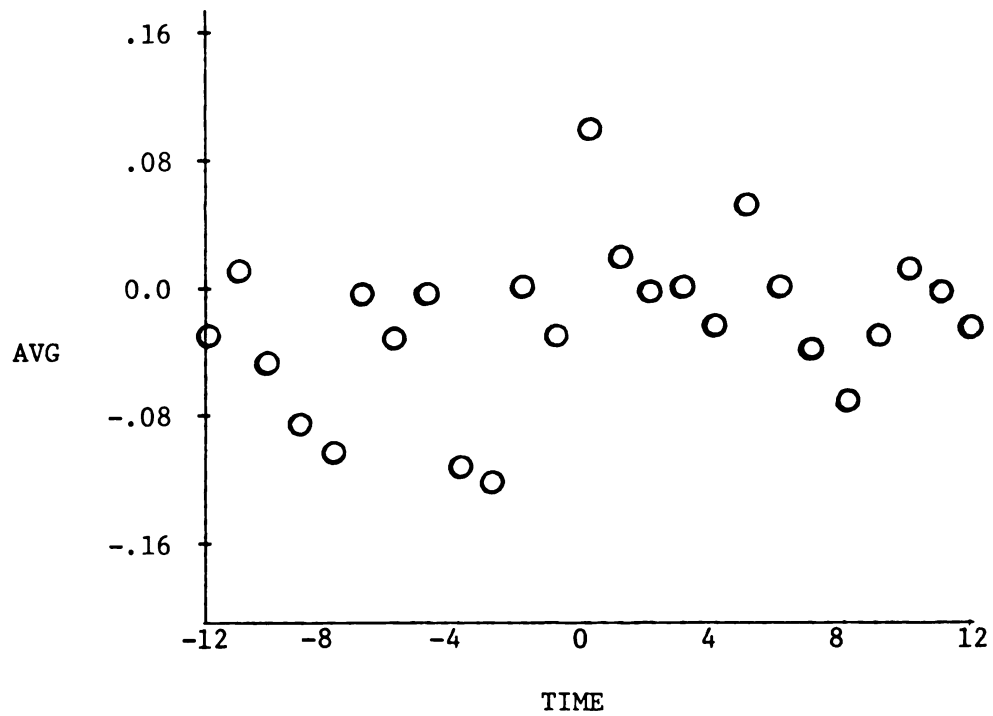


FIGURE 4.6 ABNORMAL RETURNS FOR LARGE LOSERS

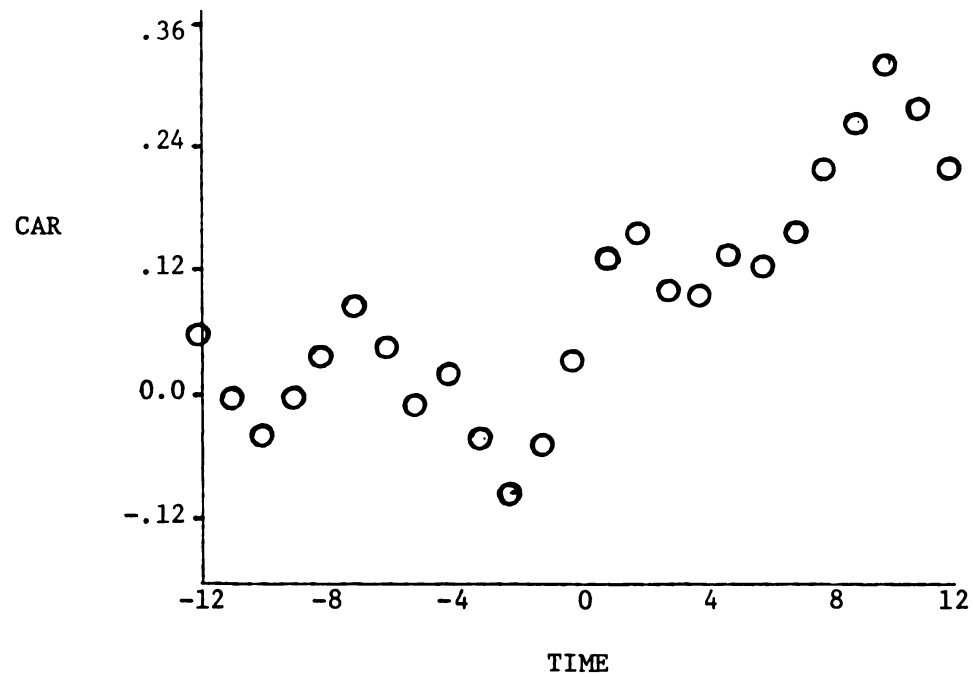
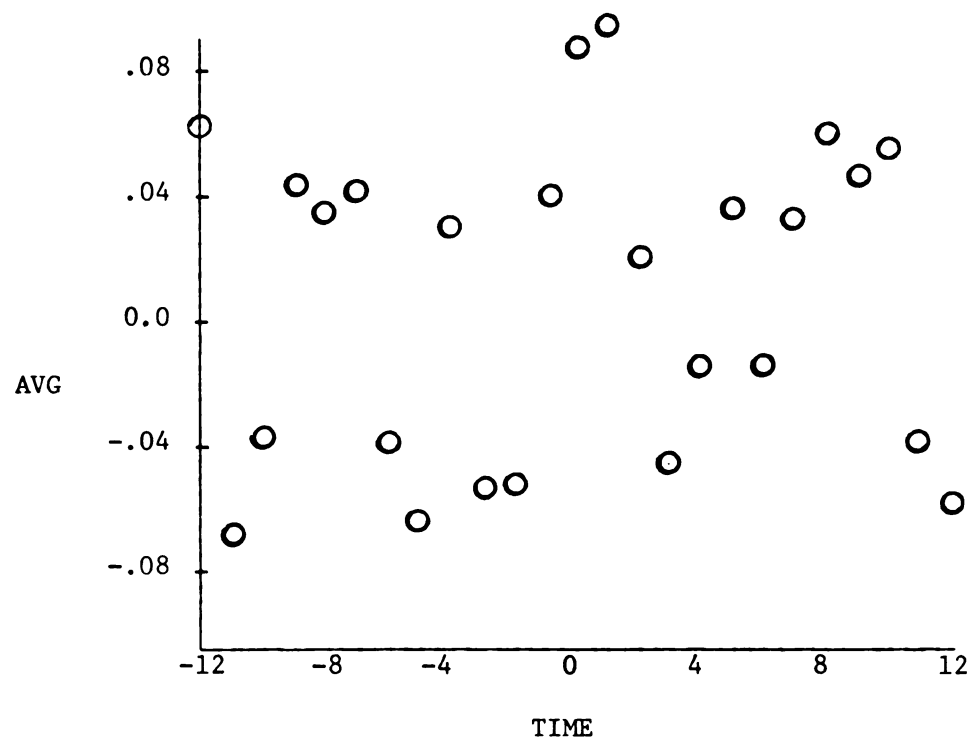


FIGURE 4.7 ABNORMAL RETURNS FOR LARGE CHANGE-MIX DIVESTITURES AFTER MARCH 1970

announcement the CAR increases substantially for this sample. The value of CAR from the announcement month until twelve months after announcement is 27.5 percent and is statistically significant.

These results indicate that the pattern of returns is different for those firms divesting to change the mix of assets as opposed to those firms that divest to correct a losing situation. In addition, it appears that those large change-mix firms announcing a divestiture after March, 1970 earned a larger post-announcement cumulative return than did those change-mix firms announcing divestitures before March, 1970. Market conditions thus seem to have some influence on the magnitude of the returns but they do not hide the basic difference between the change-mix and losers; before announcement the losers are earning large significant negative abnormal returns while the change-mix firms are not. The divestiture announcement is followed by the firms earning generally more normal returns and in the case of large change-mix firms even significantly positive returns.

TEST Statistic

One of the variables calculated for each time period and sample is the TEST statistic described in Chapter 3. This statistic is used to test the hypothesis that the observations used to compute the values of AVG and CAR can be considered to have been randomly selected. If TEST has an absolute value less than 1.96 then we would accept the null hypothesis that the observations are randomly distributed at a significance level of five percent. We can then properly interpret the significance levels for AVG and CAR.

The results show that of the 175 values of AVG computed for this study, the corresponding absolute value of TEST was greater than

1.96 only fourteen times. None of these occurrences were for the involuntary sample. Of the fourteen significant TEST values found in the voluntary group, only one was significant when the t value was significant. These findings indicate that with very few exceptions the samples can be considered to be randomly selected and a t test is appropriate.

Similarly, the results show that of the 175 values of CAR computed for this study the corresponding absolute value of TEST was greater than 1.96 only six times. None of these occurred for the involuntary sample. Three occurred for the two loser groups and none for the large losers. In addition, since Table A4 and A6 in Appendix A show forty-two significant CAR values for the losers group it seems safe to say that the CAR can also be considered to be randomly selected and a t test is appropriate.

Effect of Risk Change on Abnormal Returns

As pointed out in Chapter 2, previous research by Sunder had shown that if the beta coefficient used to compute abnormal returns changes during the twenty-five month observation period the computed abnormal returns may be biased. In the initial stages of this research an investigation was conducted to determine if this situation was present in the current research and if it was a major problem.

Cumulative returns were compared using two methods to estimate beta. The first method used the moving average method of updating beta month by month through the twenty-five month observation period. The second method assumed that beta is constant throughout the observation period and equal to the value twelve months before announcement.

Table 4.3 presents a comparison of cumulative returns for four of the samples of the study. These results which are representative of more extensive computer analysis indicate that the choice of technique did not have much impact on the estimated returns. The results lead the author to conclude that a serious problem did not exist and the moving average technique was used throughout the entire research.

Changes in Risk

The results for changes in risk are presented in Table 4.4. Results are presented for thirty-six involuntary divestitures, fifty-one voluntary divestitures where the motive was to change the investment mix, twenty large change-mix divestitures also contained in the previous sample of fifty-one and twenty divestitures where the motive was to correct a losing situation. The results presented are for paired comparison tests of the change in systematic risk, β , and for the change in unsystematic risk as measured by the correlation coefficient ρ and the standard error of the estimate SE. For example for the fifty-one change-mix firms the results in Table 4.4 indicate that a firm undergoing a change-mix divestiture experienced an average decline of the beta coefficient due to divestiture of .02. This divestiture associated change was not statistically significant since the t statistic was only -.31.

None of the four treatment groups showed a significant change in risk to be associated with the divestiture announcement using the paired comparison t test. This is not to say there are no differences between pre- and post-announcement risk for individual firms, but when compared with the control firms, these differences are not statistically significant. An investor would have observed a similar

TABLE 4.3
CUMULATIVE RESIDUALS USING DIFFERENT ESTIMATES OF RISK

Sample		CAR	CAR
		t = 12, 0	t = -12, 12
All Involuntary	a	.096	.015
	b	.095	.009
All Voluntary	a	-.074	-.069
	b	-.070	-.060
All Losers	a	-.313	-.281
	b	-.307	-.268
Large Change-Mix	a	.131	.120
	b	.125	.109

a = Moving average
b = Constant beta

TABLE 4.4

PAIRED COMPARISON RESULTS
(t values in parenthesis)

51 Change-mix Firms

β	ρ	SE
-.02 (-.31)	.02 (.72)	-.0008 (-1.27)

20 Large Change-mix Firms

β	ρ	SE
-.011 (-.098)	.039 (1.06)	-.001 (-1.01)

20 Losers

β	ρ	SE
-.13 (-.94)	-.004 (-.08)	.002 (.89)

36 Involuntary

β	ρ	SE
.068 (.98)	.025 (.879)	.0003 (.421)

change in risk with any other firm in the same industry. The findings thus show that the divestiture had no impact on either the average systematic risk or unsystematic risk of the firm.

Though the lack of statistically significant changes was not the objective of this research, a similar lack of significance was generally found in the merger studies discussed in Chapter 2. Also, these findings are probably expected given the relative size of the divestiture, the small sample size and the research design. The research design could, of course, only measure changes in average risk levels. If a firm is carrying on other financing and investment activities during the observation period, it is possible that no change is observed if the net results cancel each other. For example, when a firm divests an asset the pattern of cash flows is changed. This change not only affects the expected level of cash flow but the variance and the covariance with the market. It is highly improbable that a change in variability due to divestiture alone can be measured using monthly return data unless accompanying the divestiture is a change in the firm's investment and financing policy or the long run outlook as perceived by investors.

If a firm sells an asset whose covariance with the market (beta) equals the firm's beta, there will be no change in the firm's beta if the proceeds are reinvested in an asset of equal beta. If the firm decides to emphasize a higher or lower beta investment mix, the divestiture announcement should lead to a change in beta. However, this may not come about if the firm simultaneously is changing the financing mix. For instance, the firm may sell off a losing division which has a lower beta than the firm's beta thus increasing the firm

beta but using the proceeds to reduce the debt load and thus tending to decrease beta. The effect may cancel.

CHAPTER 5

SUMMARY, CONCLUSIONS, LIMITATIONS AND SUGGESTIONS FOR FURTHER RESEARCH

Summary

The purpose of this research was to determine the effect of divestiture announcements on the return earned and risk borne by shareholders of divesting firms. The sample consisted of 109 voluntary divesting firms and fifty-three involuntary divesting firms. The period of the announcements was 1962-1973.

This study differs from prior empirical studies of divestiture in three major ways. First, the voluntary sample was further divided into two groups on the basis of whether the announced motive for the divestiture was to change the mix of assets of the firm or else to correct a losing situation. Second, the effect of the announcement on the systematic and unsystematic risk of the firm was investigated. Third, the time period of the study included divestitures during the 1970's when market conditions were volatile and the frequency of divestiture increasing.

The research methodology is similar to other research based on the capital asset pricing model. The measured returns to shareholders were abnormal returns. These are returns above or below the level of return expected given the level of risk. For each sample the average

abnormal returns for all firms in the sample and cumulative average abnormal returns were computed for each month of a twenty-five month period centered on the announcement month.

Returns were computed for seven samples. This includes the entire group of fifty-three involuntary divestitures, the entire group of 109 voluntary divestitures and five additional groups into which the voluntary sample were further classified. One basis of classification was motive; the two motives were either to change the mix of assets or to correct a losing situation. A second basis of classification was size of divestiture. Those divestitures in which the ratio of the value of the divested asset to the total book value of the divesting firm was equal to or exceeded four percent were considered large. Finally, those large divestitures to change the mix of assets which announced after March, 1970 were analyzed to determine if time period had any effect on the returns and if the time period better explained the pattern of returns rather than the motive.

The analysis of changes in risk was conducted using a paired comparison design for four samples of firms. These included fifty-one change-mix divestitures, twenty large change-mix divestitures contained in the first group of fifty-one, twenty divestitures to correct a losing situation and thirty-six involuntary divestitures.

Each firm was matched with a control firm on the basis of industry and asset size. This was done to account for effects on risk other than the divestiture. Estimates of systematic risk and unsystematic risk were computed before and after announcement using the market model and three years of monthly returns before and after announcement. This research design is thus similar to previous studies on risk changes associated with mergers.

In summary, this study has met its objectives. The returns earned and risk borne by shareholders of divesting firms were computed and the effects of the divestiture analyzed. The conclusions drawn from the study are discussed next. A limitation is then discussed and finally suggestions are given for additional research.

Conclusions

The findings of this study show that the pattern of abnormal returns to shareholders depends on the motive for divestiture. The pattern of returns differentiates the voluntary from the involuntary divesting firms and within the voluntary sample differentiates those firms which divest to change the mix of assets from those firms which divest to correct a losing situation.

The author recognizes that the conclusions drawn from the study should be qualified by the degree of significance found and the sample size. Though not every average return or cumulative return was statistically significant (hence implying normal returns were earned) enough are available to yield the conclusions and implications which follow. Also the author recognizes that the magnitude of the returns may change with different time periods and hence are not expected to be duplicated exactly in other time periods.

The pattern for involuntary divesting firms shows positive abnormal returns earned before announcement and negative returns afterwards. For the entire voluntary sample the pattern is reversed with generally negative abnormal returns before and normal returns afterwards. The pattern for the voluntary sample is better explained when the sample

is divided into change mix and loser firms. The results show the change mix firms with generally normal returns before and after announcement while the losers experience significant negative returns before and normal returns after announcement.

These findings imply that while owners of involuntary divesting firms pay a penalty when divestiture is announced, those of voluntary divesting firms do not. Owners of firms which divest to change their mix of assets continue to earn normal returns after divestiture is announced. The most profitable finding to investors is that the significant abnormal negative returns to losing firms are essentially eliminated after the firm takes positive steps to eliminate losing operations or to reduce debt. Those investors who have sold short should probably cover their positions after a divestiture announcement.

The findings apply only to returns in the twenty-five month period about the announcement date. It is possible that longer holding periods would yield different results but then the returns would probably be associated with events other than the divestiture. The study is limited to the abnormal return behavior near the divestiture announcement date. No inference is made as to the long run benefits of the divestiture.

This study did not find a significant change in systematic or unsystematic risk associated with any of the divestiture motives. Of course, the design could only test for long run changes in risk associated with divestiture. For each group, losers, change-mix and involuntary divestitures, the findings are consistent with the hypothesis that the firm continues to invest and finance assets in a manner to keep systematic risk unchanged relative to other firms in its industry. The results for

unsystematic risk support the view that managers of divesting firms did not try to change the level of diversification in their portfolios of assets.

The implication of the findings on change in risk is that investors on the average will continue to experience the same degree of risk after divestiture as they would have experienced if the firm did not divest. Though a change could occur after announcement, the research design did not identify this "instantaneous" change. In any case, if it did exist the firm's management must have carried out other decisions, either financing or investment, which tended to keep the risk level constant relative to other firms in the industry.

Limitations of the Study

The major limitation of the study is the sample size and the time period in which the divestiture took place. The study is restricted as to the size of the population from which the samples can be drawn. As indicated in Chapter 1, divestiture was not a popular event until recently. Also, many divestitures were small relative to the size of the divesting firm and abnormal return behavior may be obscured in the residual noise. A larger sample and more extensive time period would allow stronger conclusions and broader generalizations to be made.

Suggestions for Further Research

The author has determined that four areas of future research on this topic seem especially fruitful.

First, this research only examined the returns to shareholders of divesting firms. It would be interesting to see how owners of the acquiring firms fared in the exchange. The issue involves the synergistic effects of the divestiture and the resulting split of the benefits.

Second, this study excluded spin-offs, the situation in which common stock of the divested subsidiary is distributed to the shareholders of the divesting firm. At the time of the spin-off, the common stock of the divested firm becomes publicly traded and the asset is subject to investor scrutiny as a separate entity. Any inefficiency in valuation of the parent firm before divestiture should be reflected in the subsequent share prices of the parent and spin-off.

Third, this study only examined returns to shareholders of firms which announced divestiture and actually did divest. After announcement some firms decide not to complete the divestiture. For instance if a satisfactory price cannot be agreed upon with the buyer the sale will be postponed. In other instances the firm may reconsider the merits of the particular line of business and decide to keep it. The retention decision has risk and return consequences for the shareholders which would be of interest to owners and managers of the firm.

Finally, the study can be updated to include more recent divestitures and to enlarge the sample size. This would alleviate some of the limitations of the present study and make broader generalizations possible.

APPENDIX A

APPENDIX A

TABLES OF AVG AND CAR

This appendix contains computer printout of the values of the average abnormal returns, AVG, and cumulative average returns, CAR, for each month in this study. This was the source of data from which Tables 4.1 through 4.3 and Figures 4.1 through 4.7 were constructed. The number of each Table in the appendix is matched with a correspondingly numbered Figure in Chapter 4. For example, Table A1 corresponds to Figure 4.1 in Chapter 4.

In each Table three series of numbers are given. First for each month of the twenty-five month observation period the values of AVG for that month and the CAR from the beginning of the observation period to the end of that month are given. For example, in Table A1 the value of AVG in month 0, the announcement month, is .00429. The cumulative returns from the beginning of the twenty-five month observation period until the end of the announcement month is .09654. Last is given cumulative returns from the beginning of the announcement month until the end of each month following announcement with the exception of the first month. For example, in Table A1 the cumulative return from the beginning of the announcement month until the end of the twelfth month following announcement is -.07713.

TABLE A1

ABNORMAL RETURNS FOR ALL INVOLUNTARY DIVESTITURES

MONTH	AVG	CAR
-12	0.02411	0.02411
-11	0.00266	0.02677
-10	-0.00579	0.02098
-9	-0.01097	0.01001
-8	0.02583	0.03584
-7	0.01506	0.05090
-6	-0.01893*	0.03197
-5	0.04686*	0.07883*
-4	0.03147*	0.11031*
-3	0.01980	0.13010*
-2	0.00098	0.13108
-1	-0.03883*	0.09225
0	0.00429	0.09654
1	0.01478	0.11133
2	-0.01947	0.09185
3	-0.00211	0.08974
4	-0.01135	0.07839
5	0.02389	0.10228
6	0.01720	0.11948
7	-0.00453	0.11495
8	-0.02208	0.09286
9	-0.03009	0.06277
10	-0.01187	0.05090
11	-0.00534*	0.04556
12	-0.03044*	0.01512

MONTHS	CAR
0 TO 12	-0.07713
0 TO 11	-0.04669
0 TO 10	-0.04135
0 TO 9	-0.02948
0 TO 8	0.00061
0 TO 7	0.02269
0 TO 6	0.02723
0 TO 5	0.01003
0 TO 4	-0.01387
0 TO 3	-0.00251
0 TO 2	-0.00040

* Significant at 5% level

TABLE A2

ABNORMAL RETURNS FOR ALL VOLUNTARY DIVESTITURES

MONTH	AVG	CAR
-12	0.00584	0.00584
-11	0.00921	0.01504
-10	0.00084	0.01588
-9	0.00582	0.02170
-8	-0.01160	0.01011
-7	-0.00075	0.00935
-6	-0.02240	-0.01305
-5	-0.01825	-0.03130
-4	-0.03000*	-0.06129
-3	-0.02334	-0.08463*
-2	-0.01626	-0.10089*
-1	0.00950	-0.09139*
0	0.01733	-0.07406
1	-0.00259	-0.07665
2	-0.00016	-0.07681
3	-0.01445	-0.09126*
4	-0.00922	-0.10048*
5	0.00324	-0.09724
6	0.00918	-0.08806
7	0.00301	-0.08505
8	0.00418	-0.08087
9	0.00558	-0.07529
10	-0.00303	-0.07832
11	0.01119	-0.06713
12	-0.00173	-0.06886

MONTHS	CAR
0 TO 12	0.02253
0 TO 11	0.02426
0 TO 10	0.01307
0 TO 9	0.01610
0 TO 8	0.01052
0 TO 7	0.00633
0 TO 6	0.00333
0 TO 5	-0.00585
0 TO 4	-0.00909
0 TO 3	0.00013
0 TO 2	0.01458

* Significant at 5 % level

TABLE A3

ABNORMAL RETURNS FOR ALL CHANGE-MIX DIVESTITURES

MONTH	AVG	CAR
-12	-0.00061	-0.00061
-11	0.01226	0.01165
-10	0.01079	0.02244
-9	0.01694	0.03938
-8	0.00943	0.04881
-7	0.00716	0.05598
-6	-0.02669*	0.02929
-5	-0.01498	0.01431
-4	0.00673	0.02104
-3	-0.00102	0.02001
-2	-0.00002	0.01999
-1	0.02613	0.04611
0	0.01346	0.05957
1	0.00246	0.06203
2	0.00027	0.06231
3	-0.03162*	0.03068
4	-0.01901	0.01167
5	-0.01102	0.00065
6	0.00265	0.00330
7	0.01195	0.01525
8	0.01375	0.02900
9	-0.00273	0.02627
10	-0.02024	0.00603
11	0.00424	0.01027
12	-0.00226	0.00800

MONTHS	CAR
0 TO 12	-0.03811
0 TO 11	-0.03585
0 TO 10	-0.04008
0 TO 9	-0.01984
0 TO 8	-0.01712
0 TO 7	-0.03086
0 TO 6	-0.04281
0 TO 5	-0.04546
0 TO 4	-0.03444
0 TO 3	-0.01543
0 TO 2	0.01619

* Significant at 5 % level

TABLE A4
ABNORMAL RETURNS FOR ALL LOSERS

MONTH	AVG	CAR
-12	-0.00194	-0.00194
-11	0.01126	0.00932
-10	-0.01118	-0.00186
-9	-0.04026 *	-0.04212
-8	-0.06919 *	-0.11131 *
-7	-0.02969	-0.14099 *
-6	-0.02932	-0.17031 *
-5	-0.01760 *	-0.18791 *
-4	-0.08216 *	-0.27007 *
-3	-0.04959	-0.31966 *
-2	-0.02228	-0.34194 *
-1	-0.00485	-0.34680 *
0	0.03383	-0.31297 *
1	-0.03121	-0.34418 *
2	-0.00779	-0.35197 *
3	0.01131	-0.34065 *
4	0.00605	-0.33461 *
5	0.03599	-0.29862 *
6	0.03094	-0.26769 *
7	-0.02291	-0.29060 *
8	-0.02736	-0.31796 *
9	0.01395	-0.30400 *
10	0.00747	-0.29654 *
11	0.02695	-0.26959 *
12	-0.01121	-0.28079

MONTHS	CAR
0 TO 12	0.06601
0 TO 11	0.07721
0 TO 10	0.05026
0 TO 9	0.04279
0 TO 8	0.02884
0 TO 7	0.05620
0 TO 6	0.07911
0 TO 5	0.04818
0 TO 4	0.01219
0 TO 3	0.00614
0 TO 2	-0.00517

* Significant at 5% level

TABLE A5
ABNORMAL RETURNS FOR LARGE CHANGE-MIX DIVESTITURES

MONTH	AVG	CAR
-12	0.03042	0.03042
-11	0.01495	0.04537
-10	0.01132	0.05669
-9	0.01648	0.07317
-8	0.00839	0.08156
-7	0.03280	0.11436
-6	-0.03231 *	0.08206
-5	-0.00588	0.07618
-4	-0.00952	0.06666
-3	0.00665	0.07330
-2	-0.00332	0.06998
-1	0.02879	0.09877
0	0.03203 *	0.13080
1	0.05719 *	0.18799 *
2	-0.00524	0.18275
3	-0.02243	0.16032
4	-0.02328	0.13704
5	-0.00674	0.13030
6	-0.00341	0.12688
7	0.01968	0.14656
8	0.00283	0.14939
9	-0.00108	0.14831
10	-0.02241	0.12590
11	0.02136	0.14726
12	-0.02688	0.12038

MONTHS	CAR
0 TO 12	0.02161
0 TO 11	0.04849
0 TO 10	0.02713
0 TO 9	0.04954
0 TO 8	0.05063
0 TO 7	0.04779
0 TO 6	0.02811
0 TO 5	0.03153
0 TO 4	0.03827
0 TO 3	0.06155
0 TO 2	0.08398

* Significant at 5% level

TABLE A6

ABNORMAL RETURNS FOR LARGE LOSERS

MONTH	AUG	CAR
-12	-0.03466	-0.03466
-11	0.01239	-0.02227
-10	-0.05367	-0.07594
-9	-0.08643*	-0.16237*
-8	-0.10082*	-0.26319*
-7	-0.00861	-0.27180*
-6	-0.03794	-0.30974*
-5	-0.00796	-0.31770*
-4	-0.11131*	-0.42901*
-3	-0.12218*	-0.55119*
-2	0.00248	-0.54871*
-1	-0.03243	-0.58114*
0	0.10688*	-0.47427*
1	0.02476	-0.44950*
2	-0.00601	-0.45552*
3	0.00279	-0.45272*
4	-0.02184	-0.47457*
5	0.05867	-0.41590*
6	0.00707	-0.40883*
7	-0.03956	-0.44839*
8	-0.07048	-0.51887*
9	-0.02848	-0.54735*
10	0.01692	-0.53042*
11	-0.00717	-0.53760*
12	-0.02553	-0.56313

MONTHS	CAR
0 TO 12	0.01802
0 TO 11	0.04354
0 TO 10	0.05072
0 TO 9	0.03380
0 TO 8	0.06227
0 TO 7	0.13275
0 TO 6	0.17231
0 TO 5	0.16524
0 TO 4	0.10658
0 TO 3	0.12842
0 TO 2	0.12563

* Significant at 5% level

TABLE A7

ABNORMAL RETURNS FOR LARGE CHANGE-MIX DIVESTITURES AFTER MARCH 1970

MONTH	AVG	CAR
-12	0.06522	0.06522
-11	-0.06781	-0.00259
-10	-0.03737	-0.03996
-9	0.04694	0.00698
-8	0.03819	0.04517
-7	0.04243	0.08760
-6	-0.03820	0.04939
-5	-0.06286	-0.01347
-4	0.03276	0.01929
-3	-0.06430*	-0.04500
-2	-0.05092	-0.09593
-1	0.04280	-0.05313
0	0.08825	0.03513
1	0.09667	0.13180
2	0.02270	0.15449
3	-0.04460	0.10989
4	-0.01322	0.09668
5	0.03929	0.13597
6	-0.01451	0.12145
7	0.03408	0.15553
8	0.06259*	0.21813
9	0.04632	0.26445
10	0.05686	0.32130
11	-0.03926	0.28204
12	-0.05942	0.22262

MONTHS	CAR
0 TO 12	0.27575*
0 TO 11	0.33517*
0 TO 10	0.37443*
0 TO 9	0.31757*
0 TO 8	0.27125*
0 TO 7	0.20866*
0 TO 6	0.17458*
0 TO 5	0.18909*
0 TO 4	0.14980*
0 TO 3	0.16302*
0 TO 2	0.20762*

* Significant at 5% level

APPENDIX B

APPENDIX B

MARKET WIDE PARAMETERS

This appendix contains the estimates of the marketwide parameters γ_0 and γ_1 used in the authors' research. These estimates were computed using the technique described by Fama and MacBeth and were provided by Rozeff and Kinney from the University of Iowa. The estimates are for each month from January, 1960 through December, 1974.

	γ_0	γ_1
January 1960	0.03704	0.17321
	-0.02530	0.03463
	-0.01117	-0.03036
	0.01521	0.13308
	0.07360	0.07744
	-0.08706	0.07794
	0.04251	0.13180
	-0.03410	-0.00823
	0.02034	0.02126
	0.09130	0.01472
	0.13340	-0.05700
December 1960	-0.05217	-0.01343
	0.02014	-0.03327
	-0.05270	-0.05963
	-0.11316	0.00009
	-0.03351	-0.03379
	0.07073	-0.00075
	-0.04956	-0.08192
	-0.05992	0.01822
	0.06427	-0.02777
	0.01189	0.02030
	-0.03761	0.01374
	0.03765	-0.06725
December 1961	0.07242	0.04076
	0.09306	0.00063
	-0.04609	-0.01468
	-0.05294	0.03188
	-0.10779	-0.02802
	-0.00315	-0.06810
	0.05978	-0.05424
	-0.08104	-0.01680
	0.04081	-0.00065
	0.05134	0.02867
	-0.01556	0.06758
	0.04765	-0.00076
December 1962	-0.00916	0.10647
	-0.00315	-0.06467
	0.11812	-0.00676
	0.01961	-0.01359
	0.02678	0.12810
	0.03267	-0.02412
	-0.05198	0.05339
	-0.05869	-0.06978
	0.05679	0.03649
	0.02616	-0.02149
	-0.00181	-0.01411
	-0.00704	-0.02296
December 1963	0.02222	-0.03616

	γ_0	γ_1
January 1964	-0.00307	0.02225
	-0.00695	-0.02051
	-0.01302	-0.00149
	0.02991	0.00474
	0.01556	0.00206
	-0.01981	-0.01144
	0.00788	-0.02878
	-0.01508	-0.09372
	-0.03188	0.03826
	-0.00054	-0.05700
	0.08286	-0.00830
December 1964	0.01422	-0.01065
	0.04098	-0.01982
	0.04264	-0.00360
	0.00921	0.01568
	0.05941	0.13365
	0.00707	0.04202
	0.02313	-0.00930
	0.01278	0.02693
	-0.01934	0.00217
	-0.01140	-0.04156
	0.03639	0.03613
	-0.02566	0.02689
December 1965	0.03331	0.02171
	-0.05661	0.01390
	0.02744	-0.01859
	-0.01258	0.00079
	0.00323	0.02486
	-0.04467	-0.03879
	-0.00100	-0.00054
	0.02305	0.01092
	-0.00235	-0.07459
	-0.07762	-0.08012
	-0.01995	-0.09475
	0.10421	-0.05771
December 1966	0.00501	0.00028
	0.02967	0.03461
	0.08201	0.00612
	0.05449	0.01414
	-0.00668	-0.00762
	0.02799	0.00550
	-0.00012	0.01022
	0.01299	0.02613
	-0.01231	-0.04333
	-0.03019	0.02406
	-0.00255	0.01579
	-0.02780	-0.01602
December 1967	-0.04030	-0.07148

	γ_0	γ_1
January 1968	-0.00589	-0.03584
	-0.03777	0.00465
	-0.06690	-0.04220
	-0.01704	-0.00950
	0.04915	0.02821
	0.01515	-0.02046
	0.03726	-0.04425
	-0.01056	-0.03106
	-0.05549	-0.04216
	-0.00348	0.02673
	0.05334	-0.00890
December 1968	-0.01342	-0.06072
	-0.03918	-0.05124
	0.04196	-0.00280
	-0.06658	-0.03090
	0.11667	-0.07439
	0.05709	-0.02069
	0.00643	0.01663
	0.03868	-0.02621
	-0.00984	0.04764
	-0.02478	0.05014
	0.00094	-0.02044
	0.01597	0.02651
December 1969	0.05033	-0.04136
	0.01274	0.01781
	0.00620	-0.02021
	0.07079	-0.00159
	-0.02917	-0.02360
	0.06222	0.02333
	0.01263	0.03683
	-0.00261	-0.05744
	0.03557	0.06207
	0.03504	0.06534
	0.03965	0.06267
	0.05991	0.09082
December 1970	-0.01801	0.06697
	-0.10231	0.02132
	-0.02650	-0.03992
	-0.04909	-0.07065
	0.09530	0.01065
	0.15104	0.03098
	0.03674	0.02160
	0.00661	0.06960
	0.04968	-0.00605
	0.01390	-0.01373
	0.00150	0.03485
	-0.02224	-0.07646
December 1971	0.01305	0.09712

	γ_0	γ_1
January 1972	0.08474	-0.05889
	-0.04250	0.03573
	0.04748	-0.02506
	0.02390	0.00532
	-0.01715	-0.07328
	0.03277	-0.01024
	-0.03665	-0.09115
	-0.07205	0.06133
	-0.03252	0.01664
	-0.06410	-0.09811
	-0.03376	0.02124
December 1972	-0.05548	-0.12874
	-0.05012	-0.10984
	0.02002	0.06588
	0.14861	-0.10508
	-0.03972	0.02492
	0.13828	0.02814
	0.04682	0.03958
	-0.03736	-0.04325
	-0.06184	0.08590
	-0.01021	-0.04651
	-0.04647	0.06068
	0.09503	0.03604
December 1973	-0.00960	0.02343
	-0.03341	-0.04140
	-0.06735	-0.01890
	-0.03617	-0.05080
	0.01976	-0.04416
	-0.06543	-0.08154
	-0.00647	-0.08661
	-0.11383	-0.02731
	0.15867	-0.02459
	0.08098	-0.01781
	-0.13596	-0.06868
	0.16531	0.00513
December 1974	0.01713	0.02105

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